prominent, the lateral veins slender, 8 or 9 on each side, ascending at a wide angle, nearly straight, laxly anastomosed near the margin; fruit subglobose, 4.5 cm. in diameter, terminal, solitary, subsessile, the pericarp very thick; seeds (very immature) numerous.

Type in the U. S. National Herbarium, no. 678301, collected in the vicinity of Cana, Panama, altitude 1350 meters, in 1908, by R. S. Williams (no. 814).

A relative of *Genipa americana*, apparently, but very different in the rounded apex of the leaves and rounded, obovate stipules.

ZOOLOGY.—*Classification of the Philippine operculate land shells of the family Helicinidae, with a synopsis of the species and subspecies of the genus Geophorus.*[1] PAUL BARTSCH, National Museum.

The constant demand for determinations of Philippine land shells frequently makes it necessary to lay aside monographic work on the mollusks of these islands, in order to straighten out the nomenclature of a group wholly different from the one upon which the writer may be engaged. This is true in the present instance. Several sendings of *Helicina*, in the old sense of that term, have made it necessary to subject the whole group, which is a rather large one, to critical examination. It is believed that the synopsis of the superspecific groups and the keys and brief comments on the species and subspecies of the largest genus of the family in the islands, *Geophorus*, will prove helpful in classifying material.

The genus *Geophorus* is not a difficult one. The greatest trouble in the past appears to have been the assigning of too many forms to one name, for frequently in the past authors have assigned to one species specimens which we now know belong to different genera. A very careful inventory of all the characters should enable anyone readily to place any of the known forms under its proper name by the use of the appended keys and critical remarks.

In the preparation of this paper, I have been particularly fortunate in having in the National Museum collections a set of Sowerby's cotypes collected in the Philippine Islands by Hugh Cuming, and also a set of von Möllendorff's Philippine Island shells,

[1] Published by permission of the Secretary of the Smithsonian Institution.

which helped materially in the fixing of the majority of the old names.

The members of the family *Helicinidae* found in the Philippine Islands belong to the subfamily *Helicininae,* which in turn breaks up into five genera; namely, *Ceratopoma, Pleuropoma, Sulfurina, Geophorus,* and *Kosmetopoma.*

All of these genera are based upon opercular characters which appear wonderfully constant.

Of these genera, *Ceratopoma* Möllendorff has the least specialized operculum, for here we find a simple thin transparent horny shield without calcareous deposit. The type of this genus is *Helicina caroli* Kobelt.

In *Pleuropoma* Möllendorff the operculum is still simple, i.e., a horny shield, but there is in addition a slight deposition of calcareous material. A flexuose ridge extends close to the margin in a sigmoid curve from the columellar border along the parietal edge. This gives the edge of this portion and in some species the entire operculum the appearance of being double. The type of this genus is *Helicina dichroa* Möllendorff.

In *Sulfurina* Möllendorff we find the operculum similar to that of Pleuropoma but the calcification is stronger and the flexuose line is replaced by a strong raised keel which is usually a little farther removed from the edge. The type of this genus is *Helicina citrina* Sowerby.

In typical *Geophorus* the operculum is much thickened by calcareous deposits. The columellar border bears a deep groove, giving this portion the appearance of being double.

This groove frequently extends for a considerable distance along the two long sides. The outer portion at the columellar border is frequently a little shorter than the inner, and at times considerably thickened, particularly at the posterior columellar angle, where even a knob develops in some forms. The above characters apply to *Geophorus* in the restricted sense as typified by *Helicina agglutinans* Sowerby, the genotype. There are, however, two modifications of this form of operculum, one in which the columellar border is thickened into a strong knob at the parietal edge on the outside, which is limited anteriorly by a slit or deeply

impressed groove. Upon this group I will bestow the subgeneric name *Schistopinax* with *Geophorus* (*Schistopinax*) *siquijorensis* Bartsch as genotype.

The other group has the main portion of the operculum, as in typical *Geophorus*, but a strong lamella extends across the operculum on the outside a little distance from the columellar border dividing this into a large shallow spoon shaped area, and a deep pit between the columellar border and the lamella. The group of mollusks having these opercular characters are now assigned to a new subgenus, *Diplopinax*, with *Geophorus* (*Diplopinax*) *peracutissimus* Wagner as genotype.

Geophorus therefore breaks up into the three subgenera, *Geophorus*, *Schistopinax*, and *Diplopinax*.

The most highly specialized operculum is possessed by the genus *Kosmetopoma* Wagner, which has the inside not unlike *Sulfurina*, with the internal ridge quite low, while the exterior is marked on the edge adjoining the outer and basal lip by several dentate ridges. The type of this genus is *Helicina amaliae* Kobelt.

The mollusks of this genus are earth dwellers; i.e., they live on the ground among the dead leaves about the base of trees and rocks, but their favored place of abode is found in the pockets, nooks, and crannies of honey-combed limestone in shady moist situations. I have, on several occasions, picked thousands from an area of a few square yards under such circumstances. During the rainy season they become quite active and one may then find them crawling up the lower portions of the bowl of trees and on fallen logs or rocks, while during the dry period they are neatly wedged away in the crevices of the rock and between chinks of bark and the leaf or moss-covered base of trees.

Key to the sections of the subgenus Geophorus

Spiral sculpture present.
  Angle at junction of columella and basal lip present.....I
  Angle at junction of columella and basal lip absent.....II
Spiral sculpture absent.
  Angle at junction of columella and basal lip present.....III
  Angle at junction of columella and basal lip absent.....IV

In the use of this key care must be taken not to confuse the fine cross-hatch or crinkly short lines, which are found in varying strength in all the members of the genus, with true incised spiral lines. The junction of the columella and the basal lip in one big series always forms a conspicuous angle. Members of this group practically always have the columella decidedly excavated. In the other series, the columella passes directly into the basal lip with scarcely an indication of the junction.

Section I

In this section, fine incised spiral lines are present. The columella is strongly excavated and forms a conspicuous angle at its junction with the basal lip. The following key will help in the identification of the known forms:

Greater diameter more than 14 mm.
  Periphery with an obsolete keel.....*boholensis* Bartsch
  Periphery with a strongly compressed keel
    Base decidedly inflated.....*pachychilus* Möllendorff
    Base not inflated
      Greater diameter more than 16 mm.....*romblonensis* Bartsch
      Greater diameter less than 15 mm.....*mindoroensis* Wagner
Greater diameter less than 12 mm.
  Spire rather elevated.....*negrosensis* Bartsch
  Spire rather depressed
    Shell yellow.....*nitidulus* Möllendorff
    Shell japan rose.....*versicolor* Möllendorff

The specimens of this section fall readily into two groups, one embracing large shells, in which the diameter is always more than 14 mm., and one in which the diameter is always less than 12 mm. There are four species of the larger forms. Of these, the specimens from Bohol, *Geophorus boholensis* n. sp., have the peripheral keel obsolete and the base decidedly inflated. No depression is present at the junction of the base and the peripheral keel. This is the largest of the four species. The type, Cat. No. 104419, U. S. National Museum, has 5.1 whorls and measures: altitude, 10 mm.; greater diameter, 16.5 mm.

The other three species have the peripheral keel very strongly developed. One of these, *Geophorus pachychilus* Möllendorff has the base strongly inflated and but slightly concaved at its junction with the peripheral keel. This species comes from the island of Guimaras. A typical specimen of this species, Cat. No. 258761, has 5.3 whorls and measures: altitude, 16.3 mm.; greater diameter, 14.7 mm.

The other two species have the base only moderately convex. The one *Geophorus romblonensis* n. sp., coming from the island of Romblon, is a rather compressed form, having a very broad peripheral keel, with a decided depression at the junction of the base and keel. The type of this, Cat. No. 334254, has 5.5 whorls, and measures: altitude, 8 mm.; greater diameter, 16.5 mm.

The fourth species, *Geophorus mindoroensis* Wagner which is also rather depressed, is much smaller than the last and comes from the island of Mindoro. A typical specimen, Cat. No. 184940, having 5.1 whorls, measures: altitude, 7.1 mm.; greater diameter, 14.3 mm.

Of the smaller species belonging to this section, three are known. One of these from the island of Negros, which may be known as *Geophorus negrosensis* n. sp., has the spire rather elevated. The type of this, Cat. No. 302751, has 5.5 whorls and measures: altitude, 7.3 mm.; greater diameter, 10.9 mm.

The other two species have the spire rather depressed. On one of these, *Geophorus nitidulus* (Möllendorff) Wagner, the shell varies from yellow to horn colored. This comes from central Luzon, and is particularly abundant in the region of Montalban. A typical specimen, Cat. No. 256989, having 5.3 whorls, measures: altitude, 6 mm.; greater diameter, 10.6 mm.

The last species, *Geophorus versicolor* Möllendorff, which comes from the island of Sibuyan, has the whorls japan-rose colored. A specimen of this species, Cat. No. 195495A, having 5.6 whorls, measures: altitude, 6.8 mm.; greater diameter, 11.9 mm.

Section II

The second section has fine incised spiral lines, but the columella is not strongly excavated, nor does its junction with the basal lip form a decided angle, but the columella passes almost without demarcation into the basal lip. Of this section there are five species.

Shell with a brown band on the base near the periphery.
  Greater diameter more than 15 mm.....*worcesteri* Bartsch
  Greater diameter less than 10 mm.....*benguetanus* Bartsch
Shell without a brown band on the base near the periphery.
  Greater diameter more than 14 mm.....*catainganus* Bartsch
  Greater diameter less than 8 mm.
    Shell decidedly elevated.....*trochulus* Möllendorff
    Shell depressed.....*monticolus* Möllendorff

Two of the five forms of this section have a brown band near the periphery on the base. One of these, *Geophorus worcesteri* n. sp., which

comes from the island of Leyte, is a large form. The type, Cat. No. 184931, has 5.1 whorls and measures: altitude, 8.4 mm.; greater diameter, 15.2 mm.

The other banded form, *Geophorus benguetanus*, n. sp., is globose and decidedly smaller. It comes from the mountains of the Benguet region, Luzon. The type, Cat. No. 239871, has 4.5 whorls and measures: altitude, 6.1 mm.; greater diameter, 9.4 mm.

Of the five unbanded forms, the largest, *Geophorus catainganus* n. sp., comes from Cataingan Bay on the island of Masbate. This is well elevated and has the base quite convex and a strong depression at the junction of the base and the peripheral keel. The type, Cat. No. 258768, has 5.1 whorls and measures: altitude, 9.5 mm.; greater diameter, 14.2 mm.

The two remaining forms are small species. Of these, one, *Geophorus trochulus* Möllendorff, which comes from the island of Tablas, is decidedly elevated. A specimen of this, Cat. No. 195507, has 5.1 whorls and measures: altitude, 6.2 mm.; greater diameter, 7.4 mm.

The other species, *Geophorus monticolus* Möllendorff, is rather depressed. A specimen, Cat. No. 184927, from Morong, Luzon, has 4.8 whorls and measures: altitude, 4.5 mm.; greater diameter, 6.4 mm

Section III

This group of *Geophorus* has no spirally incised lines. The columella is excavated and forms a decided angle at its junction with the basal lip. The shells thus characterized fall readily into three groups.

Shell large, broadly conic.
- Shell with color bands.....Group A
- Shell without color bands.....Group B

Shell small, narrowly conic.....Group C

Group A

Shell large, broadly conic, marked by color bands

Shell decidedly elevated.
- The summit of the last whorl falling below the strong peripheral keel and permitting this to show as a frill at the suture.....*peracutus* Wagner
- The summit of the last whorl not falling below the strong peripheral keel but appressed to it.
  - Greater diameter of shell more than 12 mm.....*leytensis* Bartsch
  - Greater diameter of shell less than 12 mm.....*leytensis basiaoensis* Bartsch

Shell rather depressed.
- Greater diameter more than 13 mm.....*siargaoensis* Bartsch
- Greater diameter less than 11 mm...*siargaoensis surigaoanus* Bartsch

There are three species and two subspecies of red and yellow-banded *Geophorus* which have a granular upper surface, no incised spiral lines, and an excavated columella that forms a decided angle at its function with the basal lip. One of these, *Geophorus paracutus* Wagner, from the island of Tablas, is a stout conic form, having the whorls but slightly convex and possessing a strong peripheral keel below which the summit of the last two turns falls in such a manner as to leave this in the suture as a frill. The early whorls of this species are yellow while the last has a zone of yellow at the summit and another at the periphery, the rest of the surface being red. The lower surface beyond the peripheral keel, which is of the same color as above, is brown, turning paler at the umbilical callus, which is pale yellow. The inside is brown while the peristome is white, washed on the inner border with brown. A specimen of six whorls measures: altitude, 8.8 mm.; greater diameter, 14.1 mm.

The banded shells from Jaro, Leyte, *Geophorus leytensis* n. sp. have the whorls more rounded than those on Tablas and the summit of the last whorl does not fall below the peripheral keel, but is appressed to its edge. The main color of the upper surface is dark red on the later whorls, edged with a narrow zone of bright yellow at the summit and the periphery. The lower surface has a yellow peripneral zone followed by a broad band of red, while the median half is pale yellow. The interior corresponds with the external color pattern. The type, Cat. No. 219023, has 5.5 whorls and measures: altitude, 8.3 mm.; greater diameter, 13 mm.

Specimens from Basiao Island, off Samar, closely resemble *Geophorus leytensis* in outline and coloring but the yellow bands are a ltttle broader and the shell is much smaller. These may be known as *Geophorus leytensis basiaoensis* n. subsp. The type of this subspecies has 5.5 whorls and measures: altitude, 7.5 mm.; greater diameter, 11 mm.

The third species is the most brilliantly colored and beautiful of all the known Philippine Island Helicinids. The shell is very broadly conic and but moderately elevated, the extreme apex extending scarcely more above the periphery than the anterior tip of the columella extends below it. The early whorls are bright yellow. The last has a broad yellow band on the summit, which is about two-thirds as wide as the dark brown band that follows, which in turn equals the bright yellow zone that bounds the very strongly angulated periphery. The brown band pales as it passes backward from the aperture which, by the way, it does not quite reach, for it terminates abruptly a little behind it and

is quite lost on the second turn back. The base is bright pale yellow excepting a sharply limited brown zone which is about as broad as the yellow zone that intervenes between this and the periphery. The interior corresponds with the exterior in coloration, the peristome being bright pale yellow. This species, which comes from the island of Siargao, may be known as *Geophorus siargaoensis* n. sp. The type, Cat. No. 184,929 has 5 whorls and measures; altitude, 7 mm.; greater diameter, 13.2 mm.

In the northeast portion of Mindanao, at Surigao, a small race of this species occurs, which differs from *Geophorus siargaoensis* chiefly in its lesser size, but also in having the basal brown band a little nearer the periphery and not so sharply limited. This smaller race may be known as *Geophorus siargaoensis surigaoanus* n. subsp. The type, Cat. No. 302772, has 5.1 whorls and measures: altitude, 6.3 mm.; greater diameter, 10.8 mm.

Group B

Shell large, broadly conic, without color bands

Peripheral keel compressed.
Operculum broadly oval.....*ticaoensis* Bartsch
Operculum rhomboidal.
Peripheral keel limited on the under side by a strongly incised line.
Middle whorls mustard yellow.
All whorls mustard yellow.....*tantalus tantalus* Bartsch
All whorls not mustard yellow, the last turns with a paler zone at the summit.....*tantalus masbatensis* Bartsch
Middle whorls capucine orange.
Last whorl pale capucine orange.*tantalus palawanensis* Bartsch
Last whorl flesh colored.....*tantalus mansalayanus* Bartsch
Peripheral keel not limited by an incised line on the under side.....*romblonensis* Bartsch
Peripheral keel rounded.....*agglutinans* Sowerby

Sowerby, in describing *Helicina agglutinans*, listed three varieties. Of these, variety *a* comes from the island of Guimaras, variety *b* from Bohol, and variety *c* from Panay. The name *agglutinans* Sowerby has since been fixed upon variety *c* by Wagner. This is a large shell which has a rounded peripheral keel, with the base somewhat inflated. There is no depressed area between the periphery and the rest of the base. The upper surface of the shell is uniformly bright yellow while the lower has a narrow zone of yellow near the periphery, below which it is suffused with reddish brown, this color shading gradually to yellow on the middle

of the base. A cotype collected by Cuming, Cat. No. 302753, has 5 whorls and measures: altitude, 9.2 mm., greater diameter, 17.3 mm.

The shells from the island of Ticao belonging to this section have the base decidedly inflated and the aperture very high, which gives the operculum an oval, rather than a trapezoidal appearance. The shells are large, barium yellow, paling toward the aperture. The upper surface is marked by coarse irregular lines of growth, the suture being rendered irregular and wavy by the coarse sculpture. The peripheral keel is reduced to a cord, which is limited by a shallow depression on the under side only. These shells may be known as *Geophorus ticaoensis* n. sp. The type, Cat. No. 256999, comes from San Miguel, Ticao. It has 5 whorls and measures: altitude, 8.9 mm.; greater diameter, 14.8 mm.

The most difficult group of this section is represented in our collection by a series of specimens from the islands of Mindoro, Palawan, Samar, and Masbate. This group embraces medium-sized shells having a moderately elevated spire and a narrow peripheral keel, which is bounded on the lower side by a well incised spiral line. They represent a distinct group to which the name *Geophorus tantalus* n. sp. may be applied. I have seen good series of specimens from the four above mentioned islands which demand a further subdivision of this species, as indicated in the key. The specimens from Samar have the shell mustard yellow and this race may carry the subspecific name *Geophorus tantalus tantalus* Bartsch. The type, Cat. No. 288773, comes from near Catbalogan, has 5 whorls, and measures: altitude, 7.1 mm.; greater diameter, 10.7 mm.

The specimens from Masbate are of similar coloration as the last excepting that on the last two turns a lighter yellow zone bounds the summit. This race may be known as *Geophorus tantalus masbatensis* n. subsp. The type of this, Cat. No. 258769, comes from Cataingan Bay and has 5.5 whorls, and measures: altitude, 6 mm.; greater diameter, 10.2 mm.

The western specimens, i.e., those from the islands of Mindoro and Palawan, have the extreme tip mustard yellow and the turns immediately succeeding capucine orange. In the specimens from Palawan the last turn is pale capucine orange. This species may bear the name *Geophorus tantalus palawanensis* n. sp. The type of this, Cat. No. 334256, comes from Bacuit, has 5.1 whorls and measures: altitude, 6.3 mm.; greater diameter, 10.6 mm.

The shells from Mindoro agree with the last excepting that the last turn is flesh colored. These may bear the trinomial designation *Geo-*

phorus tantalus mansalayanus n. subsp. The type, Cat. No. 258762, comes from Mansalay Bay, has 5.6 whorls, and measures: altitude, 6.4 mm.; greater diameter, 10.8 mm.

From the island of Romblon we have seen several lots of shells which agree with *Geophorus tantalus* Bartsch in size and general sculpture, but the peripheral keel is wider and not limited on the basal side by an incised line. A shallow depressed concave area separates the convex portion of the base from the peripheral keel. This form also has the whorls considerably more convex on the upper side than the shells of *Geophorus tantalus* and the sculpture is very coarse, while in Geophorus *tantalus* it is rather fine. I therefore feel that it is specifically distinct from *Geophorus tantalus* and it may be known as *Geophorus romblonensis* n. sp. The type, Cat. No. 208246, has 5.3 whorls and measures: altitude, 7 mm.; greater diameter, 11.5 mm.

Group C

Shell small, narrowly conic

Shell with a deep umbilical pit. . . . . *pseudomphalus* Möllendorff
Shell without a deep umbilical pit.
Shell with a strongly compressed peripheral keel
cyrtopomus Möllendorff
Shell with a rounded peripheral cord.
Peripheral cord strong, coarse and wavy
trochaceus calayanensis Bartsch
Peripheral cord well rounded, smooth.
Upper surface coarsely granular.
Greater diameter 8.9 mm. . . . . *trochaceus palauiensis* Bartsch
Greater diameter 7.9 mm. . . . *trochaceus marivelesanus* Bartsch
Upper surface finely granular.
Shell elongate conic. . . . . *trochaceus trochaceus* Möllendorff
Shell broadly conic. . . . *trochaceus nanus* (Möllendorff) Wagner

The small conic granulose *Geophorus* having an excavated columella that forms a strong angle at its junction with the basal lip and lacking spirally incised lines, fall readily into three divisions, which may be considered species. One of these, *Geophorus pseudomphalus* Möllendorff, has a strongly impressed umbilical pit. This is so far known only from the environs of Sibul, Bulacan Province, Luzon. The second species, *Geophorus cyrtopomus* Möllendorff, ranges through the mountains of central Luzon at least from Montalban to Morong. It is characterized by a decidedly compressed peripheral keel and decidedly less elevated spire than the next species. The third species, *Geophorus trochaceus* Möllendorff, has a much wider range in distribution and

breaks up into a number of geographic races. *Geophorus trochaceus trochaceus* Möllendorff comes from the island of Leyte. It is a very small shell of elongate conic form, having the peripheral keel rather rounded and the upper surface finely granulate. A specimen of *Geophorus trochaceus trochaceus* Möllendorff from Leyte, Cat. No. 302767, has 5.3 whorls and measures: altitude, 5.3 mm.; greater diameter, 6.8 mm. The most northern race, *Geophorus trochaceus calayanensis* n. subsp., comes from Calayan Island, of the Babuyanes group. This is considerably larger than the typical form with coarser incremental lines and granulations. The peripheral keel, too, is stronger, irregular and wavy. The type of this, Cat. No. 334254, has 5.3 whorls and measures: altitude, 6.2 mm.; greater diameter, 8.1 mm.

Another, *Geophorus trochaceus palauiensis* n. subsp., recalls strongly the shell from Calayan. It is almost of the same size but has the peripheral keel well rounded and is in every way less coarsely sculptured than the northern representative. It comes from Palaui Island. The type, Cat. No. 258789 has 5.3 whorls and measures: altitude, 6.2 mm.; greater diameter, 8.9 mm.

Two additional subspecies occur upon the island of Luzon. One, a medium sized form, *Geophorus trochaceus marivelesanus* n. subsp., which is known from the southern end of the Zambales range at Mariveles. This, like the Palaui race, has the upper surface coarsely granular, but it is much smaller. The type, Cat. No. 302774, has 5.3 whorls and measures: altitude, 5.3 mm.; greater diameter, 7.8 mm.

The smallest race, *Geophorus trochaceus nanus* (Möllendorff) Wagner, comes from Sibul, Bulacan Province. This race has a lesser number of whorls and is a little more finely granular than the other Luzon forms. A typical specimen, Cat. No. 195491, having 4.5 whorls measures: alitude, 4 mm.; greater diameter, 5.8 mm.

Section IV

Shell banded..... *acutissimus* Sowerby
Shell not banded.
Shell broadly conic..... *palananus* Bartsch
Shell narrowly conic.
Operculum with a knob at the posterior columellar border *perezi* Bartsch
Operculum without a knob at the posterior columellar border *caramoanus* Bartsch

The section in which the spiral sculpture is absent and in which the columella is not excavated and in which there is no decided angle at

the junction of the columella and basal lip is rather small. It is represented at present by four forms only, coming from the islands of Luzon, Pagbilao, and Bohol. One of these three forms has color bands. The largest, *Geophorus acutissimus* Sowerby, comes from the island of Bohol. In this, all but the last turn are pale yellow, the last is flesh-colored. There is a zone of rose pink at the summit and an equal one near the peripheral keel. A third cone about twice as wide as these is on the base separated from the peripheral keel by a narrow light zone. On the inside of the aperture these red bands are almost scarlet. A cotype, of this species, Cat. No. 104415, collected by Cuming, has 5 whorls and measures: altitude, 9 mm., greater diameter, 16.7 mm.

Of the three unbanded forms of this section one, *Geophorus palananus* n. subsp., is of medium size, broadly conic, and of quite uniform honey, yellow. The sculpture of the upper surface is much coarser than in the preceding. This race comes from Palanan, Isabela Province, Luzon. The type, Cat. No. 302787, has 5 whorls and measures: altitude, 6.3 mm.; greater diameter, 9.9 mm.

Two of the races have a decidedly elevated narrow conic shell. One of these, *Geophorus perezi*, n. sp., comes from the greater Pabgilao Island, off southwestern Luzon. This is a small form in which the operculum is very broad and bears a decided knob at the posterior columellar border. The type, Cat. No. 310058, has 5 whorls and measures: altitude, 5.2 mm.; diameter, 7.6 mm. The other, *Geophorus caramoanus* n. sp., comes from Caramoan on the south end of the Caramoan peninsula in Ambos Camarines, Luzon. This has the shell a little more elevated than *G. perezi* Bartsch, with the operculum much narrower and with a tooth on the posterior columellar end of it. The type, Cat. No. 195504, has 5 whorls and measures: altitude 5 mm.; greater diameter, 6.8 mm.

Schistopinax, new subgenus

In this subgenus, the columellar border is thickened into a strong knob at the parietal edge on the outside, which is limited anteriorly by a deeply incised groove.

Greater diameter more than 12 mm. . . . . *siquijorensis* Bartsch
Greater diameter less than 8 mm.
  Last whorl moderately rounded. . . . . *trochiformis* Sowerby
  Last whorl very strongly rounded
    trochiformis subtrochiformis (Möllendorff) Wagner

Of this subgenus I know only three forms and of these only one from personal examination; namely, the type of the subgenus, *Geophorus*

(*Schistopinax*) *siquijorensis* n. sp. This species, which comes from the island of Siquijor, is broadly conic and has a brown band on the base near the periphery. The type, Cat. No. 195499, has 5.5 whorls and measures: altitude, 7.5 mm.; greater diameter, 12.8 mm.

The other two forms are much smaller and narrowly conic. *Geophorus* (*Schistopinax*) *trochiformis* Sowerby comes from the island of Negros. Wagner cites 4.5 whorls with an altitude of 5.5 mm. and a major diameter of 6.5 mm. for the specimen he figures. He states and shows that this is a little less elevated and has the last whorl a little less rounded than *Geophorus* (*Schistopinax*) *trochiformis subtrochiformis* (Möllendorff) Wagner, which he describes from the island of Marinduque, and for which he gives the measurements: altitude, 5.5 mm.; greater diameter, 7 mm.

Diplopinax, new subgenus

This subgenus is characterized by having the outer surface of the operculum crossed by a lamella which divides the operculum into a shallow, large labial portion and a strong pit at the columellar end. Type: *Geophorus* (*Diplopinax*) *tagbilleranus* Bartsch.

Incised spiral lines present.
- Color band present on the base.
  - Greater diameter more than 13 mm. ..... *acutus* Pfeiffer
  - Greater diameter less than 11 mm. *albocarinatus* (Möllendorff) Wagner
- Color bands absent on the base.
  - Greater diameter more than 17 mm. ..... *bothropomus* Möllendorff
  - Greater diameter less than 12 mm.
    - Spire decidedly elevated ..... *conoidalis* Möllendorff
    - Spire decidedly depressed ..... *möllendorffi* Bartsch

Incised spiral lines absent.
- Color bands present.
  - Greater diameter more than 14 mm. ..... *peracutissimus* Wagner
  - Greater diameter less than 13 mm.
    - Interior suffused with red ..... *tagbilleranus* Bartsch
    - Interior not suffused with red ..... *cumingi* Bartsch
- Color bands absent.
  - Shell broadly conic ..... *lazarus* Sowerby
  - Shell narrowly conic ..... *duponanus* Bartsch

It is interesting to note that in none of the species so far known do we find the junction of the columella and basal lip forming a decided angle. The subgenus can be divided into two sections on the presence or absence of fine incised spiral lines.

The section in which incised spiral lines are present embraces five species coming from the islands of Luzon, Marinduque, Siquijor, and Cebu, while the six belonging to the section that has no incised spiral lines come from the islands of Luzon, Negros, Bohol, and Leyte.

Of those having incised spiral lines, two are provided with collar bands. One of these, *Geophorus* (*Diplopinax*) *acutus* Pfeiffer, is much larger than the other. A cotype, Cat. No. 104393, collected by Cuming at Argao, eastern Cebu, has 5.5 whorls and measures: altitude, 8.3 mm.; greater diameter, 13.8 mm. The smaller banded form, *Geophorus* (*Diplopinax*) *albocarinatus* (Möllendorff) Wagner, comes from the island of Siquijor. A specimen, Cat. No. 195505, having 5.1 whorls measures: altitude, 6.6 mm.; greater diameter, 10 mm.

Of the three unbanded species one, *Geophorus* (*Diplopinax*) *bothropomus* Möllendorff, is quite large. Of this I have not seen specimens. Wagner figures the operculum and gives the following measurements: altitude, 9.5 mm.; greater diameter, 18 mm. It comes from Caramoan, Luzon. The other two species are decidedly smaller. One of these *Geophorus* (*Diplopinax*) *conoidalis* Möllendorff, has the spire decidedly elevated and the base but very slightly rounded. A specimen of this species, Cat. No. 258786, has 5.3 whorls and measures: altitude, 7.4 mm.; greater diameter, 10.8 mm. The last species, *Geophorus* (*Diplopinax*) *möllendorff* in. sp., has the spire rather depressed and the base strongly rounded. The type, Cat. No. 195503, comes from the island of Siquijor. It has 5.1 whorls and measures: altitude, 4.9 mm.; greater diameter, 9.8 mm.

The section lacking incised spiral lines can be divided into a banded and plain group. The banded group embraces three forms, of which *Geophorus* (*Diplopinax*) *peracutissimus* Wagner is quite large. This species comes from the island of Negros. A specimen, Cat. No. 302777, having 5.1 whorls measures: altitude, 8 mm.; greater diameter, 14.6 mm. This has a faint brown band at the summit and another above and below the periphery, a little within the edge. The other two forms are of medium size. One, *Geophorus* (*Diplopinax*) *cumingi* n. sp., collected by Cuming on Negros, has the color bands as in *Geophorus* (*Diplopinax*) *peracutissimus* Wagner, but the shell much more elevated. The type, Cat. No. 302739, has 5.2 whorls and measures: altitude, 7.5 mm.; greater diameter, 11.2 mm. The third banded species, *Geophorus* (*Diplopinax*) *tagbilleranus* n. sp., has the last whorls suffused with red and the interior of the same color. The type of this, Cat. No. 258760, comes from Tagbileran, Bohol. It has 5.2 whorls and measures: altitude, 7 mm.; greater diameter, 11.9 mm.

Two species and a subspecies are known of the unbanded forms. Of these one, *Geophorus* (*Diplopinax*) *lazarus* Sowerby, is a broadly conic, medium-sized shell that comes from the region of Bongabong, Nueva Ecija, Luzon. A cotype of this, collected by Cuming, Cat. No. 302740, has 4.9 whorls and measures: altitude, 5.9 mm.; greater diameter, 11.6 mm. The subspecies, *Geophorus* (*Diplopinax*) *lazarus transitans* Wagner, which comes from Libmanan, Ambos Camarines, Luzon, is said to have measured: altitude, 7 mm.; greater diameter, 12 mm. The remaining species, *Geophorus* (*Diplopinax*) *duponanus* n. sp., has the shell narrowly conic. The type, Cat. No. 258787, comes from the west shore of Port Dupon, Leyte. It has 5 whorls and measures: altitude, 6.5 mm.; greater diameter, 9.4 mm.

In the preceding synopsis of the Philippine members of the genus *Geophorus*, all but the following three known forms, of which no specimens were at hand, have been heated. I suspect that all three of these belong to *Geophorus* in the restricted sense, but shall refrain from assigning them to a definite position until representative material will make it possible to do so positively. These forms are: *Geophorus trochiformis gibbosulus* (Möllendorff) Wagner cited from Tayabas, Luzon; *Geophorus agglutinans solidulus* (Möllendorff) Wagner, from the island of Lubang; and *Geophorus acutus intermedius* (Möllendorff) Wagner from the island of Cebu.