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96. *Miocene Mollusca from the Neighbourhood of Cucurrupi, Department of Chocó, Colombia*

By

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The material described in this paper was collected in 1938 by Mr. Shiro OHOMACHI, whom I wish to thank for kindly forwarding me the collection for study. The localities in which they were found are in the Tertiary deposits exposed along the Sn. Juan valley, near Cucurrupi, about 55 km. north of Buenaventura, Department of Valle del Cauca, Colombia. The localities listed below are considered to belong to the same horizon. The fossil beds, to which I suggest "Cucurrupi beds" for convenience sake, are composed of rather soft grey shale. The collection is now stored in the Imperial Geological Survey of Japan.

I wish to express my sincere gratitude to Prof. Shintarô NAKAMURA of the Institute of Geology, Kyôto Imperial University, for his invaluable suggestions, and to Mr. Ichizo ÔMURA, chief geologist of Nippon Oil Company, Limited, for his giving me the opportunity to make this study. I wish also to express my heartfelt thanks to Messrs. Kôiti SUZUKI and Fuyuji TAKAI of the Institute of Geology, Tokyo Imperial University, and to Mr. Kinji KANEHARA of the Imperial Geological Survey of Japan, for their assistance in many ways.

I. List of Localities and Fossils

- N3: On the right bank of about 4 km. up the Copoma from the confluence with the Sn. Juan.
N4: On the left bank of the Copoma, 600 m. up the stream from N3.
O5: On the left bank of the Cucurrupi, some 3.5 km. from the river junction with Sn. Juan.
P2: On the left bank of the Sn. Juan, about 6 km. upper reaches from the confluence with the Cucurrupi.

II. Correlation

Tuberá group of North Colombia: The name of Tuberá group was first suggested by ANDERSON¹⁾ without any definite delimitation, and later the name was

1) ANDERSON: Bull. Amer. Assoc. Petrol. Geol., vol. 10, no. 4, pp. 382-404, 1926.

Species	N 3	N 4	O 5	P 2	Tuberá Group			Miocene, Cartagena	Gatun Formation, Panama	Gatun Formation, Costa Rica
					M-N	P	R			
GASTROPODA										
<i>Turritella attilira</i> CONRAD	+				+	+			+	
<i>Turritella attilira chiriquiensis</i> OLSSON.....			+	+						+
<i>Architectonica granulata</i> (LAMARCK).....			+	+		+			+	+
<i>Natica guppyana</i> TOULA			+		+	+			+	+
<i>Pyrene chiriquiensis</i> (OLSSON)		+	+			+				+
<i>Pyrene ohomachii</i> n. sp.....			+	+						
<i>Pyrene tumbezia olssoni</i> n. subsp.			+							
<i>Phos gatunensis</i> TOULA			+						+	
<i>Phos mexicanus</i> BOSE.....				+						+
<i>Cantharus dalli</i> (BROWN and PILSBRY)			+					+	+	
<i>Fusinus</i> cf. <i>honensis</i> OLSSON			+							
<i>Oliva sayana immortua</i> PILSBRY and BROWN				+		+	+	+		+
<i>Vexillum cucurruapiensis</i> n. sp.			+							
<i>Cancellaria cossmanni</i> OLSSON.....			+			+				+
<i>Cancellaria dariena</i> TOULA			+			+			+	+
<i>Turris albida</i> (PERRY)			+	+	+	+			+	+
<i>Turris vanningeni</i> (BROWN and PILSBRY) ..			+	+					+	
<i>Cythara</i> cf. <i>cercadica</i> MAURY			+							
<i>Glyphostoma andersoni</i> n. sp.....			+							
" <i>Drillia</i> " <i>limonetta</i> OLSSON.....			+							+
" <i>Drillia</i> " <i>papaya</i> OLSSON			+							+
" <i>Drillia</i> " <i>aguanica</i> OLSSON.....			+							+
" <i>Drillia</i> " cf. <i>musacina</i> OLSSON			+							
" <i>Drillia</i> " cf. <i>henkeni</i> SOWERBY		+	+							
<i>Conus multiratus gaza</i> JOHNSON and PILSBRY ..		+	+					+	+	+
<i>Terebra gatunensis</i> TOULA.....			+				+			
<i>Terebra gabbi cucurruapiensis</i> n. subsp.				+						
PELECYPODA										
<i>Glycymeris lamyi trilobocosta</i> PILSBRY and BROWN.....	+							+		
<i>Arca occidentalis</i> PHILIPPI	+							+		+
<i>Anadara dariensis</i> (BROWN and PILSBRY) ..			+			+			+	
<i>Anadara hindsi</i> (OLSSON)			+							+
<i>Chama congregata</i> CONRAD	+		+							+
<i>Corculum heredium ohomachii</i> n. subsp.....	+		+							
<i>Callista maculata</i> (LINNÉ).....	+				+	+			+	+
<i>Aloidis sancti-dominici</i> (MAURY).....	+		+							+
<i>Aloidis hexacyma</i> (BROWN and PILSBRY) ..		+		+					+	

employed by him¹⁾ in a more definite treatment. The Tuberá group, consisting of shale, sandy shale, and sandstones, is well represented about Tuberá mountain and its environs. The three distinct fossil horizons, namely M-N, P and R are re-

1) ANDERSON: Proc. Calif. Acad. Sci., vol. 16, no. 3, pp. 87-91, 1927.

cognized by the same author¹⁾, who listed and described many species of mollusks from these horizons. As seen in the list of fossils, among the 36 species from the Cucurupi beds 4 are found in the horizons M-N, 10 in the horizon P, and 2 in the horizon R. The Cucurupi may be contemporaneous with horizon P, which corresponds to the Helvetian.

Miocene of Cartagena, Colombia: PILSBRY and BROWN²⁾ describe 34 species of mollusks, most of which are local forms. Only 4 species are in common with the Cucurupi beds and the Miocene of Cartagena. Exact correlation is impossible for the poor common species.

Gatun formation of Panama and of Costa Rica: The West Colombia Miocene is closely connected to that of Costa Rica and Panama. There are 17 common species between the Cucurupi beds and the Gatun formation of Costa Rica, and 13 between the Cucurupi and the Gatun of Panama. These species are cited in the accompanying list. The Gatun formation of Panama and Costa Rica may be equivalents of the Cucurupi.

Miocene of Ecuador and Peru: SHEPPARD³⁾ listed several Miocene mollusks of Ecuador, of which two species, namely *Turritella attilira* CONRAD and *Turris albida* (PERRY), are in common with the Cucurupi. OLSSON⁴⁾ reported many Peruvian Miocene shells, of which *Arca dariensis* CONRAD and *Turritella attilira* CONRAD are common to the Cucurupi beds and the Cardalitos formation. *Pyrene tumbezia olssoni* OINOMIKADO is closely related to *Pyrene tumbezia* (OLSSON) from the Lower Zorritos formation. According to OLSSON, the Peruvian Miocene clearly belongs to two separate faunal provinces, the northern or that of Zorritos being warm-water and distinctly Caribbean in character while the southern or that of the Sechura and Paracas belongs to a cooler water type, and he suggests a Tertiary geosyncline, the Bolivar geosyncline, extending from Northern Colombia south to Peru along the Pacific coast. The Cucurupi beds has probably been deposited in this geosyncline, and may be contemporaneous with the Cardalitos formation.

Miocene of Santo Domingo: 7 species are common with the Cucurupi. *Architectonica granulata* (LAMARCK), *Turris albida* (PERRY), and *Arca occidentalis* PHILIPPI are found in the Gurabo and Cercado formations. *Conus multiratus gaza* JOHNSON and PILSBRY is restricted to the Gurabo, and *Terebra gatunensis* TOULA, *Chama congregata* CONRAD, and *Aloidis sancti-dominici* (MAURY) are confined to the Cercado.

Miocene of Trinidad: The following species are in common with the Cucurupi:

Architectonica granulata (LAMARCK) Manzanilla; Springval.

Turris albida (PERRY) Manzanilla.

Glycymeris lamyi trilobocosta PILSBRY and BROWN

Tamana; Machapoorie; Manzanilla; Brasso.

1) ANDERSON: Proc. Calif. Acad. Sci., vol. 18, no. 4, pp. 73-213, 1929.

2) PILSBRY and BROWN: Proc. Acad. Nat. Sci. Phila., vol. 69, pp. 32-41, 1917.

3) SHEPPARD: Bull. Amer. Assoc. Petrol. Geol., vol. 12, no. 6, pp. 671-673, 1928.

4) OLSSON: Bull. Amer. Paleontology, vol. 19, no. 68, pp. 1-216, 1932.

Arca occidentalis PHILIPPI

Springval.

Callista maculata (LINNÉ)

Springval.

The common species between the Dominican and Trinidad Miocene formations and the Cucurupi beds are mostly living forms. Exact correlation is difficult owing to the paucity of characteristic forms. ANDERSON¹⁾ states that the middle portion of the Tuberá group is correlated to the Gatun formation of the Canal Zone and the Gurabo of Santo Domingo. The Brasso Miocene of Trinidad is regarded by MAURY²⁾ as the equivalent of the Gatun formation of the Canal Zone and the Cartagena beds of North Colombia. The deposition of the Cucurupi, correlated to the horizon P of the Tuberá group, may be nearly contemporaneous with that of the Brasso and the Gurabo.

III. Description of Species

Turritella attilira CONRAD

Pl. 29 (15), fig. 2.

Turritella attilira CONRAD, Pac. R.R. Repts., vol. 6, pt. 2, p. 72, pl. 5, f. 19, 1857; BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 358, pl. 27, f. 2, 3, 1911; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 150, pl. 14, f. 6, 7, 1922; HODSON, Bull. Amer. Pal., vol. 11, no. 45, pl. 26, f. 1, pl. 28, f. 3, pl. 29, f. 1, 1926; SHEPPARD, Bull. Amer. Assoc. Petrol. Geol., vol. 12, no. 6, p. 671, 1928; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 118, pl. 17, f. 4, 5, 1929.

Locality: N 3.

Turritella attilira chiriquiensis OLSSON

Pl. 29 (15), fig. 3.

Turritella attilira chiriquiensis OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 150, pl. 14, f. 4, 8, 9, 14, 1922.

Locality: O 5, P 2.

Architectonica granulata (LAMARCK)

Pl. 29 (15), fig. 11.

Solarium granulatum LAMARCK, An. sans. Vert., vol. 7, p. 3, 1822; MAURY, Bull. Amer. Pal., vol. 5, no. 29, p. 131, pl. 23, f. 3, 1917.

Solarium gatunense TOULA, Jarb. der K. K. Geol. Reichs., vol. 58, p. 693, pl. 25, f. 3, 1909.

Solarium granulatum gatunensis BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 360, 1911.

Architectonica granulata OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 154, pl. 13, f. 10-12, 1922; MAURY, Bull. Amer. Pal., vol. 10, no. 42, p. 236, pl. 40, f. 1, 1925; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 122, 1929.

Locality: O 5, P 2.

1) ANDERSON: Loc. cit., 1929.

2) MAURY: Bull. Amer. Pal., vol. 10, no. 42, pp. 7-250, 1925.

Natica (Naticarius) guppyana TOULA

Pl. 29 (15), fig. 18.

Natica (Stigmalax) guppyana TOULA, Jarb. der K. K. Geol. Reichs., vol. 58, p. 696, pl. 25, f. 6, 1909; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 156, pl. 13, f. 13-15, 1922.

Natica guppyana BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 360, 1911; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 123, 1929.

Locality: O 5.

Pyrene (Strombina) chiriquiensis (OLSSON)

Pl. 29 (15), figs. 6 a, b.

Strombina chiriquiensis OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 302, pl. 10, f. 14, 24, 1922; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 143, 1929.

Locality: N 4, O 5.

Pyrene (Strombina) ohomachii n. sp.

Pl. 29 (15), figs. 4 a, b.

Shell fusiform, rather solid, with about 8 whorls, lacking protoconch in all specimens seen; suture distinctly, though not conspicuously channelled; body-whorl higher than spire, abruptly narrowed below into the base, subtriangular in transverse section, though having no remarkable hump or node on the left side, flattened behind the varix; surface smooth, sometimes sculptured with several short longitudinal ripples near the suture on the ventral side of the body-whorl; canal short, slightly recurved, spirally grooved, about 8 in number.

Locality: O 5, P 2.

Measurement:

	Height	Diameter	Number of whorls
Holotype (Loc. O 5)	23.6 mm.	10.4 mm.	8
Specimen from Loc. P 2.	22.7 mm.	10.4 mm.	7
" "	21.6 mm.	9.8 mm.	7

This shell is closely allied to *Strombina prisima* PILSBRY and JOHNSON¹⁾, but differs by having no remarkable hump on the left side of the last whorl. The new species has a less slender shell than *Strombina lessepsiana* BROWN and PILSBRY²⁾, and has a higher body-whorl than *Strombina dorsata* (SOWERBY)³⁾.

Pyrene (Strombina) tumbezia olssoni n. subsp.

Pl. 29 (15), figs. 5 a, b.

Shell small, fusiform, with rather slender, long spire. Whorls about 9, the first 3 belonging to the small, smooth, pointed nucleus. Post-nuclear whorls longitudinally ribbed. Ribs numerous, strong, vertical, extending from upper suture to the lower, beaded about their upper extremities, about 19 on the penultimate whorl. The ventral side of the body-whorl ornamented with about 7, longitudinal, very slightly curved ribs, but the dorsal side smooth,

1) PILSBRY and JOHNSON: Proc. Acad. Nat. Sci. Phila., vol. 63, p. 352, pl. 25, f. 9, 10, 1911.

2) BROWN and PILSBRY: Proc. Acad. Nat. Sci. Phila., vol. 63, p. 352, pl. 25, f. 11, 12, 1911.

3) SOWERBY: Proc. Zool. Soc., p. 120, 1832.

with a sutural cord. The last rib on the body-whorl somewhat stronger than the other. Aperture narrow, linear-ovate. Outer lip large, expanded. Lower half of the inner and outer lips feebly denticulated. Canal short, beak-like, spirally striated, with about 10 threads on the back.

Locality: O 5.

Measurement:

	Height	Diameter
Holotype	7.8 mm.	3.4 mm.
Paratype	8.5 mm.	3.7 mm.
"	8.2 mm.	3.8 mm.

The shell is closely allied to *Strombina tumbezia* OLSSON¹ from the Lower Zorritos formation of Peru, but it differs from the species in that the ribs are more numerous on the penultimate whorl and shorter on the body-whorl. The new subspecies resembles *Strombina sincola* OLSSON¹ from the Gatun formation of Costa Rica, but differs from that species in that the shell is more slender; the longitudinal ribs are more numerous; the ventral side of the last whorl is more strongly ribbed; the outer lip is less thickened.

Phos (Antillophos) gatunensis TOULA

Pl. 29 (15), fig. 15.

Phos gatunensis TOULA, Jahrb. der K. K. Geol. Reichs., vol. 58, p. 701, pl. 28, f. 6, pl. 25, f. 11, 1909; BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 349, pl. 25, f. 1, 2, 1911; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 117, pl. 9, f. 4, 5, 1922.

Locality: O 5.

Phos (Antillophos) mexicanus BOSE

Pl. 29 (15), fig. 16.

Phos mexicanus BOSE, Bol. de Inst. Geol. de Mexican, no. 22, p. 38, pl. 4, f. 18-21, 1906; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 117, pl. 9, f. 10, 11, 1922.

Locality: P 2.

A single specimen obtained at Loc. P 2 having much more finely reticulated sculpture than that of the Mexican and Costa Rican fossils. The fossil forms of Costa Rica possess about 18 longitudinal ribs on the body-whorl, while the specimen from Loc. P 2 has about 20 ribs. In other respects, the Colombian fossil is exactly like the Costa Rican one. In the case of *Phos gatunensis* TOULA, according to BROWN and PILSBRY², there is rather wide variation in the number of ribs, while the number of major spirals remains very constant, *Phos mexicanus* BOSE will also be variable in the number of longitudinal ribs.

Cantharus dalli (BROWN and PILSBRY)

Pl. 29 (15), fig. 12.

Solenosteria dalli BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 348, pl. 24, f.

1) OLSSON: Op. cit., p. 10, pl. 18, f. 7, 1932.

2) BROWN and PILSBRY: Op. cit., p. 349, 1911.

14, 1911; PILSBRY and BROWN, Proc. Acad. Nat. Sci. Phila., vol. 69, p. 34, 1917; OLSSON Bull. Amer. Pal., vol. 9, no. 39, p. 113, pl. 8, f. 8, 1922.

Locality: O 5.

Fusinus cf. *honensis* (OLSSON)

cf. *Fusus honensis* OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 104, pl. 8, f. 6, 1922.

Locality: O 5.

Oliva sayana immortalua PILSBRY and BROWN

Pl. 29 (15), fig. 25.

Oliva sayana immortalua PILSBRY and BROWN, Proc. Acad. Nat. Sci. Phila., vol. 69, p. 33, pl. 5, f. 6, 1917; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 89, pl. 7, f. 6, 7, 1922.

Oliva sayana, ANDERSON (in part), Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 127, 1929.

Locality: P 2.

Vexillum (Uromitra) cucurrupeensis n. sp.

Pl. 29 (15), figs. 10 a, b.

Shell moderate, fusiform, slender, with high spire. Nuclear whorls 2, smooth rounded. Post-nuclear whorls 8, slightly inflated, sculptured with axial ribs and spiral cords. Axial ribs 14 on the body-whorl, acute, slightly curved, smooth at the summits. The intervals between the ribs are concave, and having spiral cords which are slightly broader than the interspaces, and not running over the ribs. There are 7 cords in the penultimate whorl. The cords and its interspaces in the basal part of the body-whorl are narrower than those of the periphery. Outer lip lirate within. Columella subvertical, with 5 oblique folds, decreasing in size and space from above.

Locality: O 5.

Measurement:

	Height	Diameter
Holotype	16.4 mm.	6.7 mm.

This species resembles *Mitra tortuosella* PILSBRY and JOHNSON¹⁾ but differs by its higher spire and less numerous ribs. It is distinguishable from *Mitra willcoxii* DALL²⁾ by having a slender shell.

Cancellaria (Cancellaria) cossmanni OLSSON

Pl. 29 (15), fig. 17.

Cancellaria cossmanni OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 81, pl. 6, f. 9, 11, 1922; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 117, 1929.

Locality: O 5.

Cancellaria (Cancellaria) dariena TOULA

Pl. 29 (15), fig. 19.

Cancellaria dariena TOULA, Jarb. der K. K. Reichs., vol. 58, p. 31, pl. 25, f. 13, pl. 28, f. 2, 1909;

1) PILSBRY and BROWN: Op. cit., p. 165, 1917.

2) DALL: Trans Wagner Free Inst. Sci., vol. 3, pt. 1, p. 93, pl. 3, f. 10, 1890.

BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 345, pl. 24, f. 3, 4, 1911; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 80, pl. 6, f. 8, 1922; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 115, 1929.

Cancellaria dariena trachyostraca BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 345, pl. 24, f. 1, 2, 1911.

Cancellaria dariensis COSSMAN, Jour. de Conch., vol. 61, p. 51, pl. 4, f. 9, 10, 1913.

Locality: O 5.

According to WOODRING¹⁾, OLSSON's *barretti* from Costa Rica is probably *dariena*.

Turris (Polystira) albida (PERRY)

Pl. 29 (15), fig. 13.

Pleurotoma albida PERRY, Conch. Expl., pl. 32, f. 4, 1811; DALL, Trans. Wagner Free Inst. Sci., vol. 3, pl. 1, p. 28, pl. 4, f. 8, 1890; BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 343, 1911.

Turris albida DALL, U. S. Nat. Mus., Bull. 90, p. 38, pl. 5, f. 13, pl. 14, f. 7, 1915; MAURY, Bull. Amer. Pal., vol. 5, no. 29, p. 50, pl. 8, f. 4-8, 1917; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 58, pl. 4, f. 1, 2, 1922; MAURY, Bull. Amer. Pal., vol. 10, no. 42, p. 187, pl. 32, f. 11, 1925; SHEPPARD, Bull. Amer. Assoc. Petrol. Geol., vol. 12, no. 6, p. 672, 1928; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 113, 1929.

Locality: O 5, P 2.

Turris (Gemmula) vaningeni (BROWN and PILSBRY)

Pl. 29 (15), fig. 14.

Pleurotoma (Gemmula) vaningeni BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 64, p. 505, pl. 22, f. 4, 1912; COSSMAN, Jour. de Conch., vol. 61, p. 19, pl. 2, f. 21, 22, 1913.

Locality: O 5, P 2.

Cythara cf. *cercadica* MAURY

cf. *Cythara cercadica* MAURY, Bull. Amer. Pal., vol. 5, no. 29, p. 61, pl. 9, f. 15, 1917.

Locality: O 5.

Glyphostoma andersoni n. sp.

Pl. 29 (15), figs. 8 a, b.

A single incomplete specimen at hand largely broken at apertural and basal parts. Shell moderate in size, solid, with angulated whorls, lacking protoconch, Surface sculptured with longitudinal ribs and spiral cords. Under the lens, all the surface except on the spirals very finely wrinkled. Spiral sculpture in the fifth whorl from the last one consisting of two rounded cords, the one forming the angle and the other situated near the lower suture. In the fourth whorl, a very feeble thread appears between the two spirals. The third whorl sculptured with 3 strong cords at the periphery shouldering the whorl, the middle somewhat weaker than the other, and with 2 fine threads behind the shoulder and a supersutural one. The penultimate whorl sculptured with 3 cords at the periphery, 2 granulated

1) WOODRING: Carnegie Inst. Wash., Pub. no. 385, p. 219, 1928.

threads behind the shoulder, and 2 very weak threads between the super-sutural and the lowest peripheral cord. The body-whorl ornamented with many spiral cords, of which 3 at the periphery, about 10 more granulated on the tapering base, 2 behind the shoulder, weaker than the other. The interval between the lowest peripheral cord and the uppermost granulated one is sculptured with 2 fine threads. A very fine thread is recognized between the uppermost granulated cord and next one. Longitudinal ribs mostly peripheral, crossed by spirals, about 10 in the last whorl. Anal fasciole vertical below the upper suture, then inclined to the shoulder, finely ribbed. Inner lip finely denticulated.

Locality: O 5.

Measurement:

Holotype Height 20 mm. (protoconch and basal part wanting), diameter 8.6 mm. (outer lip wanting).

This species recalls *Glyphostoma caronensis* MANSFIELD¹⁾ a fossil species of Trinidad, but differs in its larger shell and in the details of the sculpture. Compared with *Glyphostoma johnsoni* DALL,²⁾ the new species has a slender shell, and differs in the sculpture.

"Drillia" limonetta OLSSON

Drillia limonetta OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 70, pl. 5, f. 10, 1922.

Locality: O 5.

"Drillia" papaya OLSSON

Drillia papaya OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 63, pl. 4, f. 5, 1922.

Locality: O 5.

"Drillia" aquanica OLSSON

Pl. 29 (15), fig. 20.

Drillia aquanica OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 65, pl. 5, f. 16, 17, 1922.

Locality: O 5.

Measurement: Height 10.4 mm., diameter 4 mm., number of whorls 9.

Compared with the typical form, the specimen obtained at Loc. O 5 has a smaller shell with fewer ribs. In the other respects it quite agrees with the typical one. This shell will be an immature form of OLSSON's species.

"Drillia" cf. musacina OLSSON

Pl. 29 (15), fig. 9.

cf. Drillia musacina OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 69, pl. 5, f. 27, 28, 1922.

Locality: O 5.

Measurement: Height of 6 whorls 19.5 mm. (protoconch wanting), diameter 7.6 mm.

A single specimen from Loc. O 5 agrees in general aspects with OLSSON's species, but the former has more numerous ribs.

1) MANSFIELD: Proc. U. S. Nat. Mus., vol. 66, art 2, p. 26, pl. 4, f. 1, 1925.

2) DALL: Op. cit., vol. 3, pt. 2, p. 223, pl. 14, f. 4, 1892.

"*Drillia*" cf. *henekeni* SOWERBY

Pleurotoma cf. *henekeni* SOWERBY, Quart. Jour. Geol. Soc. London, vol. 6, p. 50, pl. 10, f. 6, 1849; GUPPY, Quart. Jour. Geol. Soc. London, vol. 32, p. 526, 1876.

Locality: N 4, O 5.

Conus (Leptoconus) multiliratus gaza JOHNSON and PILSBRY

Pl. 29 (15), fig. 30.

Conus gaza JOHNSON and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 342, pl. 23, f. 2, 3, 1911; PILSBRY and BROWN, Proc. Acad. Nat. Sci. Phila., vol. 69, p. 32, 1917; MAURY, Bull. Amer. Pal., vol. 5 no. 29, p. 46, pl. 7, f. 12, 1917; PILSBRY (part), Proc. Acad. Nat. Sci. Phila., vol. 73, p. 330, 1922.

Conus marginatus GABB (not SOWERBY), Trans. Amer. Philos. Soc., vol. 15, p. 230; MAURY, Bull. Amer. Pal., vol. 5, no. 29, p. 46, pl. 7, f. 11, 1917.

Conus (Leptoconus) planiliratus COSSMAN (part, not SOWERBY), Jour. de Conch., vol. 61, p. 48, pl. 3, f. 24-26 (not 27).

Conus multistriatus OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 54, pl. 1, f. 21, 23, 1922.

Conus (Leptoconus) multiliratus gaza WOODRING, Carnegie Inst. Washington, Pub., no. 385, p. 212, pl. 11, f. 3, 1928.

Locality: N 4, O 5.

Terebra (Strioterebrum) gatunensis TOULA

Pl. 29 (15), fig. 7.

Terebra (Oxymeris) gatunensis TOULA, Jahrb. der K. K. Geol. Reichs., vol. 58, p. 705, pl. 25, f. 14, 1909.

Terebra (Myurella) gatunensis COSSMAN, Jour. de Conch., vol. 61, p. 13, pl. 1, f. 26-29, 1913.

Terebra gatunensis BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 339, pl. 22, f. 2, 1911; MAURY, Bull. Amer. Pal., vol. 5, no. 29, p. 31, pl. 4, f. 5, 1917; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 36, pl. 1, f. 4-6, 1922; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 106, 1929.

Locality: O 5.

Terebra (Paraterebra) gabbi cucurrupeensis n. subsp.

Pl. 29 (15), figs. 1.

A single incomplete specimen wanting protoconch and apertural portion. Shell large, solid, rivaling in size the Dominican fossil *Terebra gabbi* DALL. Whorls 10 in the height of 61.2 mm., rapidly increasing in diameter, slightly convex. Early whorls deeply sculptured but the later one gradually diminishing in depth. Surface ornamented with 2 thickened, sub-sutural bands crossed by very fine oblique riblets and microscopic spiral threads. The lower band about half the width of the upper. The 2 bands occupying about 3/4 of the whorl. The remaining part of the whorl sunken and crossed by very fine vertical riblets and microscopic spiral threads. On the third whorl from the last one, a groove between the sub-sutural bands becomes weaker and turns into a stria. The longitudinal riblets are also weaker on the same whorl. On the penultimate whorl, the stria becomes more and more weaker. The last two whorls are ornamented with the growth lines instead of the longitudinal riblets.

Locality: P 2.

Measurement :

	Height of 10 whorls	Diameter
Holotype	61.2 mm.	18.6 mm.

This subspecies much resembles *Terebra gabbi* DALL¹⁾, but it differs from the latter in that the shell is less rapidly increasing in diameter and the sub-sutural band is broader. This *Terebra* is closely allied to *Terebra sulcifera* SOWERBY²⁾, but differs in its somewhat convex whorls and complete loss of sculpture on attaining old age. The new subspecies may probably be an intermediate form of these species.

Glycymeris lamyi trilobica PILSBRY and BROWN

Pl. 29 (15), fig. 22.

Glycymeris trilobica PILSBRY and BROWN: Proc. Acad. Nat. Sci. Phila., vol. 69, p. 39, pl. 6, f. 5, 1917; MAURY, Bull. Amer. Pal., vol. 10, no. 42, p. 32, pl. 18, f. 11, 1925.

Locality: N 3.

OLSSON³⁾ combined *Glycymeris canalis* BROWN and PILSBRY⁴⁾ from the Canal Zone and *Glycymeris trilobica* PILSBRY and BROWN from Colombia into a single species. While ANDERSON⁵⁾ suggested that the two specimens of *Glycymeris canalis* figured by OLSSON are referred to *Glycymeris lamyi* DALL⁶⁾. The specimens from Loc. N 3, one of which measures 20.9 mm. in the height and 20.7 mm. in the length, quite agree with the figure and description of *Glycymeris trilobica* given by PILSBRY and BROWN.

Arca occidentalis PHILIPPI

Pl. 29 (15), fig. 21.

Arca occidentalis PHILIPPI, Abbild. und Besch., vol. 3, p. 14, pl. 17 b, f. 4 a-c, 1847; GUPPY, Quart. Jour. Geol. Soc. London, vol. 32, p. 531, 1876; MAURY, Bull. Amer. Pal., vol. 5, no. 29, p. 163, pl. 29, f. 3, 1917; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 181, pl. 22, f. 1, 1922; WOODRING, Carnegie Inst. Washington, Pub., no. 366, p. 29, pl. 2, f. 89, 1925; MAURY, Bull. Amer. Pal., vol. 10, no. 42, p. 34, pl. 1, f. 1, 2, 1925; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 147, 1929.

Arca noae GUPPY (not LINNÉ), Quart. Jour. Geol. Soc. London, vol. 22, p. 293, 1866.

Locality: N 3.

Anadara (Scapharca) dariensis (BROWN and PILSBRY)

Pl. 29 (15), fig. 26.

Arca dariensis BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 362, pl. 22, f. 10, 1911.

1) DALL: Proc. U. S. Nat. Mus., vol. 18, no. 1035, p. 34, 1895.

2) SOWERBY: Quart. Jour. Geol. Soc. London, vol. 6, p. 47, 1850.

3) OLSSON: Op. cit., vol. 9, no. 39, p. 177, 1922.

4) BROWN and PILSBRY: Op. cit., vol. 63, p. 364, pl. 28, f. 10, 1911.

5) ANDERSON: Op. cit., vol. 18, no. 4, p. 152, 1929.

6) DALL: Bull. U. S. Nat. Mus., no. 90, p. 122, pl. 20, f. 11, 13, 1915.

Arca (Scapharca) dariensis OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 184, pl. 22, f. 10-13, 1922; MAURY, Bull. Amer. Pal., vol. 10, no. 42, p. 55, pl. 1, f. 5, 1925; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 147, 1929.

Arca (Diluvarca) dariensis OLSSON, Bull. Amer. Pal., vol. 19, no. 68, p. 68, 1932.

Locality: O 5.

Anadara (Scapharca) hindsi (OLSSON)

Pl. 29 (15), fig. 27.

Arca hindsi OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 193, pl. 24, f. 7-9, 1922.

Locality: O 5.

A single left valve, measured 14.4 mm. in the maximum length, was collected from Loc. O 5. The specimen is much smaller than the typical form, and resembles somewhat *Arca lloydi* OLSSON¹ in general contour, but it has 26 instead of 29 strongly nodulated ribs.

Chama congregata CONRAD

Pl. 29 (15), fig. 29.

Chama congregata CONRAD, Amer. Jour. Sci., vol. 23, p. 341, 1833; DALL, Trans. Wagner Free Inst. Sci., vol. 3, pt. 6, p. 1400, 1903; MAURY, Bull. Amer. Pal., vol. 5, no. 29, p. 200, pl. 33, f. 8, 1917; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 218, pl. 28, f. 11, 1922.

Locality: N 3, O 5.

Corculum (Trigoniocardia) heredium ohomachii n. subsp.

Pl. 29 (15), fig. 23.

The specimens at hand partly agree with the figure and the description of *Cardium heredium* OLSSON². They are sculptured anterior to the truncation with 13 or 14 instead of 12 or 13 ribs and with 9 or 10 instead of 7 or 8 ribs on the posterior truncation. The ribs on the anterior disk are ornamented with numerous pustules, which are arranged on the posterior half of the ribs. While in the type specimen of *Cardium heredium* OLSSON, the anterior set of ribs are smooth. In the sculpture, this subspecies somewhat resembles *Cardium hannai* OLSSON³ from the Lower Zorritos formation of Peru, but is easily distinguished by its stronger posterior truncation.

Locality: N 3, O 5.

Measurement:

	h	h'	l	Thickness
Holotype (Loc. N 3)	11.1 mm	12.7 mm	8.4 mm	4.7 mm (Left valve)
Specimen from Loc. O 5	9.3 mm	10.7 mm	7.2 mm	4.2 mm (Right valve)

Text fig. 1. Diagrammatic representation of *Corculum*, to illustrate the points where the linear measurements were taken.

1) OLSSON: Op. cit., vol. 9, no. 39, p. 192, pl. 24, f. 10-12, 1922.

2) OLSSON: Op. cit., vol. 9, no. 39, p. 227, pl. 27, f. 10, 1922.

3) OLSSON: Op. cit., p. 99, pl. 8, f. 4, 9, 10, 11, 1932.

Callista maculata (LINNÉ)

Venus maculata LINNÉ, Syst. Nat., ed. 10, p. 686, 1758.

Macrocallista (Chionella) maculata DALL, Trans. Wagner Free Inst. Sci., vol. 3, pt. 6, p. 1256, 1903; ANDERSON, Proc. Calif. Acad. Sci., vol. 18, no. 4, p. 170, 1929.

Macrocallista maculata BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 63, p. 370, 1911; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 234, pl. 31, f. 6, 7, 1922; MAURY, Bull. Amer. Pal., vol. 10, no. 42, p. 279, pl. 25, f. 1, 4, 5, 1925.

Locality: N 3.

Aloidis sancti-dominici (MAURY)

Pl. 29 (15), fig. 28.

Corbula (Aloidis) vieta MAURY (not GUPPY), Bull. Amer. Pal., vol. 5, no. 29, p. 231, pl. 39, f. 13, 1917; OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 266, pl. 28, f. 15, 16, 1922.

Corbula (Aloidis) sancti-dominici MAURY, Bull. Amer. Pal., vol. 10, no. 42, p. 98, pl. 19, f. 2, 1925.

Locality: N 3, O 5.

Aloidis hexacyma (BROWN and PILSBRY)

Pl. 29 (15), fig. 24.

Corbula hexacyma BROWN and PILSBRY, Proc. Acad. Nat. Sci. Phila., vol. 64, p. 518, pl. 26, f. 4, 1912.

Corbula (Cuneocorbula) hexacyma OLSSON, Bull. Amer. Pal., vol. 9, no. 39, p. 269, pl. 21, f. 12, 13, 1922.

Locality: N 3, P 2.

Colombia 共和國 Chocó 州 Cucurrupi 附近產中新世貝化石 (摘要)

大 炊 御 門 經 輝

此處に記載した貝化石は大町四郎學士が昭和 13 年 Colombia, Cucurrupi 附近で採集したものである。産地は 4ヶ所、略同一層準にある。化石層は可成柔い灰色頁岩中にある。此化石層は Magda'ena 河の下流に發達する Tuberá 群層の horizon P に對比され、亦 Panama, Costa Rica の Gatun 層に比較されるであらう。

Explanation of Plate 29 (15)

Fig. 1. *Terebra (Paraterebra) gabbi cucurrupiensis* n. subsp. (Holotype) ×1 Loc. P 2.

Fig. 2. *Turritella atilira* CONRAD ×1 Loc. N 3.

Fig. 3. *Turritella atilira chiriquiensis* OLSSON ×1 Loc. O 5.

Figs. 4a, b. *Pyrene (Strombina) ohomachii* n. sp. (Holotype) ×1.5 Loc. O 5.

Figs. 5a, b. *Pyrene (Strombina) tumbezia olssoni* n. subsp. (Holotype) ×3 Loc. O 5.

Figs. 6a, b. *Pyrene (Strombina) chiriquiensis* (OLSSON) ×2 Loc. O 5.

- Fig. 7. *Terebra (Strioterebrum) gatunensis* TOULA $\times 1$ Loc. O 5.
Figs. 8a, b. *Glyphostoma andersoni* n. sp. (Holotype) $\times 1.5$ Loc. O 5.
Fig. 9. "*Drillia*" cf. *musacina* OLSSON $\times 1.5$ Loc. O 5.
Figs. 10a, b. *Vexillum (Uromitra) cucurruapiensis* n. sp. (Holotype) $\times 1.5$ Loc. O 5.
Fig. 11. *Architectonica granulata* (LAMARCK) $\times 1$ Loc. P 2.
Fig. 12. *Cantharus dalli* (BROWN and PILSBRY) $\times 1$ Loc. O 5.
Fig. 13. *Turris (Polystira) albida* (PERRY) $\times 1$ Loc. P 2.
Fig. 14. *Turris (Gemmula) vaningeni* (BROWN and PILSBRY) $\times 2$ Loc. O 5.
Fig. 15. *Phos (Antillophos) gatunensis* TOULA $\times 1$ Loc. O 5.
Fig. 16. *Phos (Antillophos) mexicanus* BOSE $\times 1$ Loc. P 2.
Fig. 17. *Cancellaria (Cancellaria) cossmanni* OLSSON $\times 1$ Loc. O 5.
Fig. 18. *Natica (Naticarius) guppyana* TOULA $\times 1.5$ Loc. O 5.
Fig. 19. *Cancellaria (Cancellaria) dariena* TOULA $\times 1$ Loc. O 5.
Fig. 20. "*Drillia*" *aquanica* OLSSON $\times 2$ Loc. O 5.
Fig. 21. *Arca occidentalis* PHILIPPI $\times 1$ Loc. N 3.
Fig. 22. *Glycymeris lamyi trilobocosta* PILSBRY and BROWN $\times 1.5$ Loc. N 3.
Fig. 23. *Corculum (Trigoniocardia) heredium ohomachii* n. subsp. (Holotype) $\times 2$ Loc. N 3.
Fig. 24. *Aloidis hexacyma* (BROWN and PILSBRY) $\times 1.5$ Loc. P 2.
Fig. 25. *Oliva sayana immortalis* PILSBRY and BROWN $\times 1.5$ Loc. P 2.
Fig. 26. *Anadara (Scapharca) dariensis* (BROWN and PILSBRY) $\times 1$ Loc. O 5.
Fig. 27. *Anadara (Scapharca) hindsii* (OLSSON) $\times 1.5$ Loc. O 5.
Fig. 28. *Aloidis sancti-dominici* (MAURY) $\times 2$ Loc. N 3.
Fig. 29. *Chama congregata* CONRAD $\times 1$ Loc. N 3.
Fig. 30. *Conus (Leptoconus) multiliratus gaza* JOHNSON and PILSBRY $\times 1$ Loc. O 5.