

THE JOHNS HOPKINS UNIVERSITY  
STUDIES IN GEOLOGY

No. 3

EDITED BY  
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THE PALEONTOLOGY  
OF THE ZORRITOS FORMATION  
OF THE NORTH PERUVIAN  
OIL FIELDS

BY  
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marked by a flat-topped keel bearing four of the spiral bands. The spiral sculpture decreases in strength toward the base, and the longitudinal ribs converge toward the point of the columella. The columella is biplicate, the posterior fold rising sharply at its anterior end. The aperture is narrow, and the anterior canal reflexed. The apical angle is somewhat wide for the genus. Altitude, 2.6 cm.; maximum diameter, 9 mm.

*T. tuberosa* differs from *T. gausapata* Brown and Pilsbry,<sup>22</sup> from Gatun, and its varieties *laevifasciata* Maury,<sup>23</sup> from Cercado de Mao, Santo Domingo, and *hercudera* n. var., in its wider apical angle, less prominence of the longitudinal ribs on the main body of the whorl, and comparatively broader fasciole. *T. tuberosa* has fewer spiral bands. *T. protecta* Conrad, most recently described by Maury<sup>24</sup> from Santo Domingo, though not as close as the *gausapata* group, is similar in general conformation. The spiral bands in *protecta* are much broader, and the longitudinal ridges less elevated. The fasciole is more prominent in *tuberosa*.

Zorritos formation, Zorritos.

#### Family CONIDAE

#### Genus CONUS Linnaeus

#### *Conus multibratus* var. *gaza* Johnson and Pilsbry

*Conus gaze* Johnson and Pilsbry, Proc. Ac. Nat. Sc. Phila., vol. 63, p. 342, pl. 23, figs. 2, 3, 1911.

*Conus gaze* Maury, Bull. Amer. Pal., vol. 5, No. 29, p. 40, pl. 7, fig. 12, 1917.

*Conus multibratus* var. *gaza* Woodring, Bowden Ms.

"The shell is biconic, diameter over half the length, the spire is nearly one-third the total length, concavely conic, attenuate toward the apex. Post-embryonic whorls about

<sup>22</sup> Proc. Ac. Nat. Sc. Phila., vol. 63, p. 340, pl. 22, figs. 8, 9, 1911.

<sup>23</sup> Bull. Amer. Pal., vol. 5, No. 29, p. 27, pl. 3, fig. 10, 1917.

<sup>24</sup> Bull. Amer. Pal., vol. 5, No. 29, p. 28, pl. 4, fig. 7, 1917.

9, slightly concave, the lower edge of each angular, projecting a little; the angle tuberculate in the first post-embryonic whorl, smooth in the rest; sculptured with deeply arcuate, narrow, low and widely spaced riblets and striae; no spiral striae. Last whorl acutely angular at the shoulder, barely convex below the angle, the outline becoming concave in the lower part; sculptured with 20-22 strong, smooth spiral cords, separated by wider intervals which are sharply striated by growth-lines. Aperture very narrow. Length, 24, diam. 13.1 mm."—Johnson and Pilsbry, 1911.

Lower Zorritos. Quebrada Zapotal, Zorritos district; Santo Domingo; Bowden, Jamaica; Gatun, Panama.

Two specimens in the Hopkins collection are referable to this species. A coating of calcite obscures the finer details of sculpture, and the presence of the longitudinal striations on the body whorl characteristic of *gaza* are not clear, but other characters agree with sufficient closeness to advise at least tentative reference to the Antillean variety.

This form occurs at Cercado de Mao, Santo Domingo, in beds ascertained by Maury<sup>15</sup> to be Burdigalian in age. It occurs also in the Bowden beds of Jamaica, and at Gatun. It is closely related to *Comus bocapanensis* and *Comus berryi*, of the Zorritos fauna. A detailed discussion of its relationships to them will be found in the remarks on each.

*Comus bocapanensis* n. sp.

PLATE I—Fig. 3.

*Comus* sp. ind. A. Nelson, Trans. Conn. Acad., vol. 2, p. 104, 1870.

Shell small to medium-sized, unequally biconic, the spire turreted. The spire is fairly high, including about a third of the entire height, its slopes straight in profile. Whorls 8-9 in number, the first two of the spire smooth and rounded, the following with a marked keel at the lower third, the

<sup>15</sup> Bull. Amer. Pal. No. 30, Table at end.

surface above the keel being concave and below straight. On the spire the sculpture is of growth-lines, poorly defined, only. On the body whorl are sixteen or seventeen spiral bands, separated by narrow interspaces, with growth-lines in the interspaces. The spiral sculpture is weaker near the shoulder. The shoulder of the body whorl is sharp, the surface below being straight. Aperture fairly narrow, of constant width, the columella slightly reflexed at the base. Height, 37; diameter, 17 mm.

This species is closely related to a group of small cones from the Antillean-Carribean region. It is perhaps closest to *C. tortuosostratus* Toulou,<sup>26</sup> from Gatun; it differs only in having simple instead of differentiated spiral sculpture, and in lacking the beaded keels characteristic of *tortuosostratus*. It is also similar to *Conus multiliratus* var. *gaza* Johnson and Pilsbry,<sup>27</sup> from Gatun, Bowden, and Santo Domingo and Zorritos, but it is more slender, and has broad-topped ribs on the body whorl instead of the finer spirals of *gaza*. *C. imitator* Brown and Pilsbry,<sup>28</sup> from Gatun, differs in having 16 ribs on the lower half of the body whorl instead of 6 over the entire surface, and in having the profile of the spire concave instead of straight. The spire of *bocapanensis* differs in similar way from that of *C. planiliratus* Sowerby,<sup>29</sup> from Santo Domingo; the profile is straight in lines instead of concave.

Lower Zorritos. North of Quebrada de Boca Pan.

*Conus berryi* n. sp.

PLATE I—Fig. 4.

Shell small, biconic, the altitude little more than 1.5 times the diameter, and the cone of the body whorl about 1.5 times

<sup>26</sup> Jahrb. k.k. geol. Reich. Anst., Bd. 61, p. 508, pl. 31, fig. 22, 1911.

<sup>27</sup> Proc. Ac. Nat. Sc. Phila., vol. 63, p. 342, pl. 23, figs. 2, 3, 1911, as (*Conus gaze*).

<sup>28</sup> Idem., fig. 4.

<sup>29</sup> Maury, Bull. Amer. Pal., vol. 5, No. 29, p. 45, pl. 7, fig. 10, 1917.

the length of the spire. Whorls about 9 in number, the surface of each whorl inclined from the suture to a sharp keel, from which it recurved to the suture. The spire is thus turreted. The keel is waved, giving the spire a coronate appearance. Sculpture of slightly arcuate lines of growth on the spire; on the sides of the body whorl are spiral bands separated by narrow interspaces. The lower bands are very sharply defined, but they decrease in sharpness of definition above. Faint lines of growth cross the bands. The aperture is narrow. Height, 17; diameter, 10.75 mm.

This species is similar to *C. marginatus* Sowerby<sup>20</sup> from Antillean Miocene horizons, from which it differs in having a higher spire, which is coronate, not smoothly keeled. *C. multiratus* var. *gaza* Johnson and Pilsbry<sup>21</sup> is similar to both these forms; it differs from *bryyi* in being more tapering, longer, with a proportionally lower spire, the whorls of which are not coronately keeled.

Lower Zorritos. Hervideras, Zorritos district.

*Conus cacuminatus* n. sp.

PLATE I, FIG. 5

*Conus* sp. in F. B. Nelson, Trans. Conn. Acad., vol. 2, p. 164, 1870.

Shell large, moderately heavy; the spire of medium height, and the body whorl tapering gracefully in a straight-sided cone. Whorls 7-10 in number; the 2½ nuclear whorls smoothly convex, and the remainder concave, with a smooth keel at the outer edge just above the suture. Sculpture of lines of growth, arcuate on the whorls of the spire, straight on the body whorl and lamellose in worn specimens. The best preserved specimen shows numerous very faint spiral striae on the whorls, with a faintly impressed spiral line at the deepest point of the concave whorl-surface. Near the

<sup>20</sup> Quart. Jour. Geol. Soc. Lond., vol. 6, p. 44, 1849; Maury, Bull. Amer. Pal., vol. 5, No. 20, p. 46, pl. 7, fig. 11, 1917.

<sup>21</sup> Proc. Ac. Nat. Sc. Phila., vol. 63, p. 342, pl. 23, figs. 2, 3, 1911.

base of the body whorl are six to eight spiral cords with narrower interspaces; these are most prominent just inside the aperture. The shoulder of the body whorl is sharp, and the sides descend from it, with very little convexity, in straight lines. The aperture is somewhat wide. Height, 73; diameter, 38.5 mm.

A number of specimens of this graceful cone occur in Nelson's collection, and a cast in the Singewald collection from the Upper Zorritos formation is questionably identified with it. It is similar to *Conus molis* Brown and Pilsbry,<sup>32</sup> of the Gatan fauna, differing from that species in having straighter sides, lacking the prominent spiral striae on the body whorl, and in having a proportionally higher spire. It is a much smaller form. It differs from *C. molis* var. *bracoi*, of the local fauna, as noted in the remarks on that variety.

Upper Zorritos (?). Quebrada de las Alturas.

*Conus molis* var. *bracoi* n. var.

PLATE I. Fig. 6.

*Conus* sp. ind. C. Nelson, Trans. Conn. Acad., vol. 2, p. 194, 1870.  
 Shell large, solid, heavy. The spire very low, almost flat except at the apex, where the early whorls rise in a nipple-like peak. Whorls twelve to fourteen in number, the last four or five flat to very slightly concave, the remainder flat to convex. The whorls of the spire are depressed in some specimens at the suture, the edge of the succeeding whorl rising above the suture. Sculpture of moderately arcuate growth-lines on the spire; on the body whorl the growth-lines are prominent on worn specimens; there is no evidence of spiral sculpture on the spire and upper part of the body whorl; on the lower part of the body whorl are fairly coarse spiral threads. A distinct, thread-like keel marks the outer edge of each whorl; on the body whorl it marks the apex

<sup>32</sup> Proc. Ac. Nat. Sc. Phila., vol. 63, p. 343, pl. 23, fig. 1, 1911.

of the shoulder, which is subacute and rounded just below the keel. The surface is straight below. The aperture is long and narrow. Height, 75; diameter, 48 mm.

A number of individuals of this variety occur in both the Hopkins and Nelson collections. It differs from *C. molis* Brown and Pilsbry,<sup>33</sup> from Gatun, in being somewhat smaller, lacking the fine spiral striae, having the whorls of the spire less concave, and in being convex for a shorter distance below the shoulder of the body whorl. *Conus cacuminatus*, of the local fauna, differs in having a straighter profile and a much more conic spire.

Upper Zorritos. Quebrada Tusillal, and del Toro.

#### Family CANCELLARIIDAE

#### Genus CANCELLARIA Lamarck

#### Subgenus *Aphera* H. & A. Adams

#### *Cancellaria (Aphera) peruana* Nelson

PLATE IV—Fig. 13.

*Aphera peruana* Nelson. Trans. Conn. Acad., vol. 2, p. 190, pl. 6, fig. 3. 1870.

"Shell elongated, sub-fusiform; spire short, pointed, formed by five or six moderately convex whorls. Body whorl large, three-fourths the length of the shell, ventricose. Surface marked by nearly equal longitudinal and transverse ridges, which form strong raised cancellations, and are so arranged as to form blunt, obtuse granulations at the point of contact. Longitudinal lines finer, and much crowded near the outer lip. Aperture oblong-oval, narrow, half as long as the shell. Lips covered with callus, which is continuous above and below the aperture. Callus of columella lip strongly reflexed over the shell, much broader above than below, almost completely covering the umbilicus. Outer

<sup>33</sup> Proc. Ac. Nat. Sc. Phila., vol. 63, p. 343, pl. 23, fig. 1, 1917.

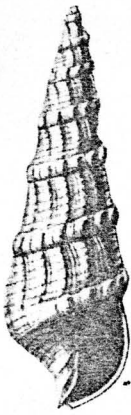
## PLATE I.

- Fig. 1. *Terebra gausapata* var. *herciderana* Spieker, x2.  
2. *Terebra tuberosa* (Nelson), x2.  
3. *Conus bocapanensis* Spieker, x2.  
4. *Conus herryi* Spieker, x2.  
5. *Conus cacuminatus* Spieker.  
6. *Conus molis* var. *bravoi* Spieker.  
7,8. *Calliostoma* (*Entrochus*) *moduliferum* Nelson, x2.  
9. *Marginella macassata* Nelson.  
10, 11. *Solenosteira alternata* (Nelson).  
12. *Thos* (?) *latirugatus* Spieker.

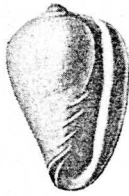




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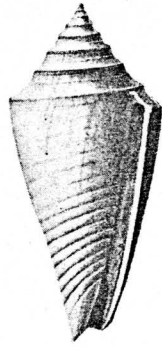
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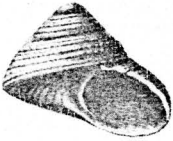
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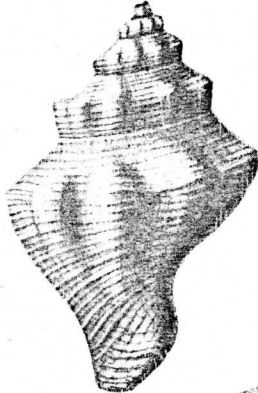
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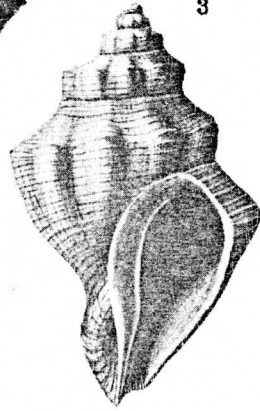
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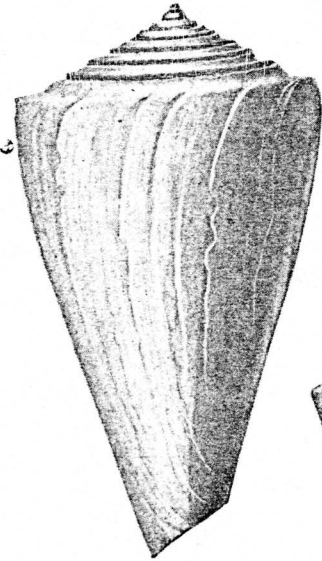
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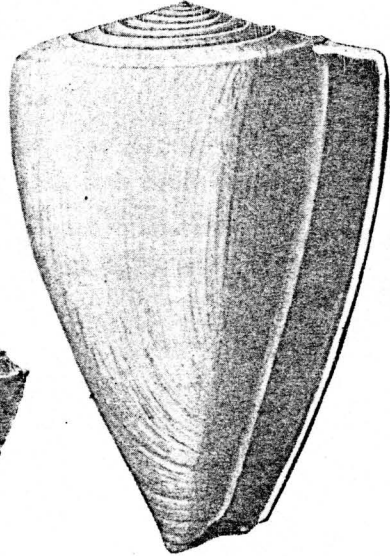
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