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New taxa and distributional notes on *Abbottella* and related taxa (Gastropoda: Littorinoidea: Annulariidae)

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Abstract

Seven new species of *Abbottella* and related taxa are described from Hispaniola: *Abbottella calliotropis* n. sp., *Abbottella diadema* n. sp., *Abbottella dichroa* n. sp., *Abbottella nitens* n. sp., *Abbottella paradoxa* n. sp., *Abbottella tenebrosa* n. sp., and *Leiabbottella thompsoni* n. sp. Distributional and habitat notes are given for additional taxa.

Key words: Annulariidae, *Abbottella*, *Lagopoma*, *Leiabbottella*, *Rolleia*, Hispaniola, new species

Introduction

Abbottella species are a highly endemic group of land snails living in Hispaniola with a single species in eastern Cuba. Most are known chiefly from Puerto Plata to the Samaná Peninsula in the Cordillera Septentrional that forms the northern coast of the Dominican Republic. A second, lowland group occupies the easternmost portion of the island from the coast west to Santo Domingo. A few puzzling outliers occur at Isla Beata and near Thomazeau, Haiti. Many species are known only from the type locality, or from an unknown locality, and thus their actual distributions remain unclear. Based on material from the Florida Museum of Natural History, the collection of Jozef Grego, and the author's collection, it is now possible to fill in some of these gaps in their distributional records. Although the family was extensively reviewed by Bartsch (1946), he lacked material from the eastern end of Hispaniola, which is shown to harbor several new species, described herein.

Most species are associated with limestone outcrops, often in humid forests. Even those species living in the lowlands away from the mountain ranges occur on isolated limestone ridges. Limestone deposits mainly exist on the coast, whereas the interior mountain ranges are primarily igneous and do not harbor these snails (F. Thompson, UF, pers. comm., March, 2013). The ranges of most species appear to be quite small; some probably occur along bluffs of ca. 20 km or less. Fortunately, some species have at least a portion of their range in protected areas such as Parque Nacional Del Este, Parque Nacional Isabel De Torres, and Parque Nacional El Choco. Despite their narrow ranges, individuals are often locally abundant.

Abbottella and its relatives appear to have evolved on mainland Hispaniola and were not part of the Tiburon Peninsula species assemblage tectonically rafted to the island (Watters, 2006). A single species occurs in Cuba, *A. decolorata* (Pfeiffer, 1859), which belongs to the subgenus *Gundlachtudora*. However, that species occurs in Guantánamo, the easternmost point on Cuba. That is less than 90 km away from the western-most point of northern Haiti at Bombardopolis, where *A. bompardopolensis* Bartsch, 1946, occurs, which significantly is also a *Gundlachtudora* (there are only three taxa total). In all likelihood *A. decolorata* was the result of rafting across this strait from Haiti. Preliminary radular and phylogenetic studies (in prep.) clearly indicate that *Abbottella* and its relatives are a distinct monophyletic group apart from the rest of the Annulariidae.

Abbottella may be organized into five species complexes based on conchological characteristics; these groups may be worthy of subgeneric status. One complex has subdued sculpture, a globose shell with a high spire, and a metallic sheen to the shell. It occurs along the Cordillera Septentrional from Sósua to Higüey. The group consists of *A. mellosa* Watters & Duffy, 2010, and *A. nitens* new species.

A second complex has small, compact shells covered with numerous, minute pustules or points, the shells often white or scarcely patterned, with only moderately expanded outer lips. This group occurs in the lowlands on the southeastern coast from Santo Domingo to the easternmost portion of the island and north to the Samaná Peninsula. It consists of *A. milleacantha* Watters & Duffy, 2010, *A. aenea* Watters, 2010, *A. tentorium* (Pfeiffer, 1850), *A. urbana* Watters, 2012, *A. crossei* (Pilsbry, 1933), and *A. calliotropis* new species. Bartsch (1946) had little material from this region and most of the taxa there were unknown to him.

A third complex consists of species with rather large, openly coiled to nearly planispiral shells with pronounced prickly sculpture and widely expanded outer lips; the shells are often strongly patterned. The group contains *A. haitensis* Bartsch, 1946, and *A. moreletianus* (Crosse, 1873). Bartsch (1946) broke *A. moreletianus* into five subspecies. Zoogeographically, this group presents a problem: the two species occur at opposite ends of the island (Thomazeau, Haiti and the Samaná Peninsula and environs). This group will be addressed in a future study.

A fourth complex consists of species with small, turbate shells, strongly sculptured with the outer lip serrate or undulating. The group is distributed in the Cordillera Septentrional from Sósua to the eastern tip of the Samaná Peninsula. It contains *A. rosaliae* (Pfeiffer, 1858) and *A. abbotti* Bartsch, 1946. *Abbottella gabbi* (Crosse, 1873) may belong to this group as well.

The fifth complex consists of species with generally large, turbate shells with minute sculpture often arranged in blocks; the outer lip is broadly expanded and the shells are usually darkly colored. It occurs along most of the Cordillera Septentrional, from Puerto Plata through the Samaná Peninsula. The group consists of *A. newcombi* (Crosse, 1873), *A. samanensis* Bartsch, 1946, *A. sanchezi* Bartsch, 1946, *A. adolfi* (Pfeiffer, 1852), *A. dichroa* new species, *A. tenebrosa* new species, and *A. wilhelmi* (Pfeiffer, 1858).

The several remaining species do not fit into the above species complexes. *Abbottella harpeza* Watters & Duffy, 2010, from Isla Beata, somewhat resembles *A. gabbi* but occurs nearly 200 km away from any other *Abbottella* species. The peculiar sculpture of *A. diadema* new species is so unique that this species may warrant a new genus to contain it.

There are several apparently related taxa to *Abbottella*: *Lagopoma*, *Rolleia*, and *Leiabbottella*. *Lagopoma* contains a single species, *L. lagopoma* Bartsch 1946, that differs from *Abbottella* in the form of the outer lip. *Rolleia* differs from *Abbottella* in lacking spiral sculpture and consists of *R. martensi* (Maltzan, 1888), *R. haitensis* Bartsch, 1946, and *R. oberi* Watters & Duffy, 2010. *Leiabbottella* contains species lacking all sculpture except for finely incised axial grooves: *L. galaxius* Watters, 2010, *L. soluta* (Pfeiffer, 1852), and *L. thompsoni* new species. The two species of the *Abbottella* subgenus *Gundlachtudora* in Hispaniola, *A. bombardopolensis* (Bartsch, 1946) and *A. paradoxa* new species, united by their opercular characteristics, are geographically separated by ca. 200 km.

Material and methods

The material used in this study was largely derived from the extensive collections made by Dr. Fred Thompson in Hispaniola now contained in the collection of the Florida Museum of Natural History. The study was supplemented by additional material from the author's collection and that of Jozef Grego, Slovak Republic. Descriptions and measurements were based on shells oriented with the spire up and the aperture facing the viewer. Length was measured from the tip of the protoconch (or teleoconch of decollate specimens) to the opposite anterior-most extension of the outer lip. Width was measured from the left edge of the adult whorl to the opposite maximum right extension of the outer lip. Subsets of the largest and smallest adult specimens were selected by eye from all available specimens and measured to determine the actual minimum and maximum lengths. The number of whorls was determined using the 1 D method of Van Osselaer (1999). Place names important to this study are mapped in Figure 6.

Abbreviations

ANSP	Academy of Natural Sciences, Philadelphia, Pennsylvania, USA
BMSM	Bailey-Matthews Shell Museum, Sanibel, Florida, USA
GTW	Collection of the author, Columbus, Ohio, USA
Grego	Collection of Jozef Grego, Banská Bystrica, Slovak Republic

MNHN	Muséum national d'Histoire naturelle, Paris, France
NHMUK	Natural History Museum, London, UK
OSUM	Ohio State University Museum of Biological Diversity, Columbus, Ohio, USA
UF	Florida Museum of Natural History, Gainesville, Florida, USA
USNM	National Museum of Natural History, Washington, D.C., USA

Taxonomy

Annulariidae Henderson & Bartsch, 1920

Annulariinae Henderson & Bartsch, 1920
 Type genus: *Annularia* Schumacher, 1817

Diagnosis. Shells to ca. 30 mm in width, helicoid to high-spined, often with a reflected lip at maturity. Spire typically decollate. Many taxa wholly or partially solute. Shell sculpture usually present, rarely produced into short spines or serrations. Spiral sculpture usually as cords or threads, axial sculpture as lamellae. In some Cuban and Bahamian taxa breathing devices are developed, varying from simple punctures to elaborate internal and external siphons. Operculum present, varying from paucispiral to multispiral. Operculum often with a calcareous deposit that may take the form of erect spiral lamellae, overlapping plates, or pin-wheel-like extensions.

Animals with bifid snout and foot longitudinally bisected into lobes. Locomotion ditaxic between lobes of foot. Taenioglossate radula with a rachidian, a single pair of laterals, and two pairs of marginals. The rachidian and lateral teeth usually unicuspid, very rarely multicuspid. Inner marginal multicuspid. Outer marginal pectinate.

Genus *Abbottella* Henderson & Bartsch, 1920

Subgenus *Abbottella* Henderson & Bartsch, 1920

Type species by original designation *Chondropoma moreletianum* Crosse, 1873.

Diagnosis. Small (generally <10 mm in width), depressed, widely umbilicate helicoid. Widely expanded, often fimbriated peristome. Axial and spiral sculpture usually present, usually forming cusps or serrations at their intersections. Multispiral operculum with erect, calcified spiral lamella. Radula with bicuspid inner marginal; inner cusp much larger than outer one.

Abbottella (Abbottella) calliotropis new species

Figures 1 A–E, 5 O, 7 A

Type material. UF 456810, holotype; length, 6.3 mm; width, 7.5 mm. UF 216131, 59 paratypes, from the type locality.

Type locality. Dominican Republic, La Altagracia Province, along Rio Yuna, 2 km S of La Guana. ca. 18.79° N, -68.67° W.

Other material examined. UF 216131, 17 juvenile, broken, or weathered specimens, all from the type locality; GTW 7085a, 1 specimen, 8 km E of Higüey, La Altagracia Province, Dominican Republic.

Distribution and habitat. Probably along the eastern edge of the easternmost outcrops of the cordillera in La Altagracia Province. Specimens were found under rocks in adjacent fields.

Description. Shell small (largest specimen, 7.0 mm total length x 8.3 mm total width; smallest specimen, 4.6 mm total length x 5.5 mm total width; holotype, 6.3 mm total length including peristome x 7.5 mm total width including peristome), depressed turbinate, whorls adnate except just before lip. Umbilicus wide, ca. 33% of total width, open to earliest whorls. Protoconch of ca. 1.25–1.5 smooth whorls but demarcation between protoconch and teleoconch not well-defined. Teleoconch of 3–3.25 whorls. Axial sculpture of 64–90 threads only indicated by their sculpture over the spiral cords. Irregular “empty” spaces interspersed may be growth stops. Spiral sculpture of 10–

17 low, weak cords; generally 5–9 above the periphery, one peripheral, 4–7 below periphery into umbilicus. Peripheral and umbilical cords strongest. Intersections of primary axial and spiral sculpture form minute pustules or denticles, most developed as serrate denticles on sutural, peripheral, and umbilical cords, as minute pustules elsewhere. Suture deeply channeled, bounded by serrate cords above and below. Aperture double, circular (3.5 mm maximum width in holotype), solute or barely adnate to final whorl. Inner lip smooth, moderately exerted. Outer lip expanded, composed of numerous lamellae, narrowest at the 11 o'clock position, slightly auriculate. Base color of shell white, tan, or dark brown patterned with diffuse, broken, brown spiral bands, often reduced to spots, bands apparent on both sides of outer lip; denticles and pustules white. Operculum multispiral with an calcareous lamella; lamella arises obliquely, then curves to vertical.

Variation in specimens. 78 specimens seen. Shells vary in degree of coloration and number of axial threads (64–90) and spiral cords (10–17).

Comparison with other species. *Abbottella calliotropis* is part of the group of small, turbate species with fine, prickly or pustulose sculpture. They occur in the easternmost parts of the island. This species is most similar to *A. crossei* (Figure 3 S–W) but the sculpture is not as prickly; *A. crossei* has two keels on the body whorl whereas *A. calliotropis* has only one. *Abbottella moreletiana wetmorei* Bartsch, 1946, from Pelican Key off the Samaná Peninsula, has similar coloration but has 39 strong axial lamellar ribs on the final whorl in comparison with the 64–90 nearly obsolete axial threads in *A. calliotropis*. *Abbottella calliotropis* differs from *A. tentorium* (Pfeiffer, 1850), *A. urbana* Watters, 2012, *A. aenea* Watters, 2010 (Figure 3 N–R), and *A. milleacantha* Watters & Duffy, 2010 (Figure 3 X–BB), in having fewer spiral cords, more pronounced denticles, and a peripheral keel of larger denticles.

Remarks. Some specimens have been damaged in the same manner—the shell is broken open on the first half of the final whorl (Figure 5 O). This suggests that all were killed by the same type of predator. This same breakage is seen in *A. diadema*, *A. dichroa*, and *A. nitens*. It is curious that this damage seems to be limited to the Samaná Peninsula and eastern La Altagracia Province.

Etymology. Gr. *kallos*, beauty + Gr. *trope*, a turning.

Abbottella (Abbottella) diadema new species

Figures 1 F–J, 5 P, 7 B

Type material. UF 456814, holotype; length, 5.1 mm; width, 6.0 mm. UF 456815, 5 paratypes, from the type locality.

Type locality. Dominican Republic, Samaná Province, Cabo Cabrón, at 280 m. ca. 19.34° N, -69.25° W.

Other material examined. UF 215985, 44 specimens, from the type locality (see Remarks).

Distribution and habitat. Known only from the type locality. This region is on the northeastern tip of the Samaná Peninsula; it is part of the Sierra de Samaná of the Cordillera Septentrional and is locally known as Loma Travesada, which name appears on the original label. Specimens were found under limestone boulders on a slope in a virgin rain forest. This is a very isolated area of the country.

Description. Shell very small (largest specimen, holotype, 5.1 mm total length including peristome x 6.0 mm total width including peristome; smallest specimen, 3.1 mm total length x 3.7 mm total width), turbate, whorls adnate except just before lip. Umbilicus wide, ca. 33% of total width, open to earliest whorls. Protoconch of ca. 1.5 minutely pustulose whorls but demarcation between protoconch and teleoconch not well-defined. Teleoconch of 2.5–2.75 whorls. Axial sculpture of numerous, crowded, low lamellae, slightly wider on spiral keels. Sculpture is more widely spaced on earliest whorls. Spiral sculpture present only as keels; 1–3 keels between the suture and the periphery; one on the periphery; one bounding the umbilicus; 0–3 in the umbilicus. The axial sculpture on the keels forms a very dense, finely serrate edge. On the whole the sculpture has a frosted aspect. Suture narrowly channeled, serrate. Aperture double, circular (2.7 mm maximum width in holotype), solute from final whorl. Inner lip smooth, narrowly exerted. Outer lip slightly expanded, slightly narrower facing the umbilicus, consisting of numerous fused lamellae, with two auricles 180° apart. Axial sculpture does not extend onto outer lip. Shell uniformly dirty white/tan or patterned with vague brown, spiral bands, most apparent on both sides of outer lip. Operculum multispiral with an oblique, erect, calcareous lamella.



FIGURE 1. A–E. *Abbottella (Abbottella) calliotropis* **new species**. A–C. Holotype (UF 456810), 7.5 mm width. D. Paratype (UF 216131), 6.8 mm width. E. Paratype (UF 216131), 7.0 mm width. F–J. *Abbottella (Abbottella) diadema* **new species**. F–H. Holotype (UF 456814), 6.0 mm width. I. Paratype (UF 456815), 4.6 mm width. J. Paratype (UF 456815), 3.7 mm width. K–O. *Abbottella (Abbottella) dichroa* **new species**. K–M. Holotype (UF 456801), 9.9 mm width. N. Paratype (UF 216112), 8.8 mm width. O. Paratype (UF 216112), 9.4 mm width. P–T. *Abbottella (Abbottella) nitens* **new species**. P–R. Holotype (UF 456806), 7.8 mm width. Note pseudoscorpion web in umbilicus. S. Paratype (UF 456808), 8.3 mm width. T. *Abbottella (Abbottella) mellosa* Watters & Duffy, 2010. Holotype (UF 420729), 7.9 mm width. U–Y. *Abbottella (Abbottella) tenebrosa* **new species**. U–W. Holotype (UF 456796), 8.9 mm width. X. Paratype (OSUM 37271), 8.6 mm width. Y. Paratype (OSUM 37271), 8.3 mm width. Z–CC. *Abbottella (Gundlachtudora) paradoxa* **new species**. Z–BB. Holotype (UF 456812), 9.0 mm width. CC. Paratype (UF 456813), 8.9 mm width. DD. *Abbottella (Gundlachtudora) bombardopolensis* Bartsch, 1946. UF 33037, 7.0 mm width.

Variation in specimens. 50 specimens seen. The degree of coloration varies from uniformly white to banded with brown. The number of spiral keels (3–7) varies but there is always a keel between the suture and periphery, at the periphery, and bounding the umbilicus. There is a tendency for larger specimens to have more spiral cords.

Comparison with other species. This species displays so many unique characteristics that it should likely be placed in its own genus. It is one of the smallest *Abbottella* yet found and has the fewest number of whorls. The curious combination of tightly packed axial sculpture and spiral cords is unlike any other annulariid.

Remarks. The 44 additional specimens range from fresh dead to weathered specimens but all are broken in the same manner as *A. calliotropis* (see Remarks there) by an unidentified predator (Figure 5 P).

Etymology. Gr. *diadem*, headband, crown.

Abbottella (Abbottella) dichroa new species

Figures 1 K–O, 5 Q, 7 C

Type material. UF 456801, holotype; length, 6.5 mm; width, 9.9 mm. UF 216112, 31 paratypes, from the type locality.

Type locality. Dominican Republic, Samaná Province, just E of El Limón, 10 km E of Las Terrenas, at sea level. ca. 19.29° N, -69.44° W.

Other material examined. UF 216112, 4 broken, weathered, or immature specimens, from the type locality; UF 216116, 118 specimens, 7 km E of Sánchez, Samaná Province, Dominican Republic; UF 236229, 18 specimens, 11 km E of Sánchez, Samaná Province, Dominican Republic; UF 216114, 10 specimens, 5 km E of Sánchez, Samaná Province, Dominican Republic; Grego coll., 1 specimen, Nagua, María Trinidad Sánchez Province, Dominican Republic.

Distribution and habitat. Known from the type locality on the north coast of the Sierra de Samaná of the Cordillera Septentrional to as far west as Nagua, also the region of Sánchez at three sites from 7–11 km E of the town along the south shore of the Samaná Peninsula. Individuals were found crawling on damp, algae-covered rocks on a shaded limestone hillside in a tropical forest.

Description. Shell small (largest specimen, 6.7 mm total length x 10.2 mm total width; smallest specimen, 5.3 mm total length x 8.0 mm total width; holotype, 6.5 mm total length including peristome x 9.9 mm total width including peristome), turbate, whorls adnate except just before lip. Umbilicus wide, ca. 37% of total width, open to earliest whorls. Protoconch of ca. 1.25 smooth whorls but demarcation between protoconch and teleoconch not well-defined. Teleoconch of 3–3.5 whorls. Axial sculpture of ca. 100 extremely fine lamellae of two strengths on the final whorl, more widely spaced in earlier whorls, often arranged in groups of 1–7 primary lamellae with irregular “empty” spaces interspersed that may be growth stops. Spiral sculpture of 30–36 low, weak cords, slightly stronger in umbilicus, occasionally stronger at periphery and elsewhere. Intersections of primary axial and spiral sculpture form minute elongated pustules or fine prickly sculpture; the sculpture appears more scalloped than serrate on the final whorl but often is more pronounced and prickly on earlier whorls. Suture narrowly channeled, serrate. Aperture double, circular (4.4 mm maximum width in holotype), solute or barely adnate with the auricle joining the final whorl, deflected to various degrees. Inner lip smooth, well-exserted. Outer lip expanded, composed of numerous lamellae, narrowest at the 10–11 o’clock position, auriculate. Base color of shell uniformly white or brown, rarely light tan, without any indication of bands on the whorls, although bands are apparent on both sides of outer lip. Sculpture white. Operculum multispiral with a calcareous, vertical lamella.

Variation in specimens. 183 specimens seen. The most obvious variation is in color; this species occurs in two colors, white or brown, with little evidence of intergrades, although all have a white outer lip banded with brown. Specimens also vary in the degree of deflection of the aperture and the height of the spire.

Comparison with other species. *Abbottella adolfi peninsularis* (Figure 3 J–L) and *A. sanchezi* (Figure 4 J–N) have much finer, denser sculpture resembling sandpaper and the umbilicus of those species has two or more strong spiral cords; *A. dichroa* lacks these cords. *Abbottella sosuaensis* (Figure 4 O–S) has fewer, almost obsolete, axial lamellae, the sculpture is weakly beaded rather than scalloped or prickly, the outer lip is narrower and deflected abaperturally. In *A. tenebrosa* (Figure 1 U–Y) the axial sculpture is obsolete and the opercular lamella is oblique. The peculiar sculpture of *A. dichroa*, arranged in “blocks” separated by smooth areas, is shared by *A. adolfi peninsularis*, *A. sanchezi*, and *A. sosuaensis*.

Remarks. This species is peculiar in having two color morphs in the same population: white or brown. Like other species on the Samaná Peninsula, specimens have been broken through on the first half of the final whorl by a predator (Figure 5 Q).

Etymology. Gr. *di-*, two + Gr. *chroa*, color of the skin; in reference to the two color morphs.

***Abbottella (Abbottella) nitens* new species**

Figures 1 P–S, 5 R,S, 8 A

Type material. UF 456806, holotype; length, 7.7 mm; width, 7.8 mm. UF 456808, 15 paratypes, from the type locality.

Type locality. Dominican Republic, La Altagracia Province, 16 km S of Higüey, at 100 m. ca. 18.46° N, -68.71° W.

Other material examined. UF 216167, 23 immature, broken, or weathered specimens, from the type locality.

Distribution and habitat. Known only from the type locality under rocks among boulders, on a limestone bluff west of Highway 4. Further collecting may show that it generally occurs along this bluff, which runs parallel to the Rio Yuma on the west, from the type locality to Boca de Yuma on the coast.

Description. Shell small (largest specimen, 8.5 mm total length x 8.6 mm total width; smallest specimen, 5.9 mm total length x 6.1 mm total width; holotype, 7.7 mm total length including peristome x 7.8 mm total width including peristome), turbinate, compact, whorls adnate. Umbilicus wide, ca. 30% of total width, open to earliest whorls. Protoconch of ca. 1.5 smooth whorls clearly demarcated from teleoconch. Teleoconch of 3–3.25 whorls. Axial sculpture of ca. 110 regularly spaced, low, fine lamellae, more widely spaced in umbilicus. Spiral sculpture of ca. 50 low, weak cords, slightly stronger in umbilicus. Intersections of axial and spiral sculpture form minute pustules or points, often nearly obsolete, elongated into blades at the suture but lamellae not fused. Suture very narrowly channeled, serrate. Aperture double, circular (3.7 mm maximum width in holotype), adnate with the auricle joining the final whorl. Inner lip smooth, slightly exerted. Outer lip narrowly, uniformly expanded, composed of numerous lamellae, auriculate. Base color of shell uniformly white or metallic tan or bronze, usually with very faint, tan spots arranged in ca. 6 spiral rows. Bands present on both sides of the outer lip. Sculpture the same color as the base except near the suture where the blades and a few rows of sculpture may be white; sculpture within the umbilicus may be white as well. Operculum multispiral with a calcareous lamella, arising obliquely then becoming vertical.

Variation in specimens. 39 specimens seen. Shells vary in color from brown to white; sculpture varies from minute pustules to being nearly imperceptible.

Comparison with other species. This species bears a striking resemblance to *A. mellosa* from Sósua (Figure 1 T), from which it differs in its more rounded, capacious whorls and greater number of spiral cords (ca. 30 in *A. mellosa* vs. ca. 50 in *A. nitens*). Both have the same obsolete sculpture and metallic sheen. However, *A. nitens* does not seem to be related to the other La Altagracia Province taxa, such as *A. milleacantha* (Figure 3 X–BB), which are characterized by their small, compact shells and fine, prickly sculpture.

Remarks. Like other *Abbottella* from the eastern part of the island, numerous examples bear signs of predation. Most have been broken into on the dorsal side of the final whorl (Figure 5 R). A few, including the holotype, have a small, circular hole bored through the shell (Figure 5 S). Similar holes have been reported from other terrestrial snail shells and may be the result of predation by the larvae of drilid or lampyrid beetles (Harry, 1950). The holotype also has a web that nearly occludes the umbilicus (Figure 1 R). Within the umbilicus was found a pseudoscorpion, family Olpiidae, subfamily Hesperolpiinae. The holotype was the only recently dead specimen (operculum still in place) and no such pseudoscorpion association was found in any of the other 42 specimens examined, which were all dead, mostly weathered specimens. It appears that the pseudoscorpion may have been commensal within the umbilicus of the live snail.

Etymology. *L. niteo*, shine, glitter, in reference to the metallic sheen of most specimens.

Abbottella (Abbottella) tenebrosa new species

Figures 1 U–Y, 8 B

Type material. UF 456796, holotype; length, 7.6 mm; width, 8.9 mm. UF 456797, 15 paratypes; OSUM 37271, 12 paratypes; BMSM 17937, 16 paratypes; all from the type locality.

Type locality. Dominican Republic, Puerto Plata Province, El Choco, near Cabarete. ca. 19.74° N, -70.42° W.

Other material examined. UF 456798, 12 immature or weathered specimens, from the type locality; GTW 7020b, 2 specimens, from the type locality.

Distribution and habitat. Known only from the type locality on limestone outcrops of El Choco.

Description. Shell large for genus (largest specimen, 8.6 mm total length x 10.1 mm maximum width; smallest specimen, 6.6 mm total length x 7.7 mm width; holotype, 7.6 mm total length including peristome x 8.9 mm total width including peristome), moderately high turbinate, whorls adnate except just before lip. Umbilicus wide, ca. 33% of total width, open to earliest whorls. Protoconch of 1.5–1.75 smooth, white or dark brown whorls with a white tip, but demarcation between protoconch and teleoconch not well-defined. Teleoconch of 2.75–3.0 whorls. Axial sculpture nearly obsolete, of numerous, crowded, low, microscopic lamellae, ca. 150 on last whorl. Spiral sculpture of ca. 50 low cords, occasionally of two sizes. Intersections of sculpture form nearly obsolete beads or scales. Whorls rounded with no indication of keels. Cords only slightly stronger in umbilicus. Suture narrowly, deeply channeled, finely serrate. Aperture double, circular (4.3 mm maximum width in holotype), adnate with final whorl. Inner lip smooth, barely exerted. Outer lip expanded, slightly narrower facing the umbilicus, somewhat undulating, consisting of numerous, fine, fused lamellae, with a prominent auricle fused to previous whorl; outer part of lip somewhat cup-shaped, inner part perpendicular to whorl. Shell uniformly dirty white to dark reddish brown, outer lip white, shell without bands except on lip. Rare specimens white on top of whorls, brown on bottom. Operculum multispiral with an oblique, cup-shaped calcareous lamella.

Variation in specimens. 58 specimens seen. Specimens vary in color from white to brown, with some individuals half white and half brown.

Comparison with other species. This species differs from *A. sanchezi* (Figure 4 J–N) and *A. adolfi peninsularis* (Figure 3 J–L) in having nearly obsolete sculpture and in lacking the prominent spiral cords delimiting the umbilicus. It differs from the adjacent *A. mellosa* (Figure 1 T) in its larger size and lack of prominent spiral cords in the umbilicus. It differs from *A. dichroa* in having obsolete sculpture and an oblique opercular lamella.

Etymology. *L. tenebrosus*, dark, gloomy, in reference to the shell color.

Subgenus *Gundlachtudora* Torre & Bartsch, 1941

Type species by original designation *Cyclostoma decoloratum* Pfeiffer, 1859.

Diagnosis. Like *Abbottella s.s.* but operculum with reflected lamellae. Operculum may not fit into aperture.

Remarks. Torre & Bartsch (1941) had created *Gundlachtudora* for a Cuban *Abbottella*-like species having an operculum with a reflected lamella forming a continuous surface. Bartsch (1946) then created *Petasipoma* for a Haitian species with the same characteristics. Watters (2006) synonymized the two genera and relegated *Gundlachtudora* to a subgenus of *Abbottella*. The species described here also has this characteristic operculum. However, it may be that these opercular features have evolved independently and the taxa are not actually closely related. Additional phylogenetic work is required to answer this question. For this reason this new species is placed in *Gundlachtudora* with reservations.

Abbottella (Gundlachtudora) paradoxa new species

Figures 1 Z–CC, 9 F

Type material. UF 456812, holotype; length, 7.8 mm; width, 9.0 mm. UF 456813, 22 paratypes, from the type locality.

Type locality. Dominican Republic, Santiago Province, Loma Diego de Ocampo, at 1200 m. ca. 19.62° N, -70.76° W.

Other material examined. UF 216119, 20 weathered or immature specimens, from the type locality.

Distribution and habitat. This species occurs at Loma Diego de Ocampo of the Cordillera Septentrional, on the mountain crest in dense forest with thick vegetative debris, mosses, and epiphytes. Loma Diego de Ocampo is located north of Santiago de los Caballeros and is the highest point of the Cordillera Septentrional at 1,200 m. Snails were collected on limestone rocks at this peak. Locally common.

Description. Shell small (largest specimen, 7.9 mm total length x 9.1 mm total width; smallest specimen, 5.9 mm total length x 6.8 mm total width; holotype, 7.8 mm total length including peristome x 9.0 mm total width including peristome), turbinate, whorls adnate except just before lip. Umbilicus wide, ca. 30% of total width, open to earliest whorls. Protoconch of ca. 1.5 erect whorls but demarcation between protoconch and teleoconch not well-defined. Teleoconch of 2.75–3.25 whorls. Axial sculpture of two sizes. The primary sculpture consists of 50–65 low, erect lamellae, widely spaced on the last ½ whorl, more closely spaced elsewhere. Secondary sculpture of 3–10 microscopic lamellae between primary sculpture. Spiral sculpture of ca. 30 low, weak cords between suture and into umbilicus. Intersections of primary axial and spiral sculpture form minute, hollow points or scallops, often obsolete on base. Suture narrowly channeled, serrate. Aperture double, circular (4.2 mm maximum width in holotype), solute from final whorl. Inner lip smooth, very narrowly exerted. Outer lip expanded, composed of numerous coarse lamellae, very narrow at the 11 o'clock position, then forming a broad auricle. Shell dirty white/tan patterned with narrow, pale brown, spiral bands, apparent on both sides of outer lip. Operculum multispiral with a calcareous lamella; lamella arises vertically, arches over distally, and overlaps with previous whorl to form a continuous plate. The edge of this plate at the 11 o'clock position overlaps the lip and in most specimens the operculum cannot be withdrawn into the aperture. However, in a few specimens this edge has been broken off and the operculum withdrawn.

Variation in specimens. 43 specimens seen. Specimens are uniform in shell characteristics, varying only in the number of primary axial lamellae (50–65) and strength of the color bands.

Comparison with other species. The structure of the operculum separates this from all other *Abbottella* except *A. bombardopolensis* from Haiti and *A. decolorata* from Cuba, the only other recognized members of the subgenus *Gundlachtudora*. *Abbottella bombardopolensis* (Figure 1 DD) is known from Bombardopolis on the western-most tip of the northern Haitian peninsula to Terre Neuve in the Cordillera Centrale over 200 km west of *A. paradoxa*. Both species have nearly identical sculpture but the outer lip of *A. paradoxa* is widely expanded and notched; the outer lip of *A. bombardopolensis* is narrower but uniformly expanded.

Etymology. *L. paradoxus*, strange, contrary to expectation; the position of this species, whether in *Gundlachtudora* or not, is problematic. It's presence in the Dominican Republic was also unexpected.

Genus *Leiabbottella* Watters, 2010

Type species by original designation *Leiabbottella galaxius* Watters, 2010.

Diagnosis. Shell small-sized for family (type species ca. 9 mm maximum width, including peristome), depressed helicoid, umbilicus wide. Protoconch not decollated, of 1¼ smooth, minute whorls. Spiral sculpture absent (or barely present in umbilicus). Axial threads on early whorls widely spaced, barely perceptible. Axial sculpture on final whorl of microscopic widely spaced grooves. Aperture double, circular, adnate to adjacent whorl, expanded to various degrees. Operculum multispiral with thin, oblique lamella.

Leiabbottella thompsoni new species

Figures 2 A–E, 7 E

Type material. UF 456799, holotype; length, 7.6 mm; width, 13.7 mm. UF 236225, 91 paratypes, from the type locality.

Type locality. Dominican Republic, Monte Plata Province, 5 km N of Majagual, at 150 m. ca. 19.09° N, -69.83° W. See Remarks under *L. soluta* below.



FIGURE 2. A–E. *Leiabbottella thompsoni* **new species**. A–C. Holotype (UF 456799), 13.7 mm width. D. Paratype (UF 236225), 14.1 mm width. E. Paratype (UF 236225), 13.6 mm width. F–I. *Leiabbottella soluta* (Pfeiffer, 1852). F. Illustration from Pfeiffer (1854: pl. 39, fig. 8). G. UF 216196, 11.9 mm width. H. UF 216196, 13.9 mm width. I. UF 216196, 13.8 mm width. J–L. *Leiabbottella galaxius* Watters, 2010. Paratype (OSUM 35491), 8.4 mm width.

Other material examined. UF 216194, 18 specimens, 5 km N of Majagual, Monte Plata Province, Dominican Republic; UF 236230, 29 specimens, 2 km N of Majagual, Monte Plata Province, Dominican Republic, at 150 m; UF 216189, 30 specimens, 7 km N of Majagual, Monte Plata Province, Dominican Republic, at 105 m; UF 216127, 26 specimens, 13 km NW of Sabana Grande de Boyá, Monte Plata Province, Dominican Republic, at 250 m; UF 249105, 6 specimens, N of Majagual, ca. 12 km NW of Sabana Grande de Boyá, Monte Plata Province, Dominican Republic, at 150 m; UF 216193, 22 specimens, 1 km N of Majagual, Monte Plata Province, Dominican Republic, at 200 m.

Distribution and habitat. Known only from the karstic region of Los Haitises, which separates the Cordillera Central from the Cordillera Oriental. The species lives at the base of deeply karsted limestone knolls and in ravines in tropical forest under debris and leaf litter. A portion of this distribution has been planted as coffee groves.

Description. Shell large for genus (largest specimen, 7.7 mm total length x 13.8 mm total width; smallest specimen, 6.6 mm total length x 11.2 mm total width; holotype, 7.6 mm total length including peristome x 13.7 mm total width including peristome), depressed, nearly planispiral, whorls adnate except just before lip. Umbilicus very wide, ca. 35% of total width, open to earliest whorls. Protoconch of ca. 1.5 erect whorls but demarcation between protoconch and teleoconch not well-defined. Teleoconch of 3.25 whorls. Shell smooth except for numerous (ca. 50–60 on final whorl), incised axial lines between which are microscopic threads. Spiral sculpture absent except for the faintest trace of umbilical cords in a few specimens. Suture deeply indented. Aperture double, circular (7.3 mm maximum width in holotype), adnate to the previous whorl. Inner lip smooth, exerted, tube-like. Outer lip broadly expanded, sinuate, adherent to the previous whorl, forming a broad, prominent, cup-shaped auricle. Shell dirty white, tan, or bronze, somewhat shiny, patterned with narrow, often interrupted, brown spiral bands, apparent on both sides of outer lip and on inner lip as well. Operculum multispiral with an oblique, calcareous lamella.

Variation in specimens. 223 specimens seen. Specimens are uniform in shell characteristics, varying only in the strength of the color bands and background color.

Comparison with other species. *Leiabbottella soluta* (Pfeiffer, 1852) (Figure 2 F–I) is closely related to *L. thompsoni*. *Leiabbottella soluta* tends to be less planispiral, with relatively wider whorls, and has a less adnate outer lip auricle than does *L. thompsoni*. *Leiabbottella soluta* occurs over 120 km to the northwest in the Cordillera Septentrional. *Leiabbottella galaxius* (Figure 2 J–L) is smaller and has a much less developed outer lip.

Etymology. Named for Dr. Fred Thompson, Curator, UF, whose unparalleled collections in Hispaniola form the basis of our understanding of this group and the terrestrial snail fauna there in general.

Distributional notes on other *Abbottella* and related taxa

Abbottella (*Abbottella*) *abbotti* Bartsch, 1946

Figures 3 A–E, 7 F

Type material. USNM 504108, holotype.

Type locality. Near Laguna, Samaná Bay [*sic*, probable error for Samaná Peninsula, see below], Dominican Republic.

Other material examined. UF 215981, El Valle, Samaná Province, Dominican Republic; UF 215983, 2 km S of El Valle, Samaná Province, Dominican Republic, at 20 m; UF 215980, 2 km S of El Valle, Samaná Province, Dominican Republic; UF 215982, hills E and W of El Valle, Samaná Province, Dominican Republic; GTW 10829a, Cayo Levantado, Samaná Province, Dominican Republic.

Distribution and habitat. This species occurs in the Sierra de Samaná of the Cordillera Septentrional. Bartsch (1946) did not give any additional information on the type locality in his description of this species. However, under his description of *Lagopoma lagopoma*, he stated that Laguna was 4 miles north of Samaná. This is probably Punta Laguna Salada, which is adjacent to El Valle, the source of most of our material. Contrary to Bartsch's description, Laguna is not on Samaná Bay but on the north coast of the peninsula; this was probably an error for Samaná Peninsula. All of our records are for the El Valle and the Las Galeras areas on the northeast coast of the peninsula. This species is probably distributed around the base of the outcrop between these two areas, a distance of ca. 20 km. Snails occur on and at the base of the steep limestone walls in cool, shaded areas with abundant vegetation and mosses.

Comparison with other species. *Abbottella abbotti* is one of a group of small species on the Samaná Peninsula characterized by thorny sculpture. It differs from similar species in its deeply fimbriated outer lip and coarse sculpture arranged in prominent keels.



FIGURE 3. A–E. *Abbottella (Abbottella) abbotti* Bartsch, 1946. A–C. UF 215980, 5.6 mm width. D. UF 215983, 6.0 mm width. E. UF 215981, 5.2 mm width. F. *Choanopoma adolfi* Pfeiffer, 1852. Pfeiffer, 1854: pl. 48, fig. 8. G–I. *Abbottella (Abbottella) cf. adolfi adolfi* (Pfeiffer, 1852). GTW 7020c, 5 mm width. J–L. *Abbottella (Abbottella) adolfi peninsularis* Bartsch, 1946. GTW 9430a, 7.8 mm width. M. *Abbottella (Abbottella) newcombi* (Crosse, 1873). Syntype (MNHN 5436), 5.7 mm length. Photo courtesy of MNHN. N–R. *Abbottella (Abbottella) aenea* Watters, 2010. N–P. GTW 14181a, 6.5 mm width. Q. GTW 14181a, 6.1 mm width. R. Paratype (OSUM 35490), 6.0 mm width. S–W. *Abbottella (Abbottella) crossei* (Pilsbry, 1933). S–U. GTW 9432a, 7.3 mm width. V. UF 216146, 7.6 mm width. W. UF 216146, 7.2 mm width. X–BB. *Abbottella (Abbottella) milleacantha* Watters & Duffy, 2010. X–Z. Holotype (UF 420728), 7.5 mm width. AA. Grego, 7.4 mm width. BB. Grego, 8.1 mm width.

***Abbottella (Abbottella) cf. adolfi adolfi* (Pfeiffer, 1852)**

Figures 3 F–I, 9 D

Remarks. The type of *Choanopoma adolfi* collected by Sallé has apparently been lost. Pfeiffer illustrated it (1854: pl. 48, figs. 5–8); figures 5–7 are only outline drawings but figure 8 is a color figure (refigured here as Figure 3 F). Bartsch (1946) had no material he could refer to this species and reproduced Pfeiffer's translated description and his figure 8. As Bartsch noted, Pfeiffer's type locality of Haiti must refer to the Dominican Republic, which was known as Haiti at the time, because Sallé did not collect in Haiti proper. The taxon shown here seems to best fit the description and figure of *C. adolfi* of all the *Abbottella* I have examined. It is from the Rio San Juan area in María Trinidad Sánchez Province (UF 216151, GTW 7020c). However, if these specimens are indeed *A. adolfi* it is most closely related to *A. wilhelmi* (Figure 4 T–X), a species found just to the west of Rio San Juan. *Abbottella wilhelmi* (Figure 4 T–X) is very similar to *A. cf. adolfi* but is smaller and has a different operculum. The operculum of *A. cf. adolfi* is composed of a broad, cup-like, oblique lamella; the operculum of *A. wilhelmi* has a nearly vertical lamella. *Abbottella sanchezi* (Figure 4 J–N) is also similar but has a vertical lamella on the operculum and the spiral sculpture tends to form a carina at the periphery. Bartsch (1946) described a subspecies from the trail from Samaná to Rio San Juan, *A. a. peninsularis* (see below, Figure 3 J–L), which differs in having an unbanded outer lip.

***Abbottella (Abbottella) adolfi peninsularis* Bartsch, 1946**

Figures 3 J–L, 8 H

Type material. USNM 504095, holotype.

Type locality. On the trail from Samaná to Rio San Juan, Samaná Peninsula.

Other material examined. UF 216164, 8 km W of Samaná, Samaná Province, Dominican Republic; UF 215974, 10 km E of Las Terrenas, Samaná Province, Dominican Republic at sea level; UF 215975, 8 km WNW of Sánchez, Samaná Province, Dominican Republic; UF 215976, 11 km E of Sánchez, Samaná Province, Dominican Republic; UF 215979a, b, 7 km E of Sánchez, Samaná Province, Dominican Republic; UF 215978a, b, 5 km E of Sánchez, Samaná Province, Dominican Republic; UF 215977, 10 km SW of Las Terrenas, Samaná Province, Dominican Republic; GTW 9430a, several km W of Sánchez, Samaná Province, Dominican Republic.

Distribution and habitat. Records place this species closer to Sánchez than to Rio San Juan in the Sierra de Samaná of the Cordillera Septentrional; also on the north coast of the peninsula near Las Terrenas. Specimens have been found at the base of limestone mogotes and chimneys in lowland rain forests on damp, algae-covered rocks; some areas are now cacao groves.

Comparison with other species. This subspecies is very similar to *A. newcombi* (Figure 3 M), a species described without an exact locality. Both species have two prominent spiral cords in the umbilicus, nearly identical sculpture, and similar dark coloration. *Abbottella newcombi* has a lower spire and less developed outer lip than does *A. a. peninsularis*, but additional material may indicate that the two taxa are not distinct from each other, in which case the name *A. newcombi* would have priority.

***Abbottella (Abbottella) aenea* Watters, 2010**

Figures 3 N–R, 8 C

Type material. UF 434777, holotype. UF 434778, 1 paratype; BMSM 17971, 2 paratypes; OSUM 35490, 2 paratypes.

Type locality. Dominican Republic, La Altagracia Province, Punta Cana.

Other material examined. GTW 14181a, from the type locality.

Distribution and habitat. Known only from the type locality. Specimens were found under moldy leaf litter.

Remarks. This species is included here for comparison. See under *A. milleacantha*, below.

***Abbottella (Abbottella) crossei* (Pilsbry, 1933)**

Figures 3 S–W, 7 G

Type material. ANSP 7951, holotype. ANSP 373769, paratype.

Type locality. Santo Domingo. Bartsch (1946: 133) believed Pilsbry's specimen came from "somewhere on the Samaná Peninsula," which is shown here to be correct.

Other material examined. UF 216146, 4 km E of Samaná, Samaná Province, Dominican Republic; UF 216134, 8 km S of Las Galeras, Samaná Province, Dominican Republic; UF 216139, 2.9 km S of Las Galeras, Samaná Province, Dominican Republic; UF 216128, 6.5 km S of Las Galeras, Samaná Province, Dominican Republic; GTW 9432a, limestone area, at side of road to Cape Samaná, 0.6 km before Cape, Samaná Province, Dominican Republic.

Distribution and habitat. This species is found along the coastal limestone bluff on the eastern tip of the Samaná Peninsula in the Sierra de Samaná of the Cordillera Septentrional, possibly to Sánchez. Bartsch (1946) added localities at 0.8 km from the sea, 2.4 km E of Puerto Francés, Samaná Province and at a cave 3.2 km NW of Sánchez, Samaná Province. I have not seen the Sánchez specimens, which seem to be out of the range of this species. Specimens have been found at the base of limestone outcrops and cliffs.

Comparison with other species. *Abbottella crossei* belongs to the group of small, heavily sculptured taxa on the Samaná Peninsula. It differs in having finer sculpture and less developed keels. It never has the fimbriated lip usually found in *A. rosaliae* (Figure 4 A–E) and *A. abbotti* (Figure 3 A–E).

***Abbottella (Abbottella) milleacantha* Watters & Duffy, 2010**

Figures 3 X–BB, 7 H

Type material. UF 420728, holotype. OSUM 32478, 1 paratype.

Type locality. Dominican Republic, northeast Isla Saona.

Other material examined. UF 216132, 2 km SE of El Peñon, La Altagracia Province, Dominican Republic; UF 216155, 2 km SE of El Peñon, La Altagracia Province, Dominican Republic; UF 33415, 17.9 km NW of Punta Cana, La Altagracia Province, Dominican Republic; UF 215971, 4 km SW of Punta Cana, La Altagracia Province, Dominican Republic; UF 215967, 3 km SW of Juanillo, La Altagracia Province, Dominican Republic; UF 216181, Boca de Yuma, La Altagracia Province, Dominican Republic; UF 244456, Boca de Yuma, La Altagracia Province, Dominican Republic; UF 216161, Isla Saona, La Altagracia Province, Dominican Republic; UF 216160, Isla Saona, La Altagracia Province, Dominican Republic; UF 216165, Isla Saona, La Altagracia Province, Dominican Republic; Grego coll., Guaraguao, La Altagracia Province, Dominican Republic; GTW 15254a, Guaraguao, La Altagracia Province, Dominican Republic.

Distribution and habitat. Described from Isla Saona, this species is now known to occur along the adjacent coast of mainland La Altagracia Province as well. It seems to be particularly associated with limestone ridges such as the one that runs from El Peñon to El Cabo and around the coast to Boca de Yuma and further to the southeastern shore of the peninsula. A portion of its range is within the Parque Nacional Del Este. Snails live in sub-mesic to mesic forests along these limestone ridges under blocks and in leaf litter.

Comparison with other species. *Abbottella milleacantha* belongs to a group of small species having a dense, minute sculpture of pustules or points. It does not have the sculpture arranged in obvious keels as in *A. gabbi*, *A. rosaliae* (Figure 4 A–E), *A. abbotti* (Figure 3 A–E), or *A. crossei* (Figure 3 S–W). The sculpture is finer and denser (ca. 120 axial threads on final whorl) than in *A. tentorium* (ca. 60 axial threads), *A. aenea* (ca. 90 axial threads; Figure 3 N–R), or *A. urbana* (ca. 70 axial threads). From *A. aenea* it also differs in color (copper in *A. aenea* vs. white in *A. milleacantha*) and in the form of the sculpture, which arises as separate points from the surface in *A. aenea* but arises from the spiral threads in *A. milleacantha*.

***Abbottella (Abbottella) rosaliae* (Pfeiffer, 1858)**

Figures 4 A–E, 9 A

Type material. Not located.



FIGURE 4. A–E. *Abbottella (Abbottella) rosaliae* (Pfeiffer, 1858). A–C. UF 216191, 9.2 mm width. D. UF 216135, 9.9 mm width. E. UF 216125, 9.3 mm width. F–I. *Abbottella (Abbottella) samanensis* Bartsch, 1946. F–H. GTW 7085c, 8.7 mm width. I. GTW 7085d, 8.0 mm width. J–N. *Abbottella (Abbottella) sanchezi* Bartsch, 1946. J–L. UF 216154, 9.1 mm width. M. UF 216154, 8.1 mm width. N. UF 216154, 7.6 mm width. O–S. *Abbottella (Abbottella) sosuaensis* Bartsch, 1946. O–Q. UF 218136, 6.9 mm width. R. UF 218136, 7.7 mm width. S. GTW 9431a, 7.6 mm width. T–X. *Abbottella (Abbottella) wilhelmi* (Pfeiffer, 1858). T–V. UF 216150, 8.5 mm width. W. UF 216150, 8 mm width. X. UF 216150, 7.6 mm width. Y–CC. *Lagopoma lagopoma* Bartsch, 1946. Y–AA. GTW 10081a, 9.7 mm width. BB. GTW 10081a, 7.6 mm width. CC. UF 216120, 7.7 mm width.

Type locality. *In insulae Haiti*. Here restricted to the Dominican Republic, Puerto Plata Province, Loma Catalina.

Other material examined. UF 216191, Loma Catalina, 6 km SE of Sosuá, Puerto Plata Province, Dominican Republic, 80 m; UF 216171, Loma Catalina, 9 km SSE of Sosuá, Puerto Plata Province, Dominican Republic, 210

m; UF 216125, Loma Catalina, 11 km SE of Sosuá, Puerto Plata Province, Dominican Republic, 260 m; UF 216135, 7 km E, 2 km S of Sosuá, Puerto Plata Province, Dominican Republic, 30 m.

Distribution and habitat. Collections at UF enable us to limit Pfeiffer's imprecise "*In insulae Haiti.*" The species is known only from Loma Catalina, an outcrop of the Cordillera Septentrional southeast of Sosuá. Much of this area is contained in the Parque Nacional El Choco. The type locality is herein restricted to the Dominican Republic, Puerto Plata Province, Loma Catalina.

Comparison with other species. This species is similar to *A. abbotti* (Figure 3 A–E) but differs in having finer, less serrate sculpture, less developed keels, and a less fluted outer lip.

Remarks. This species is perhaps unique among *Abbottella* in possessing a periostracum although it is lost in most specimens. On fresh examples this periostracum forms short bristles at the junctures of the axial and spiral sculpture. The degree of fluting and serration of the outer lip varies greatly—some specimens show virtually no fluting.

Abbottella (Abbottella) samanensis Bartsch, 1946

Figures 4 F–I, 9 B

Type material. USNM 504090, holotype.

Type locality. Cape Samaná, Dominican Republic.

Other material examined. GTW 7085d, along Rt. 5 between Santa Bárbara de Samaná and Sánchez, Samaná Province, Dominican Republic; GTW 7085c, Sánchez, Samaná Province, Dominican Republic; GTW 14791a, Samaná Peninsula, Samaná Province, Dominican Republic.

Distribution and habitat. Southern coast of the Samaná Peninsula in the Sierra de Samaná of the Cordillera Septentrional. Live snails have been found in leaf litter.

Comparison with other species. *Abbottella samanensis* is immediately identified by its peculiar enrolled outer lip on the axial side. *Abbottella sanchezi* (Figure 4 J–N) is very similar but lacks this characteristic.

Abbottella (Abbottella) sanchezi Bartsch, 1946

Figures 4 J–N, 9 C

Type material. USNM 504092, holotype.

Type locality. 2 miles northwest of Sánchez, Dominican Republic.

Other material examined. UF 215988, 5 km ENE of Sánchez, Samaná Province, Dominican Republic; UF 236224, 2 km W of Sánchez, Samaná Province, Dominican Republic; UF 215991, 3 km E of Samaná, Samaná Province, Dominican Republic; UF 215992, 15 km W of Samaná, Samaná Province, Dominican Republic; UF 215989, 9 km E of Las Terreras, Samaná Province, Dominican Republic; UF 215990, 3 km SW of Las Terreras, Samaná Province, Dominican Republic; UF 216143, 2 km W of Los Cacaos, Samaná Province, Dominican Republic; UF 216154, 40 km [4 km?] NE of Sánchez, Samaná Province, Dominican Republic, 270 m; GTW 7020a, near cave, Samaná Province, Dominican Republic; GTW 14791a, Samaná Peninsula, Samaná Province, Dominican Republic; Grego coll., Sánchez, Samaná Province, Dominican Republic.

Distribution and habitat. Sierra de Samaná of the Cordillera Septentrional. Both coasts of the Samaná Peninsula, from at least Sánchez to Los Cacaos in the south, and Las Terrenas in the north. Most specimens were collected in association with limestone boulders, leaf litter, and talus in tropical forest, also near caves; some sites have been cleared for cocoa groves. I believe the record for UF 216154 of 40 km NE of Sánchez is an error for 4 km.

Comparison with other species. *Abbottella wilhelmi* (Figure 4 T–X) is very similar but the spiral sculpture does not form a keel at the periphery. *Abbottella sanchezi* (Figure 4 J–N) differs from *A. samanensis* in lacking the enrolled axial side of the outer lip.

***Abbottella (Abbottella) sosuaensis* Bartsch, 1946**

Figures 4 O–S, 9 E

Type material. USNM 336768, holotype.

Type locality. Sosúa, 16 miles east of Puerto Plata, Dominican Republic.

Other material examined. UF 218136, 3 km W of Puerto Plata, Puerto Plata Province, Dominican Republic; UF 216124, 7 km E and 2 km S of Sosúa, Puerto Plata Province, Dominican Republic; UF 216137, 4 km SW of Sosúa, Puerto Plata Province, Dominican Republic; UF 216182, 4 km E of Sosúa, Puerto Plata Province, Dominican Republic; UF 216179, 7 km E of Sosúa, Puerto Plata Province, Dominican Republic; UF 215993, Sosúa, Puerto Plata Province, Dominican Republic; UF 216176, 1 km NE of Rio San Juan, María Trinidad Sánchez Province, Dominican Republic; UF 216110, 0.5 km NNE of Cano Claro, María Trinidad Sánchez Province, Dominican Republic, at 30 m; UF 216120, El Valle, Samaná Province, Dominican Republic; GTW 13728b, Rio San Juan, María Trinidad Sánchez Province, Dominican Republic; GTW 9431a, outskirts of Sosúa, Puerto Plata Province, Dominican Republic.

Distribution and habitat. Known from Puerto Plata through Cano Claro on the north slope of the Cordillera Septentrional and at El Valle on the Samaná Peninsula. Part of its range lies within the Parque Nacional El Choco. Specimens have been found under rocks in pasture along limestone rolling hills and under limestone rubble at the base of cliffs. Locally common.

Comparison with other species. Although closely resembling *A. samanensis* (Figure 4 F–I) and *A. sanchezi* (Figure 4 J–N), *A. sosuaensis* lacks the keel-like spiral cords in the umbilicus.

***Abbottella (Abbottella) wilhelmi* (Pfeiffer, 1858)**

Plates 4 T–X, 8 D

Type material. Not located.

Type locality. *In insulae Haiti*. But Pfeiffer continues that it “was collected under stones in moist places near Puerto Plata” [translation].

Other material examined. UF 216149, 3 km N of Madre Vieja, Loma Blanca, Puerto Plata Province, Dominican Republic; UF 216150, 1 km N of Madre Vieja, Loma Blanca, Puerto Plata Province, Dominican Republic, at 80 m; UF 216151, 18 km SE of Rio San Juan, María Trinidad Sánchez Province, Dominican Republic, at 70 m; UF 184441, Puerto Plata, Puerto Plata Province, Dominican Republic; UF 158837, Puerto Plata, Puerto Plata Province, Dominican Republic; UF 119145, Puerto Plata, Puerto Plata Province, Dominican Republic; GTW 8273a, 15273b, Pico Isabel De Torres, Puerto Plata Province, Dominican Republic; GTW 15273a, Nagua, María Trinidad Sánchez Province, Dominican Republic; Grego coll., Puerto Plata, Puerto Plata Province, Dominican Republic.

Distribution and habitat. Specimens have been reported from isolated portions of the Cordillera Septentrional at Pico Isabel de Torres near Puerto Plata, Loma Blanca at El Choco, and the north side of the outcrop between Rio San Juan and Cabrera. Thus a large portion of its range is contained within the Parque Nacional Isabel de Torres and the Parque Nacional El Choco. Specimens were collected in rainforest on the Pico Isabel de Torres and elsewhere under limestone rubble in a grassy area with royal palms and evergreens in rolling, karsted hills, in some areas cut over for pasture.

Comparison with other species. See Comparison under *A. cf. adolfi adolfi* above (Figure 3 G–I). *Abbottella sanchezi* (Figure 4 J–N) is very similar but the spiral sculpture tends to form a carina at the periphery in that species. *Abbottella wilhelmi* (Figure 4 T–X) tends to have stronger, wider spiral cords than other species of a similar size and lacks keel-like spiral cords in the umbilicus.

***Abbottella (Gundlachtudora) bompardopolensis* Bartsch, 1946**

Figure 1 DD, 8 I

Type material. USNM 504085, holotype.

Type locality. Crevices in rocks in a ravine a little west of Bombardopolis, Haiti.

Other material examined. UF 33037, 8 km W of Terre Neuve, Artibonite Department, Haiti, at 250 m.

Distribution and habitat. *Abbottella bombardopolensis* is known from Bombardopolis and Terre Neuve; both sites are in the western-most extent of the Cordillera Centrale in Haiti.

Comparison with other species. See under *A. paradoxa* above (Figure 1 Z–CC).

***Lagopoma lagopoma* Bartsch, 1946**

Figures 4 Y–CC, 8E

Type locality. USNM 356198, holotype.

Type locality. Laguna, 4 miles N of Samaná, Samaná Province, Dominican Republic.

Other material examined. UF 216120, El Valle, Samaná Province, Dominican Republic; UF 216201, El Valle, Samaná Province, Dominican Republic; UF 236121, El Valle, Samaná Province, Dominican Republic; GTW 10081a, El Valle, Samaná Province, Dominican Republic.

Distribution and habitat. Found along the base of the high limestone cliffs in the region of El Valle in the Sierra de Samaná of the Cordillera Septentrional, possibly along the south-western edge of this outcrop as well. This species is found in association with *A. abbotti* and *A. sosuaensis*.

Comparison with other species. This species is characterized by the peculiarly folded auricle and notched outer lip. *Abbottella sanchezi* (Figure 4 J–N) occasionally has a similar auricle but lacks the notch. However, it is questionable whether these minor features of the outer lip deserve a genus-level name.

***Leiabbottella soluta* (Pfeiffer, 1852)**

Figures 2 F–I, 7 D

Type material. Not located.

Type locality. Island of Santo Domingo. Restricted by Watters (2012) to the southern edge of Los Haitises Mountains, N of Majagual, ca. 12 km NW of Sabana Grande de Boyá, Monte Plata Province, Dominican Republic. However, this is now believed to be a separate species, *Leiabbottella thompsoni* new species. The type locality of *L. soluta* is herein corrected to Yásica Abajo, Puerto Plata Province, Dominican Republic.

Other material examined. UF 216196, 7 km SSW of Yásica Abajo, Puerto Plata Province, Dominican Republic, at 800 m.

Distribution and habitat. Known only from Yásica Abajo in the Cordillera Septentrional, which is on the road over the mountains between Puerto Plata and Santiago de los Caballeros.

Comparison with other species. See comparison under *Leiabbottella thompsoni* (Figure 2 A–E).

Remarks. Watters (2012) identified Pfeiffer's *Choanopoma solutus* with a specimen from the Majagual area. At the time the presence of another, closely related species was unknown. Examination of over 200 specimens of this species has revealed that the description and figure of *C. solutus* better match the second species from Yásica Abajo in the Cordillera Septentrional (compare Figures 3 F and G). The Majagual species in the Cordillera Central is here described as new, *Leiabbottella thompsoni*.

***Leiabbottella galaxius* Watters, 2010**

Figures 2 J–L, 8 F

Type material. UF 434779, holotype. UF 434780, 1 paratype; BMSM 17972, 2 paratypes; OSUM 35491, 1 paratype; all from the type locality.

Type locality. Dominican Republic, Samaná Province, Samaná Peninsula, along Rt. 5 between Santa Bárbara de Samaná and Sánchez, in the southern foothills of the Sierra de Samaná.

Other material examined. UF 236226, 0.5 km NNE of Caro Clara, María Trinidad Sánchez Province, Dominican Republic, at 30 m; UF 216122, 3 km W of Cabrar [Cabrera], María Trinidad Sánchez Province, Dominican Republic; UF 216192, 10 km WNW of Cabrar [Cabrera], María Trinidad Sánchez Province, Dominican Republic.

Distribution and habitat. Originally described from the south coast of the Samaná Peninsula, new records extend the range to the Cabrera region on the north coast west of the peninsula. This is a region of limestone cliffs and karst ridges with cool, sheltered crevices in tropical forests. Specimens were only found on cliffs, under large boulders, and in solution pits, never under talus.

Comparison with other species. See comparison under *Leiabbottella thompsoni* (Figure 2 A–E).



FIGURE 5. A–F. *Rolleia haitensis* Bartsch, 1946. A–C. Holotype (USNM 504088), 12.0 mm width. Photo courtesy of USNM. D. UF 32777, 15.4 mm width. E. UF 32777, 13.7 mm width. F. UF 32863, 13.2 mm width. G–N. *Rolleia oberi* Watters & Duffy, 2010. G–I. Holotype (UF 434775), 10.3 mm width. J. UF 236228, 10.2 mm width. K. UF 216195, 11.0 mm width. L. UF 216195, 11.5 mm width. M. UF 216195, 10.7 mm width. N. UF 216195, 11.3 mm width. O. *Abbottella (Abbottella) calliotropis* **new species**. UF 216131, 7.1 mm width. Note predation damage. P. *Abbottella (Abbottella) diadema* **new species**. UF 215985, 5.0 mm width. Note predation damage. Q. *Abbottella (Abbottella) dichroa* **new species**. UF 216112, 8.3 mm width. Note predation damage. R. S. *Abbottella (Abbottella) nitens* **new species**. R. UF 216167, 7.9 mm width. Note predation damage. S. Holotype (UF 456806), 7.8 mm width. Note predation damage.

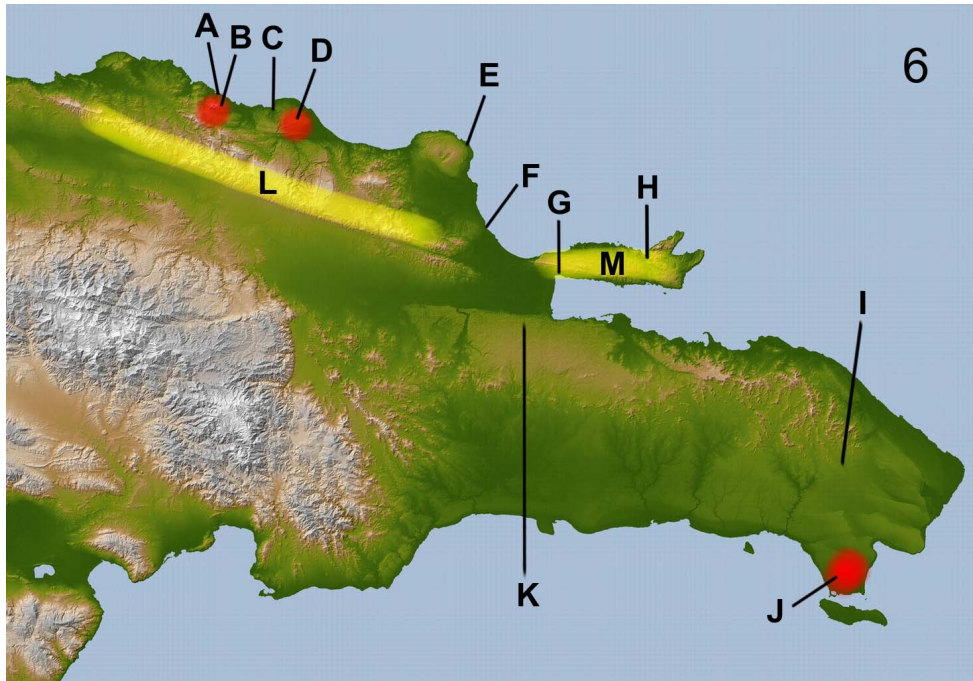


FIGURE 6. Important place names. Base map courtesy of NASA. A. Puerto Plata. B. Parque Nacional Isabel De Torres. C. Sosuá. D. Parque Nacional El Choco. E. Cabrera. F. Nagua. G. Sánchez. H. El Valle. I. Higüey. J. Parque Nacional Del Este. K. Majugual. L. Cordillera Septentrional. M. Sierra de Samaná and Samaná Peninsula.

***Rolleia haitensis* Bartsch, 1946**

Figures 5 A–F, 7 I

Type material. USNM 504088, holotype.

Type locality. Ennery, Haiti.

Other material examined. UF 32863, 9 km NE of “Dufailly” [= Duffalty], Centre Department, Haiti, at 280 m; UF 32777, hill W of waterfall, 2 km W of “Saut-d’Eau” [= Haut Saut De Eau], Centre Department, Haiti, at 440 m; UF 236258, 2 km SW of Trou Forban, L’Ouest Department, Haiti.

Distribution and habitat. Apparently limited to the Montagnes Noires range. Specimens were found in talus and in leaf litter in cut over forest, some in deep, wet ravines. Confusingly, there is a Dufailly and a Saut-d’Eau in the vicinity of Ennery (the type locality) in Artibonite Department, and indeed Saut-d’Eau has a famous waterfall, but the correct UF localities are Duffalty and Haut Saut De Eau based on the details of the collection records. These records extend the range of this species ca. 80 km to the southeast along this mountain range.

Comparison with other species. *Rolleia haitensis* has a more adnate final whorl than does *R. martensi* (Maltzan, 1888) from the Ennery region of Haiti and has more numerous axial threads. *Rolleia oberi* (Figure 5 G–N) is smaller than *R. haitensis* or *R. martensi* and has the axial sculpture produced into erect lamellae rather than threads; the outer lip is much more expanded in *R. oberi* as well.

***Rolleia oberi* Watters & Duffy, 2010**

Figures 5 G–N, 8 G

Type material. UF 434775, holotype. UF 434776, 3 paratypes; BMSM 17970, 2 paratypes; OSUM 35489, 2 paratypes; all from the type locality.

Type locality. On road half way between Santiago de los Caballeros and Puerto Plata, El Puerto, La Has, Puerto Plata Province, Dominican Republic, at 830–1000 m in the Cordillera Septentrional.

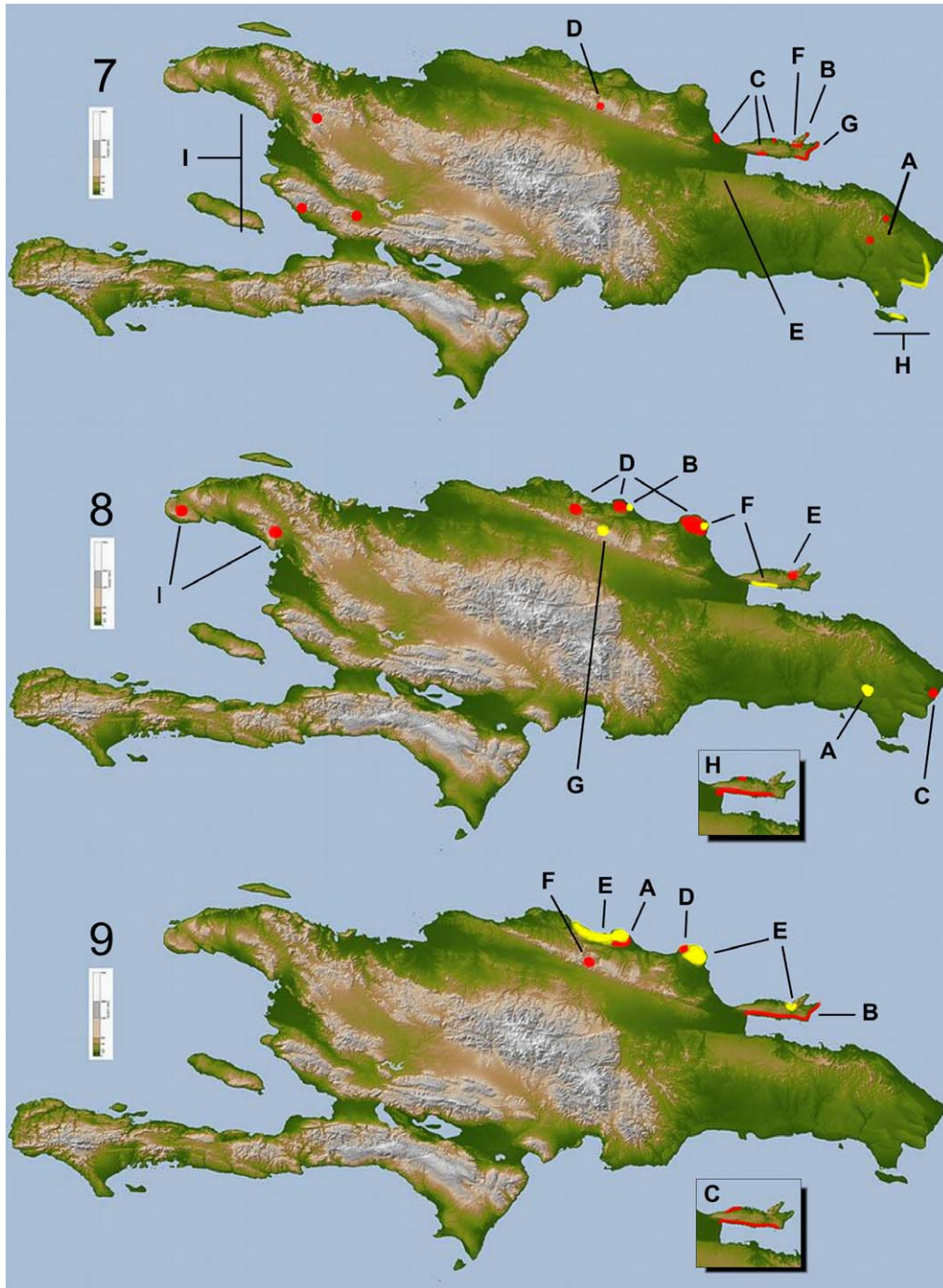


FIGURE 7. Distributions are approximate. Base map courtesy of NASA. A. *Abbottella (Abbottella) calliotropis* **new species**. B. *Abbottella (Abbottella) diadema* **new species**. C. *Abbottella (Abbottella) dichroa* **new species**. D. *Leiabbottella soluta* (Pfeiffer, 1852). E. *Leiabbottella thompsoni* **new species**. F. *Abbottella (Abbottella) abbotti* Bartsch, 1946. G. *Abbottella (Abbottella) crossei* (Pilsbry, 1933). H. *Abbottella (Abbottella) milleacantha* Watters & Duffy, 2010. I. *Rolleia haitensis* Bartsch, 1946.

FIGURE 8. Distributions are approximate. Base map courtesy of NASA. A. *Abbottella (Abbottella) nitens* **new species**. B. *Abbottella (Abbottella) tenebrosa* **new species**. C. *Abbottella (Abbottella) aenea* Watters, 2010. D. *Abbottella (Abbottella) wilhelmi* (Pfeiffer, 1858). E. *Lagopoma lagopoma* Bartsch, 1946. F. *Leiabbottella galaxius* Watters, 2010. G. *Rolleia oberi* Watters & Duffy, 2010. H. *Abbottella (Abbottella) adolfi peninsularis* Bartsch, 1946. I. *Abbottella (Gundlachtudora) bombardopolensis* Bartsch, 1946.

FIGURE 9. Distributions are approximate. Base map courtesy of NASA. A. *Abbottella (Abbottella) rosaliae* (Pfeiffer, 1858). B. *Abbottella (Abbottella) samanensis* Bartsch, 1946. C. *Abbottella (Abbottella) sanchezi* Bartsch, 1946. D. *Abbottella (Abbottella) cf. adolfi adolfi* (Pfeiffer, 1852). E. *Abbottella (Abbottella) sosuaensis* Bartsch, 1946. F. *Abbottella (Gundlachtudora) paradoxa* **new species**.

Other material examined. UF 216195, 7 km SSW of Yásica Abajo, Loma el Indio Viejo, near Puerto Plata/Santiago Province boundary, Dominican Republic, at 800 m; UF 216186, 1 km NW of Laja de Yaroa, near Puerto Plata/Santiago Province boundary, Dominican Republic; UF 236228, Laja de Yaroa, Loma de Puerto, near Puerto Plata/Santiago Province boundary, Dominican Republic, at 700 m.

Distribution and habitat. This species has only been collected off the road from Puerto Plata to Santiago de los Caballeros, which crosses the Cordillera Septentrional. The extent of its distribution along that mountain range is unknown. Locally common.

Comparison with other species. See Comparison under *R. haitensis* above (Figure 5 A–F).

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