Circuitus, a new genus of the family Tornidae (Gastropoda, Truncatelloidea) with the description of six new species

Circuitus, un nuevo género de la familia Tornidae (Gastropoda, Truncatelloidea) con la descrición de seis nuevas especies

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RESUMEN

Se describen un nuevo género y 6 nuevas especies pertenecientes a la familia Tornidae (=Vitrinellidae) (Caenogastropoda: Truncatelloidea). Las especies estudiadas proceden del sudeste del Pacífico tropical y fueron recolectadas durante las expediciones Tropical Deep-Sea Benthos, dirigidas por IRD y MNHN en Nueva Caledonia, Vanuatu, las Islas Salomón y Filipinas. El nuevo género *Circuitus* se ha basado en caracteres morfológicos únicos presentes en las seis nuevas especies descritas; se discute su posición sistemática y se compara con otros géneros de caracteres morfológicos similares. Cada una de las especies se ilustra mediante fotografías al microscopio electrónico de barrido, discutiendo su variabilidad específica y aportando datos sobre el hábitat, distribución geográfica y rango batimétrico.

ABSTRACT

A new genus and 6 new species belonging to the family Tornidae (=Vitrinellidae) (Caenogastropoda: Truncatelloidea) are described. The species studied are from the southeastern tropical Pacific and were collected during the Tropical Deep-Sea Benthos expeditions conducted by IRD and MNHN in New Caledonia, Vanuatu, the Solomon Islands and the Philippines. The new genus *Circuitus* is based on unique morphological features that are present in the six new species described; their systematic position is discussed and the new genus is compared with other genera presenting similar morphological characters. Each species is illustrated by scanning electron microscope photographs; their specific variability is discussed and information about their habitat, geographical distribution and bathymetric range is provided.

INTRODUCTION

The family Tornidae Sacco, 1898 has been studied in several areas in recent years: the West African coast (Rolán & Rubio, 1991; Rolán, Rubio & Ryall, 2000; Rubio & Rolán, 2002; Rolán & Ryall, 2002; Oliver & Rolán, 2011), the Caribbean (Rubio, Fernández-Garcés & Rolán, 2011; Rubio *et al*. 2016) and in the Pacific Ocean (Rubio & Rolán, 2014; 2015; 2016).

After the examination of the "vitrinelliform" gastropods from the tropical southeastern Pacific, collected during the Tropical Deep-Sea Benthos expeditions conducted jointly by Institut de Recherche pour le Développement (IRD)

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and Muséum National d'Histoire Naturelle (MNHN) in New Caledonia, Vanuatu, the Solomon Islands and the Philippines, our attention was caught by a small group of species with a depressed-turbinate, keeled and strongly ornamented shell, which, judging by their general appearance, could belong to the Vetigastropod genus *Arene* (see ADAMS & ADAMS, 1854 and LADD, 1966). However the latter has larger shells, frequently having large protuberances, and has a calcareous operculum, and further examination and comparison with the original descriptions of different species of this genus (LEAL, 1991) demonstrated that this could not hold. We therefore decided to define a new genus based on the shared unique characters of these species.

MATERIALS AND METHODS

In the present work, we studied the species of *Circuitus* gen. nov. from different oceanographic campaigns in the Tropical South Pacific (referred in BOUCHET, HEROS, LOZOUET & MAESTRATI, 2008). The main surveys taken into account are as follows:

- LAGON (1984-1989) on board R/V Vauban explored New Caledonia, to map the biological communities of the coral reef lagoon.

- SALOMON 1 (2001) on board R/V Alis surveyed the central part of the Solomon Islands, from Guadalcanal to Malaita and Makira.

- SANTO 2006 (Global Biodiversity Survey) explored the waters of Espiritu Santo Island in Vanuatu.

The materials obtained by the above mentioned oceanographic expeditions come from both shallow and deep waters of New Caledonia, Vanuatu, the Solomon Islands and the Philippine Islands.

Illustrations for all the studied species were prepared using a Scanning Electron Microscope (SEM) Quanta 200 and EVO LS15. All of the material consists of empty shells.

Measurements of the teleoconch, the maximum height (H) and maximum diameter (D) are based on the scale bar of the SEM micrographs. The protoconch was measured by the VERDUIN (1976) method in which a nucleus is considered at the beginning of the spire.

Abbreviations:
MNHN Muséum National d'Histoire Naturelle, Paris
D maximum diameter of the shell, measured perpendicular to the axis of coiling
H total height of the shell
stn station
s empty shells

SYSTEMATIC PART

Superfamily TRUNCATELLOIDEA Gray, 1840
Family TORNIDAE Sacco, 1896

Circuitus gen. nov.

Description: Shell small (2-3 mm in diameter), depressed-turbinate. Protoconch smooth with slightly more than two whorls, terminating on a definite, incised sigmoidal line; teleoconch with thick spiral cords that may be nodose or not, thin axial lamellae in the interspaces and micro-granules, with one or two wider spaces between cords at the periphery. Umbilicus wide and deep, funnel shaped, with an extension of the parietal callus marking the beginning of the columella. Aperture prosocline; outer lip thick, with thick denticles internally, and its inner margin forming an angle with the parietal edge.

Type species: *Circuitus caledonicus* spec. nov.

Etymology: *Circuitus*: the generic name is derived of the Latin word *circuitus, us,*

which means " ring, circuit, or whorl"; being a genus close to *Circulus* the genus name express that all the sculptural features are shown around the shell.

Remarks: Among the previously known genera, *Arene* Adams & Adams, 1854 is the most similar one, mainly because of the small to minute size of its species, the shape of their shells, with beaded spiral cords, their prosocline aperture with denticles inside the outer lip, the deep umbilicus with one or more spiral cords on the umbilical wall. However, the protoconch of ¾ whorl, typical of the Vetigastropoda, clearly differentiates both genera. The operculum of *Arene*, with an inner surface covered by a glossy corneous layer, the outer surface concave, studded with beads in a radiating pattern, is very characteristis, but this character could not be observed in the new genus.

The species of the genus *Circuitus* have a circalittoral to bathyal distribution, with a bathymetric range between 86 and 411 m; they were collected in coarse shelly sand, coarse muddy sand, or mud.

Circuitus caledonicus spec. nov. (Figures 1A-G, 7A-B)

Type material: Holotype (Figs. 1A-C, 7A-B) MNHN IM-2000-32692 and 1 paratype (Fig. 1D) in MNHN IM-2000-32693.
Material examined: New Caledonia, Secteur de Poindimié, LAGON stn DW830, 20°49'S-165°19'E, 105-110 m, shelly coarse sand: 2 s.
Type locality: New Caledonia, Secteur de Poindimié, 20°49'S-165°19'E, 105-110 m.
Etymology: The specific name is for the archipelago where the species was collected.

Description: Shell small (<3.0 mm), solid, depressed-turbinate; spire with about 4 whorls, carinate and widely umbilicate.

The protoconch has 2 whorls, a diameter of about 510 μm and a nucleus of 80 μm. It is smooth and presents two differentiated phases, terminating on a definite, incised sigmoidal line.

The teleoconch has about 2 whorls and two peripheral carinae. The ornamentation is formed by spiral cords, axial lamellae and micro-granules. In apertural position, 12 thick spiral cords can be seen on the last whorl; the first 3, adapical, are thick and nodose; the 4th and 5th ones, peripheral, are smooth, somewhat sharper and form an angle on the shell profile, as carinae; the 6th to the 12th, abapical, are thick and rounded, the last two of these placed in the outer part of the umbilicus. The 3rd, 4th and 5th cords are separated by two wide concave peripheral spaces, the adapical one widest.

At the end of the last whorl, near the outer lip, fine spiral cordlets appear between the thicker spiral cords. The spaces between the cords are occupied by axial lamellae, thinner and tighter between the suture and the first cord, and of equal thickness, but regularly spaced in the remaining ones, except between the 3rd and 4th cords where there are no lamellae, and between the 4th and the 5th cords, in which the lamellae are very short and are located next to the base of the 5th cord. The entire surface of the teleoconch is covered by spirally aligned micro-granules, more visible in the broad spaces between the 3rd and 5th cords.

The aperture is rounded, prosocline; the parietal area covered by a thick callus that projects towards the inner part of the umbilicus just at the transition to the columella which is curved, thick and reflected towards the umbilicus; the outer lip is thick, not modified by the spiral cords, with 12 denticles and a parietal angle on its inner margin.

The umbilicus is wide and deep, funnel shaped; the inner wall is slightly convex; inside there are two thick spiral cords on its outer margin, axial lamellae, growth lines and fine spiral cordlets.

Dimensions: Holotype 2.8 mm in diameter x 1.64 mm in height (H/D: 0.59).

Habitat: Bathyal species dredged at 105-110 m on a coarse shelly sand bottom.

Distribution: Only known from New Caledonia.

Remarks: *Circuitus caledonicus* spec. nov. is characterized by its large protoconch; by having three adapical cords of which the first two are nodose, with numerous axial lamellae in their interspaces. Other diagnostic features are the space between the 3rd and 4th cords lacking any lamellae and completely covered by spirally aligned micro-granules; and the presence inside the umbilicus of two spiral cords, axial lamellae and fine spiral cordlets. *Circuitus solomonensis* spec. nov. is the most similar species but has a smaller protoconch (460 μm) and only six spiral cords on the base.

Circuitus philippinensis spec. nov. (Figures 2A-F, 7C-D)

Type material: Holotype (Figs. 2B-C, 7D) MNHN IM-2000-32694 and 5 paratypes (Fig. 2A, 7C) MNHN IM-2000-32695.

Material examined: Philippines, between Panglao and Pamilacan Islands, 9º33.4'N-123º51.0'E, 106-137 m: 6 s; West Pamilacan Island, Cervera shoal, 9º28.2'N-123º50.7'E, 134-190 m, sand on Echinoderms bed: 1 s.

Type locality: Between Panglao and Pamilacan Islands, 9º33.4'N-123º51.0'E, 106-137 m.

Etymology: The specific name is for the archipelago where the species was collected.

Description: Shell small (<3.0 mm), solid, depressed-turbinate, with a spire of about 4 whorls, carinate and widely umbilicate.

The protoconch has a little more than 2 whorls, a diameter of about 500 μm and a nucleus of 70 μm. It is smooth and presents two differentiated phases, terminating on a definite, incised sigmoidal line.

The teleoconch has about 1.75 whorls and a peripheral carina. The ornamentation consists in spiral cords, axial lamellae and micro-granules. In apertural view, 10 thick spiral cords can be seen on the last whorl; the first 2, adapical, are thick and nodose; the 3rd one, peripheral, is smooth, somewhat sharper, and forms an angle on the shell profile, like a carina; the 4th to the 10th, abapically, are thick and rounded, the last one is placed on the outer part of the umbilicus. The 3rd, 4th and 5th cords are separated by two wide concave peripheral spaces, the abapical one slightly wider than the adapical.

At the end of the last whorl, near the outer lip, two fine spiral cordlets appear between the 2nd - 3rd and 3rd - 4th spiral cords. The spaces between cords are occupied by axial lamellae, all of similar size and regularly spaced, thinner and more elongated in the spaces between the adapical cords and shorter and thicker in the abapical spaces. Between the 2nd and 3rd cords the lamellae are short and are located next to the 2nd cord and between 3rd and 4th cords; the lamellae, also very small, are located next to the 4th cord. The entire surface of the teleoconch is covered by spirally aligned micro-granules, more visible in the broad spaces between the 2nd and 4th cords.

The aperture is rounded, prosocline; the parietal area is covered by a thick callus that projects towards the inner part of the umbilicus just at the transition to the columella, which is thick and is not reflected towards the umbilicus; the outer lip is thick, with its outer margin modified by the spiral cords, and with 12 thick and rounded denticles and a parietal angle on its inner margin.

The umbilicus is wide and deep, funnel shaped; the inner wall is slightly convex; inside there is a thick spiral cord on its outer margin, growth lines and fine spiral cordlets inside.

Dimensions: Holotype: 2.9 mm in diameter x 1.63 in height (H/D: 0.56).

Habitat: Outer shelf species dredged at 106-190 m in sand on Echinoderms bed bottom.

Distribution: Only known from Pamilacan Island and between this island and Panglao.

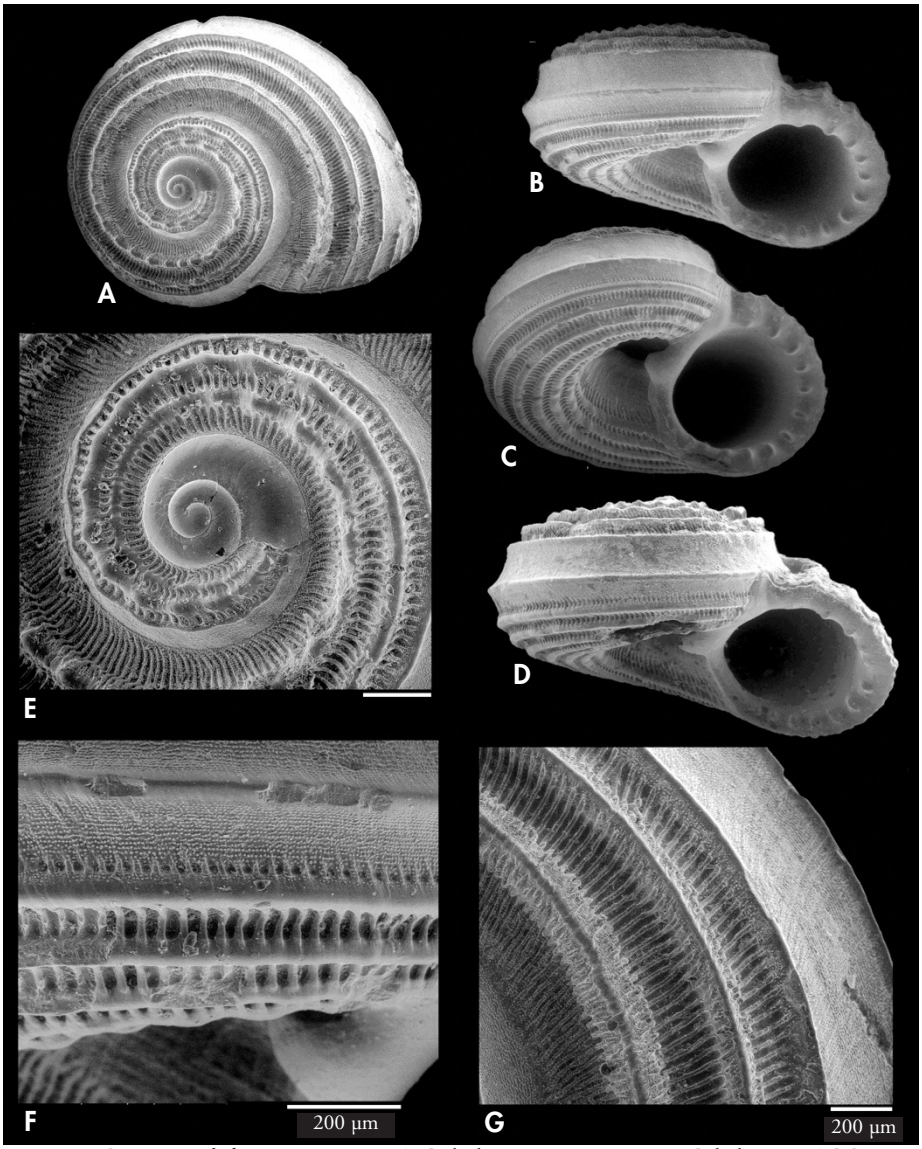

Figure 1. *Circuitus caledonicus* spec. nov. A-C: holotype MNHN, New Caledonia, LAGON stn 830 (2.8 mm in diameter); D: paratype MNHN, same locality (3.0 mm), E: protoconch of the holotype; F, G: microsculpture of the holotype in detail.
Figura 1. Circuitus caledonicus *spec. nov. A-C: holotipo MNHN, Nueva Caledonia, LAGON stn 830 (2,8 mm de diámetro); D: paratipo MNHN, misma localidad (3.0 mm), E: protoconcha del holotipo; F, G: detalles de la microescultura del holotipo.*

Remarks: *Circuitus philippinensis* spec. nov. is characterized by the number of spiral cords; by having only two thick cords adapically; by having a central peripheral carina separating two nearly equally broad interspaces; by having inside the umbilicus a thick spiral cord on its outer margin and fine spiral cordlets.

Circuitus monoplanes spec. nov. (Figures 3A-F, 7E-F)

Type material: Holotype (Figs. 3A-C, 7E-F) MNHN IM-2000-32696.
Material examined: Philippines, Bohol Island, Maribojoc Bay, 9°42'N-123°49'E, 101-110 m, on mud: 1 s.
Type locality: Bohol Island, Maribojoc Bay, 9°42'N-123°49'E, 101-110 m.
Etymology: The specific name derives from the Latin words *mono* "one" and *planus, a, um* "flat" in reference to the lateral surface of the shell, in opposition to others species of the genus which have two similar flat surfaces.

Description: Shell small (< 2.0 mm), solid, depressed-turbinate; spire with 3.6 whorls, carinate and widely umbilicated.

The protoconch has 2 whorls, a diameter of about 500 μm and a nucleus of about 80 μm. It is smooth and presents two differentiated phases, terminating on a definite, incised sigmoidal line.

The teleoconch has about 1.7 whorls and a peripheral carina. The ornamentation consists in spiral cords, axial lamellae and micro-granules. In apertural position, the last whorl shows 10 thick spiral cords; the 1st and 2nd adapical, thick and nodose and the 3rd somewhat thinner, all growing in a wavy shape; the 4th cord, peripheral, is smooth, somewhat sharper, and forms an angle on the profile of the shell like a carina; the 5th to 8th, abapical, are thick and rounded, the last of them circumscribes the umbilicus. The 3rd and 4th cords are separated by a very wide concave peripheral space.

At the end of the last whorl, near the outer lip, no intermediate cordlets were observed. The spaces between the cords are concave and are occupied by axial lamellae, all of similar size and regularly spaced. Between the suture and the first cord the lamellae are thin and elongate; between the 1st - 2nd and 2nd - 3rd the lamellae are shorter and thicker; between the 3rd - 4th cords there are no lamellae and the broad space is covered by spirally aligned micro-granules; between the 5th - 8th cords, the lamellae are short and evenly distributed.

The aperture is rounded, prosocline; the parietal area is covered by a thick callus that projects towards the inside of the umbilicus just at the transition to the columella, which is thick and slightly reflected towards the umbilicus; the outer lip is thick, with its outer margin modified by the spiral cords, with 11 rounded and thick denticles and a parietal angle on its inner margin.

Umbilicus somewhat narrower and deeper, funnel shaped; its inner wall is convex; inside a thick spiral cord and growth lines may be observed in the last quarter of the whorl.

Dimensions: Holotype: 1.67 mm in diameter x 1.56 mm in height (H/D: 0.93).

Habitat: Outer shelf species dredged at 101-110 m in mud with shells bottom.

Distribution: Only known from the type locality.

Remarks: *Circuitus monoplanes* spec. nov. is characterized by having a single flat lateral surface; by the lower number of spiral cords; by the adapical lamellae shorter than in other species; by the lack of intermediate cordlets at the end of the last whorl, and by the umbilicus which is somewhat narrower and deeper than in other species of the genus.

Circuitus medius spec. nov. (Figures 4A-F, 7G-H)

Type material: Holotype (Figs. 4A-C, 7G-H) MNHN IM-2000-32697 and one paratype in MNHN IM-2000-32698.
Material examined: Philippines, Bohol Island, W of Baclayon, 9º35.3'N-123º52.2'E, 84-87 m, coarse muddy sand: 2 s.
Type locality: Philippines, Bohol Island, W of Baclayon, 9º35.3'N-123º52.2'E, 84-87 m.
Etymology: The specific name derives from the Latin word *medius, a, um* "in the middle" making reference to the flat spiral band on the middle of the shell.

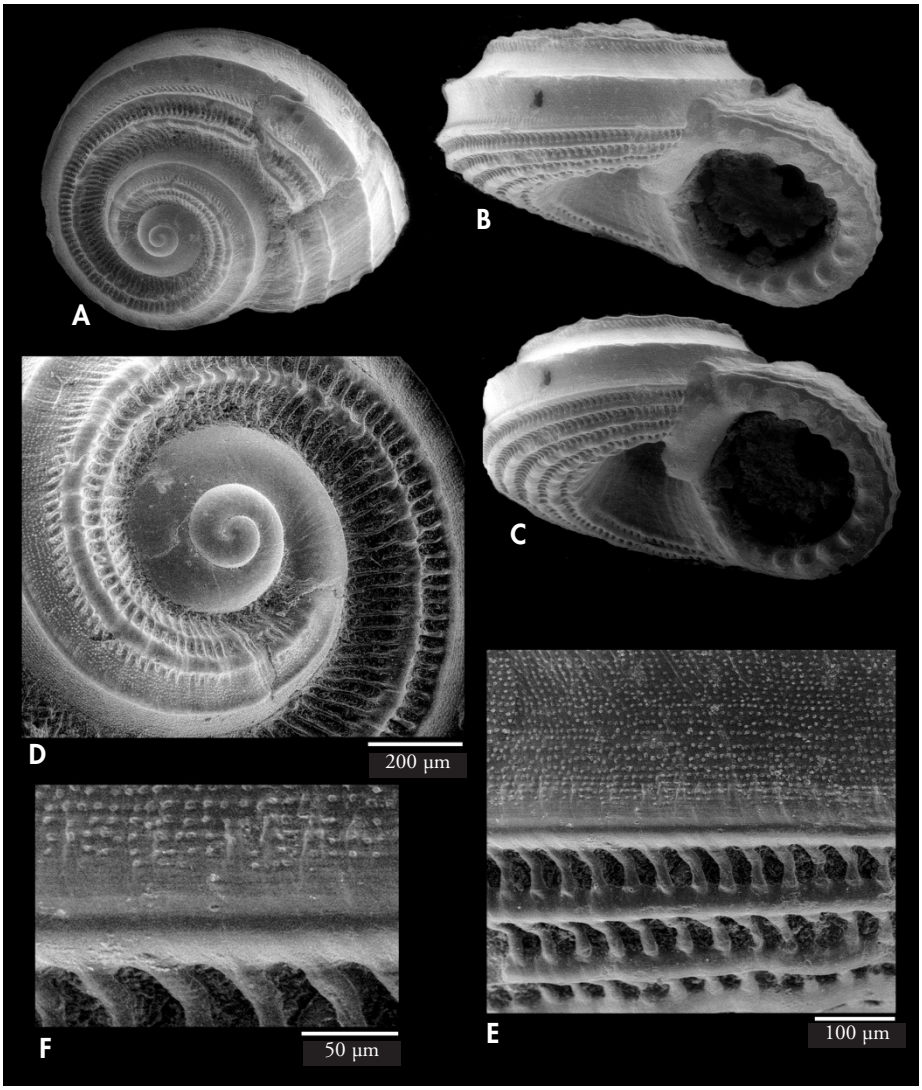

Figure 2. *Circuitus philippinensis* spec. nov. A: paratype MNHN (1.94 mm in diameter); B, C: holotype MNHN, Philippines, between Panglao and Pamilacan Islands, 9º33.4'N-123º51.0'E, 106-137 m (2.9 mm); D: protoconch of the holotype; E, F: microsculpture of the holotype and detail.
Figura 2. Circuitus philippinensis *spec. nov. A: paratipo MNHN (1,94 mm de diámetro); B, C: holotipo MNHN, Filipinas, entre las islas Panglao y Pamilacan, 9º33,4'N-123º51,0'E, 106-137 m (2,9 mm); D: protoconcha del holotipo; E, F: microescultura del holotipo y detalle.*

Description: Shell small (<3.0 mm), solid, depressed-turbinate; spire formed by 4.5 whorls, widely umbilicate, with spiral cords beaded, not carinate.

The protoconch has 2 whorls, a diameter of about 480 µm and a nucleus of 50 µm. It is smooth and presents two differentiated phases, terminating on a definite, incised sigmoidal line.

The teleoconch has 2.5 whorls and lacks any peripheral carina. Ornamentation consists in spiral cords, axial lamel-

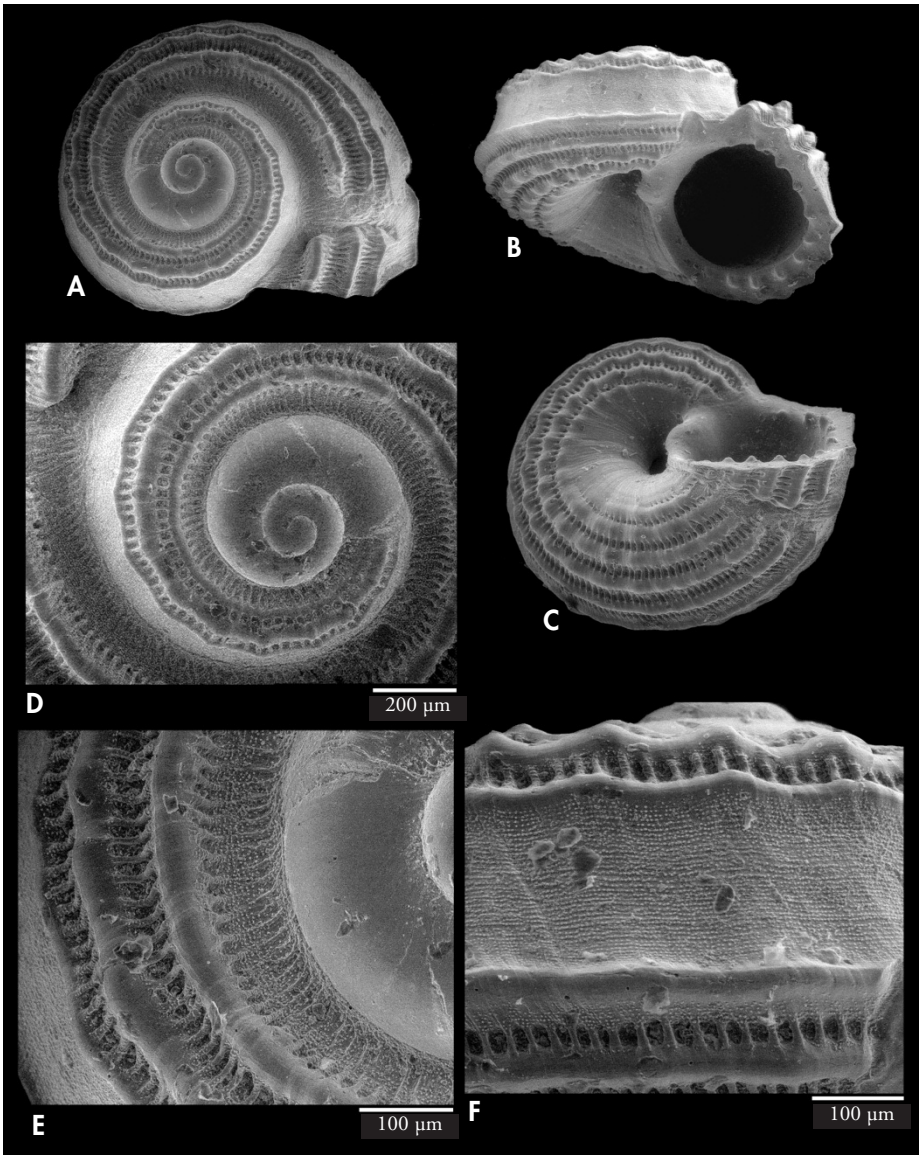

Figure 3. *Circuitus monoplanes* spec. nov. A-C: holotype MNHN, Philippines, Bohol Island, Maribojoc Bay, 101-110 m (1.67 mm in diameter). D: protoconch. E, F: microsculpture.
Figura 3. Circuitus monoplanos *spec. nov. A-C: holotipo MNHN, Filipinas, Isla Bohol, Bahía de Maribojoc, 101-110 m. (1,67 mm de diámetro). D: protoconcha. E, F: microescultura.*

lae and micro-granules. In apertural position, on the last whorl there are 10 thick nodose spiral cords distributed between the suture and the inner part of the umbilicus; the nodules are thick and rounded in the first whorl and a half, becoming gradually thinner and the cords sharper on the last whorl. The first 3 adapical cords are more prominent and their nodules are more pointed; the

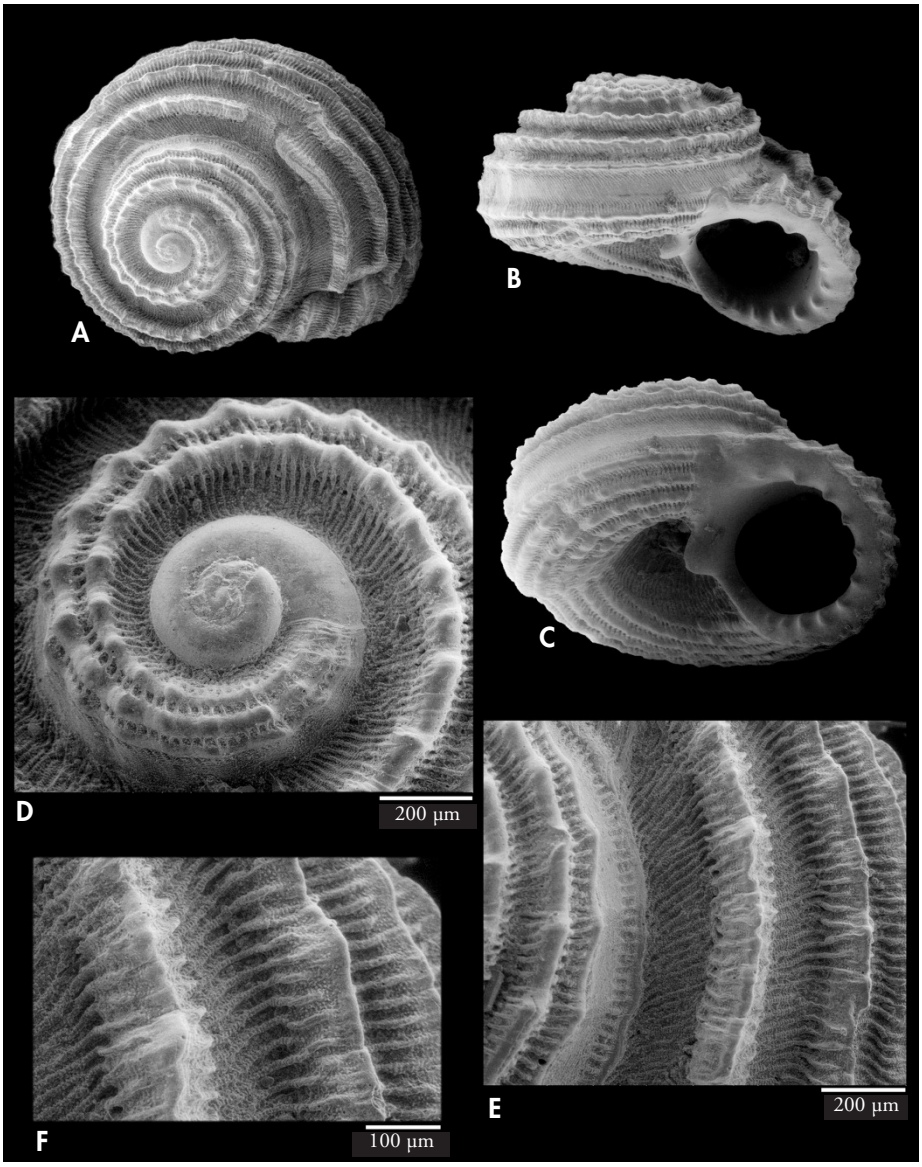

Figure 4. *Circuitus medius* spec. nov. A-C: holotype, MNHN, Philippines, Bohol Island, W of Baclayon, 84-87 m (2.85 mm in diameter). D: protoconch. E, F: microsculpture.
Figura 4. Circuitus medius *spec. nov. A-C: holotipo, MNHN, Filipinas, Isla Bohol, W de Baclayon, 84-87 m (2,85 mm de diámetro). D: protoconcha. E, F: microescultura.*

abapical cords are less prominent and their nodules are rounded. There are intermediate cordlets near the outer lip. The 3rd and 4th cords are separated by a rather wide concave peripheral space; these cords, situated on the periphery, mark a slight angle on the profile of the shell.

The spaces between cords are concave and are occupied by axial

lamellae, very numerous and tightly set. Between the adapical cords the spaces are wider than between the abapical ones, which affects the length of the lamellae, which are longer adapically; in the wider space between the 3rd and 4th cords, the lamellae are much more attenuated than in the other interspaces. The entire surface of the teleoconch and even the lamellae – but not the outer margin of the cords – is covered with micro-granules.

The aperture is rounded, prosocline; the parietal area is covered by a thick callus that projects towards the inner part of the umbilicus just at the transition to the columella, which is thick and slightly reflected towards the umbilicus; the outer lip is thick, with its outer margin modified by the spiral cords, and with 11 rounded thick denticles and a parietal angle on its inner margin.

The umbilicus is wide and deep, funnel shaped; its inner wall is concave; inside there are a spiral cord and axial lamellae covering it completely.

Dimensions: Holotype: 2.85 mm in diameter x 1.96 mm in height (H/D: 0.69).

Habitat: Circalittoral species dredged at 84-87 m in coarse muddy sand bottom.

Distribution: Only known from the type locality.

Remarks: *Circuitus medius* spec. nov. differs from the remaining species in the genus because the lamellae cover all the interspaces between cords, without exception, the micro-granules are extended over the entire surface of the teleoconch including the lamellae. The broadest band is placed in the middle of the height of the shell, and is not as broad as in *C. monoplanes* spec. nov. .

Circuitus vanuatuensis spec. nov. (Figures 5A-F, 7I-J)

Type material: Holotype (Figs. 5A-C, 7I-J) MNHN IM-2000-32699.
Material examined: Vanuatu, SANTO 2006, NW coast of Malo Island, stn EP19, 15º37.5'S-167º05.1'E, 80-94 m: 1 s.
Type locality: Vanuatu, NW coast of Malo Island, 15º37.5'S-167º05.1'E, 80-94 m.
Etymology: The specific name is for the archipelago where the species was collected.

Description: Shell small (<3.0 mm), solid, depressed-turbinate, spire formed by 4 ¼ whorls, carinate and widely umbilicate.

The protoconch has a little more than 2 whorls, a diameter of about 500 μm and a nucleus of 70 μm. It is smooth and presents two differentiated phases, terminating on a definite, incised sigmoidal line.

The teleoconch has a little more than 2 whorls and a peripheral carina. The ornamentation consists in spiral cords, axial lamellae and micro-granules. In apertural view, on the last whorl there are 11 thick spiral cords distributed between the suture and the umbilicus; of the first 3, adapical, the 1st – 2nd are thick and nodose, the 3rd somewhat finer grows in a wavy shape; the 4th is peripheral, smooth, a little sharper and forms an angle on the profile of the shell like a carina; the 5th to the 11th, abapical, are thick and rounded, the last is situated in the outer margin of the umbilicus. The 3rd, 4th and 5th cords are separated by two wide concave peripheral spaces, the abapical one slightly wider than the adapical.

At the end of the last whorl, near the outer lip, fine spiral cordlets appear between the thicker cords.

The spaces between adapical and abapical cords are occupied by axial lamellae, all of similar size and regularly spaced; they are thinner and more elongated in the spaces between adapical cords and more short and thick in abapical spaces. In the broad interspaces between the 3rd and 5th cords there are no axial lamellae. The entire surface of the teleoconch is covered by spirally aligned micro-granules, more visible between 3rd and 5th cords.

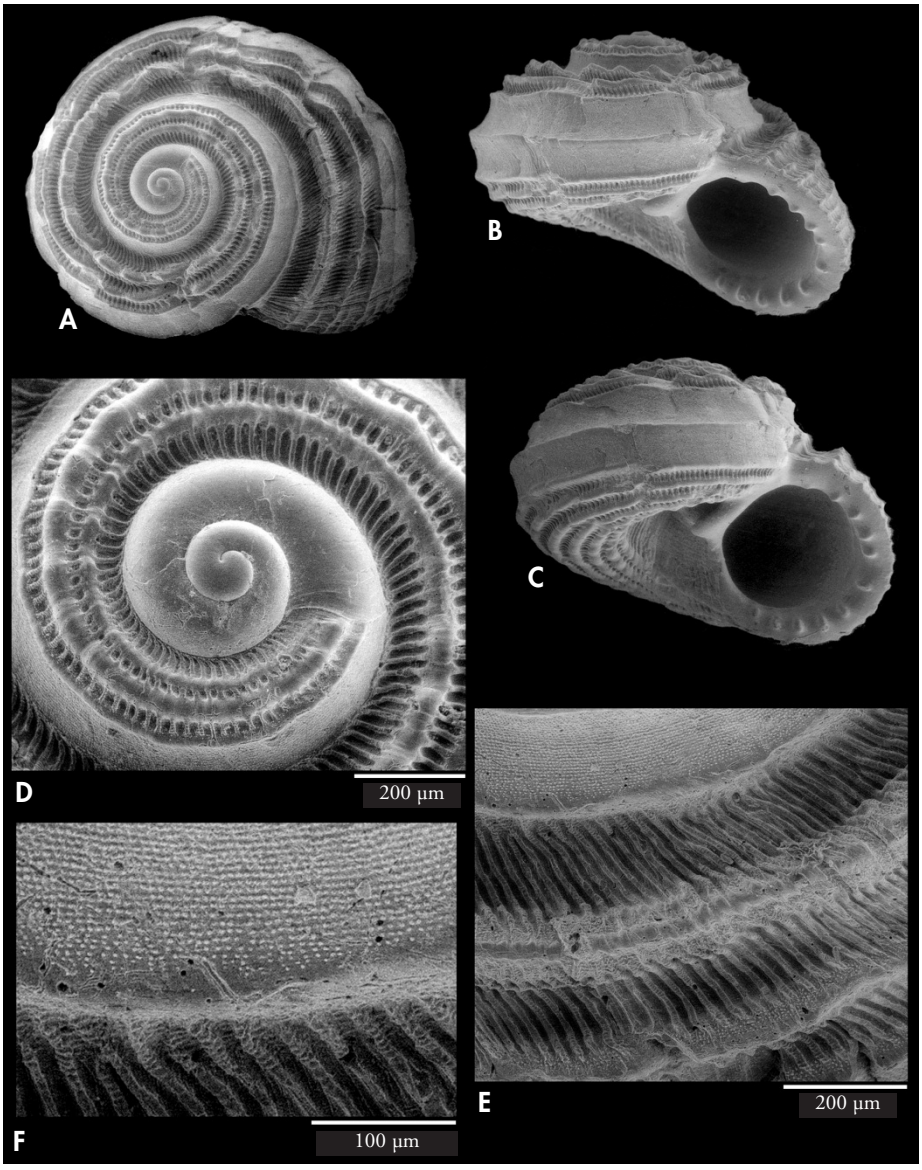

Figure 5. *Circuitus vanuatuensis* spec. nov. A-C: holotype MNHN, Vanuatu, Santo stn EP19, NW coast of Malo Island, 80-94 m (2.5 mm in diameter). D: protoconch. E, F: microsculpture and detail. *Figura 5.* Circuitus vanuatuensis *spec. nov. A-C: holotipo MNHN, Vanuatu, Santo stn EP19, costa noroeste de la isla Malo, 80-94 m (2,5 mm de diámetro). D: protoconcha. E, F: microescultura y detalle.*

The aperture is rounded, prosocline; the parietal area is covered by a thick callus that projects towards the inside of the umbilicus just at the transition to the columella, which is thick and reflected towards the umbilicus; the outer lip is very thick, with its outer margin modified by the spiral cords, and the inner margin with 11 thick rounded denticles and a parietal angle.

The umbilicus is wide and deep, funnel shaped; the inner wall is slightly convex; inside there are a thick spiral cord on its outer margin, growth lines and fine spiral cordlets.

Dimensions: Holotype: 2.5 mm in diameter x 1.72 mm in height.

Habitat: Circalittoral species dredged at 80-94 m depth.

Distribution: Only known from the type locality.

Remarks: *Circuitus vanuatuensis* spec. nov. is characterized by not having an axial ornamentation in the interspaces between 3rd - 5th cords, where only spirally aligned micro-granules are present. The most similar species is *Circuitus philippinensis* spec. nov., because the spaces between peripheral cords are similar, but it differs from it by having more numerous spiral cords and lacking ornamentation in the spaces between peripheral cords.

Circuitus solomonensis spec. nov. (Figures 6A-F, 7K-L)

Type material: Holotype (Figs. 6A-C, 7K-L) MNHN IM-2000-32700.
Material examined: Solomon Islands, SALOMON 1, stn DW1762, 8º39.9'S-160º03.9'E, 396-411 m: 1 s.
Type locality: Solomon Islands, N Buena Vista I., 08°40'S, 160°04'E, 396-411 m.
Etymology: The specific name is for the archipelago where the species was collected.

Description: Shell small (<2.0 mm), solid, depressed-turbinate; with a spire of about2 ½ whorls, carinate and widely umbilicate.

The protoconch has a little more than 2 whorls, a diameter of about 460 μm and a nucleus of 60 μm. It is smooth and presents two differentiated phases, terminating on a definite, incised sigmoidal line.

The teleoconch has 1.5 whorls and two peripheral carinae. The ornamentation consists in spiral cords, axial lamellae and micro-granules. In apertural view, on the last whorl there are 10 thick spiral cords, distributed between the suture and the umbilicus; of the first 3 adapical, the 1st – 2nd are thick and nodose and the 3rd rather fine and with scarcely marked nodules; the 4th cord, peripheral, is smooth, slightly sharper, and angles the shell like a carina; from the 5th to the 10th, abapical, they are thick and with rounded nodules, the last of them situated on the outer margin of the umbilicus. The 3rd, 4th and 5th cords are separated by two wide concave peripheral spaces, the adapical one widest.

At the end of the last whorl, near the outer lip, there are no spiral cordlets in the interspaces. The spaces between the cords are occupied by axial lamellae; thinner and tighter between the suture and the first cord and of equal thickness but regularly separated on the other, except in the broad spaces between 3rd-4th and the 4th- 5th cords, in which the lamellae are very short and are located next to the 3rd and 5th cords respectively. Between 3rd- 5th cords, marked growth lines are also observed. The entire surface of the teleoconch is covered by spirally aligned micro-granules, more visible in the broad spaces between the 3rd and 5th cords.

The aperture is rounded, prosocline; the parietal area is covered by a thick callus that projects towards the interior of the umbilicus just at the transition to the columella, which is curved, thick and reflected towards the umbilicus; the outer lip is thick, with its outer margin modified by the spiral cords, and its inner margin with 13 tubercles, the smallest of which placed at the base of the columella.

The umbilicus is wide and deep, funnel shaped; the inner wall is slightly convex; inside a thick spiral cord near its outer margin can be observed, as well axial lamellae, growth lines and fine spiral cordlets.

Dimensions: Holotype: 1.8 mm in diameter x 1.02 mm in height.

Habitat: Bathyal species dredged at 396-411 m depth.

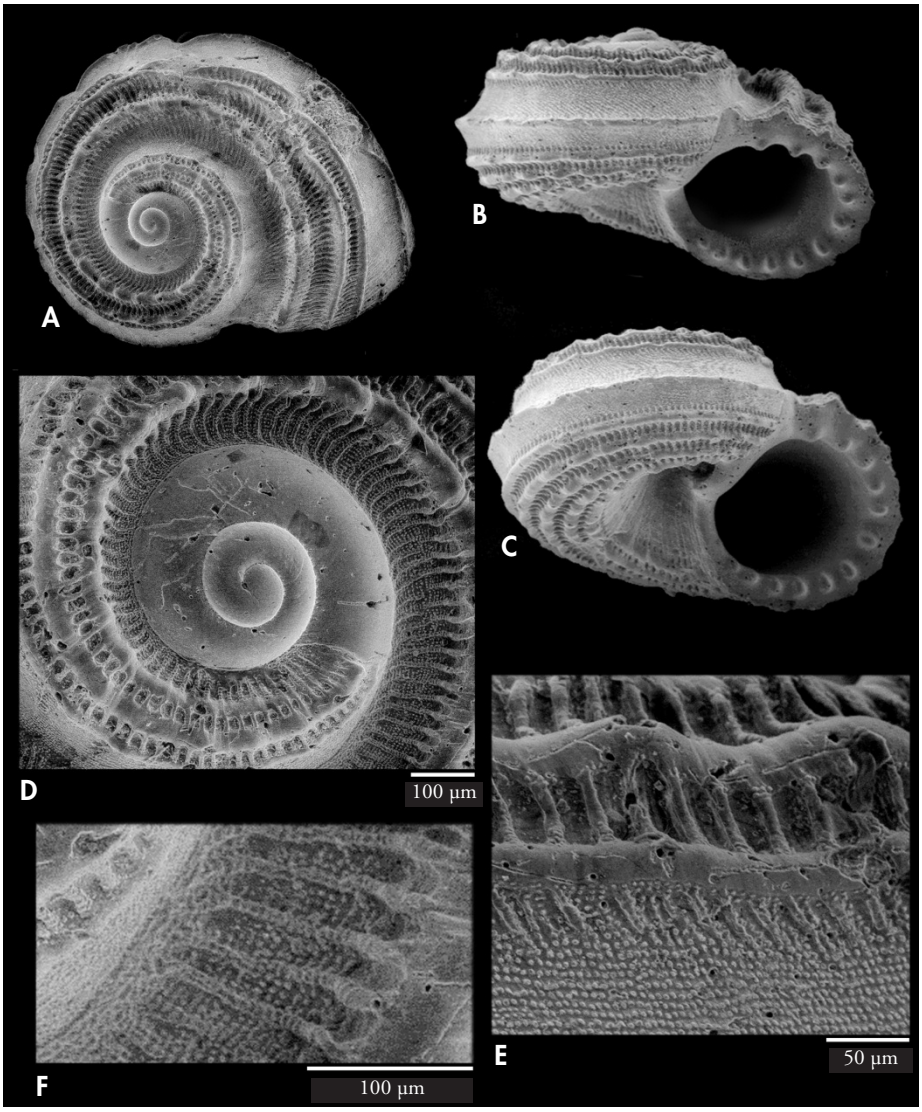

Figure 6. *Circuitus solomonensis* spec. nov. A-C: holotype MNHN, Solomon Islands, N Buena Vista I., SALOMON 1 stn DW1762, 396-411 m (1.8 mm in diameter). D: protoconch. E, F: microsculpture and detail.

Figura 6. Circuitus solomonensis *spec. nov. A-C: holotipo MNHN, Islas Salomón, N isla Buena Vista, SALOMON 1 stn DW1762, 396-411 m (1,8 mm de diámetro). D: protoconcha. E, F: microescultura y detalle.*

Distribution: Only known from the type locality.

Remarks: *Circuitus solomonensis* spec. nov. is characterized by the distribution of the spaces between the cords, presenting the largest spaces between the cords 3rd - 5th and having a denticle on the base of the columella. The species which has greater affinity is *Circuitus caledonicus* spec. nov., but this species has a wider protoconch and one more spiral cord at the base.

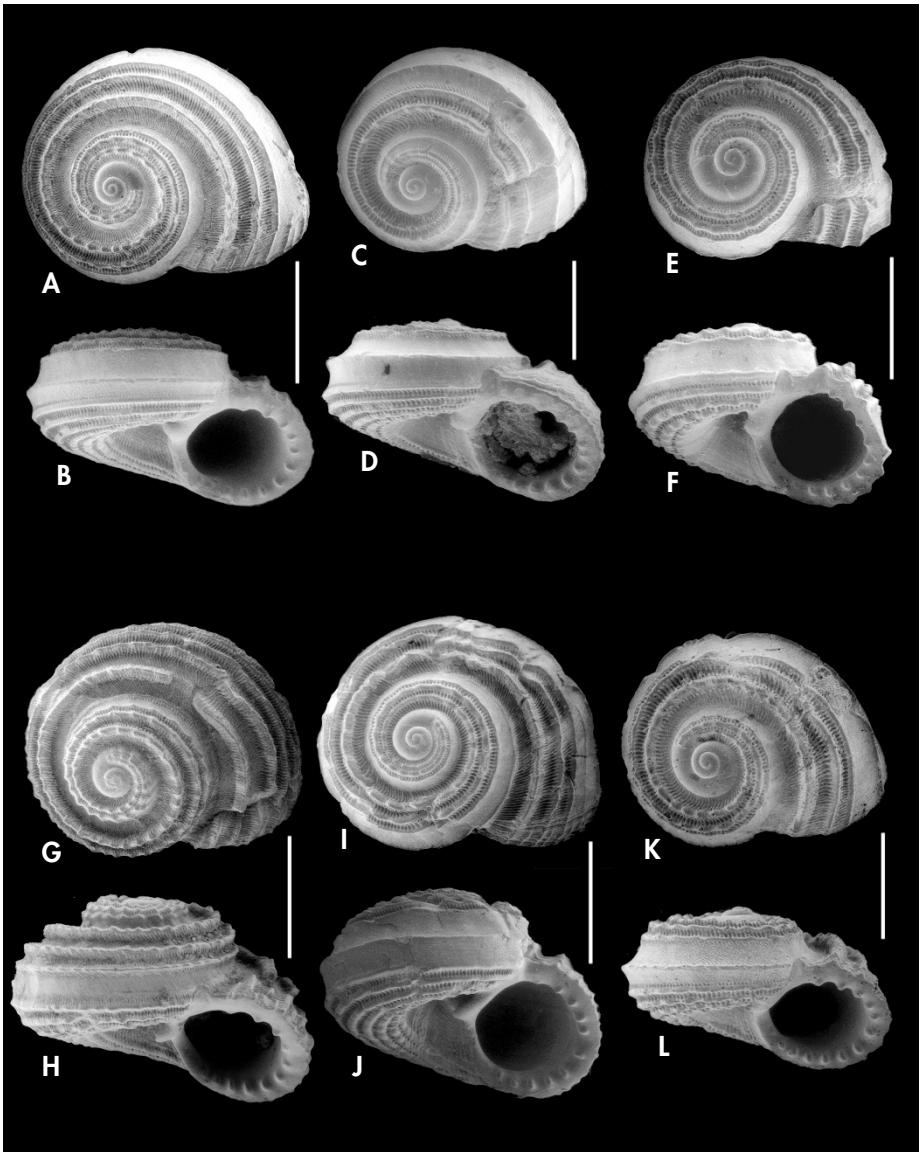

Figure 7. A, B: *Circuitus caledonicus* spec. nov. holotype, 2.8 mm in diameter (MNHN); C, D: *Circuitus philippinensis* spec. nov. C: paratype, 1.94 mm, (MNHN); D: holotype, 2.9 mm in diameter (MNHN); E, F: *Circuitus monoplanes* spec. nov., holotype, 1.67 mm in diameter (MNHN); G, H: *Circuitus medius* spec. nov., holotype, 2.85 mm in diameter (MNHN); I, J: *Circuitus vanuatuensis* spec. nov., holotype, 2.5 mm in diameter (MNHN); K, L: *Circuitus solomonensis* spec. nov., holotype, 1.8 mm in diameter (MNHN).

Figura 7. A, B: Circuitus caledonicus *spec. nov. holotipo, 2,8 mm de diámetro (MNHN); C, D:* Circuitus philippinensis *spec. nov. C: paratipo, 1,94 mm, (MNHN); D: holotipo, 2,9 mm de diámetro (MNHN); E, F:* Circuitus monoplanes *spec. nov., holotipo, 1,67 mm de diámetro (MNHN); G, H:* Circuitus medius *spec. nov., holotipo, 2,85 mm de diámetro (MNHN); I, J:* Circuitus vanuatuensis *spec. nov., holotipo, 2,5 mm de diámetro (MNHN); K, L:* Circuitus solomonensis *spec. nov., holotipo, 1,8 mm de diámetro (MNHN).*

CONCLUSIONS

The new genus *Circuitus* is studied from scanty material. Even so, its unusual characters repeated in every species appear to justify the inclusion of these species in a new genus.

One of the most characteristic morphological differences between the species now studied (Figure 7) is the presence of one or two wide concave peripheral spaces between the cords. These allow us to separate the species rather easily: *Circuitus caledonicus* spec. nov. has two of them, the upper one wider; *C. philippinensis* spec. nov. has also two, the lower one wider; *C. monoplanus* spec. nov. has only one very wide band, which is placed on the upper half of the shell; *C. medius* spec. nov. also has only one rather wide interspace but, being a species with more elevated spire, this space appears to be in the middle of the height of the shell; *C. vanuatuensis* spec. nov. has two almost equally wide spaces; finally, *C. solomonensis* spec. nov. has two spaces the lower one being smaller. So, only *C. solomonensis* and *C. caledonicus* have a similar pattern of the peripheral bands, but differ in other characters.

The geographic and bathymetric distribution of the species here described is as follows:

In the Philippines, three of the new species occur: *C. philippinensis*, *C. monoplanus* and *C. medius*. The first of these species was collected at about 134-137 m; the second at about 100 m, and the third between 84-87 m.

In New Caledonia, only one species was collected and also at similar depth (105-110 m).

In Vanuatu, only one species was collected and also at similar depth (80-94 m).

In the Solomon Islands, one species was collected but at a greater depth (396-411 m).

The habitat is not known, but probably it is of difficult access (caves or between rocks, for example), as in spite of the many collecting dredging over the whole South Pacific, during the many campaigns of the MNHN, only a very scarce number of specimens was found and those were only empty shells.

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