New species of Conradiidae Golikov & Starobogatov, 1987 (= Crosseolidae Hickman, 2013) (Gastropoda: Trochoidea) from the Tropical Indo-Pacific – I. The genus *Crossea*

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KEYWORDS. Gastropoda, Trochoidea, Conradiidae, Crossea, Indo-Pacific, new species.

ABSTRACT. New species of crosseolid vetigastropods, obtained during several expeditions in the Indo-West Pacific organized by MNHN and IRD, are studied. In the present work (part I) thirteen species of the genus *Crossea* A. Adams, 1865 are studied, of which eleven are new, described and figured here. All these species are compared with the previously known species in this genus.

RESUMEN. Se han estudiado nuevas especies de vetigastrópodos crosseólidos obtenidos en varias expediciones en el Oeste del Indopacífico organizadas por el MNHN y IRD. En el presente trabajo (parte I) se estudian 13 especies del género *Crossea* A. Adams, 1865, de las cuales 11 son nuevas, siendo descritas y representadas aquí. Todas estas especies son comparadas con las previamente conocidas en este género.

INTRODUCTION

The genus *Conradia* was proposed by A. Adams (1860), who designated *Conradia cingulifera* A. Adams, 1860 as the type species and placed it in the family Fossaridae A. Adams, 1860. Thiele (1929) considered the placement of *Conradia* uncertain, including it at the end of Fossaridae. Higo et al. (1999) transferred the genus to Skeneidae.

The description by Adams (1865) of the Japanese type of *Crossea* was not accompanied by an illustration; however, three years later, he illustrated it together with *Crossea bellula* A. Adams, 1865. A new genus name, *Crosseola* was proposed by Iredale (1924) for the Australasian species, designating as type species *Crossea concinna* Angas, 1868, from Port Jackson, New South Wales, Australia.

A. Adams (1865) originally classified *Crossea* under Epitoniidae (as Scalidae); it was classified later under Scalariidae (Watson, 1885-1886; Tryon, 1888; Tate, 1890) and Trichotropidae (May, 1922). Later, Australian and New Zealand systematists treated *Crosseola* species under Trochidae Rafinesque, 1815 (Macpherson & Gabriel, 1962); Liotiidae H. and A. Adams, 1854 (Finlay, 1927; Cotton, 1959), Cyclostrematidae Fischer, 1885 (Powell, 1961 & 1979), or Skeneidae Clark, 1851 (Beu & Maxwell, 1990; Hickman & McLean, 1990; Hickman, 1998).

Bouchet & Rocroi (2005), following the classification of Ponder (1988) and Ponder & Warén (1988), considered Conradiinae Golikov & Starobogatov, 1987 synonymous with Vanikoridae Gray, 1840, assigned in the superfamily Vanikorioidea Gray, 1840.

Hickman (2013) defined and described the family Crosseolidae, placed in the unassigned superfamily Vetigastropoda, and included the genera *Crossea* A. Adams, 1865, *Crosseola* Iredale, 1924, *Conradia* A. Adams, 1860 and *Conjectura* Finlay, 1926, previously placed in Skeneidae by W. Clark (1851). After having examining the type species of *Conradia* and *Crosseola*, Clark considered that they were similar enough to be placed in the same family. Classification at family level within Vetigastropoda is still uncertain, due to a lack of anatomical and molecular sequence data.

Bouchet et al. (2017: 75, 337, 373) considered Crosseolidae synonymous with Conradiidae Golikov & Starobogatov, 1987 (being the most recent family name), with *Conradia* as type genus and *Conradia cingulifera* A. Adams, 1860 as type species, placing it in the superfamily Trochoidea Rafinesque, 1815, based on the similarity of the radula of *Crosseola concinna* (Angas, 1868) with that of some skeneids and turbinids. Conradiidae include the same genera as Crosseolidae

Recently, Rubio & Rolán (2014, 2017a) described new Atlantic species of *Crosseola* from W. Africa, the Caribbean region and Brazil, as well as new species of *Crosseola* and *Conradia* from the Indo-Pacific.

The purpose of the present work is to complete the description of new species from the Indo-Pacific in the genera currently assigned to the family, as well as to supply new data for some previously known species. Due to the extensiveness of the work, we decided to divide it into three parts, this being the first, dedicated to the genus *Crossea*.

Material and methods

The material used for the present work was obtained during several expeditions in the Indo-Pacific organized by MNHN and IRD in the 2000s-2010s:

MUSORSTOM 6 (1989) on board R/V *Alis* on the Loyalty Ridge. (doi.org/10.17600/89004811)
MUSORSTOM 7 (1992) on board R/V *Alis* explored Wallis and Futuna. (doi.org/10.17600/92005111)
BATHUS 2 (1993) on board R/V *Alis* New Caledonia. (doi.org/10.17600/93000360)
MUSORSTOM 8 (1994) on board R/V *Alis*, explored the Vanuatu Archipelago. (doi.org/10.17600/94100040)
MUSORSTOM 10 (1998) on board R/V *Alis* explored the Fijian Archipelago. (doi.org/10.17600/98100080)
BORDAU 1 (1999) on board R/V *Alis*, explored de Fijian Archipelago. (doi.org/10.17600/99100020)
SALOMON 1 (2001) on board R/V *Alis* surveyed the central part of the Solomon Islands, from Guadalcanal to Malaita and Makira. (doi.org/10.17600/1100090)
SALOMON 2 (2004) on board R/V *Alis* explored the western part of the Solomon archipelago. doi.org/10.17600/4100090)
EBISCO (2005) (Exploration de la Biodiversité et Isolement en Mer de Corail) on board R/V *Alis* sponsored research expedition in the Coral Sea. (doi.org/10.17600/5100080)

All the material studied in the present work is constituted by empty shells, obtained in the sediments. The shells were photographed at the Scanning Electron Microscopy Center (SEM) in the Centro de Apoyo Científico y Tecnológico a la Investigación (CACTI) of the University of Vigo and in the Centro de Apoyo Científico y Tecnológico of the University of Santiago de Compostela (CACTUS).

Abbreviations

CACTI: Centro de Apoyo Científico y Tecnológico a la Investigación, University of Vigo
CACTUS: Centro de Apoyo Científico y Tecnológico a la Investigación, University of Santiago de Compostela
MNHN: Muséum national d'Histoire naturelle, Paris
NMW: National Museum of Wales, Cardiff
SEM: Scanning electron microscopy
D: maximum diameter of the shell, measured perpendicular to the axis of coiling
H: total height of the shell
Stn: station
s: empty shell

SYSTEMATICS

VETIGASTROPODA Salvini-Plawen, 1980
Superfamily **TROCHOIDEA** Rafinesque, 1815
Family **CONRADIIDAE** Golikov & Starobogatov, 1987
Conradiinae Golikov & Starobogatov, 1987: 26.
Crosseolidae Hickman, 2013: 6.

Type genus: *Conradia* A. Adams, 1860

Diagnosis. Referring to the family Crosseolidae, Hickman (2013) indicated that the diagnostic characters that distinguish this family are features that are otherwise unknown in basic gastropods: the umbilical keel, the pseudo-umbilicus, the reflected anterior portion of the columellar lip, and the characteristic short, shallow anterior canal at the base of the columella. Unusual ontogenetic features occurring in the family include variciform axial thickenings on the shell, descending suture and downturned final aperture, and adult terminal variciform thickening of the outer lip.
The family Conradiidae (= Crosseolidae) currently includes the same genera: *Conradia* A. Adams, 1860; *Crossea* A. Adams, 1865; *Crosseola* Iredale, 1924 and *Conjectura* Finlay, 1926. It comprises Recent and fossil species.
The protoconch of these species is always paucispiral, which usually means small distribution areas due the difficulty of getting to distant islands with a direct embryonic development.

Habitat. Intertidal and shelf depths, microhabitat unknown, shells typically recovered from coarse to medium-fine clastic substrates, shell grit.

Distribution. The current geographic distribution of these genera is predominantly Australasia, Japan, Indo-Pacific, (*Crosseola*, *Conjectura*); South Africa and West Africa (Rubio & Rolán, 2017a, 2017b).
The geographic distribution of the genera *Crossea* and *Conradia*, includes Japan and Australasia (Rubio & Rolán, 2017b).
The distribution of the genus *Conjectura* is known in Australasia and South Africa.

Stratigraphic distribution. Eocene to Recent (Australia and New Zealand); Cretaceous (Africa). Recovered primarily by sieving bulk samples from microfossil-rich horizons.

Remarks. Although the original description of *Crossea miranda* Adams, 1865, type species of the genus, was not accompanied by any illustration, three years later A. Adams (1868: 55, pl. IV, figs 9, 10) provided the first illustrations of *Crossea miranda* and *Crossea bellula*. He noted their similarity to some *Conradia* species as for the shape and sculpture of the shell and showed that one of the most remarkable characters was the angled and channeled projection existing in the lowest part of the aperture ["Anterior canal at base of the columella" of Hickman (2013)].

Actually, the "punctate sculpture" is the main character common to the species of *Crossea*, *Crosseola* and *Conradia*. It is the ornamentation composed of spiral cords and axial ribs or marked growth lines, that, when crossed, form an irregular reticulate pattern of rectangular/quadrangular to oval spaces.

In order to make a correct generic separation of the species of this family, we present the Table I.

Table I. Identification key for the genera.

1 -	Shell turbiniform high spired	2
-	Shell turbiniform low spired	3
2 -	Early teleoconch with irregular reticulate pattern	4
3 -	Early teleoconch totally smooth	5
4 -	Umbilical cord strongly developed and crossed by numerous axial ridges	6
-	Umbilical cord scarcely developed, being formed by a periumbilical nodulose cord	***Conradia***
5 -	Umbilicus with two strong unornamented periumbilical keels	***Conjetura***
6 -	Teleoconch with variciform thickenings regularly distributed	***Crossea***
-	Teleoconch without variciform thickenings	***Crosseola***

Genus ***Crossea*** A. Adams, 1865

Crossea A. Adams, 1865: 323 [Type species: (by subsequent designation, Suter, 1913), *Crossea miranda* A. Adams, 1865. "Gotto Islands" (off western Kyushu), Japan, 64 fms].

Diagnosis (from Hickman, 2013). Adult shell size typically 4 mm. Umbilical keel strongly developed and crossed by numerous axial ridges, but not punctate. Columellar lip thinner than in *Crosseola*, with prominent anterior notch. Sculpture coarsely pitted initially, becoming cancellate and typically dominated by spiral elements on body whorl. Final lip fluted within and with exterior variciform thickening. These are irregularly placed and varying in number on shell.

Remarks. *Crossea* shares with *Crosseola* numerous characters such as:

- Sculpture coarsely initially pitted, becoming cancellate and typically dominated by spiral elements on body whorl.
- Variciform thickenings regularly placed.
- Columellar lip thinner than in *Crosseola*, with prominent anterior notch.
- Final lip fluted within and with exterior variciform thickening.
- Umbilical cord strongly developed and crossed by numerous axial ridges.
- Thick umbilical cord separated from the columellar lip by a deep pseudo-umbilical groove.
- Columellar lip thinner than in *Crosseola*, with prominent anterior notch.

The varix-like thickenings on the shell are unique to the genus. In reality, this is the true generic differentiating character.

Sasaki (2008) noted that the "varices" on shells of *Crossea miranda* are variable in their placement among individuals and are not synchronized (*sensu* Savazzi & Sasaki, 2004).

Some specimens have a double variciform thickening on the body whorl and an offset in spiral sculpture between the first and second portion of the thickening.

The coarse pitted appearance of the initial teleoconch whorl is reminiscent of the pitting in species of *Crosseola*.

Crossea and *Crosseola* have been consistently treated as closely related taxa. The Treatise on Invertebrate Paleontology treats *Crosseola* as a subgenus of *Crossea* (Knight et al. 1960).

Thiele (1929) treated *Crosseola* as a synonym of *Crossea*. *Crossea* has not been reported from fossil record and is not part of the Australasian complex of crosseolid genera and species. *Crossea* is also a relatively shallow (shelf depths) taxon that is recovered from clastic substrates.

Recent Indo Pacific species:

Crossea alliciens Melvill, 1910
Crossea biconica Hedley, 1902
Crossea cordata n. sp.
Crossea exornata n. sp.
Crossea extrema n. sp.
Crossea miranda A. Adams, 1865
Crossea nicober n. sp.
Crossea gatliffi Hedley, 1902
Crossea inverta Hedley, 1907
Crossea regularis n. sp.
Crossea sepcris n. sp.
Crossea spiralis n. sp.
Crossea ulevidens n. sp.
Crossea ultidepre n. sp.
Crossea vanuatuensis n. sp.
Crossea veraspiralis n. sp.
Crossea victori Poppe, Tagaro & Stahlschmidt, 2015

Crossea miranda A. Adams, 1865
Fig. 1A-C

Crossea miranda A. Adams, 1865: 323. Figured in A. Adams, 1868: 55-56 pl. 4 fig. 9. [Type locality: Gotto Islands, Japan, 64 fms].

Type material. Syntype MNHN-IM-2000-31223 (Fig. 1A-C).

Material examined. Gotto Islands, Japan. Collection of Journal de Conchyliologie ex Coll. Crosse & A. Adams. Examined via photograph.

Distribution. Only known from the type locality.

Habitat. Bathyal species collected at 115 m (64 fms) (A. ADAMS, 1865).

Description (based on the MNHN syntype). Shell of small size (<5.00 mm), turbinate, with a high spire formed by 4.8 whorls separated by a marked, deep suture; with axial varix and narrowly umbilicate. The protoconch is smooth and has 0.8 whorls.

The teleoconch has 4 whorls and its periphery is rounded. Ornamentation formed by spiral cords, axial ribs and variciform thickenings. When crossing each other, cords and ribs form in the interspaces an irregular reticulate pattern, composed of quadrangular /rectangular spaces in the two and a half first whorls of the teleoconch. In the last 1½ whorls, the spiral cords predominate; 2-3 prominent spiral cords angulate the periphery. There are 7 variciform axial thickenings regularly placed on the 1½ last whorl; the last one at the end of the spire on the outer lip. A prominent spiral cord formed by successive axial ridges borders and delimits the umbilicus, forming a keel. Umbilicus reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip. Aperture rounded, prosocline; columella thin, arched, reflected towards the umbilicus, with an anterior channel at base. Outer lip not modified by the spiral cords; external margin thickened or variciform.

Dimensions: Syntype: 4.0 mm in diameter x 5.18 mm in height (H/D = 1.45).

Remarks. *Crossea miranda* is the type species of the genus, showing both the common generic characters and the differences, described by HICKMAN (2013: 20), which distinguish *Crossea* from *Crosseola*. The variciform thickenings on the shell constitute the true generic differential character.

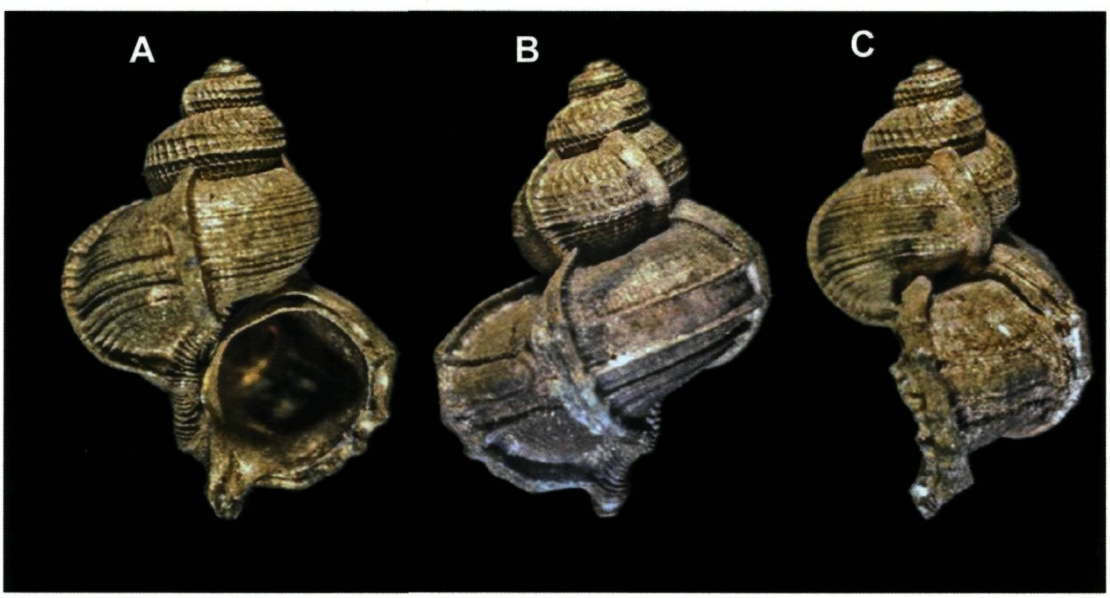

Figure 1
A-C. *Crossea miranda* A. Adams, 1865. Syntype MNHN-IM-2000-31223. Gotto Islands, Japan. Collection of *Journal de Conchyliologie* ex Coll. Crosse & A. Adams.

Crossea victori Poppe, Tagaro & Stahlschmidt, 2015
Fig. 2A-D

Crossea victori Poppe et al., 2015: 21-22, pl. 5, figs 1-2 [Type locality: Philippines, Mactan Island, Maribago].

Type material. Holotype MNHN-IM-2000-30331 (Fig. 2A-D).

Material examined. Philippines, Mactan Island, Maribago. Examined by photograph.

Description. In Poppe, Tagaro & Stahlschmidt (2015). The shell is elongate with an elevate spire, whorls convex, suture deep, in the last two whorls are present two and three axial enlargements, and one more at the spire end forms the wide outer lip. A periumbilical cord almost vertical with numerous cordlets. Umbilicus closed.

Distribution. Mactan, Olango and Jolo Islands, Philippines.

Habitat. Bathyal species collected at 130-250 m in sand and gravel bottoms (Poppe et al., 2015).

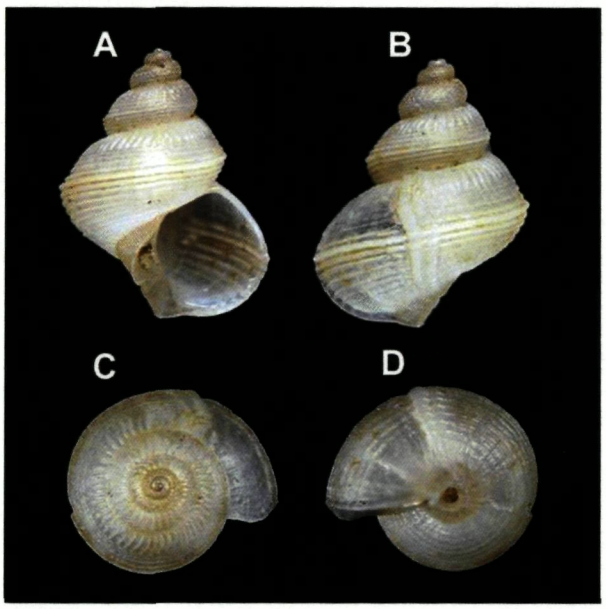

Figure 2A-D
Crossea victori Poppe, Tagaro & Stahlschmidt, 2015. Holotype MNHN-IM-2000-30331. Philippines, Mactan Island, Maribago, 3.5 mm.

Remarks. We had doubts about the assignation of this species to the genus *Crossea*, due to the lack of any clear axial ridges typical of the genus, only observed two near the end of the spire in the holotype. However, in the original description, Poppe *et al.* (2015) indicate that the shells examined develop thick varices which vary from 1-4 according to the shells viewed, mainly paratype 1 from Mactan Island.

Crossea extrema n. sp.
Fig. 3A-E

Type material. Holotype MNHN-IM-2000-34286 (Fig. 3A-B).

Material examined. New Caledonia. BATHUS 2: 1 s, stn DW730, 23°03'S-166°58'E, 397-400 m.

Type locality. S New Caledonia, 23°03'S-166°58'E, 397-400 m.

Habitat. Bathyal species dredged at 397-400 m depth.

Distribution. Only known from the type locality.

Description. Shell of very small size (<2.0 mm), robust, turbiniform, high spire formed by 3.8 whorls separated by a deep suture, carinate and narrowly umbilicated.
The protoconch has 0.8 whorls, smooth surface and a diameter of 250 µm.
The teleoconch has 3.1 whorls and its ornamentation is formed by spiral cords, axial ribs, variciform thickenings and micro-granules. The spiral peripheral cords are more prominent and one of them, as a carina, angle the periphery of the shell. The other cords are less prominent. The micro-granules cover the entire surface of the teleoconch.
In apertural view, 4 spiral cords are observed in the first and second whorls and 2 peripheral carinae and 4-5 cords in the last one. When crossing the spiral cords, the axial ribs form a regular reticle of rectangular/quadrangular spaces and small nodules at the intersection points; in the later whorl, the spiral carinae predominate. Except in the subsutural zone, all spaces between cords are markedly concave.
There are 3 variciform axial thickenings placed on the last quarter whorl; the last one is at the end of the spire on the outer lip. A prominent periumbilical cord, formed by successive thick transverse ridges, borders and delimits the umbilicus. Umbilicus reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip. Aperture rounded, prosocline; columella wide, thick and basally reflected towards the umbilicus, with a thick nodule and an anterior channel at the base. Outer lip with margin internally scalloped; external margin thickened or variciform.
Dimensions: Holotype: 1.74 mm in height x 1.54 mm in diameter (H/D = 1.13).

Etymology. The specific name alludes to the fact that the axial ridges (typical of the genus) only appear at the end of the spire.

Remarks. *Crossea extrema* n. sp. is characterized by thick cords and peripheral carinae; by the marked concave interspaces; by the thick periumbilical cord and by the three variciform thickenings in the last quarter of the last whorl.

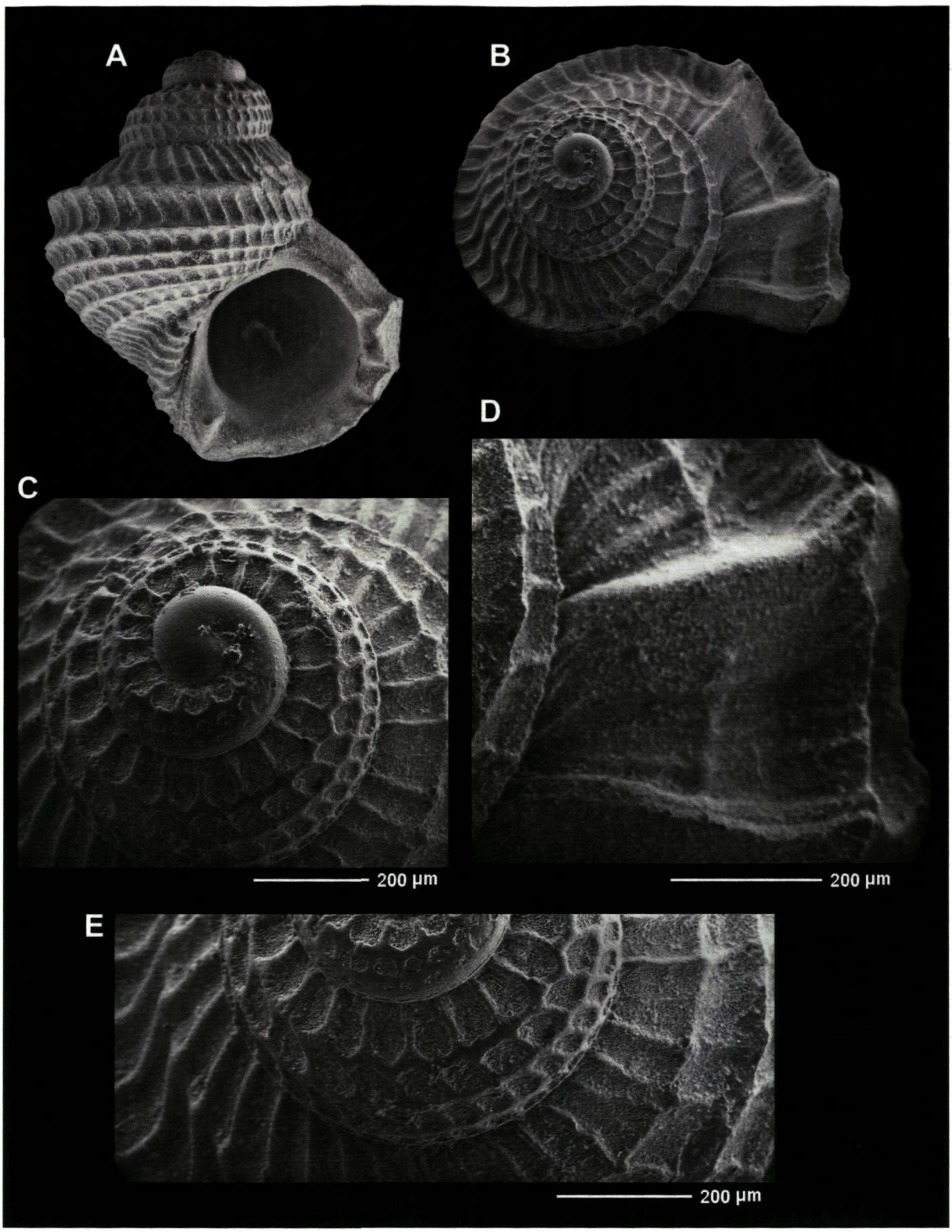

Figure 3A-E
Crossea extrema n. sp. A-B. Holotype MNHN-IM-2000-34286, 1.74 mm, S New Caledonia, 23°03'S-166°58'E, 397-400 m; C. Protoconch and first teleoconch whorls; D-E. Detail of the sculpture.

It differs from *C. ulevidens* n. sp. by its internally scalloped outer lip.
From *C. regularis* n. sp. it differs by the different distribution of the variciform thickenings.
Crossea miranda and other congeners, are distinguished by a lower spiral and the presence of three variciform thickenings in the last quarter of the last whorl.

Crossea ultidepre n. sp.
Fig. 4A-F

Type material. Holotype MNHN-IM-2000-34287 (Fig. 4A-B).

Material examined. New Caledonia, EBISCO: 1 s, NW Bellona, stn DW2565, 20°21'S-158°41'E, 414-419 m.

Type locality. New Caledonia, NW Bellona, 20°21'S-158°41'E, 414-419 m.

Habitat. Bathyal species dredged at 414-419 m depth.

Distribution. Only known from the type locality.

Description. Shell of small size (<4.00 mm), turbinate, with a high spire formed by 4.8 whorls separated by a marked and deep suture; bicarinate and narrowly umbilicate.
The protoconch has 0.8 whorls, smooth surface and a size of 185 μm in diameter.
The teleoconch has 4 whorls and its periphery is bicarinate. Ornamentation formed by spiral cords and carinae, axial ribs, variciform thickenings and microgranules. The entire surface of the teleoconch is covered with microgranules. When crossing each other, cords and ribs form in the interspaces an irregular reticulate pattern, composed of quadrangular/rectangular spaces in the 2 ¾ first whorls of the teleoconch. In the last 1 ¼ whorls, the spiral cords predominate; the axial rib practically disappears, leaving only fine spiral cords and the two peripheral carinae which angle the periphery. There are 7 variciform axial thickenings regularly placed on the 1½ last whorl; the last one at the end of the spire forming the outer lip. A prominent spiral cord formed by successive axial ridges, borders and delimits the umbilicus, which is reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip. Aperture ovate, prosocline; columella thin, arched, basally reflected towards the umbilicus, with an anterior channel at the base. Outer lip modified by the spiral carinae; external margin thickened or variciform.
Dimensions: Holotype: 3.06 mm in height x 2.41 mm in diameter (H/D = 0.79).

Remarks. *Crossea ultidepre* n. sp. is characterized by being peripherally bicarinate; by the almost complete disappearance in the last whorl of the axial sculpture, with the predominance of the spiral one and by the unusual shape of the periumbilical cord.
It differs from *C. extrema, C. exornata, C. cordata, C. nicober, C. veraspiralis* and *C. regularis* by not having a scalloped internally outer lip.

Etymology. The specific name alludes to the shell sculpture, which in the last whorl is very depressed, by the fusion of the Latin adjectives *ultimus, a, um*, "ulti" and *depressus, a, um* "depre".

Crossea ulevidens n. sp.
Fig. 5A-D

Type material. Holotype MNHN-IM-2000-34288 (Fig. 5A-B).

Material examined. New Caledonia, MUSORSTOM 6: 1 s, Lifou, 20°42'S-167°00'E, stn DW416, 343 m.

Type locality. New Caledonia, Lifou, 20°42'S-167°00'E, stn DW416, 343 m.

Habitat. Bathyal species dredged at 343 m depth.

Distribution. Only known from the type locality.

Description. Shell of small size (<3.0 mm), robust, turbiniform, with a high spire formed by 4.8 whorls separated by a deep suture, carinate and narrowly umbilicate.
The protoconch is broken.
The teleoconch has 4 whorls and its ornamentation is formed by spiral cords, axial ribs, variciform thickenings and microgranules. The peripheral cords are the most prominent and as carinae they angle slightly at the periphery.
In apertural view, 4 spiral cords are observed in the first and second whorls and 2 peripheral carinae and 12 cords on the last whorl. The axial ribs, when crossing the spiral cords, form a regular reticle of rectangular/quadrangular spaces and small nodules at intersection points. Except in the subsutural zone, all spaces between cords are markedly concave. The microgranules cover the entire surface of the teleoconch.
There are 2 variciform axial thickenings located at the middle of the last whorl; the last one is placed at the end of the spire on the outer lip. A prominent periumbilical cord formed by successive transverse ridges borders and delimits the umbilicus. Umbilicus reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip. Aperture rounded, prosocline; columella wide, thick and basally reflected towards the umbilicus, with an anterior channel at base. Outer lip with external margin thickened or variciform and inner margin not scalloped.

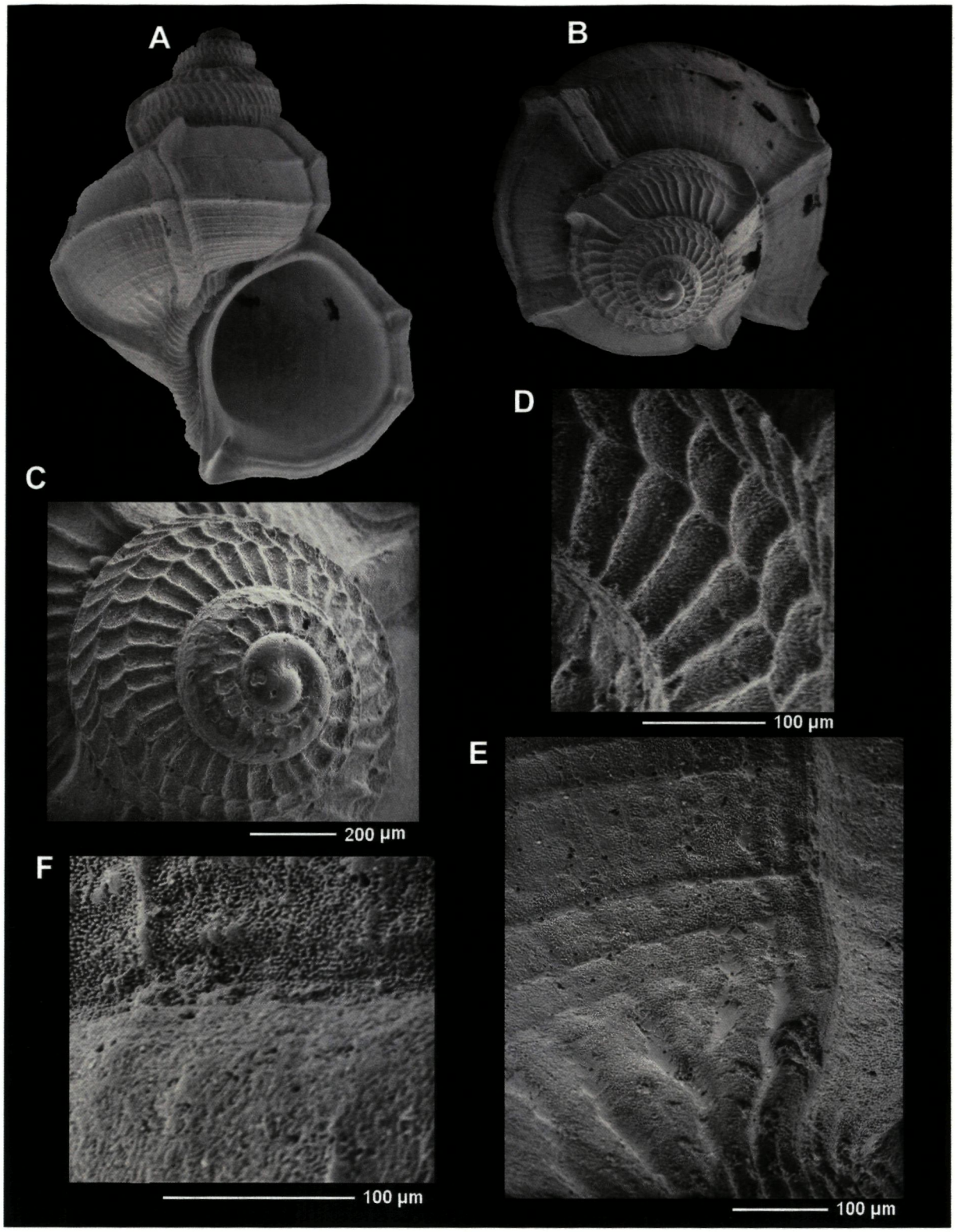

Figure 4A-F
Crossea ultidepre n. sp. A-B. Holotype MNHN-IM-2000-34287, 3.06 mm, New Caledonia, NW Bellona, 20°21'S-158°41'E, 414-419 m; C. Protoconch and first teleoconch whorls; D-F. Detail of the sculpture and microsculpture.

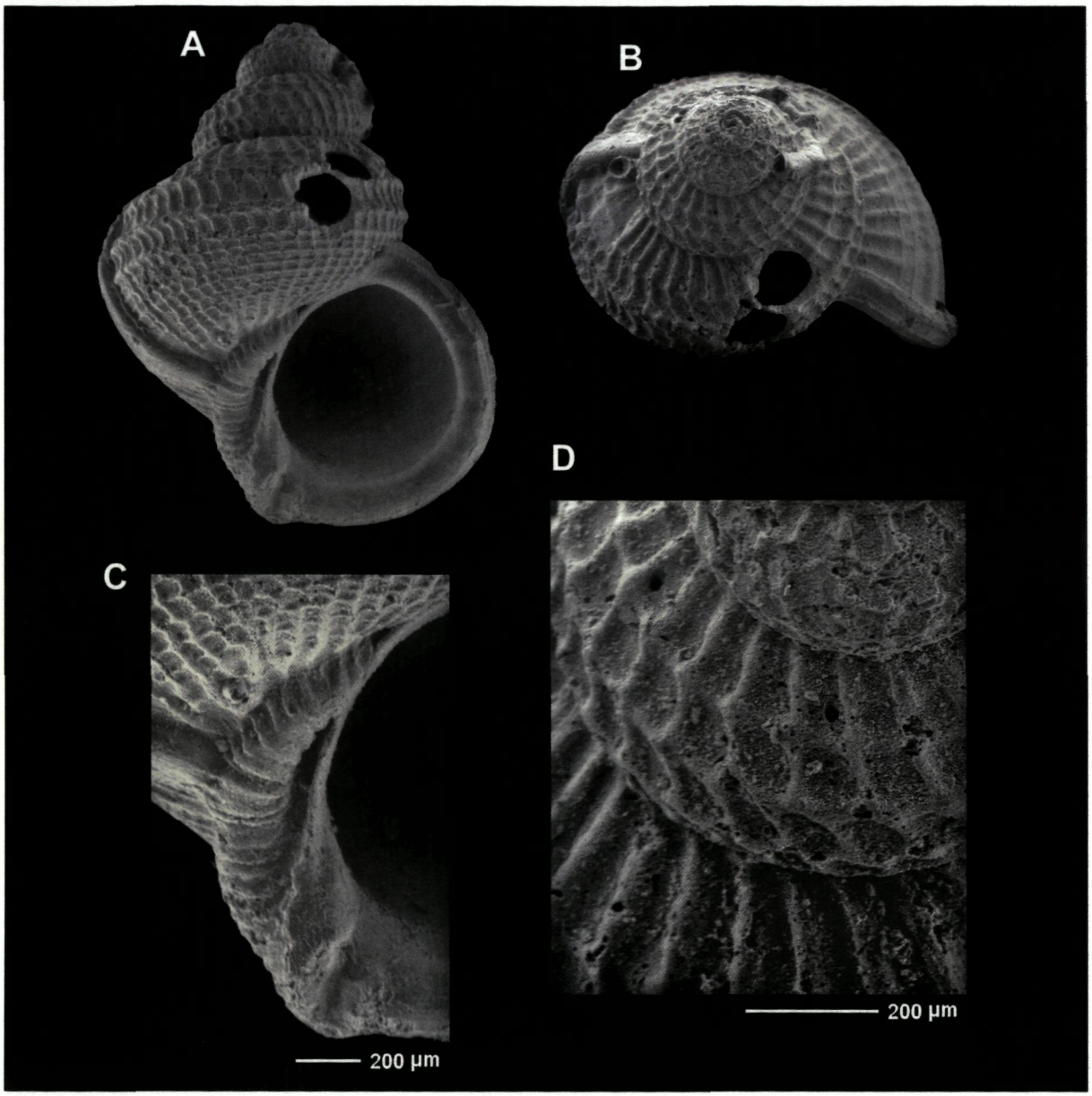

Figure 5A-D
Crossea ulevidens n. sp. A-B. Holotype MNHN-IM-2000-34288, 2.6 mm, New Caledonia, NW Lifou, 20°42'S-167°00'E, 343 m; C-D. Detail of the sculpture.

Dimensions: Holotype: 2.6 mm in height x 2.11 mm in diameter (H/D = 1.23).

Remarks. Despite disposing of only a single specimen, which moreover is in a poor condition, we have decided to describe it and give it a name because its characters do not resemble those of any other known species and can be clearly distinguished.
Crossea extrema n. sp. has a similar aspect, but the number of spiral cords is lower (about 7 in the last whorl in front compared to about 15-17 in *C. ulevidens* n. sp.).
The new species differs from *C. regularis* by the larger number of spiral cords. It differs from *C. extrema* by the different distribution of variciform thickenings. It differs also from *C. exornata, C. cordata, C. nicober, C. veraspiralis* and *C. regularis* by the absence of an internally scalloped outer lip.

Etymology. The specific name alludes to its sculpture, which in the last whorl is evident, with the fusion of the beginning of the Latin words *ultimus, a, um* "ul", and *evidens, entis* "evidens".

Crossea exornata n. sp.
Fig. 6A-G

Type material. Holotype MNHN-IM-2000-34289 (Fig. 6A-B).

Material examined. New Caledonia, MUSORSTOM 6: 1 s, stn DW459, Lifou, E Cap des Pins 21°01'S-167°31'E, 425 m.

Type locality. New Caledonia, Lifou, E Cap des Pins 21°01'S-167°31'E, 425 m.

Habitat. Bathyal species dredged at 425 m depth.

Distribution. Only known from the type locality.

Description. Shell of small size (<4.00 mm), turbinate, with a high spire formed by 5 whorls separated by a marked and deep suture, not carinate and narrowly umbilicate.
The protoconch has 0.8 whorls, a smooth surface and a size of 230 μm in diameter.
The teleoconch has 4.2 whorls and its periphery is rounded. Ornamentation formed by spiral cords, axial ribs, variciform thickenings and microgranules. The entire surface of the teleoconch is covered by microgranules. Cords and ribs cover the entire surface of the teleoconch, forming in the interspaces an irregular reticle of rectangular/quadrangular spaces and a small nodule at intersection point.
There is no predominance of axial or spiral ornamentation; only 2-3 peripheral cords that project slightly over the others, but without affecting the rounded periphery of the teleoconch. The variciform axial thickenings are very wide and prominent; there are 3 variciform axial thickenings regularly placed on the last whorl; the last one is at the end of the spire on the outer lip. A prominent periumbilical cord formed by successive axial ridges borders and delimits the umbilicus.
Umbilicus reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip. Aperture rounded, prosocline; columella thin, arched, basally reflected towards the umbilicus, with an anterior channel at the base. Outer lip scalloped internally with external margin thickened or variciform.
Dimensions: Holotype: 3.55 mm in height x 2.67 mm in diameter (H/D = 1.33).

Remarks. *Crossea exornata* n. sp. is characterized by the number and size of the very prominent variciform axial thickenings; because there is no predominance of one ornamentation over the other; by the shape of the periumbilical cord; and by the outer lip internally scalloped. *Crossea ulevidens* n. sp. can have some of the above characters, but its periumbilical cord is wider, its apertural outer lip is not modified by the spiral sculpture, and the microsculpture is not so fine. Also the axial ridges appear more separate.
Crossea exornata n. sp. differs also from *C. ultidepre, C. sepcris, C. vanuatuensis* and *C. spiralis* by having an internally scalloped outer lip.

Etymology. The specific name alludes to the fact that the shell is entirely covered by a prominent sculpture, employing the participle of the Latin verb *exorno, as, are, avi, atum* which means "to adorn, to embellish".

Crossea sepcris n. sp.
Fig. 7A-E

Type material. Holotype MNHN-IM-2000-34290.

Material examined. New Caledonia, EBISCO: 1 s, Lansdowne, stn DW2617, 20°06'S-160°22'E, 427-505 m.

Type locality. New Caledonia, Lansdowne, 20°06'S-160°22'E, 427-505 m.

Habitat. Bathyal species dredged at 427-505 m depth.

Distribution. Only known from the type locality.

Description. Shell of very small size (<2.0 mm), robust, turbiniform, with a high spire formed by 4 whorls separated by a deep suture, carinate and narrowly umbilicate.
The protoconch has 0.75 whorls, smooth surface and size 227 μm in diameter.
The teleoconch has 3.25 whorls. The ornamentation is formed by spiral cords, some more prominent as a carina that angulates the periphery of the shell; there are also ribs, axial varices and microgranules. In apertural view, there are 5 spiral cords on the first and second whorls, 2 peripheral carinae and 8-9 thinner cords on the last one. Axial ribs cross the spiral cords forming nodules at the intersection points. In the first two whorls, the ribs crossing spiral cords form a regular lattice of square or rectangular spaces; in the later whorls the spiral carinae predominate and the axial ribs also form rectangular spaces. In the last two whorls there are 7 variciform axial thickenings placed on the last 1½ whorls; the last one is at the end of the spire on the outer lip. A prominent periumbilical cord formed by successive fine axial ridges borders and delimits the umbilicus, forming a keel. Umbilicus reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip. Aperture rounded, prosocline; columella thin, straight and reflected towards the umbilicus, with an earlier channel at the base. Outer lip with scalloped margin, modified by the spiral carinae; external margin thickened or variciform.
Dimensions: Holotype: 1.92 mm in height x 1.65 mm in diameter (H/D = 1.16).

Remarks. *Crossea sepcris* n. sp. is characterized by the numerous axial ridges (7 on the last whorl), a very fine microsculpture of tubercles, and the presence of two main carinae and several spiral cords on the last 1½ whorls.

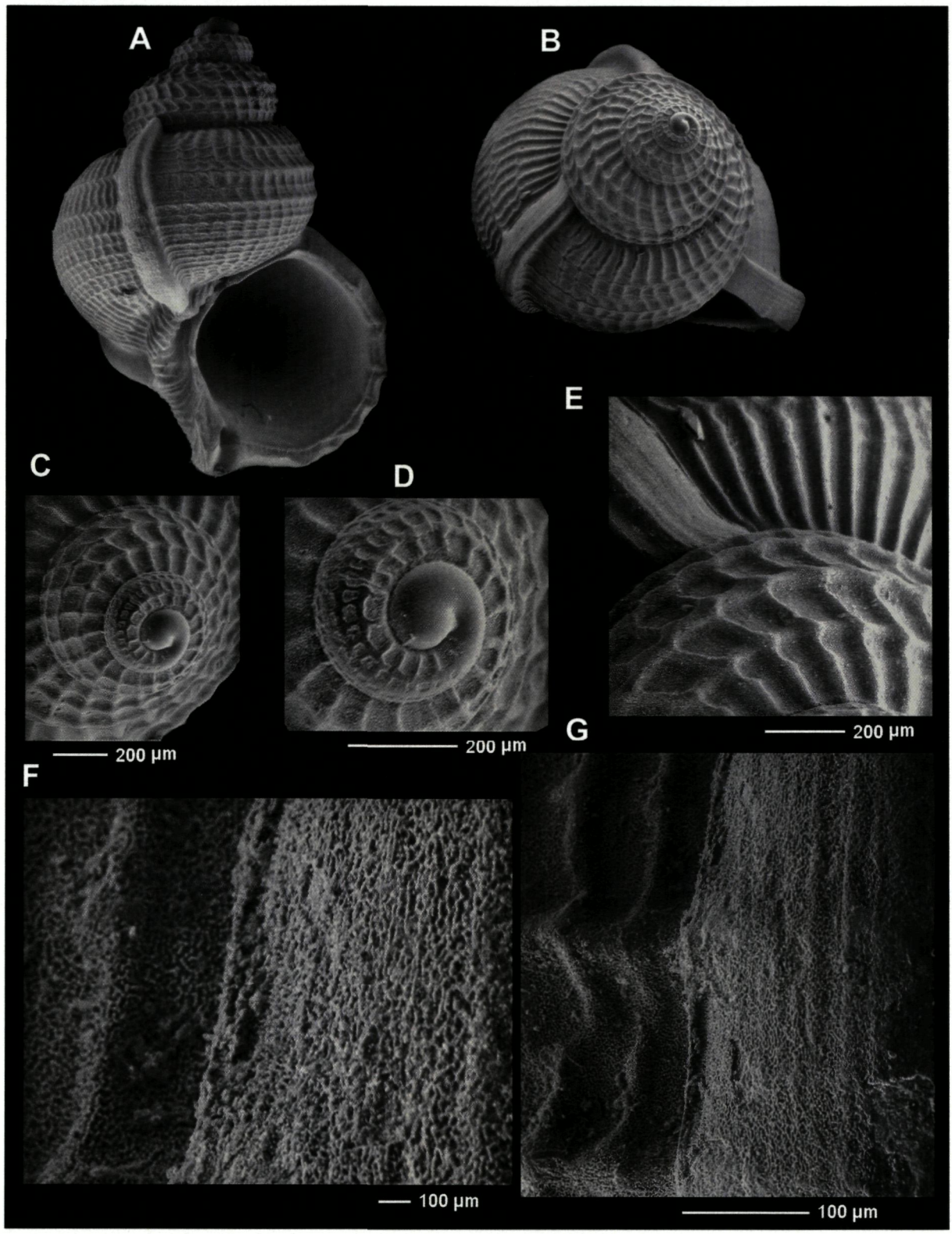

Figure 6A-G
Crossea exornata n. sp. A-B. Holotype MNHN-IM-2000-34289, 3.55 mm in height, New Caledonia, Lifou, E Cap des Pins, 21°01'S-167°31'E, 425 m; C-D. Protoconch and first teleoconch whorls; E-G. Sculpture and microsculpture.

Crossea ultidepre n. sp. from New Caledonia has one less spiral carina, and the microsculpture of the last whorl is more depressed and less apparent; it also has fewer axial ridges.

Crossea exornata n. sp. from New Caledonia has a larger shell, more elongate, with the main spiral carinae smaller and which do not cross the axial ridges. It differs also from *C. extrema, C. cordata, C. nicober, C. veraspiralis* and *C. regularis* by not having an internally scalloped outer lip.

Etymology. The specific name is formed by the union of the beginning of the Latin words *septem* which means "seven" and *crista* "crest", alluding to the presence of the seven axial elevations on the last whorl.

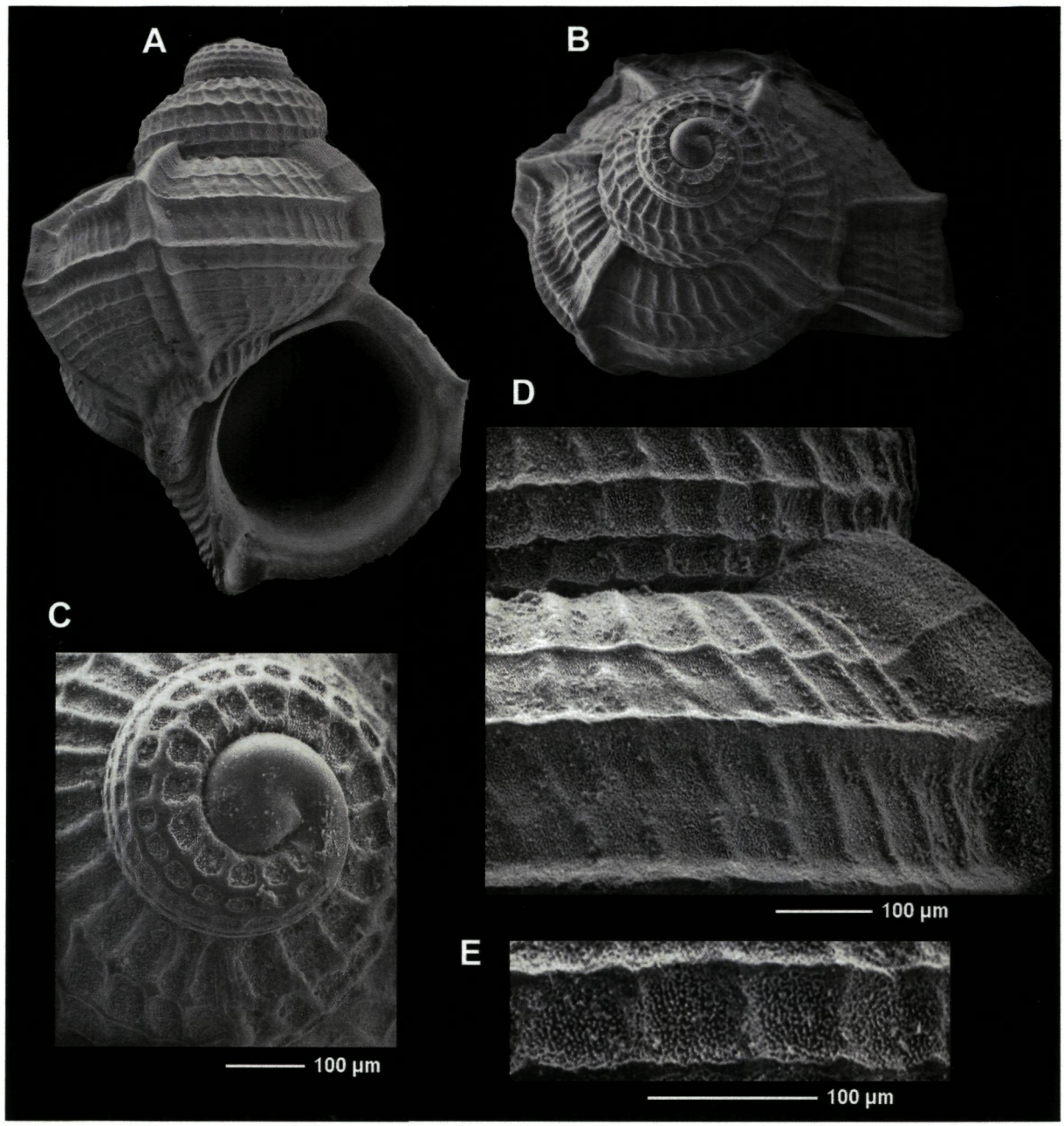

Figure 7A-E
Crossea sepcris n. sp. A-B. Holotype MNHN-IM-2000-34290, 1.92 mm in height, New Caledonia, Lansdowne, 20°06'S-160°22'E, 427-505 m; C. Protoconch; D-E. Sculpture and detail.

Crossea cordata n. sp.
Fig. 8A-D

Type material. Holotype MNHN-IM-2000-34292 (Fig. 8A-B) and one paratype MNHN-IM-2000-34293.

Material examined. Wallis & Futuna, MUSORSTOM 7: 2 s, stn DW601, 13°19'S-176°17'W, 350 m.

Type locality. Wallis & Futuna, Wallis Island, 13°19'S-176°17'W, 350 m.

Habitat. Bathyal species dredged at 350 m depth.

Distribution. Only known from the type locality.

Description. Shell of small size (<5.0 mm), robust, turbiniform, high spire formed by 5.3 whorls separated by a deep suture, carinate and narrowly umbilicate.
The protoconch has 0.8 whorls, smooth surface and a size of 280 µm in diameter.
The teleoconch has 4.5 whorls. The ornamentation is formed by prominent spiral cords, as a carina that angulates the periphery of the shell; between them there are intermediate spiral cordlets, ribs and axial varices. In apertural view there are 3 spiral cords in the first whorl, 2 peripheral carinae and 2 cordlets in the second and third whorls, and a subsutural cord and 6 peripheral carinae on the last one. Axial ribs cross the spiral cords forming nodules at the intersection points. In the first two whorls, the axial ribs crossing the spiral cords form a regular lattice of square or rectangular spaces; in the later whorls the spiral carinae predominate and the axial ribs form rectangular spaces between them.
In the last two whorls, there are 7 variciform axial thickenings; the last of them is at the end of the spire on the outer lip. A prominent periumbilical cord formed by successive fine axial ridges borders and delimits the umbilicus, forming a keel. Umbilicus is reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip. Aperture rounded, prosocline; columella thin, straight, reflected towards the umbilicus, with an anterior channel at the base. Outer lip with margin scalloped, modified by the spiral carinae; external margin thickened or variciform.
Dimensions: Holotype: 4.4 mm in height x 3.14 mm in diameter (H/D = 1.35). Paratype is 3.26 mm in diameter.

Remarks. Differential characters in *Crossea cordata* n. sp. are the presence of six prominent carinae on the last whorl, but with their presence in lower number in the previous whorls. The axial sculpture is orthocline.
Crossea sepcris n. sp. from New Caledonia has a shell with a smaller height, the prominent carinae are only two, spirally with several cords, the axial sculpture is prosocline, and the number of the axial ridges is higher.

Etymology. The specific name alludes to the presence of numerous spiral elevated cords, unusual in other species of this genus.

Crossea nicober n. sp.
Fig. 9A-E

Type material. Holotype MNHN-IM-2000-34294 (Fig. 9A) and 1 paratype MNHN-IM-2000-34295 (Fig. 9B).

Material examined. Fiji, MUSORSTOM 10: 1 s, S Viti Levu, stn DW1383, 18°18'S-178°03'E, 230-251 m (holotype); 1 s, S Viti Levu, stn DW1376, 18°19'S-178°09'E, 497-504 m (paratype).

Type locality. Fiji, S Viti Levu, 18°18'S-178°03'E, 230-251 m.

Habitat. Bathyal species dredged at 230-504 m depth.

Distribution. Only known from the type locality.

Description. Shell of small size (<5.0 mm), robust, turbiniform, with a high spire formed by 5¼ whorls separated by a deep suture, carinate and narrowly umbilicate.
The protoconch has 0.75 whorls, with a smooth surface and a size of 232 µm in diameter. The teleoconch has 4½ whorls. The ornamentation is formed by prominent spiral cords, like carinae which angle the periphery of the shell; there are spiral intermediate cordlets and also axial ribs and varices. In apertural view, 4 spiral cords are seen in the first whorl, 2 peripheral carinae and 2 cordlets on the second and third whorls, and a subsutural cord and 5 peripheral carinae in the last one. The axial ribs cross the spiral cords forming small nodules at the intersection points. On the first two whorls, the axial ribs when crossing the spiral cords form a regular reticle of rectangular/quadrangular spaces. In the later whorls the ribs become thinner and more numerous, narrowing the spaces. The last two whorls have 7 variciform axial thickenings, grouped by two or three; the last three are placed at the end of the spire on the outer lip. A prominent periumbilical cord, formed by successive fine axial ridges borders and delimits the umbilicus, forming a keel. Umbilicus reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip. Aperture rounded, prosocline. Columella thin, straight, reflected towards the umbilicus, with an earlier channel at the base. Outer lip with a scalloped margin, modified by the spiral carinae; external margin thickened or variciform.

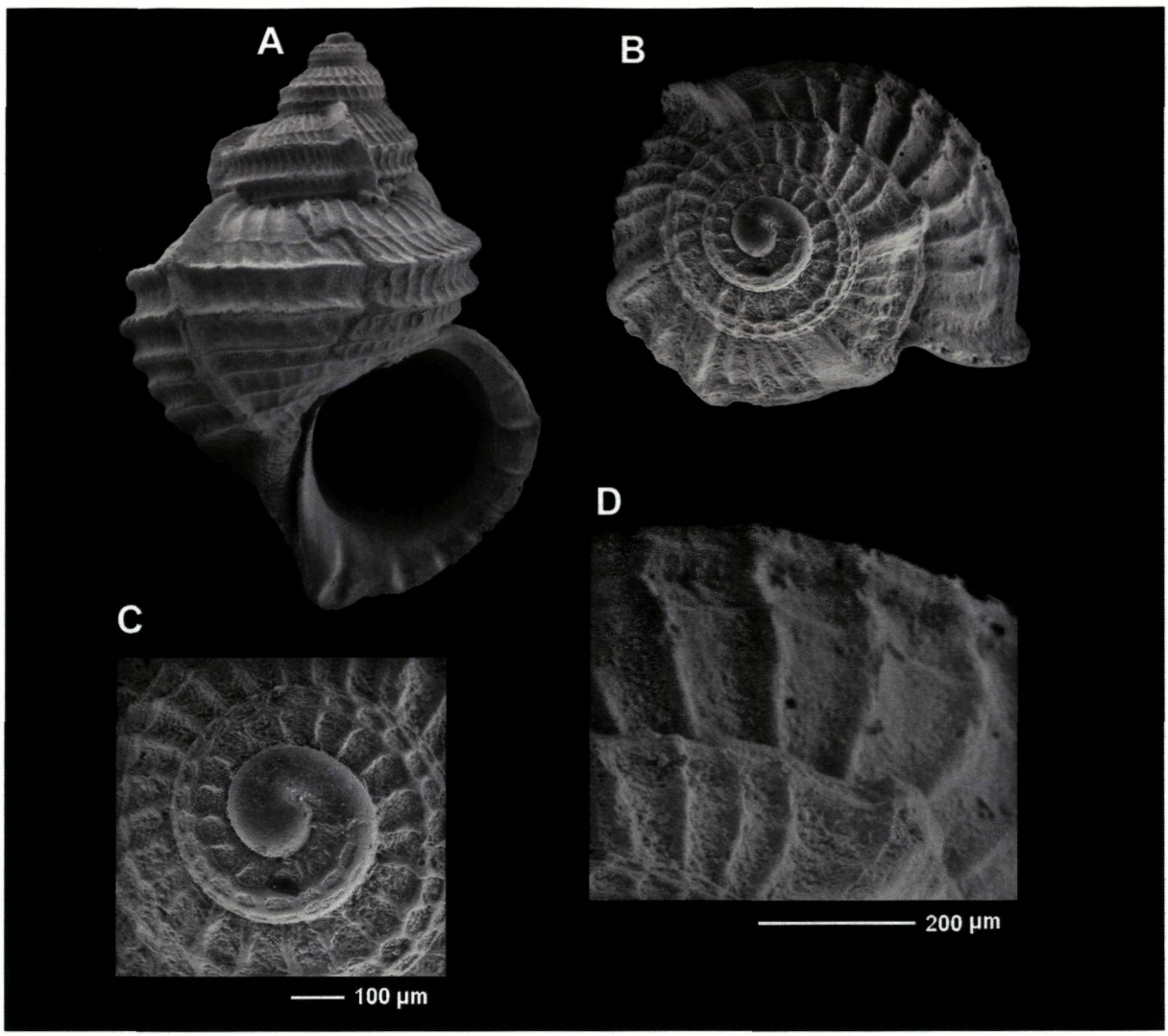

Figure 8A-D
Crossea cordata n. sp. A-B. Holotype MNHN-IM-2000-34292, 4.4 mm, Wallis & Futuna, Wallis Island, 13°19'S-176°17'W, 350 m; C. Protoconch; D. Sculpture.

Dimensions: Holotype: 4.70 mm in height x 3.56 mm in diameter (H/D = 1.32); the paratype is 3.70 mm in diameter.

Remarks. *Crossea nicober* n. sp. from Fiji is characterized by the prominent carinae that angulate the periphery of the shell; by thin and very numerous axial riblets forming small nodules at the intersections with the spiral cords. By the variciform thickenings that are grouped in two or three in the last 1½ whorls and by its outer lip which has a scalloped margin.
It differs from *C. miranda*, type species of the genus, by the increased number and size of the carinae and by its axial ornamentation, formed by fine and very numerous axial ribs.
Crossea cordata n. sp. from Wallis is distinguished by the higher number of spiral carinae in the last whorl and because the axial varices are regular and not grouped by two or three as in *Crossea nicober* n. sp.

Etymology. The specific name is formed by the union of the beginning of two names: Nicolás Francolini, called "Nico" and Bernardo Medina, called "Ber" and good friends of the first author. Noun in apposition.

Crossea spiralis n. sp.
Fig. 10A-D

Type material. Holotype MNHN-IM-2000-34296 (Fig. 10A-B).

Material examined. Fiji, BORDAU 1: 1 s, Lau Ridge, stn DW1469, 19°40'S-178°10'W, 314-377 m.

Type locality. Fiji, Lau Ridge, 19°40'S-178°10'W, 314-377 m.

Habitat. Bathyal species dredged at 314-377 m depth.

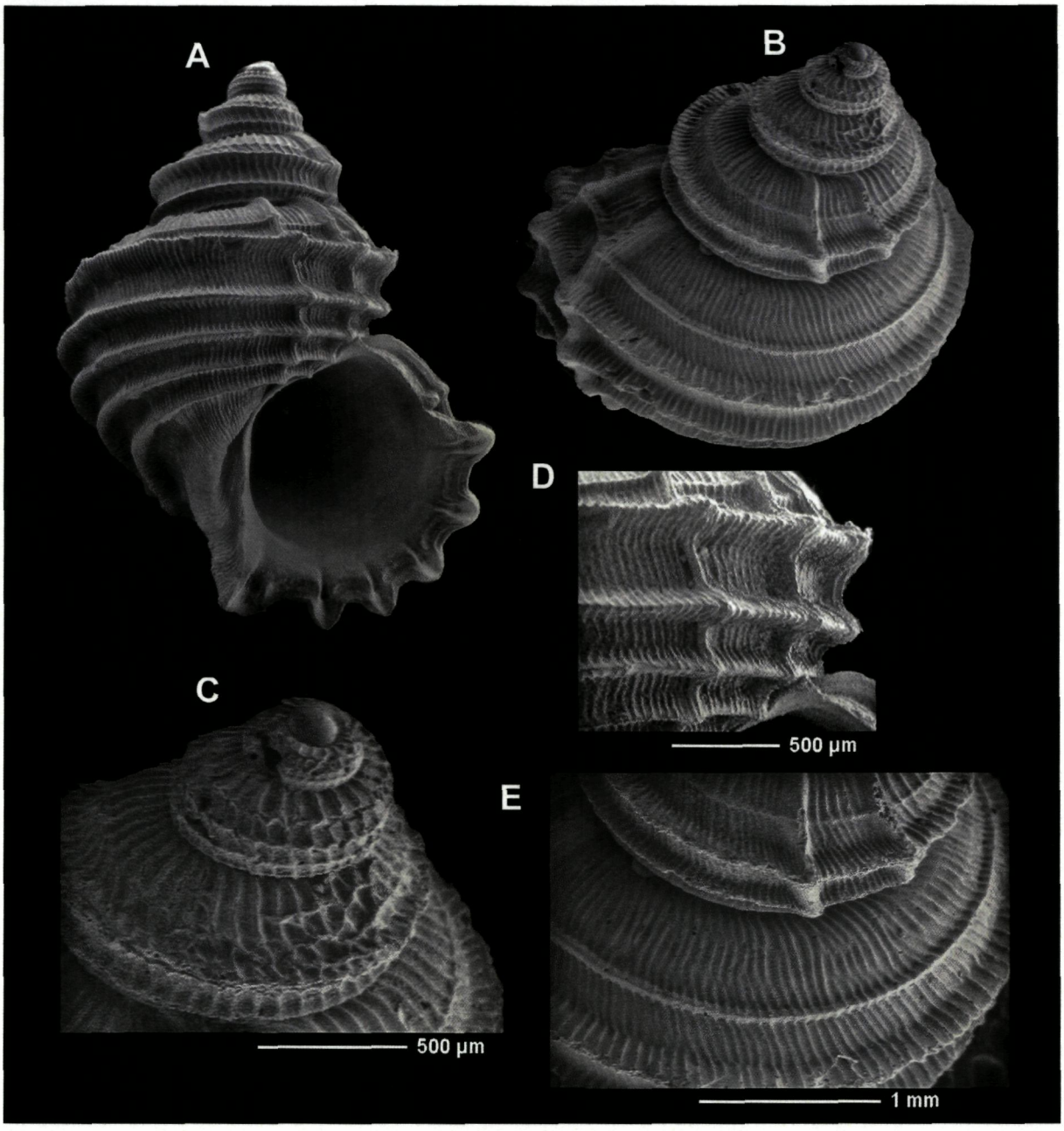

Figure 9A-E
Crossea nicober n. sp. A. Holotype MNHN-IM-2000-34294, 4.7 mm in height, Fiji, S Viti Levu, 18°18'S-178°03'E, 230-251 m; B. Paratype MNHN-IM-2000-34295, 3.7 mm in diameter, same locality, 497-504 m; C. Protoconch and first teleoconch whorls; D-E. Sculpture.

Distribution. Only known from the type locality.

Description. Shell of small size (<4.5 mm), turbinate, with a high spire formed by 4.3 whorls separated by a marked and deep suture; not carinated and narrowly umbilicate.
The protoconch is damaged.
The teleoconch has 3.5 whorls and its periphery is rounded, non carinate. Ornamentation formed by spiral cords, axial ribs, variciform thickenings and microgranules. The entire surface of the teleoconch is covered by microgranules. Cords and ribs cover the entire surface of the teleoconch, in the first two whorls forming a regular reticle of rectangular/quadrangular spaces and small nodules at intersection points. In the last 1½ whorls, the spiral cords predominate; the axial ribbing practically disappears, leaving only fine spiral cords; in apertural view 4-5 spiral cords are seen in the first whorl, 5-6 in the second and 22-24 in the last. There are 6 variciform axial thickenings regularly placed on the 1½ whorls on the last part of the shell; the last one is at the end of the spire on the outer lip;

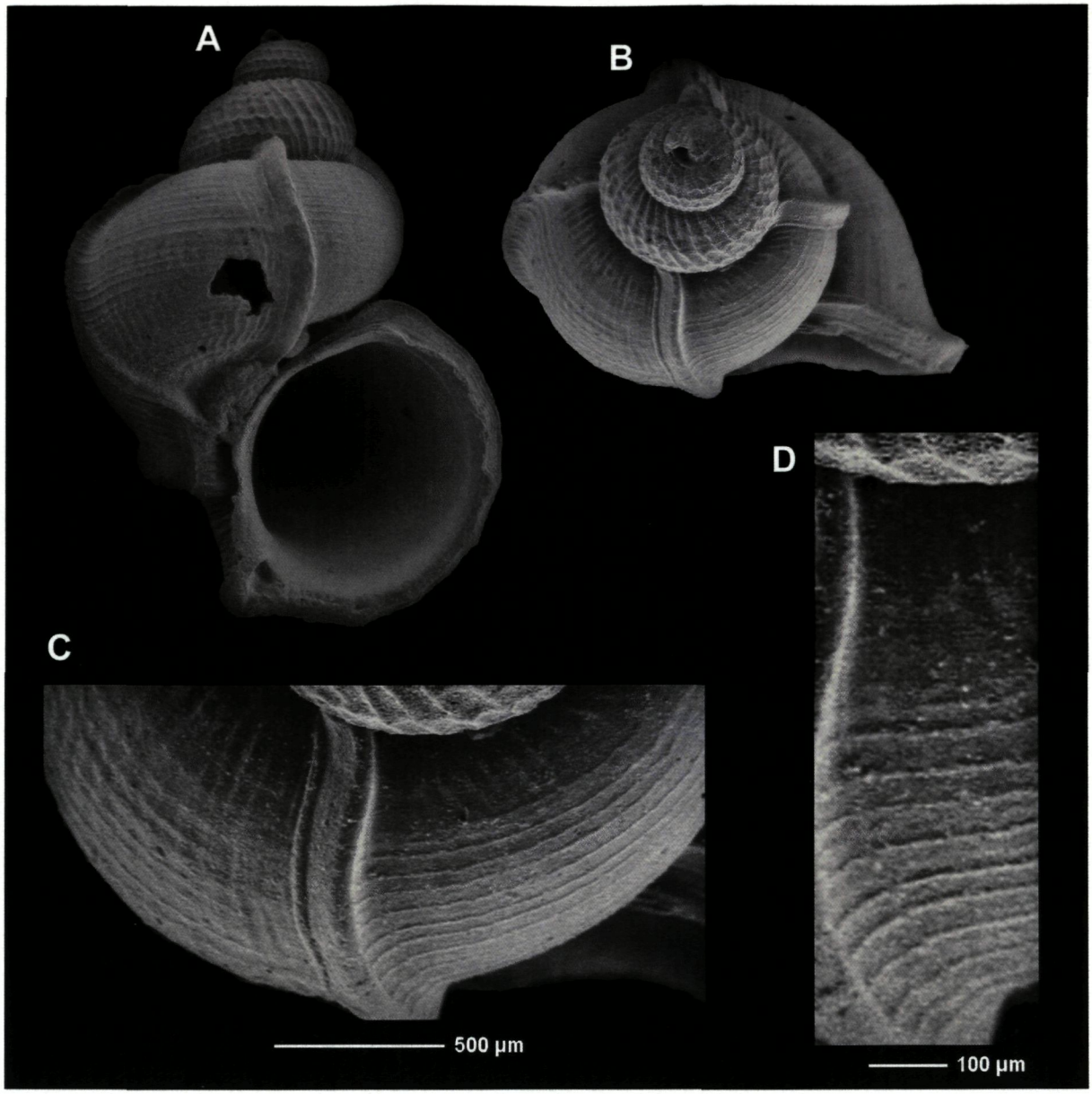

Figure 10A-D
Crossea spiralis n. sp. A-B. Holotype MNHN-IM-2000-34296, 4.28 in height, Fiji, Lau Ridge, 19°40'S-178°10'W, 314-377 m; C-D. Detail of the sculpture.

its anterior side is smooth and the posterior side is covered by spiral cords.
A prominent periumbilical cord formed by successive axial lamellae borders and delimits the umbilicus.
Umbilicus reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip.
Aperture ovate, prosocline; columella thin, arched, basally reflected towards the umbilicus, with an anterior channel at the base. Outer lip not modified by the spiral cords; external margin thickened or variciform.
Dimensions: Holotype: 4.00 mm in height x 2.96 mm in diameter (H/D = 0.74).

Remarks. *Crossea spiralis* n. sp. is characterized by its rounded periphery; by the predominance of the spiral sculpture in the last 1½ whorls and by the number and ornamentation of the variciform thickenings.
The most similar species at first glance is *Crossea ultidepre* n. sp. from New Caledonia, but the latter has a slightly smaller shell, with two prominent spiral cords; the sculpture is very depressed in both species but in *C. ultidepre* n. sp. that spiral is only present on the lower part of the last whorl, below the cords, while in *C. spiralis* it is present on the entire last whorl.

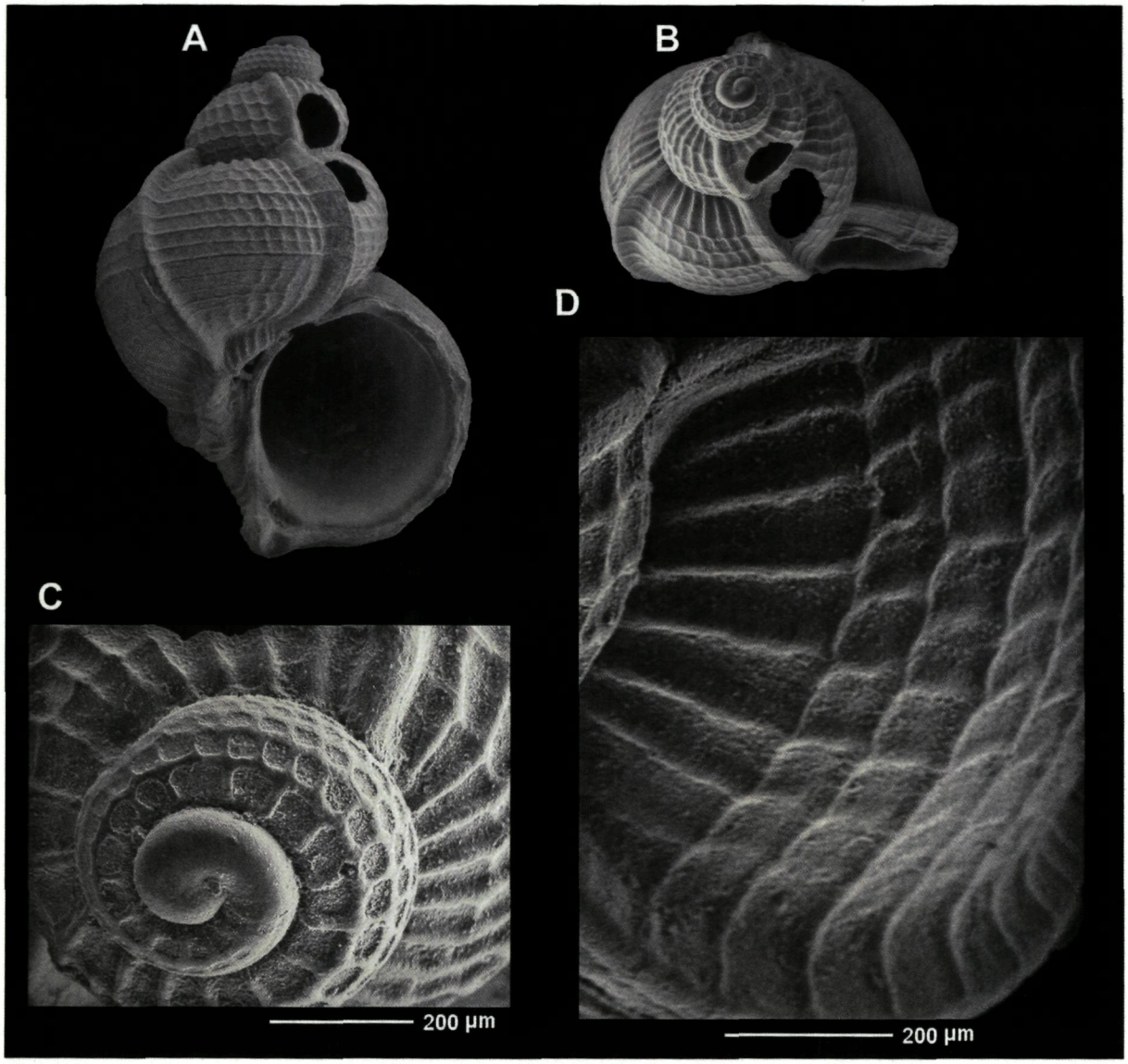

Figure 11A-D
Crossea vanuatuensis n. sp. A-B. Holotype MNHN-IM-2000-34297, 2.64 mm in height, Vanuatu, 20°19'S-169°53'E, 252-280 m; C. Protoconch; D. Sculpture.

Etymology. The specific name alludes to the predominant microsculpture that is spiral, although depressed on the last whorl.

Crossea vanuatuensis n. sp.
Fig. 11A-D

Type material. Holotype MNHN-IM-2000-34297 (Fig. 11A-B).

Material examined. Vanuatu, MUSORSTOM 8: 1 s, stn DW969, 20°19'S-169°53'E, 252-280 m.

Type locality. Vanuatu, 20°19'S-169°53'E, 252-280 m.

Habitat. Bathyal species dredged at 252-280 m depth.

Distribution. Only known from the type locality.

Description. Shell of small size (<3.0 mm), turbinate, with a high spire formed by 4.3 whorls separated by a marked and deep suture; not carinate and narrowly umbilicate.
The protoconch has 0.8 whorls, smooth surface and a size of 238 µm in diameter.
The teleoconch has 3.5 whorls and its periphery is rounded. Ornamentation formed by spiral cords, axial ribs, variciform thickenings and microgranules. The entire surface of the teleoconch is covered by microgranules; and cords and ribs are present on the entire surface of the teleoconch, forming a regular reticle of rectangular/quadrangular spaces and small nodules formed at intersection points.

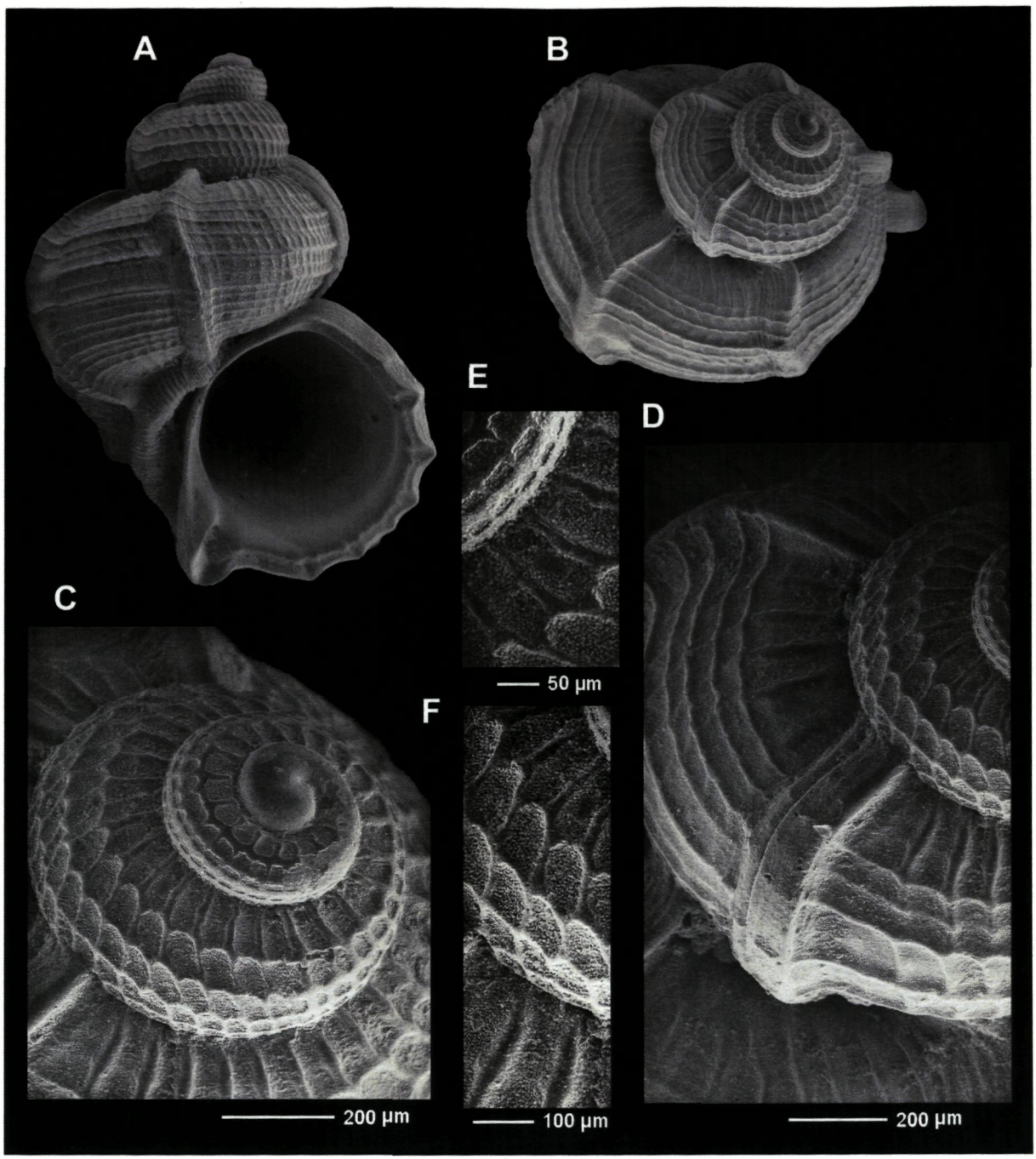

Figure 12A-F
Crossea veraspiralis n. sp. A-B. Holotype MNHN-IM-2000-34298, 3.28 mm in height, Solomon Islands, SE Sta Isabel Island, 08°17'S-160°00' E, 489-491 m; C. Protoconch and first teleoconch whorls; D-F. Sculpture and microsculpture.

There is no predominance of axial or spiral ornamentation; only the peripheral cords that project slightly over the others, but they do not modify the rounded periphery of the teleoconch. The variciform axial thickenings are very wide and prominent, and they are crossed by spiral cords; there are 6 variciform axial thickenings regularly placed on the last two whorls; the last of them, at the end of the spire on the outer lip.

A prominent periumbilical cord is formed by successive strong axial ridges, borders and delimits the umbilicus.

Umbilicus reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip.

Aperture rounded, prosocline; columella thin, arched, basally reflected towards the umbilicus, with an anterior channel at the base. Outer lip scalloped internally with external margin thickened or variciform.
Dimensions: Holotype: 2.62 mm in height x 1.89 mm in diameter (H/D = 0.72).

Remarks. *Crossea vanuatuensis* n. sp. is characterized by the regularity of its reticulation; by its non-carinated periphery; by the axial lamellae of the periumbilical cord, thicker and less numerous than in its congeners and because the spiral cords, unlike other species, cross the variciform axial thickenings.
It differs from *Crossea veraspiralis* n. sp. by the regularity of its reticulation; by the lower number of axial lamellae in the periumbilical cord and by the lack of axial lines in the variciform thickenings. From *C. sepcris* n. sp. it differs by its high spire.

Etymology. The specific name alludes to the archipelago where the species was collected.

Crossea veraspiralis n. sp.
Fig. 12A-F

Type material. Holotype MNHN-IM-2000-34298 (Fig. 12A-B).

Material examined. Solomon Is. SALOMON 2: 1 s, stn DW2183, SE Santa Isabel Island, 08°17'S-160°00'E, 489-491 m.

Type locality. Solomon Islands, SE Santa Isabel Island, 08°17'S-160°00'E, 489-491 m.

Habitat. Bathyal species dredged at 489-491 m depth.

Distribution. Only known from the type locality.

Description. Shell of small size (<4.0 mm), turbinate, with a high spire formed by 4.8 whorls separated by a marked and deep suture; not carinate and narrowly umbilicate.
The protoconch has 0.8 whorls, a smooth surface and a size of 232 µm in diameter.
The teleoconch has 4 whorls and its periphery is rounded. Ornamentation formed by spiral cords, axial ribs, variciform thickenings and microgranules. The entire surface of the teleoconch is covered by microgranules. Cords and ribs cover the entire surface of the teleoconch, forming an irregular reticle of rectangular/quadrangular spaces in the interspaces and small nodules at intersection points.
There is a predominance of spiral ornamentation, especially on the last whorl; only some peripheral cords project slightly over the others, but without altering the rounded periphery of the teleoconch.
The 9 variciform axial thickenings are very wide and prominent and they have numerous axial growth lines regularly placed on the two last whorls; the last one at the end of the spire on the outer lip. A prominent periumbilical cord is formed by successive axial lamellae, and it borders and delimits the umbilicus.
Umbilicus reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip.
Aperture rounded, prosocline; columella thin, arched and basally reflected towards the umbilicus, with an anterior channel at base. Outer lip scalloped internally with external margin thickened or variciform.
Dimensions: Holotype: 3.43 mm in height x 2.74 mm in diameter (H/D = 1.19).

Remarks. *Crossea veraspiralis* n. sp. has as differential characters the number of spiral cords on the last whorl; by the greater number of axial lamellae on its periumbilical cord; by the presence of axial growth lines in the variciform thickenings; and by its internally scalloped outer lip.
It differs from *Crossea regularis* n. sp. (see below) by being smaller; by the greater number of spiral cords on its last whorl; by the irregular reticulation; and by the outer lip being scalloped internally.
Crossea vanatuensis n. sp. is slightly smaller, has fewer axial ridges on the last whorl, the sculpture of the periumbilical cord is vertical and the peripheral sculpture is formed of rectangles.
Crossea spiralis n. sp. from Fiji has a shell with more attenuated peripheral sculpture, mainly the axial one, the outer lip has smaller prominences.
Crossea exornata n. sp. from New Caledonia, has fewer axial ridges which are stronger and lack microsculpture, the peripheral sculpture (especially the axial one) is more prominent, the outer lip has less prominent nodules.
Crossea ulevidens n. sp. is smaller, with more prominent sculpture, but the axial ridges are few and not very prominent, the periumbilical cord is wider.

Etymology. The specific name derives from the Latin words *vera* which means "really" and *spiralis* alluding to the sculpture which is more evident than in the species called *C. spiralis* n. sp.

Crossea regularis n. sp.
Fig. 13A-F

Type material. Holotype MNHN-IM-2000-34299 (Fig. 13A-B).

Material examined: Solomon Islands, SALOMON 1: 1 s, stn DW1762, 08°40'S-160°04'E, 396-411 m.

Type locality. Solomon Islands, 08°40'S-160°04'E, 396-411 m.

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

Distribution. Only known from the type locality.

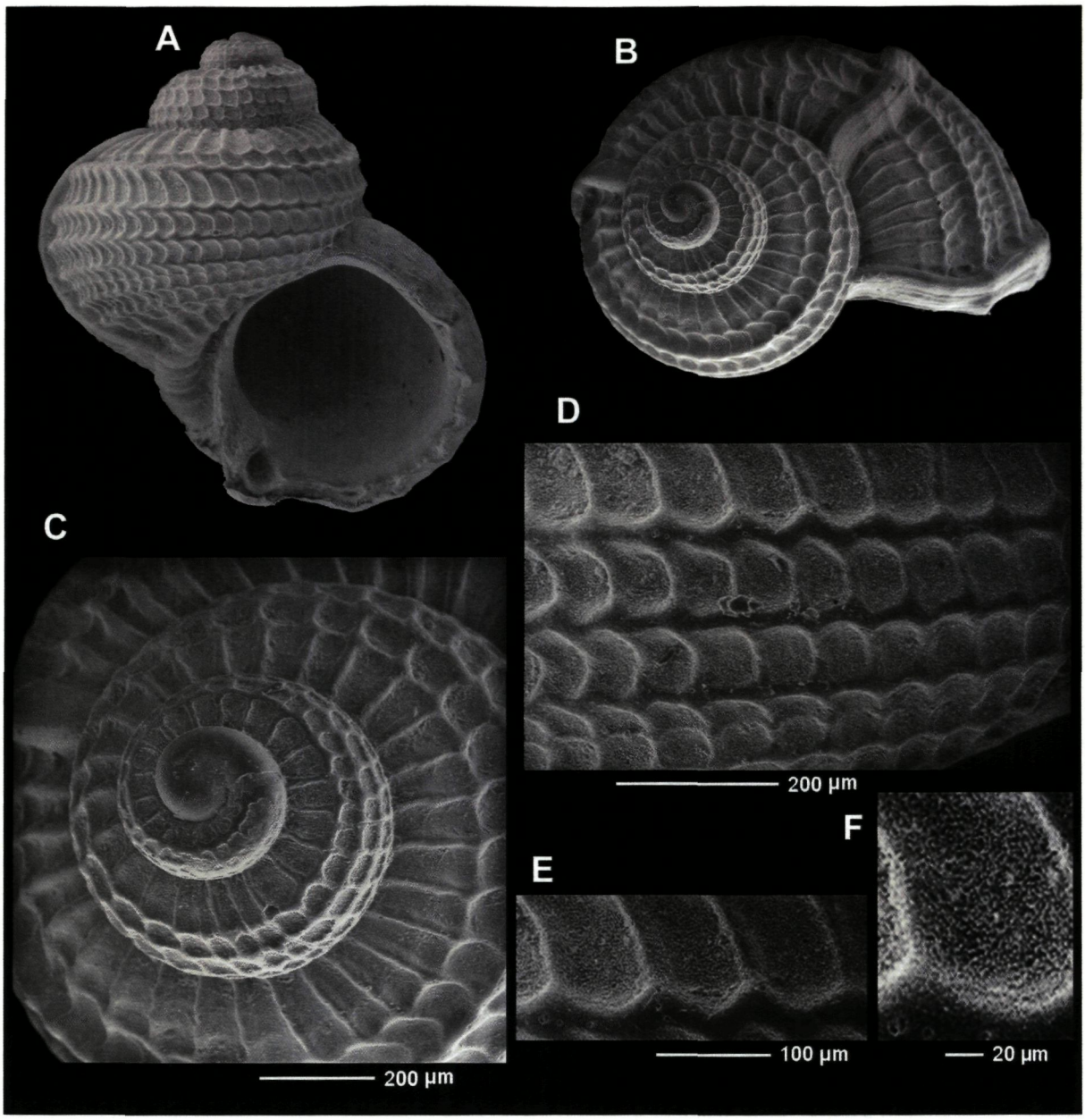

Figure 13A-F
Crossea regularis n. sp. A-B. Holotype MNHN-IM-2000-34299, 1.82 mm, Solomon Islands, 08°40'S-160°04'E, 396-411 m; C. Protoconch and first teleoconch whorls; D-F. Sculpture and details.

Description. Shell of very small size (<2.0 mm), robust, globose to turbinate, almost as high as wide, formed by 3.8 whorls separated by a marked suture, non carinated and narrowly umbilicated.

The protoconch is smooth, has about 0.8 whorls with a maximum diameter of 227 µm. The teleoconch has 3.1 whorls and its periphery is rounded.

Ornamentation formed by spiral cords, axial ribs, variciform thickenings and microgranules; the spaces between cords are not convex. The entire surface of the teleoconch is covered by microgranules. Cords and ribs cover the entire surface of the teleoconch, forming a regular reticle of rectangular/quadrangular spaces and small not very prominent nodules at intersection points.

In apertural view, 4 spiral cords are visible on the first two whorls, and 7 on the last one.

The variciform axial thickenings are very wide and prominent; there are 3 variciform axial thickenings regularly placed on the half last whorl; the last one at the end of the spire on the outer lip.

A prominent periumbilical cord is formed by successive strong transverse ribs, and it borders and delimits the umbilicus.

Umbilicus reduced to a narrow fissure, placed between the periumbilical cord and the columellar lip.

Aperture rounded, prosocline; columella thin, arched and basally reflected towards the umbilicus, with an anterior channel at the base. Outer lip scalloped internally with external margin thickened or variciform.
Dimensions: Holotype: 1.82 mm in height x 1.72 mm in diameter (H/D = 1.05).

Remarks. *Crossea regularis* n. sp. has as differential characters as its small size, globose aspect and its lower spiral height; by the smaller number of spiral cords and not convex space between cords; and by the shape and the ornamentation of the variciform axial thickening.
The only other species of this genus with some similarity is *Crossea extrema* n. sp. from New Caledonia, which has a higher shell, with several axial ridges restricted to the end of the spire, the spiral cords are less prominent, the axial sculpture being curved between the closed cords, the outer lip with less prominent modifications.
Another small species of this genus is *Crossea sepcris* n. sp. from New Caledonia, but it is very different in view of the peripheral carinae and the numerous axial ridges.

Etymology. The specific name alludes to the regularity of the sculpture, in contrast with other species of the genus.

COMMENTS AND CONCLUSIONS.

The present study was carried out on the basis of the material collected by the MNHN and IRD and represents the first part of a work that will be continued with other genera of the family Conradiidae.

For the present genus, 11 species have been studied that have proved to be new to science. It is remarkable that all of them were collected at significant depths: 2 to more than 200 m deep; 4 at more than 300 m; and 5 at more than 400 m. Perhaps for this reason or because of their habitat (caves, rocky areas, corals, etc.) the material collected for each species has been minimal. Therefore, there are no data on their habitat, or about their soft parts and radular morphology.

The distribution of the species studied is irregular: the prevalence seems to correspond to New Caledonia, with 5 species; 2 were found in Fiji and another 2 in Solomon Is.; only one in Vanuatu and another one in Wallis & Futuna.

The morphology of those found in New Caledonia, appears to offer no doubt about their specific separation. The existence of strong axial and spiral sculpture, as well as of a periumbilical cord and the persistence of apertural thickenings, has allowed a clear differentiation in every case.

The size of the studied species is small but variable. Three species have a maximum dimension below 2 mm. Three are smaller than 3 mm; two were less than 4 mm in size, and three more are less than 5 mm in maximum dimension.

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