



ANDREFRANCIA SOLEM, 1960 (GASTROPODA: PULMONATA: CHAROPIDAE) – A SYSTEMATIC REVISION

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ABSTRACT: The revision of the endemic New Caledonian genus *Andrefrancia* Solem, 1960 is based on 1,167 specimens from 108 localities (collection Paris Museum of Natural History). Seventeen earlier described species are revised, and 33 new species are described; data on further six species, absent from the Paris collection but included in *Andrefrancia*, are cited. Identification keys, synonymy, conchological and anatomical descriptions and figures, as well as distribution maps are provided. Phylogeny reconstruction used 21 conchological characters with 64 character states, and 26 characters of the reproductive system with 62 character states. The characters were polarised based on out-group comparison (out-groups: Charopidae from the Pacific islands, Australia, New Zealand, Juan Fernandez and Chile; Endodontidae from the Pacific islands) and ontogenetic criterion. The aim of the study was to answer the following questions: (1) is the genus monophyletic? (2) are species groups within the genus monophyletic? (3) what are phylogenetic relationships among the species and their groups? Difficulties resulted from incompleteness of data (only shells available for some species), frequent instances of convergent evolution and consequent paucity of unequivocal apomorphies which would define monophyletic groups. As a result the phylogenies provided are only preliminary, and any formal classification changes would be premature. Based on combination of characters the genus was divided into seven groups; most species were assigned to groups distinguished by earlier authors; one new group was proposed. The geographical distribution was analysed in terms of endemism, but the lack of unequivocal phylogeny made it impossible to analyse it in the light of evolutionary relationships.

KEY WORDS: terrestrial snails, Charopidae, *Andrefrancia*, New Caledonia, revision, new species

INTRODUCTION

New Caledonia, a Melanesian Island in the South-west Pacific, is well known for its high level of endemism and recognised as one of the “hot spots” in tropical forest diversity. In regard to terrestrial snails it also presents an important opportunity to study the very old part of Gondwanan fauna, that has been evolving in increasing isolation since its separation from the Northern Island of New Zealand. New Caledonia lies at the centre of distribution of the large family Charopidae which spreads as far east as the Society Islands and as far north as Indonesia and parts of Micronesia. Despite the extensive work on the family, done by A. SOLEM in 1960–1983 (SOLEM 1960, 1961, 1970, 1976, 1983), the phylogenetic relationships amongst some groups, as well as their taxonomic

structure still remain unclear. The literature reflects knowledge based on material collected mainly around 1850–1900, with scattered additional collecting until the 1930s. Extensive collections were made by the staff of the Paris Museum of Natural History in 1978–1994, in part within the context of the museum’s programme “Evolution and Vicariance in New Caledonia”. In contrast to the earlier 19th century material, the newly collected material is well localised, consists of larger series of specimens, and is mostly suited for anatomical work and detailed examination of shell microsculpture. The objective of this study was a revision of the most speciose New Caledonian charopid genus – *Andrefrancia*.

CHARACTERISTICS OF CHAROPIDAE

Shell

The Charopidae are a family of minute to large pulmonate land snails. Their most striking character is a very diverse and often complex apical sculpture of the shell. For example, the Pacific island Charopidae have an apical sculpture primitively featuring broadly rounded spiral cords, usually 8–12 in number, without any radial elements. Frequently just before teleoconch 1–3 low radial undulations will appear in the shell surface. In a few species, the number of spiral cords has increased to more than 20, and there are 10–20 radial undulations. Such a pattern is typical for Pacific island species. In extralimital areas, however, the pattern of apical sculpture is much more complex, with Charopidae from Australia and New Zealand, for example, showing a variety of types (e.g. SOLEM 1970: pl. 58, Figs 3–6). Postapical whorls bear major radial ribs and a microsculpture of radial riblets, combined with secondary spiral elements. In many taxa, however, the sculpture has been secondarily reduced or lost. The whorl counts and shell shape vary rather widely, the umbilicus ranges from widely open to closed. The shell colour is monochrome, flammulated or tessellated. In several lineages apertural barriers have evolved, probably independently (SOLEM 1983), but most species have no trace of dentiture.

Reproductive system

Like the shell, the genital system is highly variable. The ovotestis consists typically of one or two clusters of long follicles that lie parallel to the outer wall of the body cavity and occur sequentially. In some taxa the ovotestis is broken up into a series of lobes that are perpendicular to the outer wall of the body cavity and widely separated from each other. The hermaphroditic duct is either straight or coiled, usually an iridescent tube entering laterally into the apex of carrefour. The talon is a finger-like projection or swollen head on a short stalk. The albumen gland, of irregular shape, is deeply indented by loops of intestine and head of spermatheca. The prostate and uterus are fused, with partial common lumen, the uterus with separate and sequential glandular sections. The

thin free oviduct section varies in length, the base of spermatheca and the upper section of vagina are normally swollen. The spermathecal container is located above the apex of pallial cavity, and ranges from short to long oval. Its shaft tapers abruptly entering the free oviduct. The vas deferens is slender, usually entering a clearly differentiated epiphallus, often through a complex valvular pore. In many taxa the epiphallus is secondarily compressed into penis or absent. The penis is usually stout, at least in its upper section, which only rarely is long and slender; the lower part is often a thin tube. The interior of penis frequently bears a well developed verge, circular ridges, stimulatory pilasters, and pocket stimulators. The penial retractor muscle is usually very short, inserting in a simple or complex fashion on the penis/epiphallus junction, the epiphallus or penis with vas deferens piercing the muscle. The interior of lower female tract is simple, or with very large pilasters which may be simple or corrugated; the outlets of free oviduct and/or spermathecal shaft vary from simple pores to apertures provided with complex valves.

Ecology and distribution

Charopidae exploit the semiarborescent and arboreal habitats, but are also well represented in the ground stratum. In terms of species, it is the dominant land snail group of New Zealand, New Caledonia, parts of Australia (Tasmania, Victoria, less abundant in New South Wales, South Australia, southwestern Western Australia, sparse in the Northern Territory, well represented in the rain forest areas of Queensland), Lord Howe Island, Norfolk Island and Kermadec Island. Approximately 300 species in 70 genera from Australia and Pacific Islands have been described (SOLEM 1983, STANISIC 1990). The Charopidae are only sparsely represented in Indonesia, New Guinea, Solomon Islands, and New Hebrides.

Extralimital to the Pacific Basin, species of charopids are common to dominant in southern Africa, and were common on St. Helena. One genus is found on the Subantarctic Islands. There is a modest Juan Fernandez radiation and many scattered descriptions and records from Southern South America, Andes and Central America. Two species occur in western North America.

STUDY AREA

New Caledonia is a French territory in the Coral Sea in the southwestern Pacific Ocean. It incorporates the island of New Caledonia, along with numerous small offshore islands and reefs, the Isle of Pines, the Loyalty Islands, the d'Entrecasteaux Reefs, and most distantly the Chesterfield Reefs. The island of New Caledonia itself is sometimes referred to as the

Grande Terre. It is a large (16,648 km²) elongated island located approximately equidistantly from northern New Zealand, southeastern Papua New Guinea, and the east-central coast of Australia (BAUER & SADLIER 2000). The topography of New Caledonia is dominated by a chain of relatively high mountains that runs along its entire length, rising to over 1,600 m.



The high points are Mt. Panié (1,629 m) in the north and Mt. Humboldt (1,618 m) in the south but many peaks exceed 1,000 m.

The climate of New Caledonia is subtropical, with temperatures averaging 22–24°C. Trade winds from the east yield the high orographic precipitation typical of the east-facing slopes of the island. As a result, the windward eastern coast is mesic, with 2,500–4,000 mm of rain per annum, whereas the leeward west coast typically receives less than 1,200 mm. The north-western area, including the northern tip of the island, averages less than 800 mm per annum. August to November are typically relatively dry, whereas January to May are the wettest months, although rain can fall at any time of the year in the east. From November to April, the region is subjected to tropical depressions, and cyclones periodically strike New Caledonia (BAUER & SADLIER 2000).

A wide range of vegetation types are present on New Caledonia, reflecting the various climatic and edaphic conditions found on the island. The most diverse element is humid evergreen forest with over 82% endemic vascular plants. Originally almost 70% of New Caledonia was covered in forest, but today it is largely restricted to fragments on the east coast and isolated mesic spots in the west. Such rainforests are often dominated by large trees and characterized by a high canopy. Even more highly endemic, although not as species rich, are the maquis formations. Maquis is a heathy or scrubby vegetation type associated with the edaphic conditions of the ultramafic substrates, chiefly in the south of the island. It generally occurs on poor soils of high metal content, and its formations range from dwarf sclerophyllous assemblages to high-canopied humid forest. Maquis formation occurs from sea level to high elevations. The most endangered vegetation type is sclerophyll forest. These forests once covered 24% of New Caledonia, but are today restricted to less than 2–3% of their former range and are highly fragmented. These remaining patches of forest occur in the west coast lowland below about 300 m, an area of intense agricultural activity. Sclerophyll forests have a low (<15 m) canopy and are often very dense, without clear stratification. Disturbed areas of forest generally become converted to grassland or naiouli woodland. The sclerophyll forest, dominated by *Acacia spirorbis* and *Leucaena leucocephala*, is far less distinctive than the rain forest or maquis. Many of the drier areas of New Caledonia are today dominated by naiouli (*Melaleuca quinquenervia*) savanna. Its fire resistant qualities have allowed it to spread over much of the west coast in concert with expanding agricultural disruptions of the native bush formations, such as sclerophyll forest. Savanna formations were rare in New Caledonia prior to human settlement, but now cover 32% of the land area. These savannas, as well as the relatively small areas of littoral vegetation and mangrove, are much less

diverse than any of the forest or maquis formations. The vegetation of the Isle of Pines has largely been disrupted by plantations, but extensive forests remain on the east coast. Stands of *Araucaria columnaris* also are patchily distributed throughout the island and give it its name. Typical maquis vegetation occurs on the plateau. The vegetation of the Loyalty Islands is depauperate relative to mainland New Caledonia. *Araucaria columnaris* stands occur on the southern coasts of the two largest islands and coastal mangroves are also present. The island areas support humid forest. Grassy savanna habitat occurs only in south central Maré. Ouvéa, which is smaller, drier, and more heavily impacted by human activity than the other islands, has the least diverse flora.

Although most recent changes in the regional flora are attributable to human activity, New Caledonia was subject to substantial climatic variation throughout the Pleistocene. This has also influenced the extent of the major vegetation types. For example, more cool-adapted *Nothofagus* forests once covered areas of the Plaine des Lacs that are now dominated by maquis formations. Natural fires, even in humid forest types, have long played a role in vegetational changes. It seems likely, however, that the extent and frequency of human-mediated fires exceed those of pre-human times, resulting in potential losses of diversity in addition to changes in vegetational distribution (BAUER & SADLIER 2000).

The evolution of New Caledonia's nature has been strongly influenced by its geological and tectonic history. The New Caledonian mainland is Gondwanan in origin. New Caledonia is often regarded as a component of the Inner Melanesian Arc, a series of land masses associated with the breakup of Gondwanaland in the mid Jurassic and the opening of the Coral and Tasman Seas. This arc runs from eastern New Guinea through New Caledonia, and along the Norfolk Ridge and Lord Howe Rise to New Zealand (BAUER & SADLIER 2000). During the Upper Cretaceous (about 80 my ago) a continental fragment with today's New Caledonia, Norfolk Island, Lord Howe Island and New Zealand was detached from Austro-Antarctica. This fragment was further subdivided and, since the definitive separation from the Northern Island of New Zealand slightly over 20 my ago, New Caledonia has become an isolated island (COLEMAN 1980, HAASE & BOUCHET 1998). During the Tertiary large parts of New Caledonia underwent a series of submersions and by the late Eocene nearly all of the island was covered with up to 2,000 meters of peridotites, a type of igneous rock formed from ocean crust that was slowly over-thrust during the preceding tectonic movement (GUILLON 1975, MOORES 1973, PARIS et al. 1979). The extensive ultramafic substrates (peridotites and serpentinites) that once covered nearly all of Grande Terre and its associated islands have been reduced by erosion (GUILLON 1969, 1975, TRESCASES

1969, 1975, GUILLON & ROUTHIER 1971), but today still cover about 5,500 km², or about 1/3 of the total land area (JAFFRÉ et al. 1987). These has given rise to New Caledonia's characteristic ultrabasic soils (LATHAM 1975a, b, c, 1981, 1986), which have exceptionally high levels of Fe, Mg, and of several heavy metals such as Ni, Cr, Co, and Mn, along with very low levels of N, P, K, Ca, and Al (JAFFRÉ et al. 1987). The chemical imbalances result in highly specialised edaphic conditions. Thus, the stock of the New Caledonian flora and fauna is very old and has independently evolved in increasing isolation, partly in adaptation to the mentioned above ultramafic conditions (BAUER & SADLIER 2000).

HISTORICAL ACCOUNT

Pioneer studies on New Caledonian non-marine shells were done by GASSIES (1863, 1871, 1880), CROSSE (1894), and DAUTZENBERG (1923) and summarised by FRANC (1957) in an illustrated handbook. However, having at his disposal only museum specimens from old collections, FRANC did not attempt any changes in classification. FRANC's (1957) study dealt with the taxonomy of the New Caledonian snails at

the specific level. Examination of the material collected by T. D. A. COCKERELL in 1928 (SOLEM 1960) and review of museum material, yielded an annotated check list of New Caledonian land and freshwater snails (SOLEM 1961). Solem synonymized species' names, made some innovations in FRANC's classifications and showed probable relationships between the New Caledonian genera, classified with Endodontidae at that time. The classification was provisional, based entirely on conchology, with the genera grouped on the basis of the type of apical sculpture (spiral, radial, smooth). Among the researchers dealing with the New Caledonian malacofauna it is necessary to mention the following names: FISCHER (1871, 1873), SAINT SIMON (1880), ANCEY (1882, 1888), SYKES (1895b), HEDLEY (1898), GUDE (1905), PRESTON (1907) and PAIN (1955, 1958). These authors wrote, among other things, about classification of New Caledonian helicoid forms, described new species of terrestrial fauna, anatomy of *Placostylus* and carnivorous helicoids. The genus *Andrefrancia* was established by SOLEM (1960) who included there 23 species and divided them in six groups based on shell characters (SOLEM 1961) (for detailed discussion – see "Phylogeny").

MATERIAL AND METHODS

The Paris Museum of Natural History houses an extensive collection of the endemic Charopidae from New Caledonia. The material that I had at my disposal constitutes only a small subsample of this collection. A total of 1,167 specimens were examined from ca. 108 localities. 507 of them were preserved in alcohol (a) and 660 as dry shells (d). Twelve samples lacked the exact locality data and one had an illegible label. The examination of the material resulted in addition of 33 species to the 23 already described, thus yielding the total number of 56 species. Six of the 23 species originally included in *Andrefrancia* by SOLEM (1961) were not available in the collections. Their original descriptions are cited after FRANC (1957), and they are not considered in the phylogenetic analysis.

SEM photos of gold-coated shells were taken at the laboratory of the Royal Belgian Institute, Brussels.

The studied material is deposited in the following collections: MNHN – Museum of Natural History, Paris (Muséum National d'Histoire Naturelle) and CNHM – Museum of Natural History, Chicago.

The shells were measured under stereomicroscope with calibrated eye-piece, to the nearest 0.01 mm. Shell macrosculpture was examined, and genitalia dissected under stereomicroscope; shell and genital drawings were made with camera lucida. The following shell parameters were examined (Fig. 1): N_w – number of whorls; D – shell diameter; D_u – umbilicus width; H –

shell height; H_a – aperture height; H_{sp} – spire height; W_a – aperture width; W_{bw} – body whorl width; W_{10} – width of penultimate whorl; H/D – shell height/shell diameter ratio; D/N_w – velocity of whorl increment; D/D_u – shell diameter/umbilicus width; H_a/W_a – aperture height/aperture width ratio; H_{sp}/H – spire height/shell height ratio; W_{bw}/W_{10} – body whorl width/width of penultimate whorl. The shell whorls were counted using EHRMANN's (1933) method.

CHARACTERISTICS OF THE GENUS *ANDREFRANCIA*

Shell

The range of shell size in the studied New Caledonian species is very wide, however variation within species groups is narrow. Generally, groups III and VII (for species groups see below) are very small, of the maximum diameter of ca. 1.70–2.40 mm. Groups I, IV and VI are small to medium-sized, with the maximum diameter of ca. 3.00–6.00 mm. Groups II and V are medium-sized to large, the maximum diameter being ca. 6.00–9.00 mm. The similarity of the ranges of H/D ratios between the groups – 0.40–0.71 – emphasises the stability of the shell shape. *A. ostiolum* and *A. melaleucarum* (group IV) are exceptional in having the H/D ratio between 0.70 and 1.00. The shell coiling pattern in groups I, III, IV and VI is tight, in II and V

normal. The mean velocity of whorl increment in group III is 0.33–0.44, in *A. miracidium* (group VII) – 0.54, in group VI – 0.60–0.90, in group I – 0.72–1.13 (only in *A. compressa* – 0.63), in group IV – 0.70–1.20, in group V – 0.94–1.15 (in *A. bazini* – 0.81 and in *A. pinicola* – 1.62), in group II – 1.02–1.63.

The umbilicus varies from narrow to widely open, only in *A. angustiumbilitata* the umbilicus is pin-point (see Fig. 34). The umbilicus is very narrow in *A. compressa* ($D/D_u = 31.00$, Fig. 17), in *A. bourailensis* ($D/D_u = 14.33$, Fig. 108), and in *A. tillieriana* ($D/D_u = 9.40$ – 14.00 , Fig. 26). In most species the umbilicus is contained 3–5 times in the shell diameter.

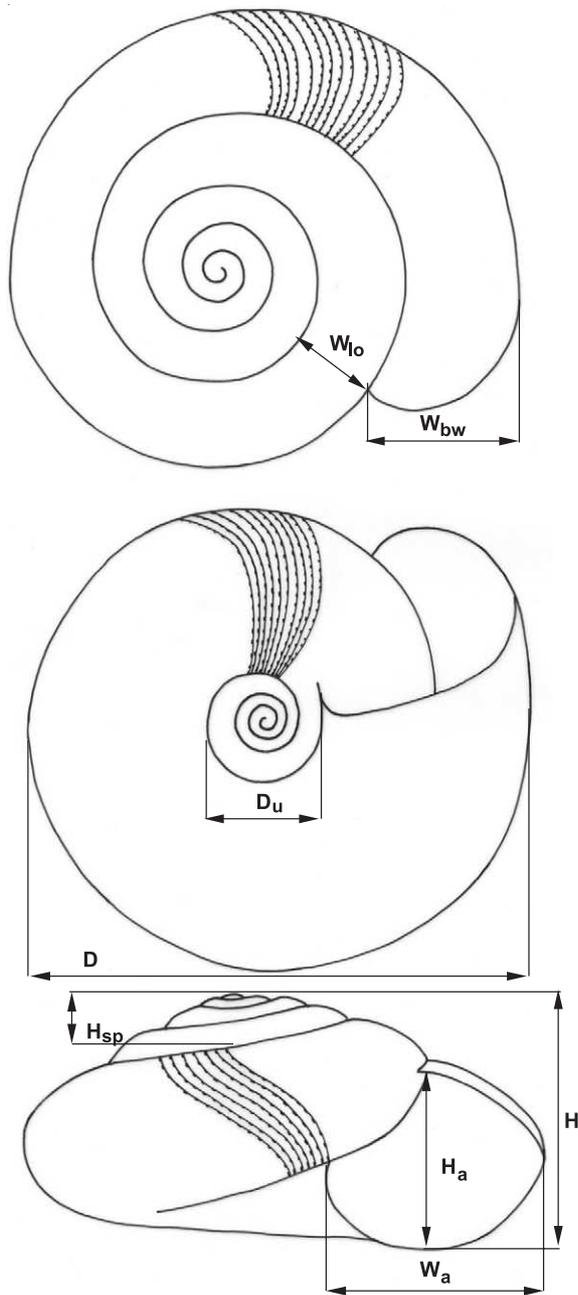


Fig. 1. Shell measurements (explanations in text)

In all the groups except VI, the umbilical margin contours are rounded. In a few species of group VI these contours are shouldered.

The body whorl profile in the examined species is often laterally compressed (e.g. Figs 17, 71, 198); it may be partially keeled like in *incipiens* (Fig. 128), or strongly keeled in *A. miracidium* (Fig. 201, 206). Usually the body whorl is flattened above and below (e.g. Figs 50, 122) or rounded below (e.g. Figs 23, 34, 50), rounded (e.g. Figs 12, 173) or shouldered above and flattened below (e.g. Figs 82, 182). The sutures are impressed or normal, in group V very often impressed-detached (Fig. 149) and channelled, like in *A. mandjeliana* (Fig. 24), *A. angustiumbilitata* (Fig. 36), *A. alveolus* of group I and *A. canaliculata* (Fig. 166). Generally, the upper margin of the aperture is slanted, in group I mostly sinuous (e.g. Figs 12, 23) and in a few species protruding (Figs 15, 162, 198).

The presence of apertural barriers is characteristic of group III. The shape and number of barriers are constant within the examined species. The number varies from one parietal, like in *A. vincentina* (Fig. 66) and *A. cryptodon* (Fig. 90), two parietals like in *A. kuenthiana* (Figs 79, 81), 1–3 parietals and 1–8 palatals in other species (e.g. Figs 70, 97), while *A. tuberculata* has also one columellar barrier (Fig. 86). The dentition can be well visible in apertural view or deeply recessed. The barriers are usually high and well-developed, but sometimes they are reduced to low ridges, tubercles or creases.

The typical pattern of apical sculpture of the examined New Caledonian species is prominent spiral cords, more or less widely spaced in groups I and III (e.g. Figs 13, 31, 72, 77), fine and dense in groups IV and VI (e.g. Figs 110, 175, 184), very fine and very dense in groups II and V (e.g. Figs 54, 58, 126, 139). Wavy spiral cords on the embryonic shell are present in *A. mamieana* (Fig. 68), *A. incipiens* (Fig. 130) and often in members of group I (e.g. Figs 27, 36). A reduced sculpture – smooth whorls – is observed in a few species of groups: III, IV, V, VI (Figs 62, 103, 120, 168), malleated in *A. tuberculata* (Fig. 83). The presence of spiral grooves/striae on the embryonic shell is exceptional and found only in *A. rusticula* (Fig. 47) and *A. bazini* (Fig. 152).

The sculpture of definitive whorls involves variations of the pattern of major radial ribs and microsculpture of microradials and low spiral cords. Periostracal blades are often present on major ribs, but short. In group V there are two species with periostracal setae along the major ribs – *A. setosa* (Fig. 124) and *A. costulifera* (Fig. 169). Major radial ribs in group I are fine and narrow (e.g. Figs 21, 28), in group II – fine and lamellate (Fig. 46), in group III – of varied height and width (e.g. Figs 74, 80, 89), in group IV reduced and very low (e.g. Figs 106, 112), in groups V and VI – mostly moderately high and wide (e.g. Figs 136, 165, 186, 196). Strongly reduced macro-

sculpture is found in *A. compressa* (Figs 18, 19); *vincentina* (Fig. 64); *A. bourailensis* (group IV), *A. reduculpta* (Fig. 159) and *A. miracidium* (Figs 203, 205). Usually the radial ribs are protractively sinuated, but group I is characteristic in having strongly protractively curved ribs (e.g. Fig. 30). Only *A. mamieana* has vertical ribs (Fig. 70). In most species the radial ribbing is regular. Irregularly spaced ribs can be found in species of group IV.

The microsculpture typically consists of radial riblets, spiral cords/lirae or ridges and small elongate beads/knobs at their intersection (e.g. Fig. 14). Sometimes the knobs remain only on the first definitive whorl, like in *A. kouvneleana* (Fig. 190), or are reduced and indistinct, or absent, like in *A. ostiolum* (Fig. 105). The spiral cords can be obscure, like in *A. tondeuana* (Fig. 187) and *A. kouvneleana* (Fig. 191) or *A. rotunda* (Fig. 55). Some interesting departures from this typical pattern are found in groups I, III and V. In *A. compressa* there are no spiral cords on the spire, they appear only on the body whorl (Figs 18, 19). *A. vincentina* is exceptional in having obsolete radial riblets and continuous, distinct spiral cords with small knobs at the intersection (Fig. 64). *A. tuberculata* shows even more unusual sculpture features. Its microsculpture consists of dense, exceptionally fine, thread-like radial riblets crossed by spiral cords, which form large beads at the intersection. Such a microsculpture makes the spiral cords look like spirally arranged beads (Fig. 84). *A. miracidium* is characterized by the sculpture reduced to naturally rough surface without any radial or spiral elements. The body whorl microsculpture exhibits incised spiral grooves/striae. The grooves are very fine and dense above the keel; just below it, there are a few more distinct and widely spaced spiral incised lines, which become gradually finer and more crowded again towards the umbilicus (Fig. 204). The most modified microsculpture is that found in group V. On 1–2 first definitive whorls there is a typical pattern of radial riblets and spiral cords with knobs at the intersection. On the next whorls, between the microriblets, there are numerous fine microcreases crossing obliquely (Fig. 136). Two exceptions are found in group V – *A. bazini* and *A. reduculpta*. In *A. bazini* there are very low radial ridges and conspicuous spiral cords, which form fine knobs at their intersection, but no microcreases crossing obliquely (Figs 153, 154). *A. reduculpta* has its microsculpture remarkably reduced – there are no radials, spirals, microcreases crossing obliquely. It consists of fine, oblique grooves/incised lines, sometimes crossing here and there (Figs 159, 160).

Genital system

Nineteen out of 50 species were dissected. The remaining species, distinguished solely based on the shell characters, were either represented by dry shells and/or immature specimens, or the soft parts

were too poorly preserved to allow for a satisfactory dissection.

Ovotestis. The hermaphroditic gland lies buried in the digestive gland, above the stomach – intestine junction. It consists of two clusters of palmately clavate alveoli. Single clusters are found only in very small-sized species: *A. densicostata* (Fig. 32) and *A. angustiumbilicata*. The branching of the ducts is simple.

Hermaphroditic duct. The most common pattern in the Charopidae from the Pacific Islands is a straight hermaphroditic duct; in none of them is it coiled, contrary to Endodontidae (SOLEM 1976b: p. 75, fig. 45). Coiling occurs in many Austrozealandic charopid taxa (SOLEM 1976b: p. 75).

Almost all of the examined species from New Caledonia have more or less convoluted hermaphroditic duct; only in *A. tondeuana* (Fig. 183) and *A. coerulea* (Fig. 181) it is straight. Moreover, a yellow–golden sheen of this structure, sometimes with a greenish tint, is the typical condition in New Caledonian charopids. None of New Caledonian species shows a purple–red, iridescent sheen, characteristic for the extralimital charopids.

Talon and carrefour. In all dissected species the talon is a round container on a stalk, the carrefour is a slight swelling in the tract below the bend of the hermaphroditic duct.

Albumen gland. The albumen gland is irregular in shape, with the surface deeply indented by intestinal loops, spermathecal container, oesophagus, arteries, and stomach base. Upon dissection this structure is highly friable which makes it difficult to bring out intact.

Prostate and uterus. The prostate and uterus are completely fused. The prostatic alveoli are elongated and not arranged in distinct rows. Generally, the prostate is as long as the uterus, but the lower chamber of the latter can be more expanded. The uterus consists of an upper thin-walled narrower chamber and a lower thick-walled, more expanded chamber.

Terminal male genitalia. The vas deferens is typically a thin tube descending from the prostate-uterus to the penioviducal angle and then reflexing to join apically the epiphallus. Sometimes it can be slightly distended at its departure from the hermaphroditic canal. In a part of species (groups I, III, VI) the vas deferens is thin on its entire length, without any distension at the vas deferens-epiphallus junction. No pilasters shine through the walls of this junction, and the vas deferens seems to enter the epiphallus through a simple pore. However, the interior of this structure could not be checked directly, because of its size and, in some cases, the condition of preserved specimens. In *A. dispersa*, *A. rusticula*, *A. rotunda* and *A. planispira* of group II and *A. tandjiana*, *A. cressoniana*, *A. incipiens*, *A. perspectiva*, *A. goanna*, *A. maoyana* of group V the vas deferens enters epiphallus

through a pair of “lips” or a “valve” (e.g. Figs 53g, 114e, 138d). Externally such a junction is a conspicuous swelling. *A. setosa* shows an unusual interior of vas deferens-epiphallus entrance. Four pilasters come out of the vas deferens, then slightly widen and get wavy, to become 6–7 tiny pilasters coming into the epiphallus (Fig. 123d). Externally quite a considerable swelling corresponds to this structure.

The epiphallus is an abruptly expanded muscular tube, usually shorter than the penis, internally with two longitudinal pilasters, reflexed before entering the penis subapically (e.g. Fig. 202) or apically (e.g. Fig. 35). Departures from this general pattern include species with epiphallus as long as penis, with three or more longitudinal pilasters inside, entering penis laterally. Only in one species – *A. vetula* – an epiphallic muscular sheath was observed (Fig. 174). The epiphallus enters penis through a pore or most often through a verge.

The penial retractor muscle inserts apically (e.g. Fig. 202) or subapically (e.g. Fig. 44) on penis near or at the epiphallus/penis junction. Coiling of the retractor muscle around epiphallus or/and vas deferens was observed in about 30% of the examined New Caledonian taxa (e.g. Fig. 49a).

The penis is a muscular tube of moderate length, usually two-chambered and peanut-shaped (e.g. Fig. 49b), the shape reflecting its internal structures, or often pouch-shaped (e.g. Fig. 202) without constriction, rarely pear-shaped (Fig. 115), and in *A. vetula* tubular (Fig. 174). Two species have a muscular penis sheath covering the mid part of the penis – *A. rusticula* (Fig. 49b) and *A. perspectiva* (Fig. 133a). Penial glandulae are present in fairly many species (e.g. Figs 49b, 138a). Two species – *A. miracidium* and *A. setosa* – have a finger-like appendix, apically (Fig. 202a) or in the mid part of penis (Fig. 123a).

The penis interior varies between species. Apically there is an entrance of epiphallus through a simple pore (e.g. Fig. 123b) or most often through a globular verge (e.g. Fig. 119b). There are two common patterns of sculpture of internal penial walls – longitudinal pilasters and sculpture modified. The latter can be a horseshoe-like pilaster (Fig. 138b), thickenings and spongy pustulations (Fig. 123b), transverse short folds and two circular pads (Fig. 133b), an ovate pad (Fig. 138b), longitudinal corrugated pilasters with tiny transverse corrugations in between (Fig. 183c) or a V-shaped pilaster (Fig. 193b). Half of the examined species show a large, usually conical stimulator (e.g. Fig. 115b). In *A. dispersa* the stimulator is globular (Fig. 44b), in *A. planispira* funnel-shaped (Fig. 57c), in *A. vincentina* finger-like (Fig. 63b) and in *A. memaoyana* it resembles a flower-bud (Figs 144b, c).

Interior of the penis in some species bears a constricting collar, that is either a transverse, thick circular fold (e.g. Fig. 138b) or much thickened walls constricting the passage between the two penial chambers (e.g. Fig. 53c).

Terminal female genitalia. The New Caledonian species show rather a repetitive pattern of the structure of terminal female genitalia. The vagina is cylindrical, sometimes expanded, mostly shorter than penis, sometimes as long, only in *A. khedeigneana* it is extremely short (Fig. 197a). Its internal wall sculpture has a form of longitudinal pilasters, very rarely absent. *A. densicostata* is unusual in having a mushroom-like structure in the vagina (Fig. 32c). *A. rotunda* is exceptional in that it has an external conical appendix on the free oviduct/vagina junction (Fig. 53d).

The free oviduct is a muscular tube mostly shorter than penis, only in two species equally long. A transverse strand of a tight muscular sheath is found in *A. vincentina* (Fig. 63a). In *A. khedeigneana* the free oviduct, which is as long as penis and tubular, is covered on its entire length by a tight muscular sheath; the lower half of free oviduct is additionally covered by (?) glandular tissue (Fig. 193a). Internal walls of free oviduct are typically sculptured with longitudinal pilasters. In *A. vetula* and *A. khedeigneana* the pilasters are reduced.

The spermathecal shaft is wider at base, then gradually or abruptly narrowing. The ovate spermathecal container lies buried in the albumen gland on the border with prostate. Internally the spermathecal shaft shows longitudinal pilasters not observed only in *A. vetula*.

Spermatophores were found in 11 species. They are comma- (e.g. Fig. 202d), tadpole- (e.g. Fig. 193c), club- (Fig. 49e), drop- (Fig. 53f), or hook-shaped (Fig. 144e).

PHYLOGENY

The genus *Andrefrancia* Solem, 1960 originally included less than half of the number of species considered in this paper, and no anatomical characters were known. The present revision should have provided answers to the following questions: 1. Is *Andrefrancia* sensu SOLEM (1960) monophyletic? 2. Are species groups within the genus monophyletic and corresponding to subgenera? 3. What are phylogenetic relationships among the species and their groups included in the genus? Attempts at solving these problems encounter three serious obstacles. Firstly, the available material, though much richer than what SOLEM had at his disposal, still could not yield consistent information on all characters for all species since many of them were represented by shells only. Secondly, charopids are a very speciose and widely distributed family, with no doubt many instances of convergent or parallel evolution (for details of character distribution in Pacific genera see SOLEM 1983, for Australian genera see STANISIC 1990). Thirdly, SOLEM followed traditional school of thinking in systematics, and consequently did not provide explicit apomorphies that would support monophyly of his taxa (though some of them later proved monophyletic)

(CAMERON et al. 2005). Thus any phylogenetic inferences presented below can only be tentative, and attempts to modify the present, traditional, classification – premature. They are to provide guidelines for further research rather than to propose a new system.

The morphological and anatomical characters were polarised based on out-group comparison (out-groups: Charopidae from Pacific Islands (SOLEM 1983), Australia (STANISIC 1990), New Zealand (CLIMO 1969b, 1970, 1978, 1980, 1981, 1983, 1985, SOLEM 1983), Juan Fernandez and Chile (SOLEM 1983) and Pacific Islands Endodontidae (SOLEM 1976b) and ontogenetic criterion. The following characters were used in the analysis (polarisation criteria for each character specified after/):

Shell:

1. H/D ratio (0.00–0.50, 0; 0.51–1.00, 1)/ontogenetic;
 2. Velocity of whorl increment D/N_w (0.00–0.50, 0; 0.51–1.00, 1; 1.01–1.50, 2; 1.51–2.00, 3)/ontogenetic;
 3. Shell diameter/umbilical width ratio D/D_u (0.01–2.50, 0; 2.51–5.00, 1; 5.01–7.50, 2; 7.51–10.00, 3; 10.00-closed, 4)/ontogenetic;
 4. Number of ribs on body whorl (0–50, 0; 51–100, 1; 101–150, 2; 151–200, 3; 201–250, 4; strongly reduced, 5)/ontogenetic;
 5. Body whorl profile (keeled, 1; partially keeled, 7; flattened above and below periphery, 3; flattened above and rounded below, 4; shouldered above and flattened below, 5; rounded, 2; laterally compressed, 0; laterally compressed and flattened above, 6)/out-group comparison;
 6. Shell coiling pattern (tight, 0; normal, 1)/out-group comparison;
 7. Umbilical margin contours (rounded, 0; shouldered, 1)/out-group comparison;
 8. Suture (normal, 0; impressed, 1; impressed-detached, 2; channelled, 3)/ontogenetic;
 9. Shape of upper margin of aperture (normal, 0; sinus, 1; protruding, 2)/out-group comparison;
 10. Presence of apertural barriers (absent, 0; present, 1)/out-group comparison;
 11. Apical sculpture (spiral cords, 0; smooth, 1; malleated, 2; spiral cords wavy in nucleus, 3; spiral grooves, 4)/out-group comparison;
 12. Weak, radial growth ridges/wrinkles on protoconch (absent, 1; present, 0)/out-group comparison;
 13. Radial ribs (well developed, 0; reduced very low but countable, 1; strongly reduced and uncountable, 2)/out-group comparison;
 14. Postnuclear microradials (absent, 1; present, 0)/out-group comparison;
 15. Postnuclear microspirals (absent, 1; present, 0)/out-group comparison;
 16. Elongate beads at the intersection of microradials and microspirals (absent, 1; present, 0)/out-group comparison;
 17. Postnuclear short microcreases crossing obliquely (absent, 0; present, 1)/out-group comparison;
 18. Postnuclear spiral or oblique grooves/incised lines (absent, 0; present, 1)/out-group comparison;
 19. Periostracal blades on major ribs (absent, 1; present, 0)/out-group comparison;
 20. Postnuclear periostracal setae (absent, 0; present, 1)/out-group comparison;
 21. Shell colour (monochrome, 0; flammulated, 1)/out-group comparison.
- Genital system:
1. Number of lobes/clusters in ovotestis (one, 0; two, 1)/out-group comparison;
 2. Hermaphroditic duct coiling (not coiled, 0; coiled, 1)/out-group comparison;
 3. Epiphallus length (shorter than penis, 0; as long as penis, 1; longer than penis, 2)/ontogenetic;
 4. Epiphallic muscular sheath (absent, 0; present, 1)/out-group comparison;
 5. Number of pilasters on internal wall of epiphallus (two, 0; three, 1; more, 2)/out-group comparison;
 6. Position of epiphallus-penis junction (apical, 0; subapical, 1; lateral, 2)/out-group comparison;
 7. Epiphallic entry into penis (through pore, 0; through verge, 1)/out-group comparison;
 8. Position of penial retractor muscle insertion (apical on epiphallus/penis junction, 0; subapical, 1; lateral, 2)/out-group comparison;
 9. Penial retractor muscle coiling around epiphallus (absent, 0; present, 1)/out-group comparison;
 10. Penial retractor muscle coiling around vas deferens (absent, 0; present, 1)/out-group comparison;
 11. Penial glandulae (absent, 0; present, 1)/out-group comparison;
 12. Penial muscular sheath (absent, 0; present, 1)/out-group comparison;
 13. Finger-like appendix on penis (absent, 0; present, 1)/out-group comparison;
 14. Penis shape (tubular, 0; pouch-, 1; peanut-, 2; pear-shaped, 3)/out-group comparison;
 15. Penis length (long, 0; moderate, 1)/ontogenetic;
 16. Presence of penial stimulator (absent, 0; present, 1)/out-group comparison;
 17. Internal penial sculpture (longitudinal pilasters, 0; modified, 1; smooth, 2; longitudinal + transverse pilasters, 3; transverse pilasters, 4)/out-group comparison;
 18. Internal penial collar/constricting ‘sphincter’ (absent, 0; present, 1)/out-group comparison;
 19. Length of vagina (shorter than penis, 0; extremely short, 1; as long as penis, 2)/ontogenetic;
 20. Vaginal pilasters (absent, 0; present, 1)/out-group comparison;
 21. Mushroom-like structure in vagina (absent, 0; present, 1)/out-group comparison;
 22. Conical appendix on free oviduct/vagina junction (absent, 0; present, 1)/out-group comparison;



23. Muscular sheath covering free oviduct (absent, 0; present, 1)/out-group comparison;
24. Coiling of free oviduct and spermathecal shaft (absent, 0; present, 1)/out-group comparison;
25. Pilasters in free oviduct (absent, 0; present, 1)/out-group comparison;
26. Pilasters in spermathecal shaft (absent, 0; present, 1)/out-group comparison.

Many of these characters are autapomorphies of individual species and thus useless for phylogeny reconstruction. It should be also remembered that in the case of some other characters (morphometric characters, proportions, coloration) convergence is very likely.

The genus *Andrefrancia* was proposed by SOLEM (1960) for New Caledonian species, formerly placed in *Charopa* Albers, 1860 and *Ptychodon* Ancey, 1888 (SOLEM 1961). The latter two genera are actually restricted to New Zealand and include species of different shell characters: smooth apical whorls or faint traces of radial ribbing.

SOLEM (1960: 2) defined the genus *Andrefrancia* as having "Shell small (1.75 mm) to medium (8.5 mm), 4–6.5 tightly to loosely coiled whorls. Apical whorls 1–1.5 usually with a sculpture of 18–20 fine spiral ribs. Postapical whorls with relatively prominent radial ribs (or secondarily smooth), between 40 and 150 on the body whorl. Ribs vertical or sinuous. A microsculpture of radial riblets crossed by fine spiral lines between the major ribs. Aperture more or less ovate, toothed or toothless. Umbilicus open, contained 2.5 to 9 times in the diameter, internally angulated in the more open species. Type species: *Helix rhizophorarum* Gassies, 1865. A coarser sculpture of 10–12 spiral lirae is found in some New Zealand, Polynesian and Melanesian species (*Mocella*). The East Australian and Tasmanian (*Roblinella* and *Gyrocochlea*) have the same apical sculpture as the New Caledonian species, but differ in size, shape and umbilical characters". However, he listed no anatomical characters, since at that time no alcohol-preserved material was available, but later (SOLEM 1983) he mentioned a distinctive anatomy of several dissected *Andrefrancia*.

None of the characters listed in SOLEM's (1960) diagnosis is unique to members of *Andrefrancia*, for example the same shell size and number of whorls are common also in other charopid genera (for review of characters see SOLEM 1983, STANISIC 1990); the combination of radial and spiral macro- and microsculpture is, apart from *Andrefrancia*, found also in all Pacific island Charopidae (SOLEM 1983), most of Australian Charopidae, like *Setomedeia*, *Gyrocochlea*, *Biomphalopa*, *Nautiliropa*, *Rhophodon*, *Cralopa*, *Elsothera*, *Coenocharopa*, *Egilomen*, *Ophaloropa*, *Sinployea*, *Rotacharopa* (STANISIC 1990), most of New Zealand Charopidae (CLIMO 1970, 1978, 1980, 1981, 1985), majority of Pacific island Endodontidae (SOLEM 1976b). On the other hand, the anatomical examination of the available species re-

vealed no character that could be regarded as a synapomorphy of the entire genus in its original sense. *Andrefrancia* may well be monophyletic but characters to support its monophyly are yet to be found.

If the genus *Andrefrancia* is to be provisionally retained, the diagnosis should be modified in accordance with the characters found in the species which were not considered by SOLEM (1960). Most New Caledonian charopids covered in this study have spiral cords/lirae on embryonic shell. However, their number can be much lower than the 18–20 range given in the original diagnosis. Conchologically, some of the observed species (mainly group II) are very similar to *Sinployea* Solem, 1983 from Pacific Islands. Nevertheless, anatomically they are distinct.

Within the genus *Andrefrancia* SOLEM (1961) distinguished six species groups (23 species) based on shell characters. The groups outlined in Solem's annotated check list (SOLEM 1961: 455, fig.11) have the same basic apical sculpture and "probably are modifications from the same ancestral stock. The groups are readily separable but form a homogenous series in comparison with other New Caledonian endodontids" (SOLEM 1961: 454).

The examined species loaned from the Paris collection were provisionally assigned to six groups according to SOLEM's (1961) division. The analysis of their morphological characters allowed a division into seven groups. All of them are characterised by a combination of plesio- and apomorphic shell features, and none of them has unique apomorphies that would not be found in any other group. The analysis of characters of the genital system in these few instances where alcohol-preserved material was available, provided no grounds for a clear division into groups. There is a certain range of anatomical features found in each group, but they cannot be classified as typical for any of them. Besides, apparently some apomorphic characters appeared more than once in different species as a result of parallel evolution.

The shell features characteristic for particular groups are presented below. In almost every group there are some exceptions – species with one or two characters missing. One species – *A. miracidium* – has been excluded from group III and transferred to a distinct group VII.

Group I

1. Shell small to medium sized, max. diameter 3.20–6.00 mm.
2. Shell coiling pattern – tight (plesiomorphic).
3. Mean velocity of whorl increment – 0.72–1.13, only in *A. compressa* – 0.63 (apomorphic).
4. Mean body whorl width/width of penultimate whorl ratio – 1.80–2.78, only in *A. tiabetus* – 1.58 and in *A. mandjeliana* – 1.48. Whorls slightly to strongly overlap each other.

5. D/D_u ratio – 3.00–14.00, only in *A. compressa* – 31.00 (apomorphic) and in *A. angustiumbilocata* – 0.00 umbilicus pin-point (plesiomorphic).
6. Umbilicus margin contours rounded (plesiomorphic).
7. Suture impressed or channelled (apomorphic), only in *A. kaala* normal (plesiomorphic).
8. Upper margin of aperture strongly sinuated (apomorphic), two exceptions – *A. tiabetus* – protruding (apomorphic) and *A. compressa* – normal (plesiomorphic).
9. Body whorl profile – gently flattened above and rounded below periphery or rounded (apomorphic), *A. tiabetus* and *A. compressa* laterally compressed (plesiomorphic).
10. Aperture – ovately or roundly lunate and flattened above periphery, *A. compressa* has crescent-shaped aperture.
11. No barriers (plesiomorphic).
12. Apical sculpture: a) ca. 7–18 prominent spiral cords or ridges (plesiomorphic), b) prominent spiral cords wavy in nucleus in *A. kaala*, *A. blemou*, *A. tillieriana*, *A. angustiumbilocata* (apomorphic).
13. Major ribs well developed (plesiomorphic), strongly protractively sinuated and dense, except for *A. tiabetus* – with lower number of gently sinuated ribs, and *A. compressa* with greatly reduced macrosculpture (apomorphic).
14. Microsculpture typical (plesiomorphic), consisting of a lattice of radial riblets and spiral cords with elongate knobs at the intersection, in *A. compressa* only microriblets present on spire and typical microsculpture on the body whorl.
15. Shell colour monochrome (plesiomorphic) brown, amber, horn or horn-reddish with creamy-white flammulations (apomorphic), often shiny, shells very fragile and fine.

Group II

1. Shell large, max. diameter 6.00–9.00 mm.
2. Shell coiling pattern – normal (apomorphic).
3. Mean velocity of whorl increment – 1.02–1.63 (apomorphic).
4. Mean body whorl width/width of penultimate whorl ratio – 1.91–2.13.
5. D/D_u ratio – 2.92–5.00 (apomorphic).
6. Umbilicus margin contours rounded (plesiomorphic).
7. Suture normal (plesiomorphic).
8. Upper margin of aperture normal (plesiomorphic).
9. Body whorl profile – flattened above and below, flattened above and rounded below periphery or rounded (apomorphic).
10. Aperture – roughly rounded and slightly to distinctly flattened above periphery.
11. No barriers (plesiomorphic).

12. Apical sculpture: a) very fine and dense spiral cords (plesiomorphic), b) fine spiral grooves in *A. rusticula* (apomorphic).
13. Major ribs well developed, lamellate and dense, *A. dispersa* with lower number of ribs (plesiomorphic).
14. Microsculpture typical, consisting of narrow radial riblets and fine spiral cords, tiny knobs present at the intersection (plesiomorphic).
15. Shell colour monochrome, brown, horny or brightly brown, dull (plesiomorphic).

Group III

1. Shell very small, max. diameter 1.71–2.40 mm.
2. Shell coiling pattern – tight (plesiomorphic).
3. Mean velocity of whorl increment – 0.33–0.44 (plesiomorphic).
4. Mean body whorl width/width of penultimate whorl ratio – 1.17–1.50, in *A. cryptodon* – 1.69.
5. D/D_u ratio – 2.71–5.85, in *A. cryptodon* – 4.40–8.30 (plesiomorphic).
6. Umbilicus margin contours rounded (plesiomorphic).
7. Suture impressed (apomorphic), normal in *A. vincentina* (plesiomorphic).
8. Upper margin of aperture normal (plesiomorphic).
9. Body whorl profile – mostly laterally compressed (plesiomorphic), shouldered above and flattened below in *A. vincentina*, *A. tuberculata*, *A. cockerelli* (apomorphic).
10. Aperture – ovate.
11. Apertural barriers present (apomorphic).
12. Apical sculpture: a) spiral cords – prominent, not dense, usually ca. 10 (plesiomorphic), in *A. mamieana* wavy in nucleus (apomorphic), b) smooth in *A. vincentina* (apomorphic), c) malleated in *A. tuberculata* (apomorphic).
13. Major ribs well developed (plesiomorphic), strongly reduced in *A. vincentina* (apomorphic).
14. Microsculpture typical, consisting of narrow radial riblets and fine spiral cords, tiny knobs present at the intersection. *A. vincentina* exceptional in having obsolete radial riblets and distinct spiral cords. *A. tuberculata* has exceptionally fine, thread-like microriblets and spiral cords looking like spirally arranged beads (plesiomorphic).
15. Shell colour monochrome, horn, golden-brown, dull (plesiomorphic).

Group IV

1. Shell small to medium sized, max. diameter 2.95–6.00 mm.
2. Shell coiling pattern – tight (plesiomorphic).
3. Mean velocity of whorl increment – 0.70–1.20 (apomorphic).
4. Mean body whorl width/width of penultimate whorl ratio – 1.70–2.08.



5. D/D_u ratio – 4.80–14.33 (apomorphic).
6. Umbilicus margin contours rounded (plesiomorphic).
7. Suture normal (plesiomorphic).
8. Upper margin of aperture normal (plesiomorphic).
9. Body whorl profile – laterally compressed (plesiomorphic), keeled (apomorphic), flattened above and rounded below periphery or rounded (apomorphic).
10. Aperture – ovate or rounded.
11. No barriers (plesiomorphic).
12. Apical sculpture: a) smooth (apomorphic), b) spiral cords – fine and dense in *A. vaoana* (plesiomorphic).
13. Major ribs reduced, very low or strongly reduced (apomorphic).
14. Microsculpture typical, consisting of narrow radial riblets and fine spiral cords, tiny knobs present at the intersection, no knobs in *A. ostiolum* (plesiomorphic).
15. Shell colour monochrome, milky, or brightly horn, dull (plesiomorphic).

Group V

1. Shell medium sized to large, max. diameter 4.50–9.00 mm.
2. Shell coiling pattern – normal (apomorphic) but in *A. canaliculata* tight (plesiomorphic).
3. Mean velocity of whorl increment – 0.94–1.15, 0.81 in *A. bazini* and 1.62 in *A. pinicola* (apomorphic).
4. Mean body whorl width/width of penultimate whorl ratio – 1.90–2.38, 1.87 in *A. bazini* and 1.83 in *A. canaliculata*.
5. D/D_u ratio – 2.94–4.53 (apomorphic), in *A. reducisculpta* – 5.38–6.50 (apomorphic), in *A. perspectiva* – 2.24–2.61 (plesiomorphic).
6. Umbilicus margin contours rounded (plesiomorphic).
7. Suture: a) impressed-detached (apomorphic), b) impressed in *A. setosa* and *A. perspectiva* (apomorphic), c) normal in *A. bazini* and *A. reducisculpta* (plesiomorphic), c) channelled in *A. canaliculata* (apomorphic).
8. Upper margin of aperture normal (plesiomorphic), slightly protruding in *A. canaliculata* (apomorphic).
9. Body whorl profile – flattened above and below or rounded below periphery, partially keeled in *A. incipiens*, rounded in *A. goanna* (apomorphic).
10. Aperture – roughly subquadrate strongly flattened above and below, roundly lunate and flattened above.
11. No barriers (plesiomorphic).
12. Apical sculpture: a) spiral cords or ridges – very fine and dense (plesiomorphic), b) smooth in *A. cressoniana* and *A. costulifera* (apomorphic), c) spi-

- ral cords wavy in nucleus in *A. incipiens* (apomorphic), d) very fine discontinuing spiral grooves in *A. bazini* (apomorphic).
13. Major ribs well developed (plesiomorphic); reduced (apomorphic), very low in *A. setosa*, *A. bazini* and strongly reduced in *A. reducisculpta* (apomorphic).
14. Microsculpture unusual, of 1–2 first postembryonic whorls consisting of radial riblets and spiral cords with knobs at the intersection (plesiomorphic). On the next whorls between microriblets there are numerous fine microcreases crossing obliquely (apomorphic); two exceptions: *A. bazini* – microsculpture consists of very low radial ridges and conspicuous spiral cords, which form fine knobs at their intersection (plesiomorphic). There are neither postnuclear microcreases crossing obliquely nor grooves/incised lines; *A. reducisculpta* – microsculpture remarkably reduced – there are no radials, spirals, microcreases crossing obliquely (plesiomorphic), microsculpture consists of fine, oblique grooves/incised lines, sometimes crossing here and there (apomorphic).
15. Shell colour light yellow horn with reddish flammulations (plesiomorphic).

Group VI

1. Shell medium sized, max. diameter 3.20–6.10 mm.
2. Shell coiling pattern – tight (plesiomorphic).
3. Mean velocity of whorl increment – 0.60–0.90 (apomorphic).
4. Mean body whorl width/width of penultimate whorl ratio – 1.60–1.88, in *A. khedeigneana* – 2.04, in *A. kouvneleana* – 2.32.
5. D/D_u ratio – 2.06–2.73 in *A. tondeuana*, *A. kouvneleana* and *A. webbi* (plesiomorphic), 2.73–5.00 in *A. vetula*, *A. coerulea*, *A. khedeigneana*, *A. lenis* and *A. noumeensis* (apomorphic).
6. Umbilicus margin contours rounded (plesiomorphic) or shouldered (apomorphic).
7. Suture impressed (apomorphic), in *A. noumeensis* normal (plesiomorphic).
8. Upper margin of aperture normal (plesiomorphic), in *A. tondeuana* and *A. lenis* – protruding (apomorphic).
9. Body whorl profile – rounded, shouldered above and flattened below, flattened above and below or rounded below, laterally compressed and flattened above (apomorphic), laterally compressed (plesiomorphic).
10. Aperture – ovate, subovate, rounded, rounded and flattened above.
11. No barriers (plesiomorphic).
12. Apical sculpture: a) spiral cords – fine, dense or more widely spaced, ca. 7–20 (plesiomorphic), b) smooth in *A. noumeensis* (apomorphic).



Table 2. Species of *Andrefrancia* endemic to smaller islands

Species/island	Isle of Pines	Lifou	Art Island
<i>A. vaoana</i>	X		
<i>A. quadrilamellata</i>	X		
<i>A. canaliculata</i>		X	
<i>A. khedeigneana</i>		X	
<i>A. pinicola</i>			X

ported by characters: shell minute, macro- and micro-sculpture well developed except for two species, apical sculpture mostly with spiral cords, body whorl laterally compressed or shouldered above and flattened below, upper margin of aperture slanted, presence of apertural barriers, aperture ovate, shell coiling pattern tight, suture impressed, low velocity of whorl increment and mean body whorl width/width of penultimate whorl ratio, whorls not overlapping), the trees

Table 3. Distribution of species of *Andrefrancia* endemic to the main island

Species/area	North-west	South-east	Middle
<i>A. kaala</i>	X		
<i>A. tiabetus</i>	X		
<i>A. mandjeliana</i>	X		
<i>A. tillieriana</i>	X		
<i>A. densicostata</i>	X		
<i>A. angustiumblicata</i>	X		
<i>A. miracidium</i>	X		
<i>A. cressoniana</i>	X		
<i>A. compressa</i>		X	
<i>A. blemou</i>		X	
<i>A. alveolus</i>		X	
<i>A. dispersa</i>		X	
<i>A. rusticula</i>		X	
<i>A. calliope</i>		X	
<i>A. rotunda</i>		X	
<i>A. planispira</i>		X	
<i>A. cryptodon</i>		X	
<i>A. manieana</i>		X	
<i>A. berlieri</i>		X	
<i>A. derbesianus</i>		X	
<i>A. melaleucarum</i>		X	
<i>A. ostiolum</i>		X	
<i>A. bazini</i>		X	
<i>A. costulifera</i>		X	
<i>A. tondeuana</i>		X	
<i>A. coerulea</i>		X	
<i>A. kouwneleana</i>		X	
<i>A. noumeensis</i>		X	
<i>A. subcoacta</i>			X
<i>A. amoana</i>			X
<i>A. tuberculata</i>			X
<i>A. cockerelli</i>			X
<i>A. bourailensis</i>			X
<i>A. tandjiana</i>			X
<i>A. incipiens</i>			X
<i>A. goanna</i>			X
<i>A. perspectiva</i>			X
<i>A. reducisculpta</i>			X
<i>A. kuenthiana</i>		X	X
<i>A. memaoyana</i>		X	X

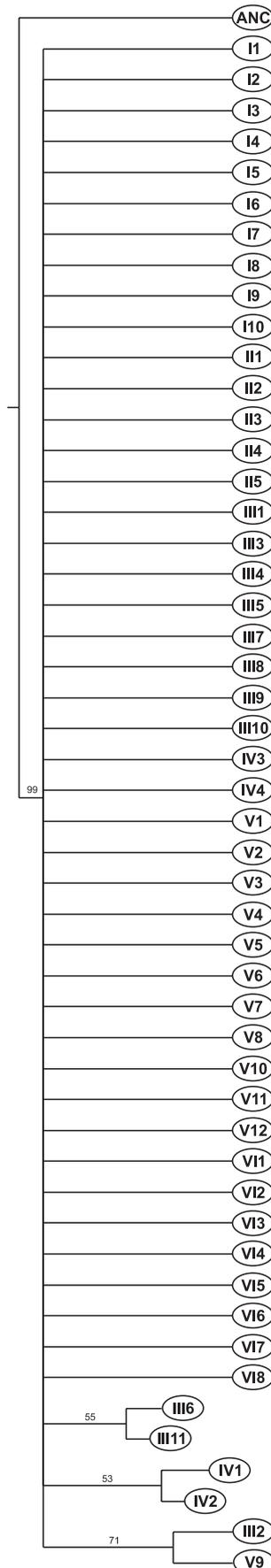


Fig. 2. Cladogram of the genus *Andrefrancia*

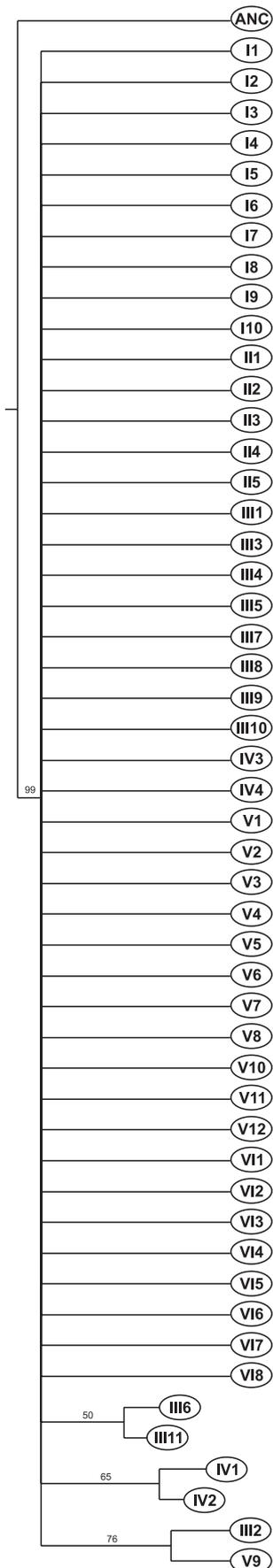


Fig. 3. Cladogram of the genus *Andrefrancia*

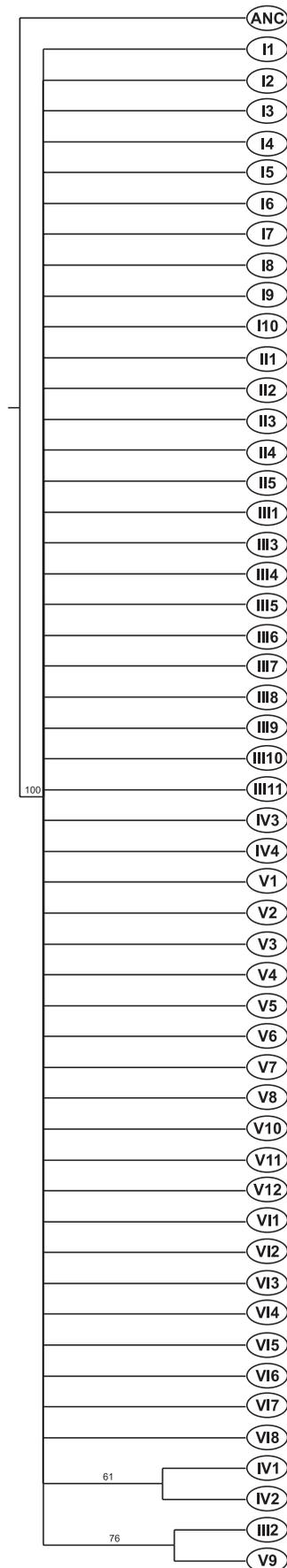


Fig. 4. Cladogram of the genus *Andrefrancia*

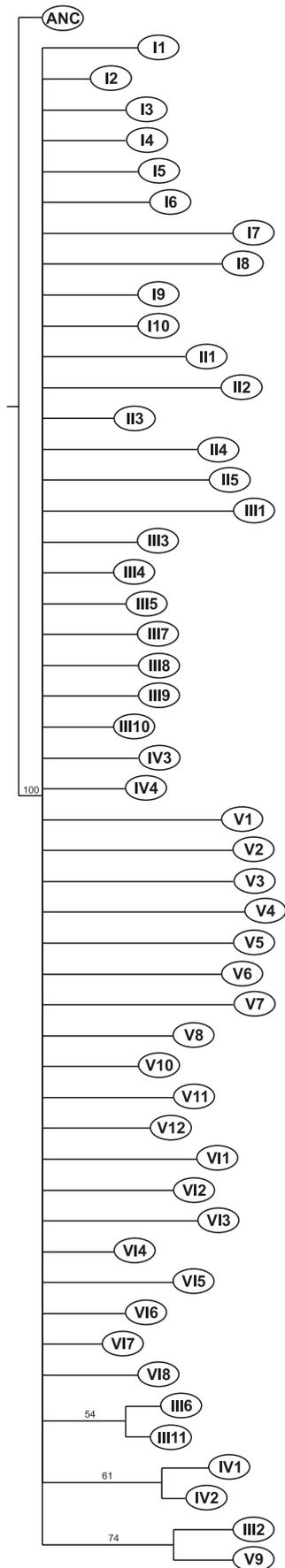


Fig. 5. Cladogram of the genus *Andrefrancia*

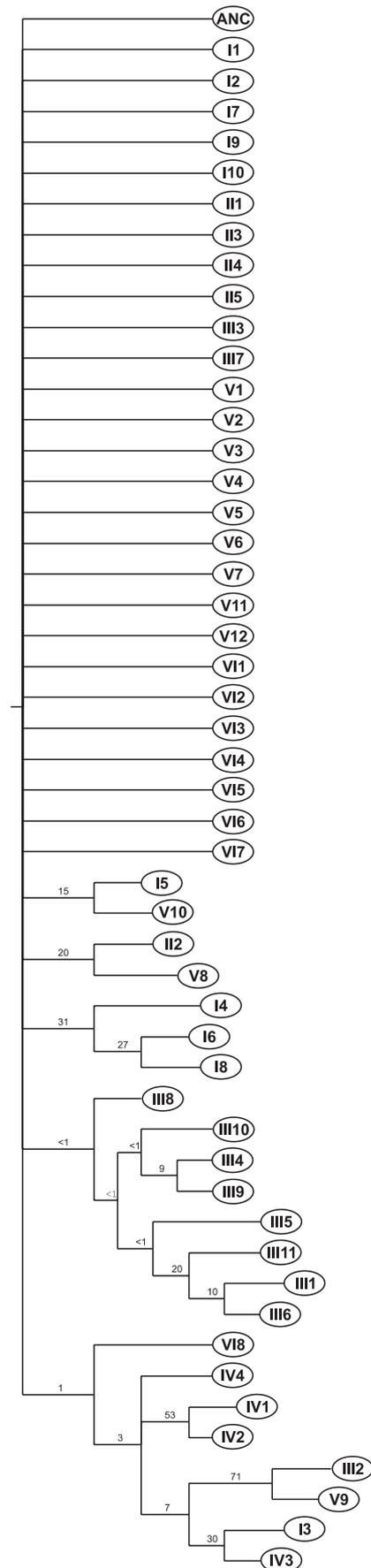


Fig. 6. Cladogram of the genus *Andrefrancia*

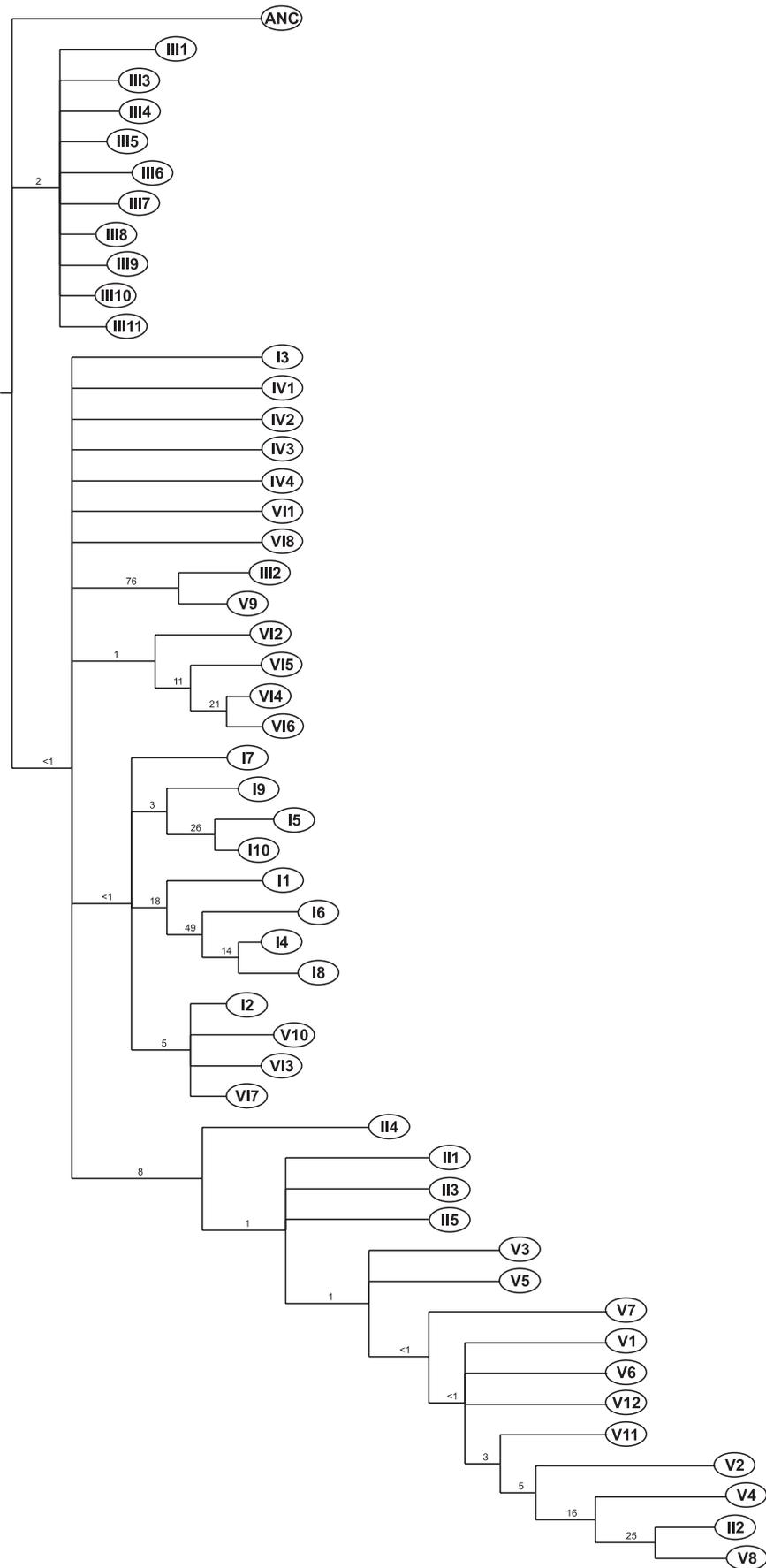


Fig. 9. Cladogram of the genus *Andrefrancia*

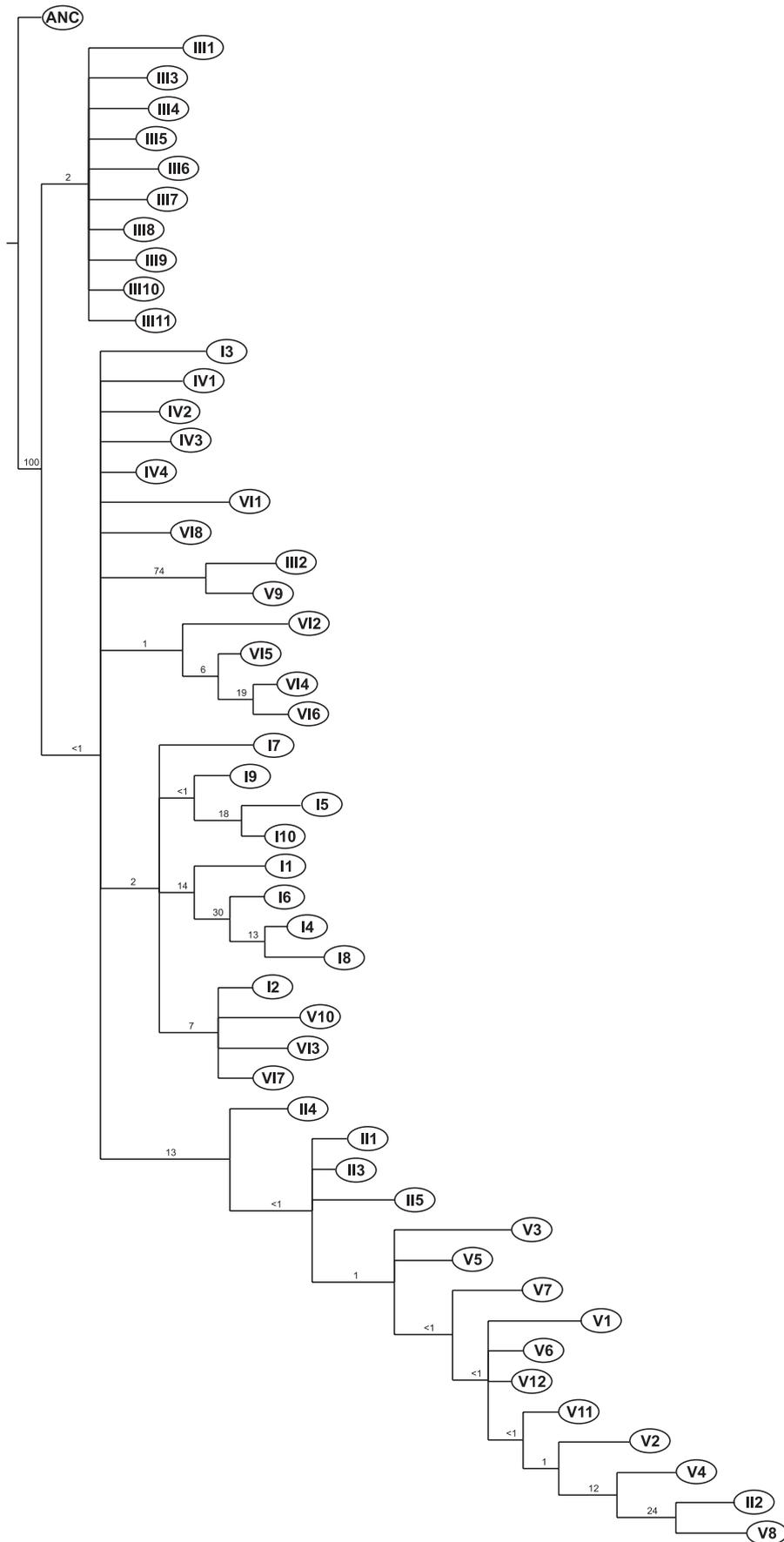


Fig. 10. Cladogram of the genus *Andrefrancia*

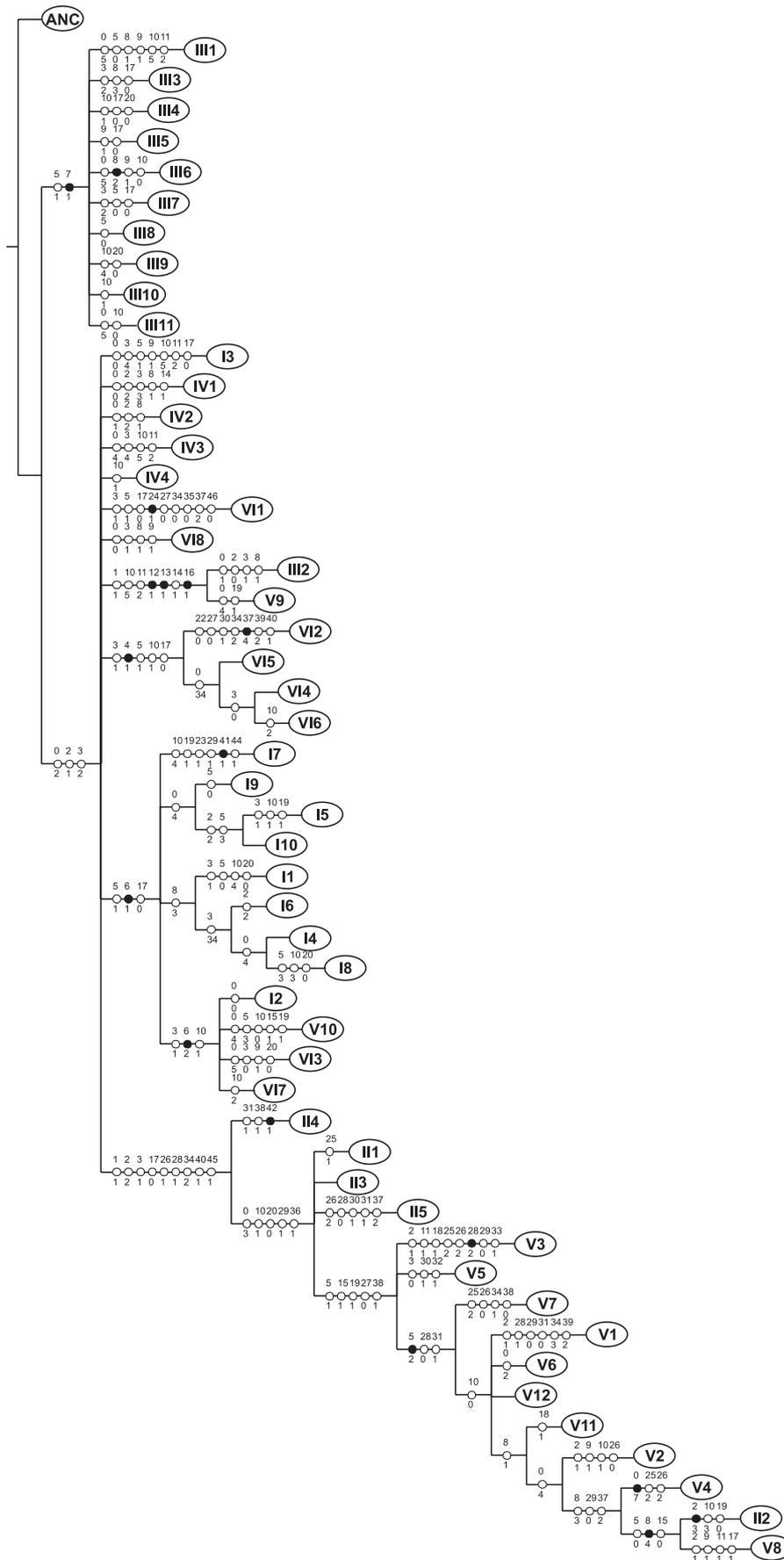


Fig. 11. Cladogram of the genus *Andrefrancia*

provide no grounds to propose a uniformly monophyletic classification.

In summary: the genus *Andrefrancia* sensu SOLEM (1960) may or may not be monophyletic. The original division into groups has to be modified according to the present knowledge – with *A. miracidium* removed from group III to a separate group. The groups, possibly except group III, may not represent monophyletic units but should be retained because they facilitate identification, and be provisionally assigned sub-generic rank. The most important line of research for the future is to include all the species in anatomical examination.

ZOOGEOGRAPHICAL REMARKS

In view of the absence of any consistent, unequivocal phylogenetic hypothesis on relationships within the genus *Andrefrancia* (except, possibly, group III), and considering that for some species locality data are imprecise, the distribution could not be analysed in relation to phylogeny. However, based on the distribution of the majority of species, some zoogeographical remarks can be made.

Out of 47 species of known distribution, only two, *A. vincentina* and *A. vetula*, occur on more than one island, the former on New Caledonia and Isle of Pines, the latter on New Caledonia, Isle of Pines, Ouvéa and Art Island. The remaining 45 are limited to one island each: five to smaller islands (Table 2), 40 to New Caledonia. None of the species groups, except group II which is limited to the south-eastern corner of New Caledonia, shows a consistent distribution pattern.

A great majority of the 40 species that are confined to the main island show limited distribution ranges: eight are found only in the north-western corner, twenty only in the south-eastern corner, ten are distributed roughly in the mid part of the island, and only two were recorded from the middle of the island and from the south-east (Table 3).

The overall distribution patterns indicate that the main island of New Caledonia was the centre of radiation of the genus. Since the anthropogenic changes are fairly uniform all over the island, the disproportionate number of species inhabiting the northern and western parts of the island can be explained only by the fact that these parts of the island received the least rainfall (BAUER & SADLER 2000).



IDENTIFICATION KEYS

Key to species groups

- 1. Shell very small, max. diameter 2.40 mm, apertural barriers present, no keel group III
- Shell medium to large. 2
- 2. Shell medium, max. diameter 6.00 mm, major ribs prominent, strongly protractively sinuated and dense, whorls slightly to strongly overlapping, upper margin of aperture distinctly sinuated; ribs prominent or reduced, gently curved with upper margin of aperture protruded or slanted . group I
- Shell medium to large, major ribs prominent or reduced, gently protractively curved, whorls not overlapping 3
- 3. Shell medium, max. diameter 6.00 mm, major ribs reduced and low to strongly reduced, microsculpture typical, shell colour monochrome group IV
- Shell medium to large, ribs prominent to reduced, microsculpture typical or modified 4
- 4. Shell medium, max. diameter 6.10 mm, major ribs prominent, whorls tightly coiled, suture impressed, microsculpture typical, shell colour monochrome group VI
- Shell medium to large, ribs prominent or reduced, whorls normally coiled, suture different (normal, impressed-detached, impressed, channelled), microsculpture typical or modified 5
- 5. Shell medium to large, max. diameter 9.00 mm, major ribs well developed, lamellate, microsculpture typical, shell colour monochrome group II
- Shell medium to large, ribs well developed or reduced, microsculpture unusual, shell colour flammulated group V
- 6. Shell very small, max. diameter 2.25 mm, apertural barriers absent, keel present group VII

Key for species identification (group I)

- 1. Major ribs prominent, strongly protractively sinuated and dense, upper margin of aperture distinctly sinuated 2
- Ribs prominent or reduced, gently curved with upper margin of aperture protruding or slanted. 9
- 2. Suture channelled. 3
- Suture normal or impressed. 5
- 3. Umbilicus widely open 4
- Umbilicus pin-point *Andrefrancia angustiumbilitata*
- 4. Umbilicus contained 3.80–4.25 times in diameter, 60–80 ribs on body whorl *A. mandjeliana*
- Umbilicus contained 4.80–5.30 times in diameter, ca.112 ribs on body whorl *A. alveolus*
- 5. Major ribs very dense, more than 200 on body whorl 6
- Number of ribs < 200 on body whorl 7
- 6. Whorls strongly overlapping, umbilicus widely open, suture normal, shell colour monochrome . *A. kaala*
- Whorls overlapping, umbilicus narrowly open, suture impressed, shell colour flammulated . *A. densicostata*
- 7. Max. shell diameter 6.00 mm, umbilicus contained 9.40–14.00 times in diameter, shell colour flammulated *A. tillieriana*
- Max. shell diameter 3.60 mm, umbilicus contained < 9.00 times in diameter, shell colour monochrome . 8
- 8. Major ribs more protractively sinuated, upper margin of aperture more distinctly sinuated, umbilicus slightly narrower, contained 7.20–8.30 times in diameter, more impressed suture *A. blemou*
- Major ribs less protractively sinuated, upper margin of aperture less distinctly sinuated, umbilicus slightly wider, contained 5.40–7.50 times in diameter, suture normal *A. subcoacta*
- 9. Major ribs well developed, upper margin of aperture protruding, umbilicus widely open . . . *A. tiabetus*
- Postnuclear sculpture greatly reduced, upper margin of aperture slanted, umbilicus very narrow *A. compressa*

Key for species identification (group II)

- 1. Apical sculpture consisting of spiral cords 2
- Apical sculpture consisting of very fine spiral grooves 5
- 2. Shell medium-sized up to 6.00 mm, umbilicus widely open, contained ca.3.00 times in diameter, major ribs relatively widely spaced, 50–80 on body whorl *A. dispersa*
- Shell large up to 9.00 mm, umbilicus > 3.80 times in diameter. 3
- 3. Major ribs relatively more closely spaced, 100–167 on body whorl, body whorl profile rounded . *A. rotunda*
- Ribs relatively more widely spaced, 70–110 on body whorl, body whorl profile flattened above and below periphery 4

4. Max. diameter 9.00 mm, outer margin of aperture slightly arched. *A. calliope*
 – max. diameter 7.80 mm, outer margin of aperture not arched *A. planispira*
 5. Major ribs very dense, 150–210 on body whorl, umbilicus contained 4.00–5.00 times in diameter,
 whorls relatively rapidly increasing. *A. rusticula*

Key for species identification (group III)

1. Apical sculpture smooth, macrosculpture greatly reduced, aperture with single high parietal barrier. *A. vincentina*
 – Apical sculpture with spiral cords or malleated, major ribs prominent 2
 2. Apical sculpture with spiral cords, macrosculpture typical 3
 – Apical sculpture malleated, macrosculpture unusual in having dense, exceptionally fine, thread-like radial riblets crossed by spiral cords, which form large beads at the intersection, aperture with 1 parietal barrier, 1 low columellar ridge, irregular palatal protuberance *A. tuberculata*
 3. Umbilicus contained > 4.50 times in diameter 4
 – Umbilicus contained < 4.50 times in diameter 5
 4. Apical sculpture with spiral cords wavy in nucleus, aperture with 2 parietal and 1 palatal barrier well visible in apertural view *A. mamieana*
 – Apical sculpture with spiral cords, aperture with 1 parietal, deeply recessed low ridge *A. cryptodon*
 5. Aperture with 2 parietal barriers and with or without palatal low crease, body whorl laterally compressed. 6
 – Aperture with 1–3 parietal and 2–8 palatal barriers, body whorl laterally compressed or shouldered above and flattened below 7
 6. Aperture with 2 parietals and palatal crease well visible in apertural view, major ribs 60–100 on body whorl *A. amoana*
 – Aperture with 2 parietal barriers deeply recessed, major ribs 110–160 on body whorl *A. kuenthiana*
 7. Umbilicus contained < 3.00 times in diameter 8
 – Umbilicus contained > 3.00 times in diameter, body whorl laterally compressed 9
 8. Aperture with 1 parietal and 4 palatal barriers, major ribs very dense, body whorl laterally compressed *A. berlieri*
 – Aperture with 3 parietal and 6 palatal barriers, major ribs widely spaced, body whorl shouldered above and flattened below *A. cockerelli*
 9. Aperture with 2 parietal and 2 palatal barriers, 90–150 ribs on body whorl. *A. quadrilamellata*
 – Aperture with 2 parietal and 8 palatal barriers, 80 ribs on body whorl *A. derbesianus*

Key for species identification (group IV)

1. Major ribs reduced and very low. 2
 – Radial ribs greatly reduced, umbilicus very narrow, contained ca.14 times in diameter *A. bourailensis*
 2. Shell small, max. diameter 3.00 mm, umbilicus contained < 6.00 times in diameter, major ribs relatively widely spaced *A. vaoana*
 – Shell medium-sized, max. diameter 6.00 mm, umbilicus contained 6.00–10.00 times in diameter, major ribs closely set 3
 3. Major ribs irregularly spaced, umbilicus narrow, showing only penultimate whorl inside, body whorl laterally compressed *A. ostiolum*
 – Major ribs quite regularly spaced, umbilicus showing all whorls inside, body whorl bluntly keeled. *A. melaleucarum*

Key for species identification (group V)

1. Major ribs prominent or reduced and low, macrosculpture with creases crossing obliquely 2
 – Major ribs reduced and low or greatly reduced, macrosculpture without creases crossing obliquely, suture normal 11
 2. Major ribs prominent, apical sculpture smooth, suture impressed-detached 3
 – Major ribs prominent or reduced and low, apical sculpture with spiral cords, suture impressed, impressed-detached or channelled 4
 3. Shell medium sized max. diameter 5.00 mm, body whorl profile flattened above and rounded below periphery, no setae on major ribs, microspirals present on first definitive whorl. *A. cressoniana*
 – Shell large max. diameter 7.20 mm, body whorl profile flattened above and below rounded periphery, major ribs with setae, microspirals present on first two definitive whorls *A. costulifera*



- 4. Suture impressed, major ribs prominent or reduced and low 5
- Suture impressed-detached or channelled, ribs prominent. 6
- 5. Major ribs reduced and low with periostracal setae, umbilicus contained 3.60–4.00 times in diameter. *A. setosa*
- Major ribs prominent, no setae, umbilicus contained 2.20–2.60 times in diameter *A. perspectiva*
- 6. Suture impressed-detached, whorls normally coiled, upper margin of aperture slanted 7
- Suture channelled, whorls tightly coiled, upper margin of aperture slightly protruding *A. canaliculata*
- 7. Body whorl partially keeled, apical sculpture with spiral cords wavy in nucleus *A. incipiens*
- Body whorl flattened above and below periphery or rounded, apical sculpture with spiral cords 8
- 8. Body whorl rounded *A. goanna*
- Body whorl flattened above and below periphery 9
- 9. Shell medium sized max. diameter 6.20 mm, narrower reddish flammulations *A. tandjiana*
- Shell large max. diameter 8.00–9.00 mm, broad reddish flammulations. 10
- 10. Slightly higher H/D ratio, slightly lower velocity of whorl increment *A. memaoyana*
- Max. diameter 9.00 mm, slightly higher H/D ratio, whorls increasing slightly more rapidly *A. pinicola*
- 11. Major ribs reduced and low 20–70 on the body whorl, umbilicus contained 3.40–4.50 times in diameter, apical sculpture with discontinuous spiral grooves *A. bazini*
- Macro- and microsculpture greatly reduced, umbilicus contained 5.40–6.50 times in diameter, apical sculpture with spiral ridges *A. reducisculpta*

Key for species identification (group VI)

- 1. Apical sculpture with spiral cords, umbilicus contained <5 times in diameter 2
- Apical sculpture smooth, umbilicus relatively narrow, contained 5.00 times in diameter, major ribs dense *A. noumeensis*
- 2. Umbilicus very widely open, contained <2.50 times in diameter 3
- Umbilicus contained 2.70–4.70 times in diameter 5
- 3. Upper margin of aperture slanted, umbilical margin contour shouldered 4
- Upper margin of aperture protruding, umbilical margin contours rounded, major ribs widely spaced *A. tondeuana*
- 4. Body whorl flattened above and below, 55–70 major ribs on body whorl *A. kouvneleana*
- Body whorl rounded, 117 major ribs on body whorl *A. webbi*
- 5. Upper margin of aperture protruding, body whorl laterally compressed, 110–126 major ribs on body whorl. *A. lenis*
- Upper margin of aperture slanted. 6
- 6. Max. diameter 6.10 mm, major ribs relatively closely spaced, body whorl rounded, umbilical margin contours rounded *A. vetula*
- Max. diameter 3.25 mm, major ribs comparatively more widely spaced, umbilical margin contours shouldered 7
- 7. Umbilicus contained <3.10 times in diameter, body whorl rounded *A. coerulea*
- Umbilicus contained >3.30 times in diameter, body whorl flattened above and rounded below *A. khedeigneana*

Key for species identification (group VII)

- 1. Macro- and microsculpture greatly reduced, apical sculpture smooth, spiral grooves in postnuclear microsculpture present *A. miracidium*

SYSTEMATIC REVIEW

GROUP I

Andrefrancia kaala n. sp. (Figs 12–14, 40)

Type locality: Mount Kaala, New Caledonia.

Type material: Mount Kaala, S slope, 340 m a.s.l. (164°23'23"E 20°38'48"S). Dry forest, slope of ultrabasic rocks. CHAZEAU, TILLIER & TILLIER, August 27, 1986. Holotype d & paratypes 2 d MNHN.

Diagnosis. *A. kaala* is most similar to *A. subcoacta* but differs in having more numerous ribs on the body whorl, wider umbilicus, aperture ovately lunate, which is as high as the shell, strongly overlapping whorls, strongly sinuate lip, thin and shiny shell.

Description. Shell small, diameter 3.00–3.20 mm (holotype 3.20), with $3\frac{3}{4}$ – $4\frac{1}{8}$ (holotype $4\frac{1}{8}$) whorls. Apex and spire flat or barely elevated, shell height 1.40–1.50 mm (holotype 1.4), H_{sp}/H ratio 0.00–0.07 (mean 0.02, holotype 0.00), H/D ratio 0.44–0.50 (mean 0.47, holotype 0.44). Body whorl not descending. Protoconch with $1-1\frac{3}{8}$ whorls (holotype $1\frac{3}{8}$). Apical sculpture of about 12 distinct and narrow spiral lirae, wavy on embryonic shell. Sculpture of definitive

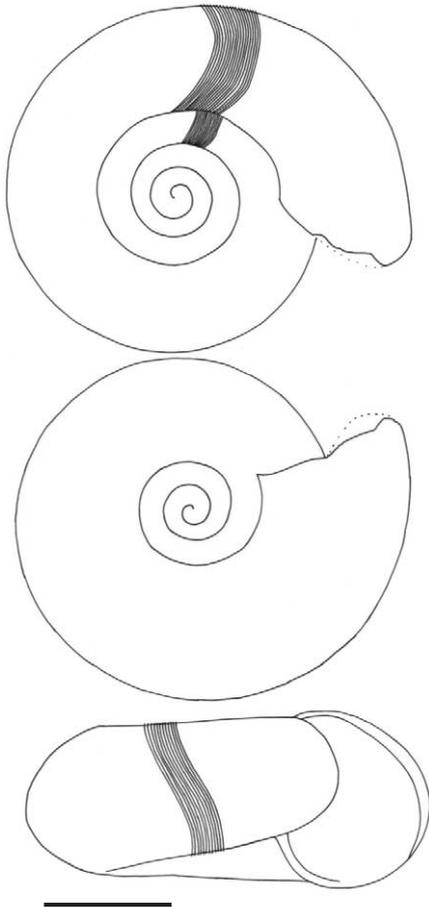


Fig. 12. *Andrefrancia kaala* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

whorls of narrow, fine, very dense, strongly protractively sinuated radial ribs, regularly spaced, 200–220 (mean 210, holotype 200) on the body whorl. Microsculpture of a lattice of radial riblets and spiral cords, which form well visible, elongate knobs at the intersection. Umbilicus open, 3.00–3.33 times (mean 3.18, holotype 3.20) smaller than shell diameter. Suture normal, spire whorls mildly rounded. Body whorl rounded. Aperture ovately lunate with oblique upper margin, aperture height equals that of shell, H_a/W_a ratio 1.27–1.40 (mean 1.32, holotype 1.27). Whorls strongly overlapping, W_{bw}/W_{lo} ratio 2.25–3.33 (mean 2.78, holotype 2.75). D/N_w ratio 0.77–0.80 (mean 0.78, holotype 0.78). Lip strongly sinuated. Colour uniform, faded horn; the shell shiny, slightly transparent and thin.

No alcohol-preserved material was available.

Name derivation. The name is derived from the name of the type locality Mount Kaala.

Distribution: Mount Kaala, New Caledonia, known from the type locality only.

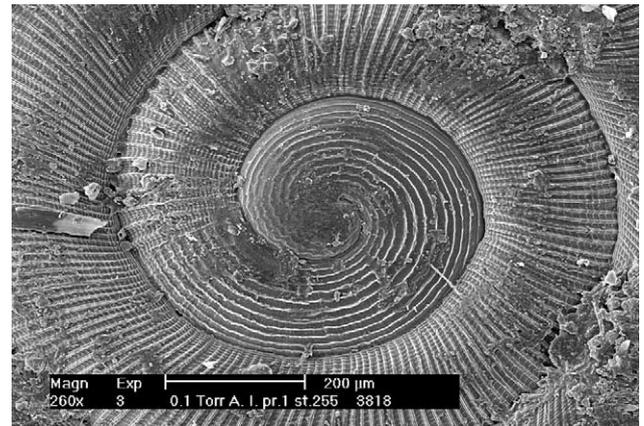


Fig. 13. *Andrefrancia kaala* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

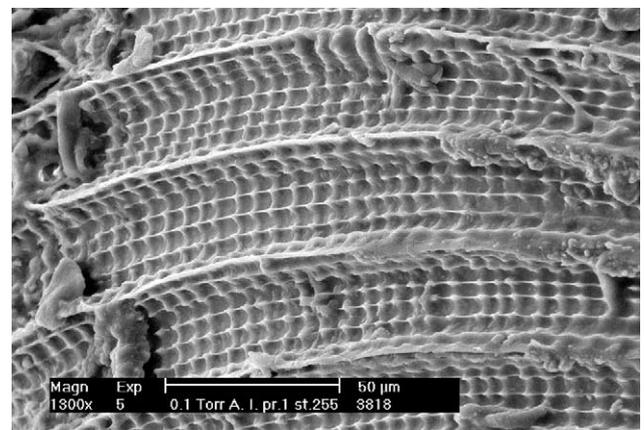


Fig. 14. *Andrefrancia kaala* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

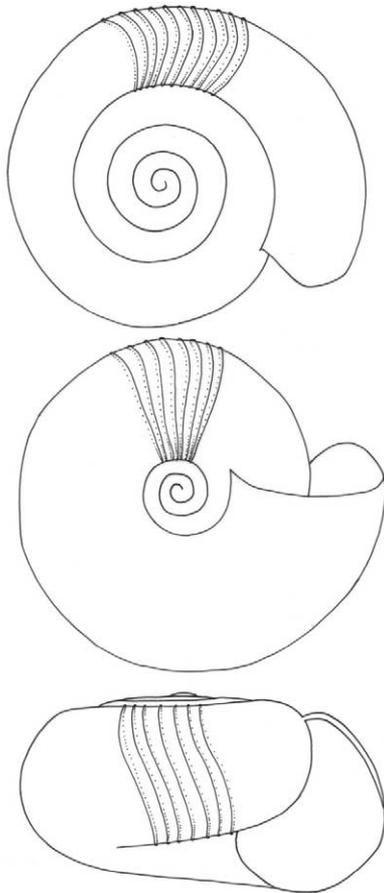
***Andrefrancia tiabetus* n. sp.** (Figs 15–16, 40)**Type locality:** Tiabet, New Caledonia.**Type material:** Tiabet (62°16'01.09"E 20°08'24"S). Dry forest. BOUCHET & CHEREL, August 1978. Holotype d & paratypes 6 d MNHN.**Diagnosis.** Conchologically this species is most similar to *A. compressa*, but well developed ribs, much wider umbilicus, body whorl less compressed laterally and ovately lunate aperture with protruding upper margin of the new species make them easy to distinguish.**Description.** Shell small, diameter 3.40–3.60 mm (holotype 3.40), with $4\frac{1}{4}$ – $4\frac{3}{4}$ (holotype $4\frac{1}{4}$) whorls. Apex and spire flat or barely elevated, shell height 1.70–2.00 mm (holotype 1.70), H_{sp}/H ratio 0.00–0.05 (mean 0.01, holotype 0.00), H/D ratio 0.50–0.56 (mean 0.53, holotype 0.50). Body whorl slightly descending. Protoconch with $1-1\frac{1}{2}$ whorls (holotype $1\frac{1}{4}$). Apical sculpture of about 10–12 spiral lirae. Definitive whorls with low, blunt, protractively sinuated radial ribs, regularly spaced, 55–84 (mean 71, holotype 70) on the body whorl. Microsculpture of radial riblets and spiral cords, which form well visible, elongate knobs at the intersection. Umbilicus open, 3.50–4.86 times (mean 4.27, holotype 4.86) smaller

Fig. 15. *Andrefrancia tiabetus* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

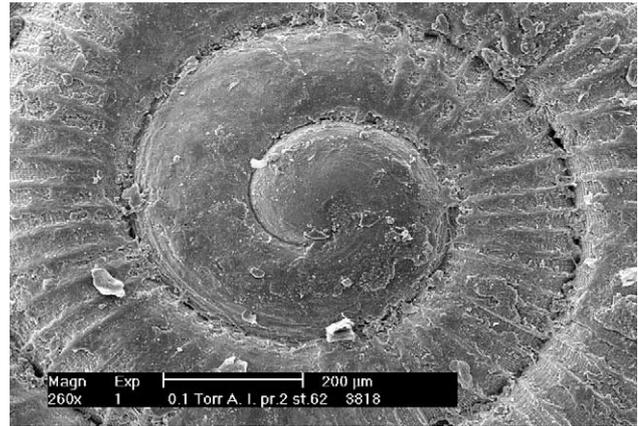


Fig. 16. *Andrefrancia tiabetus* n. sp.: apical and early post-nuclear sculpture of a paratype from the type locality (MNHN)

than the diameter. Suture impressed, spire whorls rounded. Body whorl laterally compressed and somewhat flattened above periphery. Aperture ovately lunate with flattened palatal wall above periphery, upper margin of aperture protruding, H_a/W_a ratio 1.06–1.25 (mean 1.14, holotype 1.07). Whorls slightly overlapping, W_{bw}/W_{lo} ratio 0.91–2.00 (mean 1.58, holotype 1.00). D/N_w ratio 0.76–0.80 (mean 0.79, holotype 0.80). Colour uniform, dull brown.

No alcohol-preserved material was available.

Name derivation. The name is derived from the name of the type locality Tiabet.**Distribution:** Tiabet, New Caledonia, known from the type locality only.***Andrefrancia compressa* n. sp.** (Figs 17–19, 40)**Type locality:** Bleue River, New Caledonia.**Type material:** Bleue River (166°39'16"E 22°06'13"S), 160 m a.s.l. Humid forest/alluvia. TILLIER & TILLIER, February 5, 1987. Holotype 1 d MNHN.**Diagnosis.** Greatly reduced major ribs, very narrow umbilicus, strongly laterally compressed body whorl and crescent-shaped aperture effectively separate this species from all its congeners.**Description.** Shell small, diameter 3.10 mm, with $4\frac{7}{8}$ whorls. Apex and spire unevenly flat, shell height 1.80 mm, H_{sp}/H ratio 0.00, H/D ratio 0.58. Body whorl rapidly descending. Protoconch with $1\frac{3}{4}$ whorl. Apical sculpture of about 18 low, narrow, spiral ridges very closely set. Radial ridges on embryonic shell invisible. Definitive whorls sculpture greatly reduced, consists of very fine, dense, low, and narrow, protractively sinuated radial ribs, present only on the second half of the body whorl. Microsculpture of each whorl except the last one of radial riblets, closely and regularly set. Microsculpture of body whorl consists of a lattice of radial riblets and low spiral cords, which form fine knobs at the intersection. Umbilicus very narrow, 31

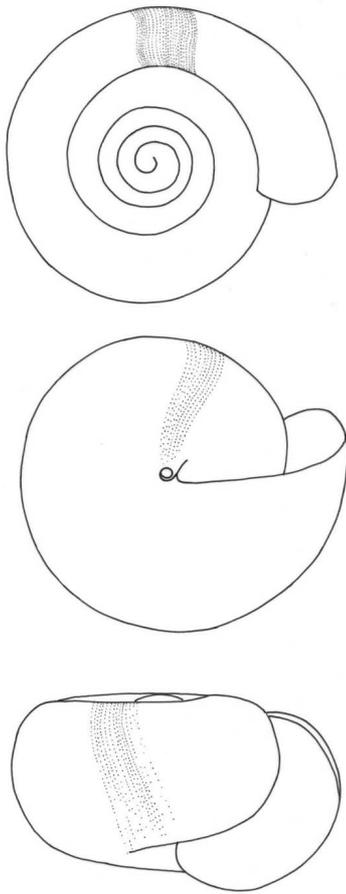


Fig. 17. *Andrefrancia compressa* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

times smaller than shell diameter. Suture impressed, spire whorls rounded. Body whorl strongly laterally compressed. Aperture crescent-shaped, H_a/W_a ratio 1.06. Whorls slightly overlapping, W_{bw}/W_{lo} ratio 1.80. D/N_w ratio 0.64. Lip slanted. Colour uniform amber, the shell slightly shiny.

Unfortunately, only a single specimen, with no soft parts present, was available.

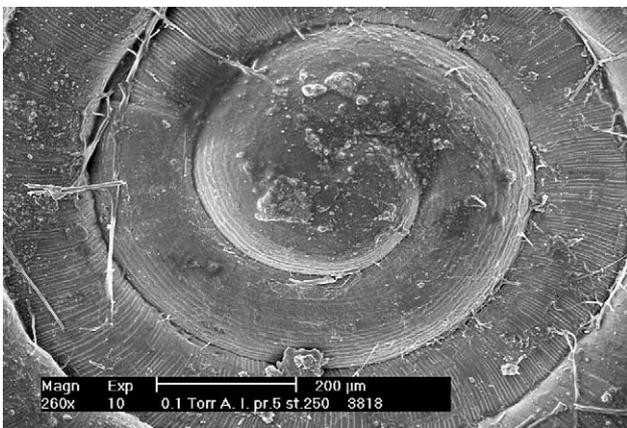


Fig. 18. *Andrefrancia compressa* n. sp., holotype (MNHN): apical and early postnuclear sculpture

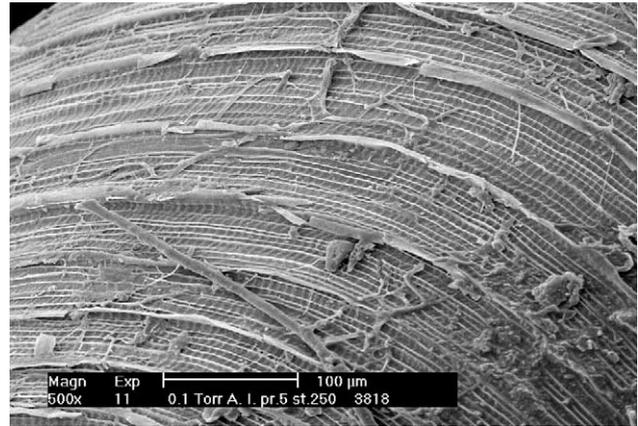


Fig. 19. *Andrefrancia compressa* n. sp., holotype (MNHN): sculpture of body whorl

Name derivation. The name is derived from the strongly laterally compressed body whorl.

Distribution: Bleue River, New Caledonia, known from the type locality only.

Andrefrancia blemou n. sp. (Figs 20–22, 40)

Type locality: Bleue River, New Caledonia.

Type material: Bleue River (166°39'25"E 22°05'47"S). Humid forest/ultrabasic rocks. BOUCHET, January 06, 1979. Holotype d. MNHN; Mount Mou (166°20'34"E 22°03'55"S), 1,150 m a.s.l. Humid forest. BOUCHET, August 21, 1985. Paratypes 2 d. MNHN.

Diagnosis. This species is quite similar to *subcoacta* but can be distinguished by its more strongly protractively sinuated ribs, more distinctly sinuated lip, slightly narrower umbilicus, more impressed suture and shiny shell.

Description. Shell small, diameter 2.50–3.60 mm (holotype 3.60), with $3\frac{1}{4}$ – $4\frac{1}{3}$ (holotype $4\frac{1}{3}$). Apex and spire slightly elevated, shell height 1.40–2.20 mm (holotype 2.20), H_{sp}/H ratio 0.06–0.09 (mean 0.07, holotype 0.09), H/D ratio 0.55–0.61 (mean 0.57, holotype 0.61). Body whorl descending. Protoconch with $1\frac{1}{4}$ – $1\frac{1}{2}$ whorls (holotype $1\frac{3}{8}$). Apical sculpture of 12–14 distinct and narrow spiral lirae, wavy on embryonic whorls, and numerous fine radial growth wrinkles. Between spirally sculptured protoconch and teleoconch there is a short disruptive segment that shows dense microriblets more pronounced than microspirals. Definitive sculpture consists of fine, dense, narrow, strongly protractively sinuated radial ribs, regularly spaced 125–145 (mean 133, holotype 145) on the body whorl. Microsculpture of a lattice of radial riblets and low spiral cords, which form conspicuous knobs at their intersection. There is one strongly pronounced microriblet only on one side of major ribs. Umbilicus narrow, 7.20–8.33 (mean 7.76, holotype 7.20) times smaller than shell diameter. Suture impressed, spire whorls rounded. Body whorl

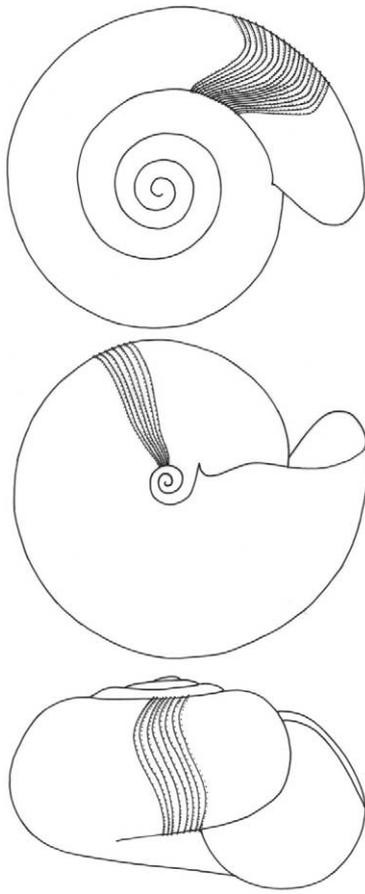


Fig. 20. *Andrefrancia blemou* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

slightly laterally compressed and gently flattened above periphery. Aperture roundly lunate and slightly flattened above periphery, H_a/W_a ratio 1.06–1.18 (mean 1.10, holotype 1.06). Whorls slightly overlapping, W_{bw}/W_{lo} ratio 2.50–2.75 (mean 2.64, holotype 2.75). D/N_w ratio 0.77–0.83 (mean 0.81, holotype 0.83). Lip distinctly sinuated. Colour uniform dark amber, shell shiny.

No alcohol-preserved material was available.

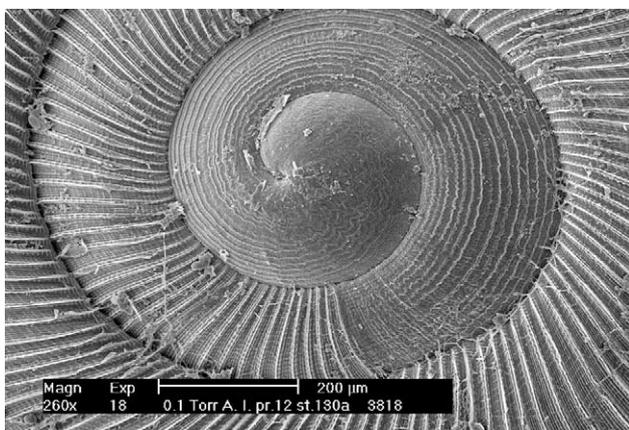


Fig. 21. *Andrefrancia blemou* n. sp., a specimen from Mount Mou (MNHN): apical and early postnuclear sculpture

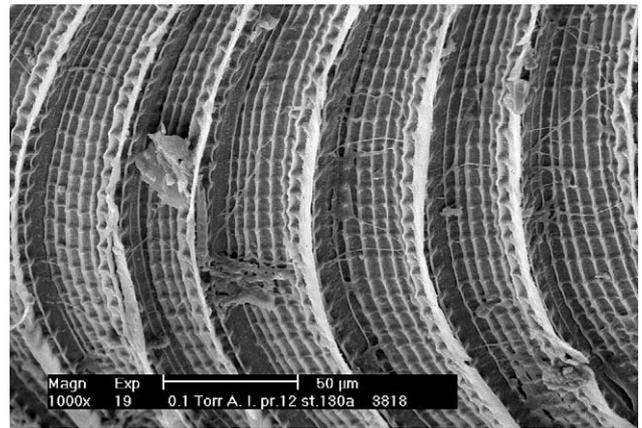


Fig. 22. *Andrefrancia blemou* n. sp., a specimen from Mount Mou (MNHN): sculpture of body whorl

Name derivation. The name is coined from the first three letters of the name of the river and the name of the mountain to indicate that this genus is found in both sites.

Distribution: Bleue River, Mount Mou, New Caledonia.

Andrefrancia mandjeliana n. sp. (Figs 23–25, 40)

Type locality: Mandjelia, New Caledonia.

Type material: Mandjelia (164°30'06"E 20°22'29"S), 400 m a.s.l. Humid forest: palms, tree ferns. TILLIER & TILLIER, July 02, 1979. Holotype d. & paratypes 3 d. MNHN.

Diagnosis. At first sight *A. mandjeliana* is much similar to *A. alveolus*, but it has wider umbilicus, nearly twice fewer ribs on the body whorl and slightly lower H/D ratio. The two samples were taken on the opposite ends of the island (Table 4).

Description. Shell large, diameter 4.60–5.10 mm (holotype 5.00), with $4\frac{1}{8}$ – $4\frac{3}{8}$ (holotype $4\frac{3}{8}$) whorls. Apex and spire flat or barely elevated, shell height 2.10–2.70 mm (holotype 2.70), H_{sp}/H ratio 0.00, H/D ratio 0.46–0.54 (mean 0.51, holotype 0.54). Body whorl slightly descending. Protoconch with $1\frac{1}{8}$ – $1\frac{1}{2}$ whorls (holotype $1\frac{1}{2}$). Apical sculpture of 12–14 distinct and narrow spiral lirae. Between spirally sculptured protoconch and teleoconch there is a short disruptive segment that shows dense micro-riblets more pronounced than microspirals. Definitive sculpture consists of fine, strongly protractively sinuated radial ribs, regularly spaced 63–76 (mean 69, holotype 76) on the body whorl. Microsculpture of a lattice of radial riblets and low spiral cords, which form small knobs at their intersection. Umbilicus open, 3.83–4.25 (mean 4.02, holotype 4.17) smaller than shell diameter. Suture channelled, spire whorls gently rounded. Body whorl slightly flattened above and rounded below periphery. Aperture roundly

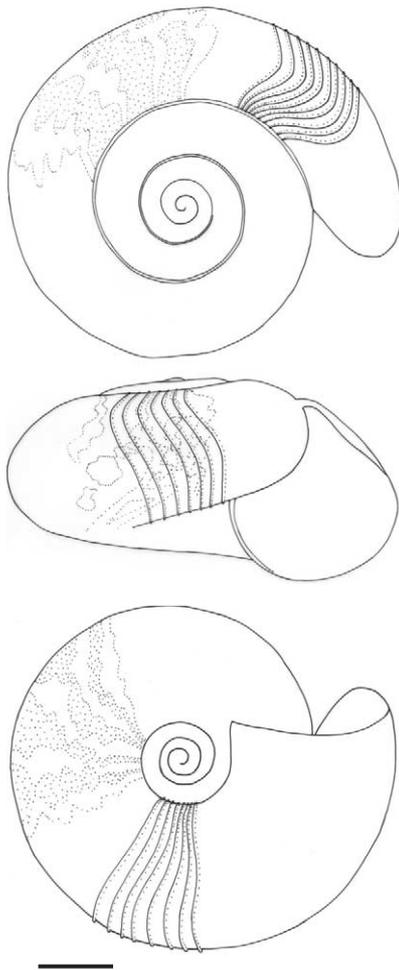


Fig. 23. *Andrefrancia mandjeliana* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

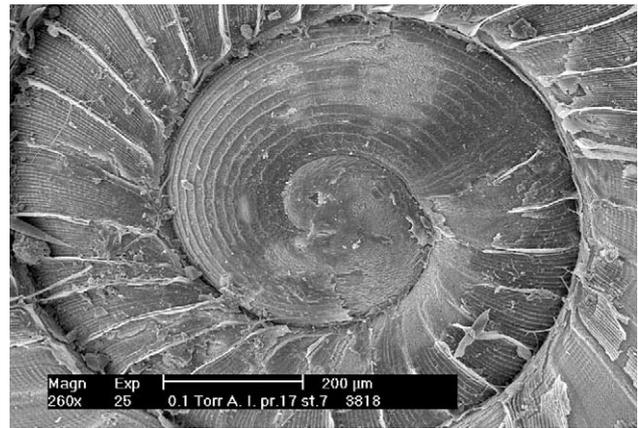


Fig. 24. *Andrefrancia mandjeliana* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

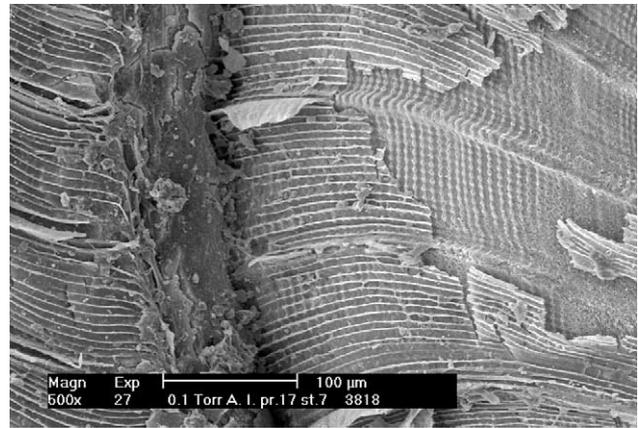


Fig. 25. *Andrefrancia mandjeliana* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

Table 4. Comparison of morphometric characters of *A. mandjeliana* and *A. alveolus*

Locality	H/D ratio	H _{sp} /H ratio	D/D _u ratio	Number of ribs on body whorl	Whorls
Baie du Prony (<i>A. alveolus</i>)	0.56	0.11	5.33	112	4 ¹ / ₄
	0.58	0.11	4.80	113	4 ³ / ₈
Mandjelia (<i>A. mandjeliana</i>)	0.46	0.00	3.83	63	4 ¹ / ₈
	0.54	0.00	3.83	68	4 ¹ / ₄
	0.51	0.00	4.25	64	4 ³ / ₈
	0.54	0.00	4.17	76	4 ³ / ₈

lunate with oblique upper margin, H_a/W_a ratio 1.00–1.14 (mean 1.05, holotype 1.14). W_{bw}/W_{lo} ratio 1.30–1.63 (mean 1.48, holotype 1.30). D/N_w ratio 1.08–1.17 (mean 1.13, holotype 1.14). Lip distinctly sinuated. Colour horn-reddish with creamy white flammulations.

No alcohol-preserved material was available.

Name derivation. The name refers to its occurrence in Mandjelia.

Distribution: Mandjelia, New Caledonia, known from the type locality only.

***Andrefrancia tillieriana* n. sp.** (Figs 26–28, 40)

Type locality: Mandjelia, New Caledonia.

Type material: Mandjelia (164°30'06"E 20°22'29"S), under a sawmill, 500 m a.s.l. Humid forest: palms, tree ferns. TILLIER & TILLIER, July 02, 1979. Holotype d. & paratypes 3 d. MNHN.

Other material examined: Mount Panié, summit, (164°45'57"E 20°35'27"S). 1,620 m a.s.l. Maquis *Agathis/Araucaria*. TILLIER & TILLIER, November 19, 1986. MNHN, 2 d.

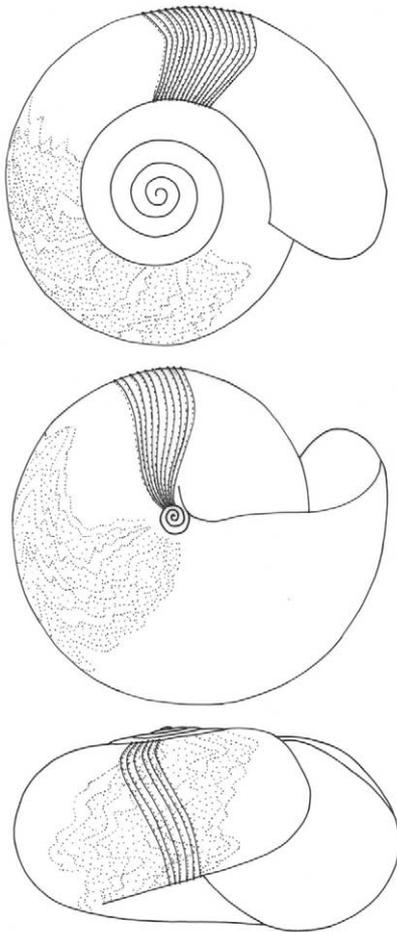


Fig. 26. *Andrefrancia tillieriana* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

Diagnosis. Conchologically this species resembles *A. mandjeliana* but differs from it in having more numerous ribs on the body whorl, impressed suture, much narrower umbilicus, less sinuated lip and rounded body whorl. It can be easily distinguished from *A. densicostata* by its larger size, lower number of major ribs on the body whorl, narrower umbilicus and more pronounced flammulations.

Description. Shell large, diameter 4.70–6.00 mm (holotype 6.00), with $4\frac{1}{4}$ – $5\frac{1}{4}$ (holotype $4\frac{1}{4}$) whorls. Apex and spire flat or barely elevated, shell height 2.60–3.50 mm (holotype 3.50), H_{sp}/H ratio 0.03–0.06 (mean 0.05, holotype 0.06), H/D ratio 0.55–0.59 (mean 0.57, holotype 0.57). Body whorl slightly descending. Protoconch with $1\frac{1}{4}$ – $1\frac{1}{3}$ whorls (holotype $1\frac{1}{4}$). Apical sculpture of about 14 distinct and narrow spiral lirae, wavy on embryonic shell, and numerous fine, radial wrinkles. Between spirally sculptured protoconch and teleoconch there is a short disruptive segment that shows dense microradials more pronounced than microspirals. Definitive sculpture con-

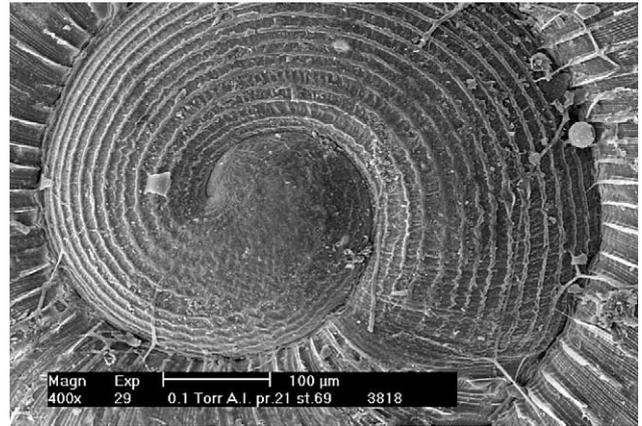


Fig. 27. *Andrefrancia tillieriana* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

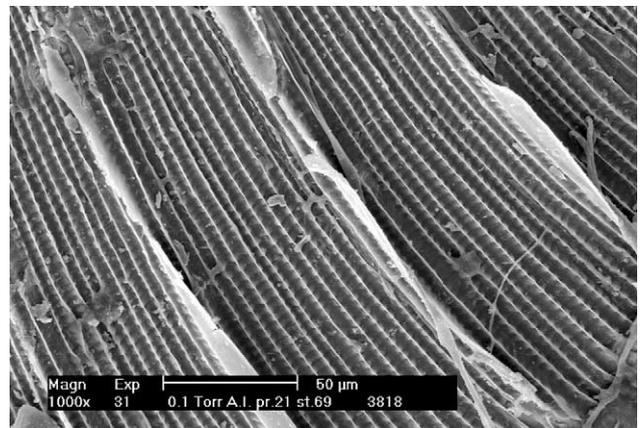


Fig. 28. *Andrefrancia tillieriana* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

sists of fine, strongly protractively sinuated radial ribs, regularly spaced 104–133 (mean 118, holotype 133) on the body whorl. Microsculpture of narrow radial riblets and obscure spiral cords, that are more pronounced as lateral supports to the microradials on their both sides. Tiny knobs at the intersection present. This pattern of strongly reduced microspirals occurs on each whorl. Umbilicus narrow, 9.40–14.00 (mean 12.10, holotype 12.00) smaller than shell diameter. Suture impressed, spire whorls barely rounded. Body whorl rounded. Aperture roundly lunate with flattened columellar margin and flattened above periphery, H_a/W_a ratio 0.97–1.09 (mean 1.03, holotype 0.97). Whorls strongly overlapping, W_{bw}/W_{lo} ratio 2.43–3.00 (mean 2.59, holotype 2.50). D/N_w ratio 1.01–1.41 (mean 1.13, holotype 1.41). Lip sinuated. Colour horn-reddish with creamy white flammulations.

No alcohol-preserved material was available.

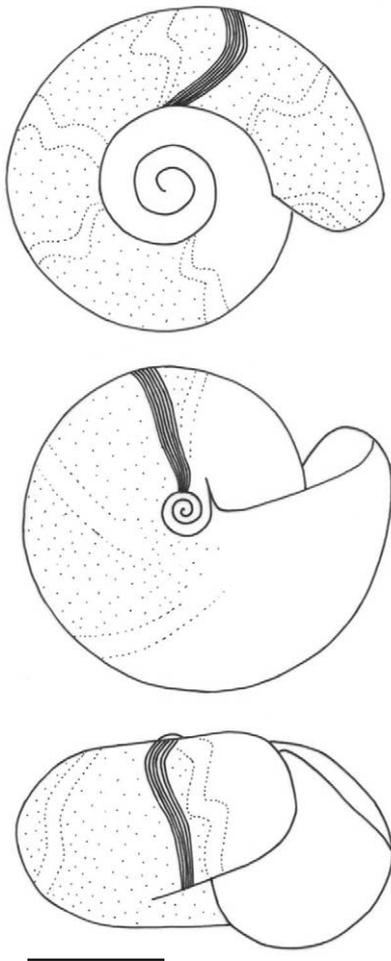
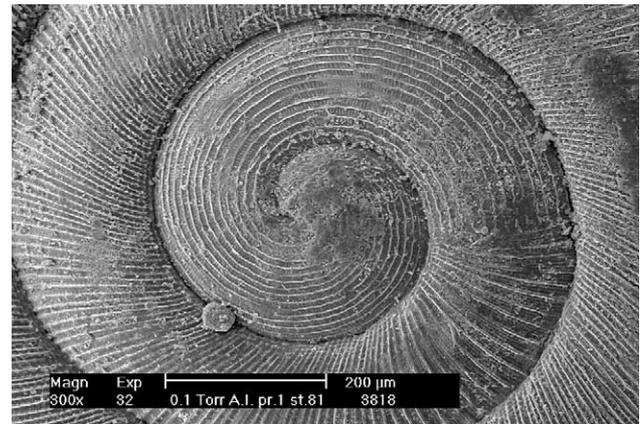
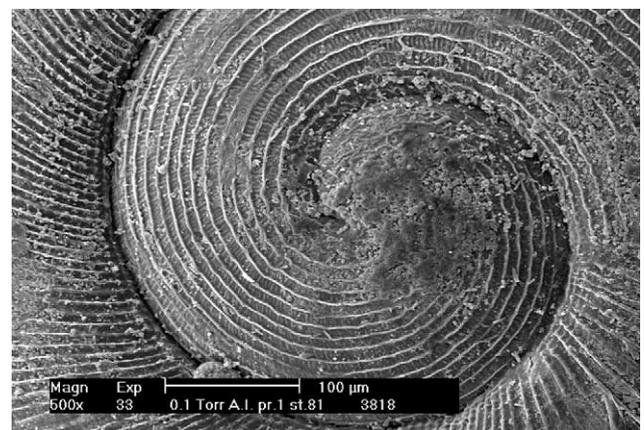
Name derivation. The name is derived from the name of the collectors of the new species.

Distribution: Mandjelia, Mount Panié, New Caledonia.

***Andrefrancia densicostata* n. sp.** (Figs 29–33, 40)**Type locality:** Mount Panié, New Caledonia.**Type material:** Mount Panié (164°47'40"E 20°35'53"S), 1,100 m a.s.l. *Pandanus* and palm forest. BOUCHET & CHEREL, August 14, 1978. Holotype a. & paratypes 8 a. (4 dissected). MNHN.**Other material examined:** Mount Panié (164°45'38"E 20°34'53"S), E slope, 1,350 m a.s.l. Humid forest, *Agathis*/schist. CHAZEAU, TILLIER & TILLIER, November 18, 1986. 2 a. MNHN.**Diagnosis.** *A. densicostata* differs from *A. tillieriana* in its much smaller shell size; fine, very dense major ribs; wider umbilicus; indistinct, mild zigzag and widely spaced flammulations.**Description.** Shell. Shell diameter 1.70–3.50 mm (holotype 2.60), with 2⁵/₈–4 (holotype 3¹/₂) whorls. Apex and spire flat, shell height 1.00–2.20 mm (holotype 1.60), H_{sp}/H ratio 0.00–0.05 (mean 0.00, holotype 0.00), H/D ratio 0.47–0.63 (mean 0.58, holotype 0.62). Body whorl slightly descending. Protoconch with 1–1³/₈ whorls (holotype 1¹/₄). Apical sculpture of about 14 distinct and narrow spiral lirae,

way on embryonic whorls, and numerous fine, radial wrinkles. Definitive sculpture consists of fine, very dense, distinctly protractively sinuated radial ribs, regularly spaced 200–250 (mean 235, holotype 240) on the body whorl. Microsculpture of narrow radial riblets and remnants of spiral cords, which form barely visible knobs at their intersection. Spiral cords and tiny beads better pronounced in the sutures. Umbilicus narrow, 5.60–8.75 (mean 7.06, holotype 8.67) smaller than shell diameter. Suture impressed, spire whorls gently rounded. Body whorl rounded. Aperture roundly lunate with flattened columellar margin and flattened above periphery, H_a/W_a ratio 1.06–1.30 (mean 1.15, holotype 1.07). Whorls overlapping, W_{bw}/W_{lo} ratio 2.00–3.33 (mean 2.54, holotype 2.25). D/N_w ratio 0.67–1.00 (mean 0.83, holotype 0.73). Lip sinuated. Colour horn-reddish with creamy white flammulations, mildly zigzag, widely spaced. The flammulations become oblique stripes, fading up on shell base.

Animal creamy white.

Genital system. Ootestis as a single cluster of palmately clavate alveoli. Hermaphroditic duct slightly convoluted with a yellow-golden sheen. Epiphallus asFig. 29. *Andrefrancia densicostata* n. sp.: shell of the holotype (MNHN); scale bar = 1 mmFig. 30. *Andrefrancia densicostata* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculptureFig. 31. *Andrefrancia densicostata* n. sp., a paratype from the type locality (MNHN): apical sculpture

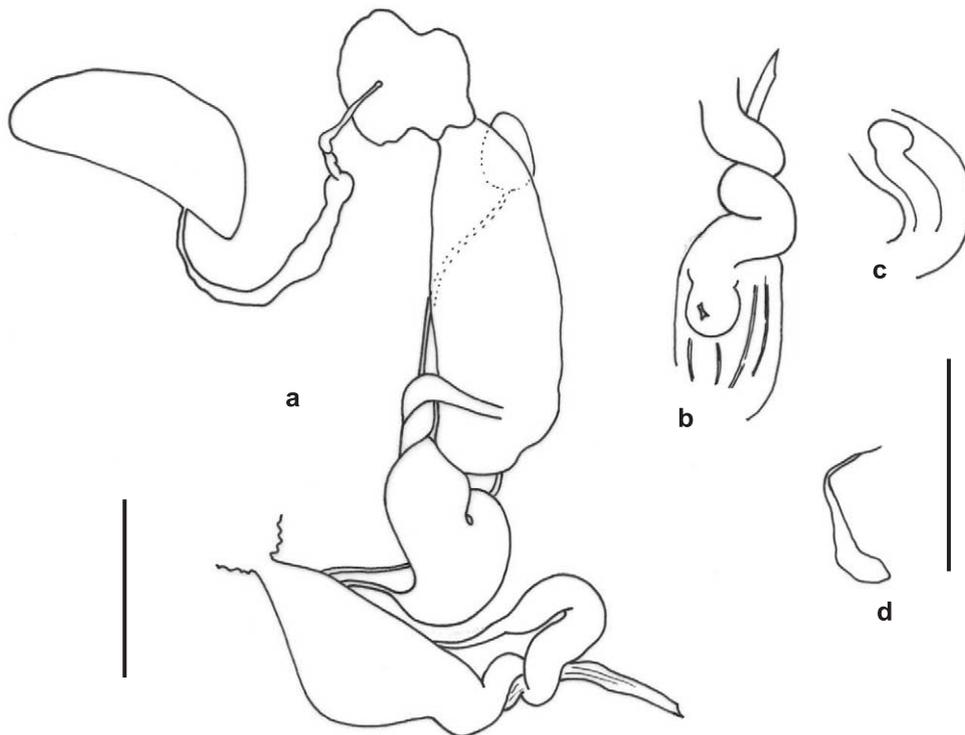


Fig. 32. *Andrefrancia densicostata* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – interior of penis; c – interior of vagina; d – spermatophore; scale bar = 1 mm

long as penis, coiled around penial retractor muscle. The interior of epiphallus could not be examined because of its very small size. Epiphallus enters the penis apically through a fleshy globular verge. Penial retractor muscle inserts at the penis/epiphallus junction. Penis constricted in one third of its length, tapering to atrium junction. There are neither penial glandulae nor other accessory structures. Internally penis shows an apical small, bulbous verge with terminal pore, which is the outlet of epiphallus. Below, there are few longitudinal pilasters. Vagina cylindrical, shorter than penis. Inside vagina there is a unique mushroom-shaped structure. Few fine longitudinal pilasters. Free oviduct and spermathecal shaft twisted twice. No data on pilasters in free oviduct and spermathecal

shaft. Free oviduct shorter than penis, narrow. Spermathecal shaft very wide at base, then narrowed abruptly. Spermatophore tadpole-shaped.

Name derivation. The name of the new species *densicostata* is derived from the very densely arranged major ribs.

Distribution: Mount Panié, New Caledonia.

Andrefrancia angustiumbilocata n. sp. (Figs 34–37, 40)

Type locality: Mount Panié, New Caledonia.

Type material: Mount Panié, summit (164°45'57"E 20°35'27"S), 1,620 m a.s.l. Maquis *Agathis/Araucaria*. TILLIER & TILLIER, November 19, 1986. Holotype a & paratypes 2 a. (1 dissected). MNHN.

Diagnosis. This species differs from *A. densicostata* in having somewhat wider spaced major ribs, pin-point umbilicus and channelled suture.

Description. Shell. Shell diameter 2.70–3.10 mm (holotype 2.9), with $3\frac{3}{4}$ –4 (holotype $3\frac{3}{4}$) whorls. Apex and spire barely elevated, shell height 1.60–1.70 mm (holotype 1.60), H_{sp}/H ratio 0.06 (holotype 0.06), H/D ratio 0.43–0.55 (mean 0.47, holotype 0.55). Body whorl slightly descending. Protoconch with $1\frac{1}{4}$ – $1\frac{1}{3}$ whorls (holotype $1\frac{1}{3}$). Apical sculpture of about 10 distinct and narrow spiral lirae, wavy on embryonic whorls, and numerous fine, radial wrinkles. Definitive sculpture consists of fine, very dense, distinctly protractively sinuated radial ribs, regularly

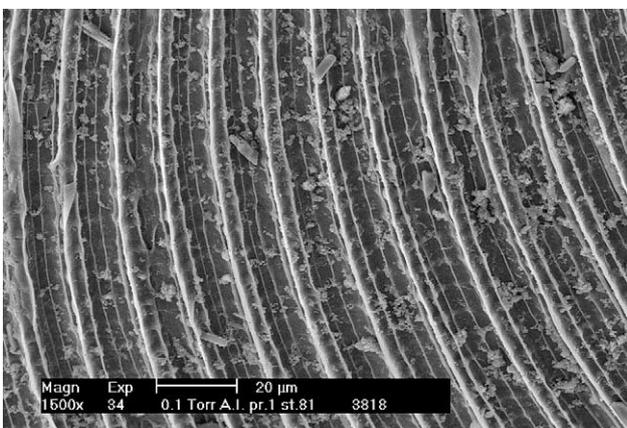


Fig. 33. *Andrefrancia densicostata* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

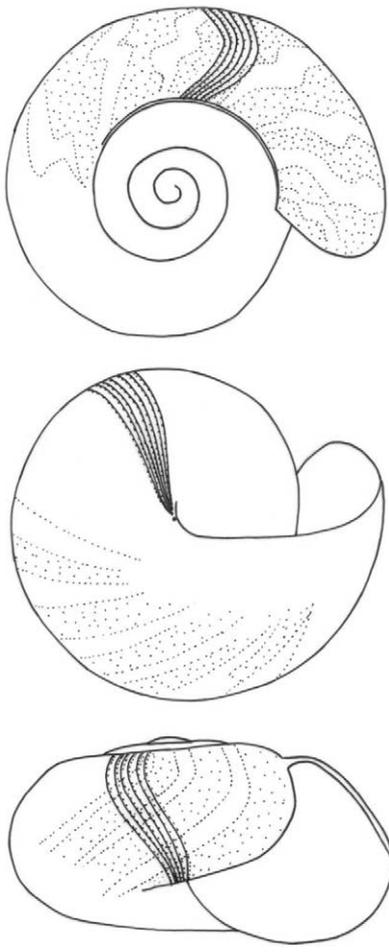


Fig. 34. *Andrefrancia angustiumblicata* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

spaced 135–181 (mean 162, holotype 181) on the body whorl. Microsculpture of a lattice of equally developed radial riblets and spiral cords, which form elongate beads at their intersection. One more pronounced microriblet present on one side of each major rib. Umbilicus pin-point. Suture narrowly channelled, spire whorls barely rounded. Body whorl rounded, slightly flattened above periphery, no keel. Aperture roundly lunate with flattened columellar

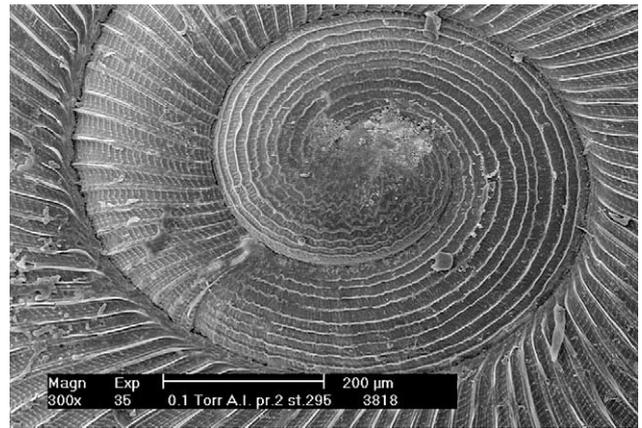


Fig. 36. *Andrefrancia angustiumblicata* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

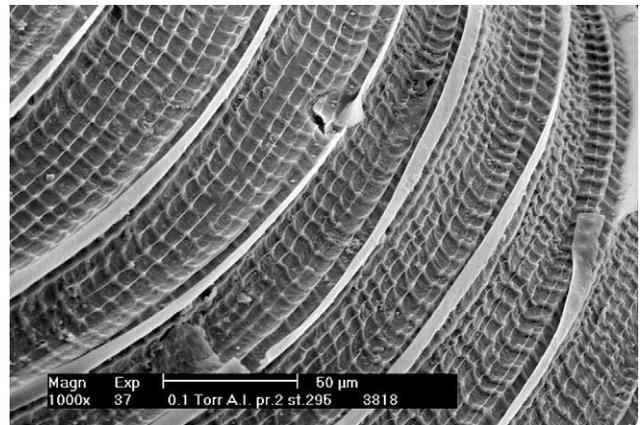


Fig. 37. *Andrefrancia angustiumblicata* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

margin and flattened above periphery, H_a/W_a ratio 0.82–0.93 (mean 0.87, holotype 0.93). Whorls overlapping, W_{bw}/W_{10} ratio 1.80–2.25 (mean 2.02, holotype 2.25). D/N_w ratio 0.72–0.78 (mean 0.76, holotype 0.77). Lip sinuated. Colour horn-reddish with creamy white flammulations, mildly zigzag. The flammulations become oblique stripes on shell periphery, fading up on shell base.

Animal creamy white.

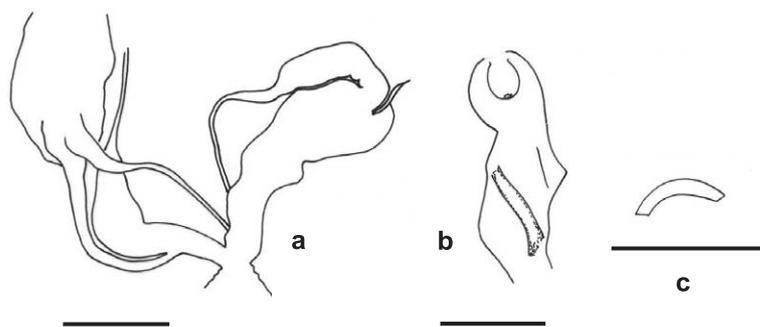


Fig. 35. *Andrefrancia angustiumblicata* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – interior of penis; c – spermatophore; scale bar = 1 mm

Genital system. Ovotestis is a single cluster of palmately clavate alveoli. Hermaphroditic duct slightly convoluted with a yellow-golden sheen. Epiphallus shorter than penis, internally with two pilasters, entering the penis apically through a fleshy globular verge. Penial retractor muscle inserts at the penis/epiphallus junction, not twisted. Penis pouch-shaped, tapering to atrium junction. There are neither penial glandulae nor other accessory structures. Internally penis shows an apical small, bulbous verge with terminal pore, which is the epiphallus outlet. Below, in the mid position, an oblique thickening. Vagina cylindrical, slightly shorter than penis. No vaginal pilasters. Free oviduct and spermathecal shaft not twisted. No data on pilasters in free oviduct and spermathecal shaft. Free oviduct long. Spermathecal shaft wide at base then narrowed abruptly. Spermatophore comma-shaped.

Name derivation. The name of the new species refers to its pin-point umbilicus.

Distribution: Mount Panié, New Caledonia, known from the type locality only.

***Andrefrancia subcoacta* (Gassies, 1870) (Figs 38, 40)**

Helix subcoacta GASSIES 1870: 140. Type locality: Art Island, New Caledonia. Holotype figured by FRANC 1957: pl. 12, fig. 160, The Natural History Museum, London.

Helix subcoacta GASSIES 1871: 24, pl. 1, fig. 10.

Charopa subcoacta (Gassies) ANCEY 1888: 366; CROSSE 1894: 235; PILSBRY 1894: 33; FRANC 1957: 122–123, pl. 12, fig. 160 (holotype of *A. subcoacta*).

Andrefrancia subcoacta (Gassies) SOLEM 1961: 456.

Material examined: Bourail, seacoast, river drift; COCKERELL 1928 CNHM 73953, 6 d (labelled as *Andrefrancia subcoacta*).

Diagnosis. *A. subcoacta* differs from *A. kaala* in having a lower number of major ribs on the body whorl, narrower umbilicus, aperture roundly lunate and lower than shell height, slightly overlapping whorls, less distinctly sinuated lip and more solid shell. This species is quite similar to *A. blemou*, but can be distinguished by its less protractively sinuated radial ribs, slightly wider umbilicus, less distinctly sinuated lip and normal suture.

Description. Shell diameter 2.05–3.36 mm, with $3\frac{1}{4}$ – $4\frac{1}{2}$ whorls. Apex and spire slightly elevated, shell height 1.10–1.71 mm, H_{sp}/H ratio 0.05–0.13, (mean 0.08), H/D ratio 0.46–0.53 (mean 0.50). Body whorl descending rapidly. Protoconch with $1\frac{1}{4}$ – $1\frac{1}{2}$ whorls. Apical sculpture of about 7 spiral lirae. Definitive sculpture of fine, very dense, distinctly protractively sinuated radial ribs regularly spaced 110–150 (mean 135) on the body whorl. Microsculpture of a lattice of

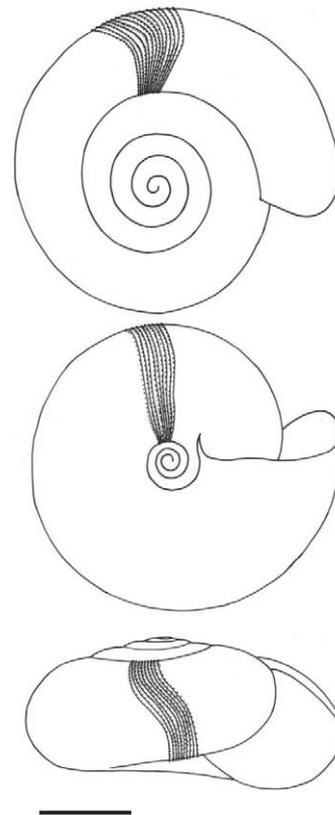


Fig. 38. *Andrefrancia subcoacta*: shell of a specimen from Bourail (CNHM 73953); scale bar = 1 mm

radial riblets and spiral cords. Umbilicus relatively narrow, 5.44–7.50 (mean 6.18) smaller than shell diameter. Suture normal, spire whorls barely rounded. Body whorl slightly flattened above periphery and rounded below. Aperture roundly lunate with flattened columellar margin and flattened above periphery, H_a/W_a ratio 0.86–1.00 (mean 0.93). Whorls slightly overlapping, W_{bw}/W_{lo} ratio 1.50–2.75 (mean 2.06). D/N_w ratio 0.63–0.80 (mean 0.72). Lip sinuated. Colour uniformly brightly horn.

No alcohol-preserved material was available.

Remarks. There are some differences between the present results and the description of *Charopa subcoacta* given by FRANC (1957). FRANC mentioned quite a large umbilicus, less than four times smaller than shell diameter, relatively deep suture, the aperture slightly angulated and rusty shell colour. *A. subcoacta* needs an SEM examination, to observe microsculpture details.

Distribution: Bourail, New Caledonia.

***Andrefrancia alveolus* (Gassies, 1881) (Figs 39–40)**

Helix alveolus GASSIES 1881: 336–337. Type locality: Baie du Prony, New Caledonia. Holotype pl. 11, fig. 1. Holotype of *Andrefrancia alveolus* CNHM 46239, paratype of *A. margueritae* ANSP 98180.

Micromphalia alveolus (Gassies) TRYON 1886: 216, pl. 63, fig. 77–79.

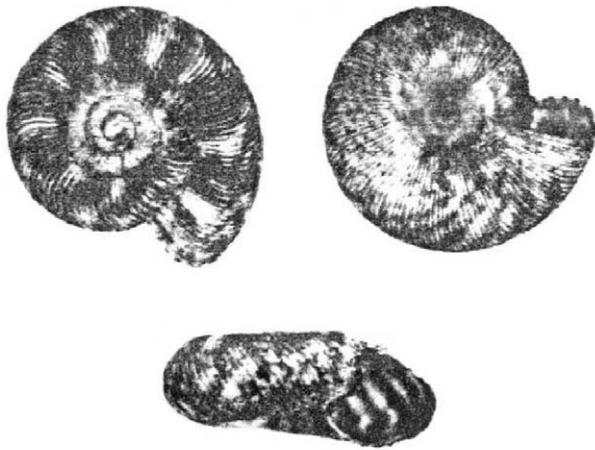


Fig. 39. *Andrefrancia alveolus*: shell of a paratype of *Andrefrancia margaritae* (ANSP 98180), after SOLEM 1961

Charopa alveolus (Gassies) ANCEY 1888: 368; CROSSE 1894: 232.

Endodonta (Charopa) alveolus (Gassies) PILSBRY 1893: 33.

?*C. margaritae* (Preston) PRESTON 1907a : 217, fig. 2 (holotype of *A. margaritae*).

Charopa alveolus (Gassies) FRANC 1957: 117, pl. XII, fig. 150 (holotype of *A. margaritae*).

Andrefrancia alveolus (Gassies) SOLEM 1961: 454, 456, fig. 12 (holotype of *A. margaritae*).

Material examined: Baie du Prony leg. DUPUY 1887. MNHN, 2 d (labelled as *Andrefrancia/Helix alveolus*).

Diagnosis. Conchologically *A. alveolus* is most similar to *A. mandjeliana* but narrower umbilicus, nearly twice more numerous major ribs on the body whorl and remote localities make them easy to tell apart.

Description. Shell large, diameter 4.80 mm, with $4\frac{1}{4}$ – $4\frac{3}{8}$ whorls. Apex and spire flat or barely elevated, height of shell 2.70–2.80 mm, H_{sp}/H ratio 0.11, H/D ratio 0.56–0.58 (mean 0.57). Body whorl slightly descending. Protoconch with $1\frac{1}{3}$ – $1\frac{3}{8}$ whorls. Apical sculpture of several spiral lirae. Definitive sculpture consists of fine, strongly protractively sinuated radial ribs, regularly spaced 112–113 on the body whorl. Microsculpture of a lattice of radial riblets and low spiral cords. Umbilicus open, 4.80–5.33 (mean 5.07) smaller than shell diameter. Suture channelled, spire whorls gently rounded. Body whorl rounded and slightly flattened above periphery. Aperture roundly lunate with oblique upper margin, H_a/W_a ratio 1.05–1.15 (mean 1.10). W_{bw}/W_{lo} ratio 1.75–2.00 (mean 1.88). D/N_w ratio 1.10–1.13 (mean 1.11). Lip distinctly sinuated. Colour light, yellow horn with reddish flammulations.

No alcohol-preserved material was available.

Remarks. Two examined specimens conform to the description of *Charopa alveolus* given by FRANC (1957), but there is one inaccuracy in the characteristics, concerning the nature of the suture. FRANC described it as well marked, while SOLEM (1961) mentioned a channel. *A. alveolus* needs SEM examination to ob-

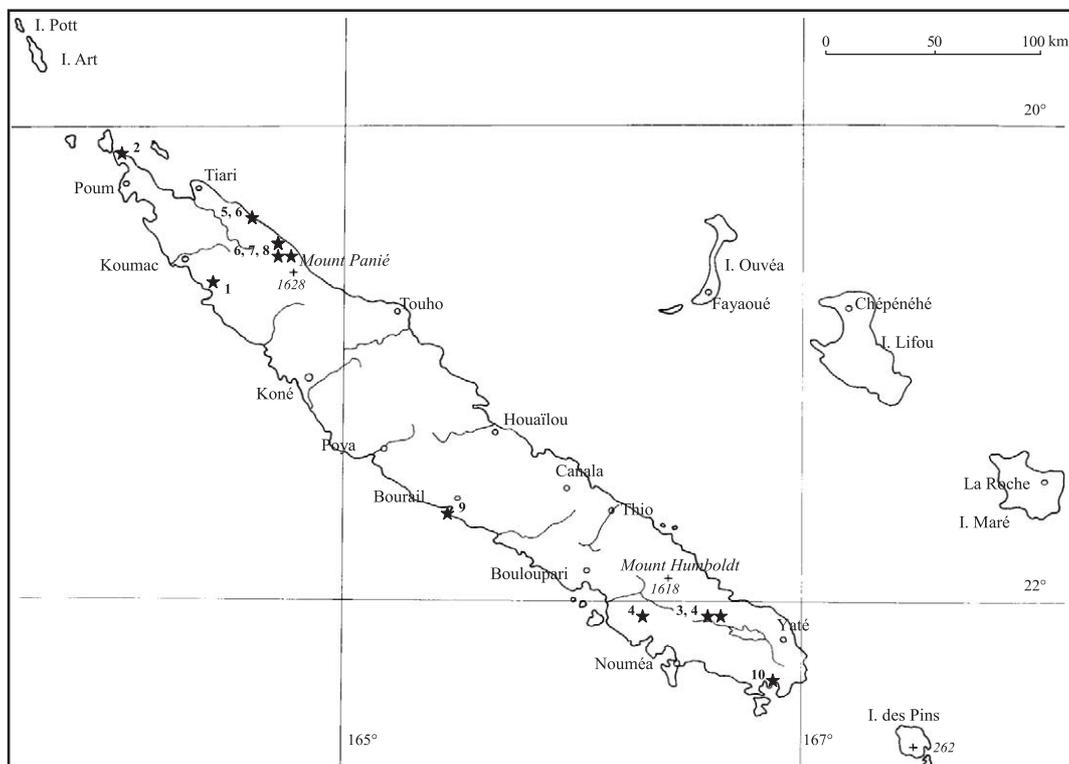


Fig. 40. Distribution map of *Andrefrancia*, group I

1 – *A. kaala*, 2 – *A. tiabetus*, 3 – *A. compressa*, 4 – *A. blemou*, 5 – *A. mandjeliana*, 6 – *A. tillieriana*, 7 – *A. densicostata*, 8 – *A. angustiumbilicata*, 9 – *A. subcoacta*, 10 – *A. alveolus*

serve details of embryonic and postembryonic sculpture. SOLEM (1961) distinguished two species: *Andrefrancia alveolus* and *A. margueritae* on the basis of some differences between a paratype (ANSP 98180) of the latter and *A. alveolus* (CNHM 46239). *A. margueritae* was not examined in this revision.

Distribution: Prony Bay, New Caledonia.

GROUP II

***Andrefrancia dispersa* (Gassies, 1863)** (Figs 41–44, 60)

Helix gyrina GASSIES 1859 (not Deshayes, 1850): 369.

Type locality: Isle of Pines, New Caledonia. Holotype figured by FRANC 1957: 121, pl. 12, fig. 157a, The Natural History Museum, London.

Helix dispersa GASSIES 1863: 29, pl. 1, fig. 12 – new name for *H. gyrina*; GASSIES 1859 (not Deshayes, 1850).

Rhytida dispersa (Gassies) ANCEY 1882: 86.

Charopa dispersa (Gassies) ANCEY 1888: 336; PILSBRY 1893: 33; CROSSE 1894: 228.

Endodonta (*C.*) *dispersa* (Gassies) DAUTZENBERG 1923: 141.

Charopa aheni PRESTON 1907: 217, fig. 1.

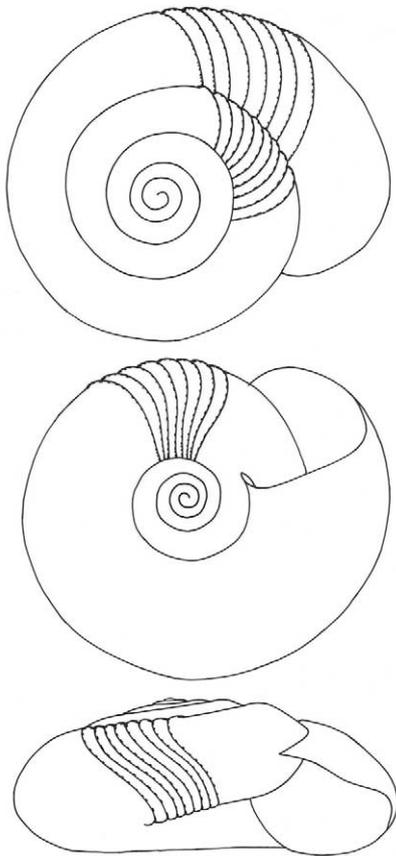


Fig. 41. *Andrefrancia dispersa*: shell of a specimen from Nouméa (MNHN); scale bar = 1 mm

Charopa dispersa (Gassies) FRANC 1957: 121, pl. 12, Figs 157a (holotype of *dispersa*), 157b (holotype of *aheni*), pl. 13, fig. 157.

Andrefrancia dispersa (Gassies) SOLEM 1961: 457 (paratype of *Charopa aheni* Preston ANSP 98184).

Material examined: Nouméa. Fischer, leg. MARIE, 1872. MNHN, 5 d. (labelled as *Andrefrancia/Helix dispersa*, *Helix gyrina*); Bleue River (166°40'01"E 22°05'59"S). 170 m a.s.l. Humid forest/slope of ultrabasic rocks. TILLIER & TILLIER, August 15, 1986. MNHN, 1 d; Bleue River (166°40'01"E 22°05'59"S). 170 m a.s.l. Humid forest/slope of ultrabasic rocks. TILLIER & TILLIER, January 13, 1987. MNHN, 4 a. (2 dissected).

Diagnosis. *A. dispersa* can be easily distinguished from *A. rusticula* and *A. calliope* by its smaller size, lower number of ribs which are very regularly spaced on the body whorl; more widely open umbilicus, 3 times or over 3 times smaller than shell diameter, and the upper margin of aperture arc-like inflected.

Description. Shell. Shell diameter 3.50–6.00 mm with $4\frac{1}{6}$ – $5\frac{1}{4}$ whorls. Shell height 1.60–2.90 mm, H_{sp}/H ratio 0.03–0.16 (mean 0.09), H/D ratio 0.46–0.52

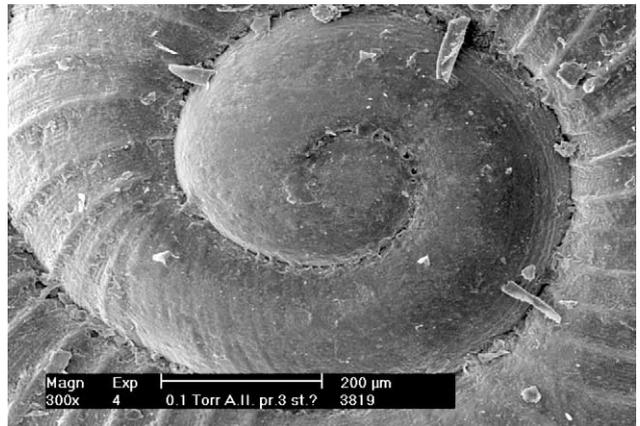


Fig. 42. *Andrefrancia dispersa*, a specimen from Nouméa (MNHN): apical and early postnuclear sculpture

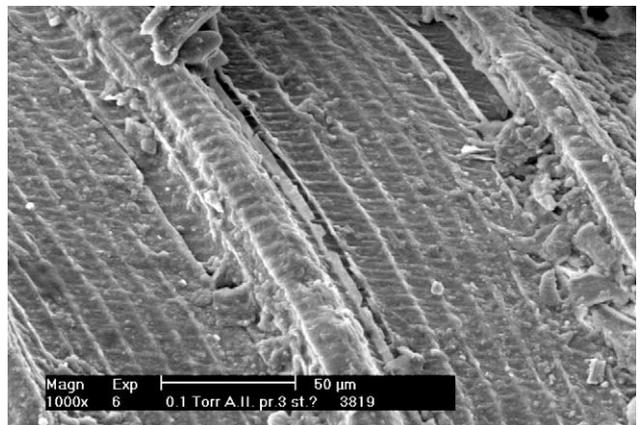


Fig. 43. *Andrefrancia dispersa*, a specimen from Nouméa (MNHN): sculpture of penultimate whorl

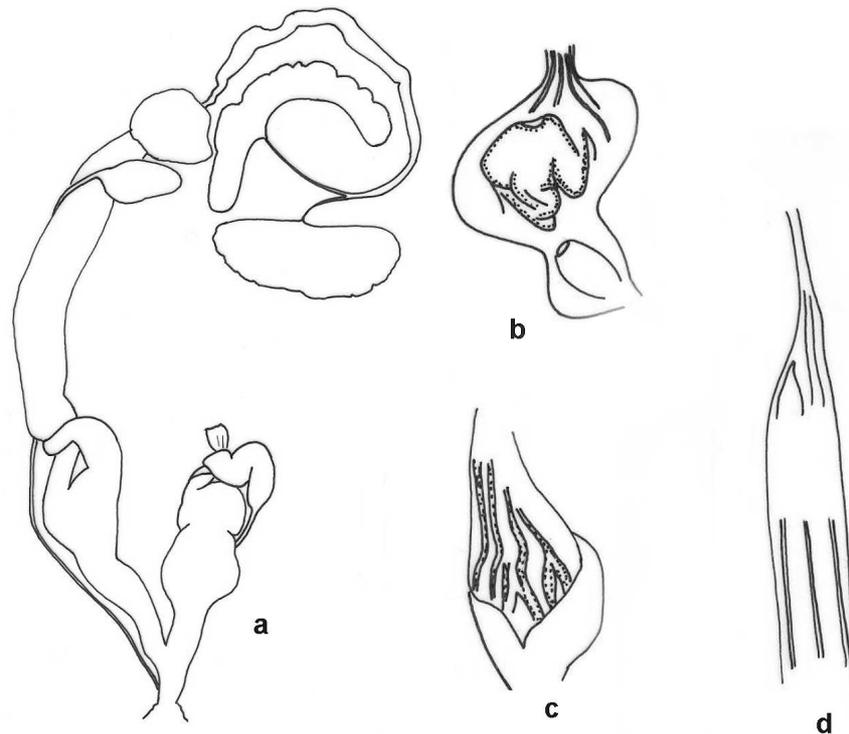


Fig. 44. *Andrefrancia dispersa*: reproductive system of a specimen from Bleue River (MNHN): a – genitalia; b – interior of penis; c – interior of vagina; d – interior of epiphallus and vas deferens entrance; scale bar = 1 mm

(mean 0.50). Protoconch with $1\frac{1}{4}$ – $1\frac{1}{2}$ whorls. Apical sculpture of some very fine spiral lirae, visible on the outer part of protoconch width. Definitive sculpture of 52–80 (mean 66) ribs on the body whorl. Microsculpture typical of the group. Umbilicus widely open, 2.92–3.38 times (mean 3.16) smaller than shell diameter. Body whorl more or less equally flattened above and below periphery. Aperture roughly rounded, distinctly flattened above periphery, upper margin often arc-like inflected, outer margin slightly arched, H_a/W_a ratio 0.86–1.44 (mean 1.00). W_{bw}/W_{lo} ratio 1.60–2.13 (mean 1.91). D/N_w ratio 0.84–1.20 (mean 1.02). Colour uniformly horny brown, dull.

Animal greyish.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct slightly convoluted with a golden-yellow sheen. Epiphallus shorter than penis, entering it subapically through a fleshy globular verge. Internally epiphallus shows three longitudinal pilasters. Vas deferens entrance into epiphallus valvular. Penial retractor muscle insertion adjacent to the penis/epiphallus junction; enfolding epiphallus. Penis moderately long, two-chambered, strongly constricted in the middle and tapered to atrium junction. There are neither penial glandulae nor other accessory structures. Internally upper chamber with a fleshy, globular verge, which is the outlet of epiphallus. Lower chamber, sculptured with tiny longitudinal pilasters, has a large stimulator with a canal inside, more or less globular,

lying partly unattached against one wall of penis. Vagina as long as penis, internally with numerous longitudinal pilasters. Free oviduct and spermathecal shaft not twisted. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct shorter than penis. Basal part of spermathecal shaft wider, than gradually narrowing. Spermatophore not seen.

Remarks. The studied specimens conform to FRANC's (1957) description of *Charopa dispersa*. According to SOLEM (1961) a part of retained paratype of *Charopa athena* Preston (ANSP 98184) is not identical with the holotype of *Ch. dispersa*, but the two forms may be ecological races.

Distribution: Nouméa, Bleue River, New Caledonia. According to SOLEM (1961) type locality: Isle of Pines, New Caledonia (*gyrina*) and New Caledonia (*athena*).

***Andrefrancia rusticula* (Gassies, 1859)** (Figs 45–49, 60)

Helix rusticula GASSIES 1859: 369. Type locality: Isle of Pines, New Caledonia. Holotype figured by FRANC 1957: pl.12, figs 151, The Natural History Museum, London.

Helix rusticula GASSIES 1863: 28, pl. 1, fig. 11.

Patulastra rusticula (Gassies) ANCEY 1882: 86.

Charopa rusticula (Gassies) ANCEY 1888: 367; TRYON 1893: 33; CROSSE 1894: 228.

Helix melitae GASSIES 1870: 141; 1871: 24–25, pl. 1, fig. 9.

Charopa rusticula (Gassies) FRANC 1957: 117–118, pl.12, figs 151 (holotype of *rusticula*), 151a (holotype of *melitae*).

Andrefrancia rusticula (Gassies) SOLEM 1961: 457.

Material examined: Nouméa. Fischer. MNHN, 3 d (labelled as *Helix/Patula dispersa*, *H. gyrina*, *H. punctum dispersa*, *Andrefrancia rusticula*); Mount Mou. Fischer leg. MARIE 1868. MNHN, 3 d (labelled as *Andrefrancia rusticula*, *Helix dispersa*, *Helix gyrina*); Mount Mou (166°20'34"E 22°03'55"S), 1,150 m a.s.l. Humid forest, pandanus. MORDAN & TILLIER, February 05, 1981. MNHN, 13 a (4 dissected).

Diagnosis. *A. rusticula* differs from *A. dispersa* in its larger size, twice more numerous ribs on the body whorl; narrower umbilicus, 4 to 5 times smaller than shell diameter; higher D/N_w ratio and body whorl rounded below periphery.

Description. Shell. Shell diameter 5.10–8.50 mm, with 4–4 $\frac{7}{8}$ whorls. Height of shell 2.60–4.30 mm, H_{sp}/H ratio 0.03–0.10 (mean 0.06), H/D ratio 0.44–0.54 (mean 0.48). Protoconch with 1 $\frac{1}{8}$ –1 $\frac{3}{8}$ whorls. Apical sculpture of some very fine spiral striae. Definitive sculpture of 150–210 (mean 186)

ribs on the body whorl. Microsculpture typical of the group. Umbilicus open, 4.15–5.00 times smaller (mean 4.58) than shell diameter. Body whorl slightly flattened above and rounded below periphery. Aperture roughly widely rounded, flattened above periphery, outer margin slightly arched, H_a/W_a ratio 0.76–0.97 (mean 0.88). W_{bw}/W_{lo} ratio 1.82–2.42

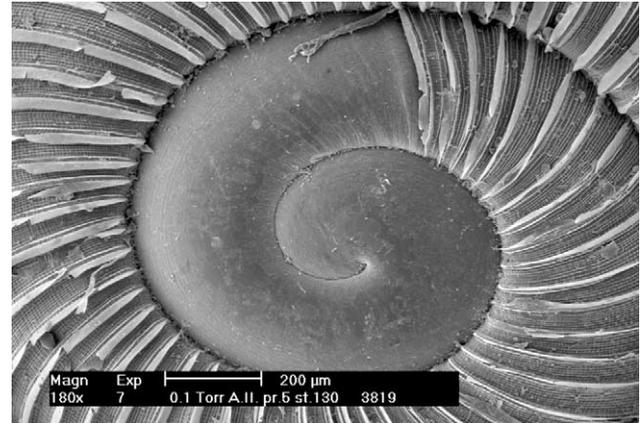


Fig. 46. *Andrefrancia rusticula*, a specimen from Mount Mou, 1150 m a.s.l. (MNHN): apical and early postnuclear sculpture

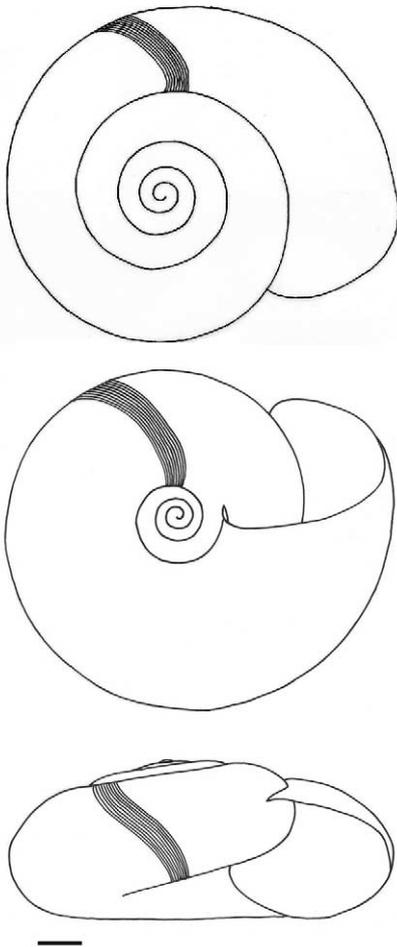


Fig. 45. *Andrefrancia rusticula*: shell of a specimen from Mount Mou, a.s.l.; scale bar = 1 mm

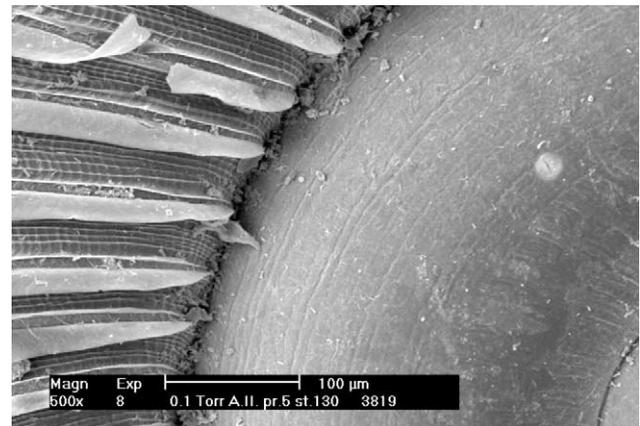


Fig. 47. *Andrefrancia rusticula*, a specimen from Mount Mou, 1150 m a.s.l. (MNHN): details of embryonic shell

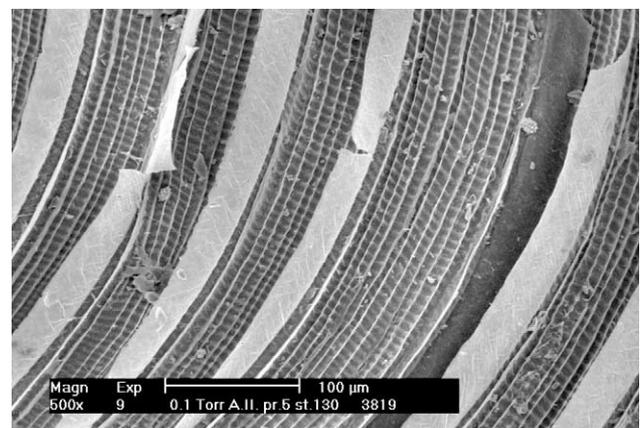


Fig. 48. *Andrefrancia rusticula*, a specimen from Mount Mou, 1150 m a.s.l. (MNHN): sculpture of body whorl

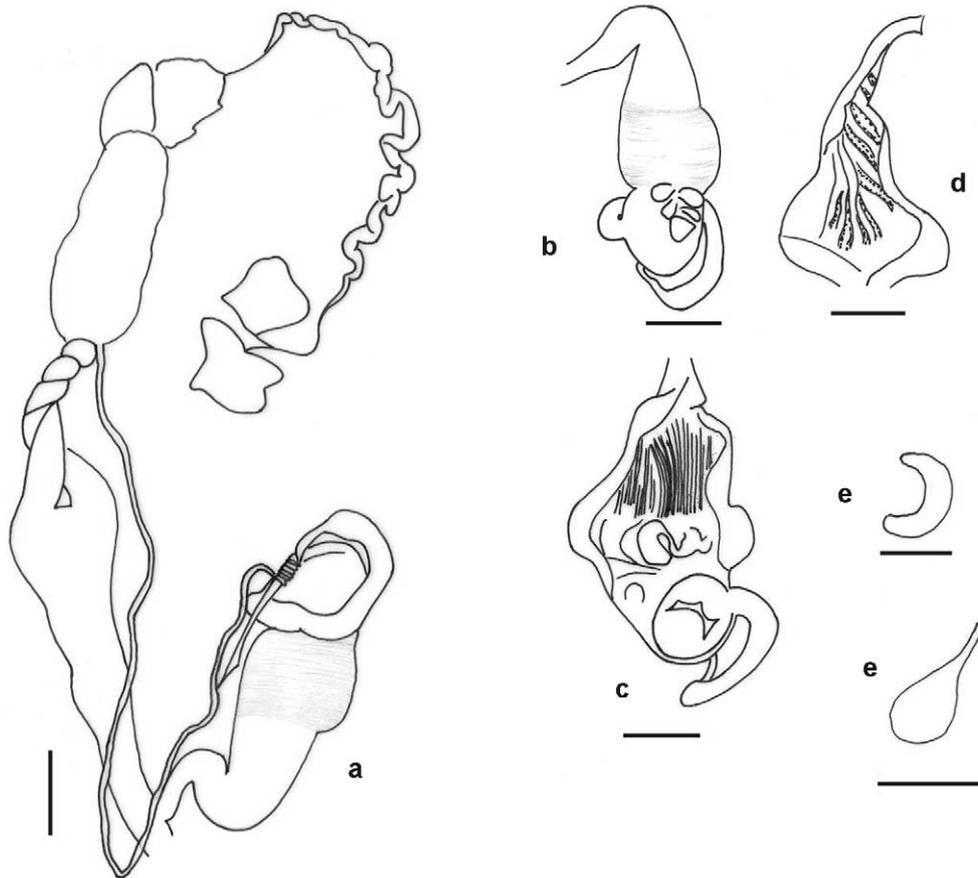


Fig. 49. Reproductive system of *A. rusticula*: a – genitalia; b – male genitalia; c – interior of penis; d – interior of vagina; e, spermatophores; a specimen from Mount Mou, 1150 m a.s.l.

(mean 2.13). D/N_w ratio 1.28–2.00 (mean 1.63). Colour uniformly brightly brown, dull.

Animal greyish.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct extensively convoluted with a golden-yellow sheen. Epiphallus shorter than penis, entering it subapically through a large, fleshy globular verge. Internally epiphallus shows two longitudinal pilasters. Vas deferens entering epiphallus through a valve. Penial retractor muscle inserts on the penis subapically, remote from the penis/epiphallus junction; vas deferens coiled 6 times around penial retractor muscle. Penis moderately long, consisting of three parts, narrowed in $\frac{1}{3}$ and $\frac{2}{3}$ of its length and tapering to atrium junction. There is one grape-like penial gland on the upper chamber. Internally upper chamber with a large, fleshy, globular verge, which is the epiphallus outlet. Immediately below the verge, in lower chamber, there are some fleshy, thick pilasters – transverse and longitudinal. Beneath them fine and dense pilasters are situated longitudinally. The walls of second penial part are very thick and covered with a muscular sheath. The third part of penis cylindrical without any sculpture. Vagina shorter than penis, internally with numerous longitudinal pilasters. Free

oviduct and spermathecal shaft twisted several times. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct shorter than penis. Basal part of spermathecal shaft wider, than gradually narrowing. Spermatophore club-shaped.

Remarks. The examined specimens conform to FRANC's (1957) description of *Charopa rusticula*.

Distribution: Nouméa, Mount Mou, New Caledonia. According to SOLEM (1961) type locality: Isle of Pines, New Caledonia (*rusticula*) and Art Island, New Caledonia (*melitae*).

Andrefrancia calliope (Crosse, 1869) (Figs 50, 60)

Helix calliope CROSSE 1869: 413–414. Type locality: New Caledonia. Holotype figured by FRANC 1957: pl.13, fig. 159, The Natural History Museum, London.

Helix calliope CROSSE 1874: 97–98, pl. 2, fig. 1.

Rhytida calliope (Crosse) ANCEY 1882: 86.

Charopa calliope (Crosse) ANCEY 1888: 368; PILSBRY 1893: 33, CROSSE 1893: 230.

Endodonta (Charopa) calliope (Crosse) DAUTZENBERG 1923: 142.

Charopa calliope (Crosse) FRANC 1957: 122, pl. 13, fig. 159 (holotype of *calliope*).

Andrefrancia calliope (Crosse) SOLEM 1961: 457.

Material examined: No exact locality. CAILLOT. MNHN, 24 d. (labelled as *Andrefrancia calliope*); Baie du Sud. Fischer leg. PETIT, 1874. MNHN, 11 d. (labelled as *Andrefrancia calliope*); Baie du Prony. leg. ROSSITER (4632), Eyerdam coll. CNHM 110161, 6 d. (labelled as *Andrefrancia calliope*).

Diagnosis. *A. calliope* differs from *dispersa* in its larger size, more numerous ribs on the body whorl; and narrower umbilicus which is about four times smaller than shell diameter. This species is distinguished from *A. rusticula* by having much fewer ribs on the body whorl and wider umbilicus.

Description. Shell diameter 5.00–9.00 mm, with $4\frac{1}{8}$ – $5\frac{1}{8}$ whorls. Height of shell 2.60–4.20 mm, H_{sp}/H ratio 0.04–0.13 (mean 0.09), H/D ratio 0.43–0.55 (mean 0.49). Protoconch with $1\frac{1}{8}$ – $1\frac{3}{4}$ whorls. Apical sculpture of some very fine spiral cords. Definitive sculpture of 70–115 (mean 96) ribs on the body whorl. Microsculpture typical of the group. Umbilicus open, 3.79–4.58 times (mean 4.22) smaller than shell diameter. Body whorl more or less equally slightly flattened above and below periphery. Aperture roughly widely rounded, flattened above periphery, outer

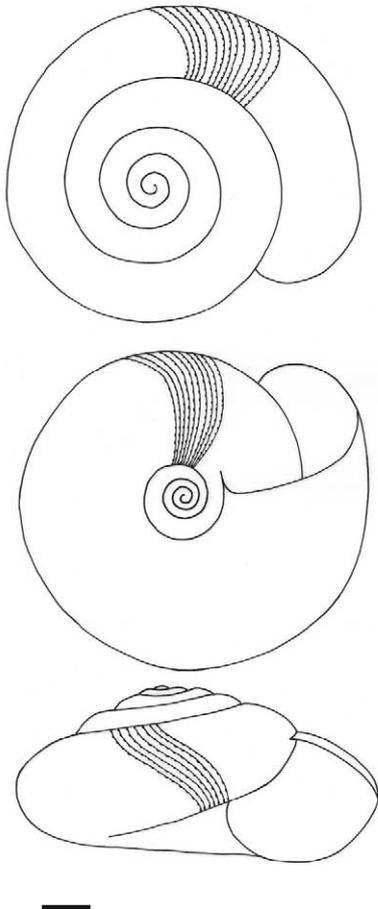


Fig. 50. *Andrefrancia calliope*. shell of a specimen from an unknown locality in New Caledonia (MNHN); scale bar = 1 mm

margin slightly arched, H_a/W_a ratio 0.63–0.96 (mean 0.84). W_{bw}/W_{lo} ratio 1.62–2.43 (mean 1.98). D/N_w ratio 1.09–1.76 (mean 1.49). Colour uniformly brightly brown, dull.

No alcohol-preserved material was available.

Remarks. The examined specimens correspond to the description of *Charopa calliope* given by FRANC (1957).

Distribution: Baie du Sud, Baie du Prony, New Caledonia. According to FRANC (1957) it is found on the summit of Mount Koghi; Baie du Sud; Nou Island; Isle of Pines and in the vicinity of Prony.

Andrefrancia rotunda n. sp. (Figs 51–55, 60)

Type locality: Goro, New Caledonia.

Type material: Goro (167°00'25"E. 22°19'37"S), 5–20 m a.s.l. Second growth forest/ultrabasic rocks. TILLIER & TILLIER, July 25, 1986. Holotype a & paratypes 25 a (3 dissected), 12 d, MNHN.

Other material examined: Goro. Cascade (167°00'21"E 22°18'57"S). Humid forest on ultrabasic rocks. BOUCHET, June 25, 1978. MNHN, 5 a (2 dissected); Baie Ngo (166°42'49"E 22°18'02"S) 30 m a.s.l. Humid forest. TILLIER, BOUCHET & TRICLOT, October 16, 1984. MNHN, 14 a (3 dissected), 6 d; Bleue River (166°39'16"E 22°06'13"S), 160 m a.s.l. Humid forest/alluvia. TILLIER & TILLIER, August 01, 1986. MNHN, 2 d; Bleue River (166°40'01"E 22°05'59"S), 170 m a.s.l. Humid forest/slope of ultrabasic rocks. TILLIER & TILLIER, March 16, 1987. MNHN, 1 d; Bleue River (166°36'28"E 22°04'07"S) 300 m a.s.l. Humid forest. TILLIER, TILLIER, BOUCHET & TRICLOT, November 11, 1984. MNHN, 8 a (2 dissected); Mount St. Vincent, S ridge (166°12'59"E 21°52'03"S), 1,170 m a.s.l. Humid forest. TILLIER, TILLIER, BONNET & LETOCART, August 5, 1987. MNHN, 11 a (1 dissected).

Diagnosis. *A. rotunda* differs from *A. calliope* in having more numerous ribs on the body whorl, more reduced microspirals, rounded body whorl, not arched

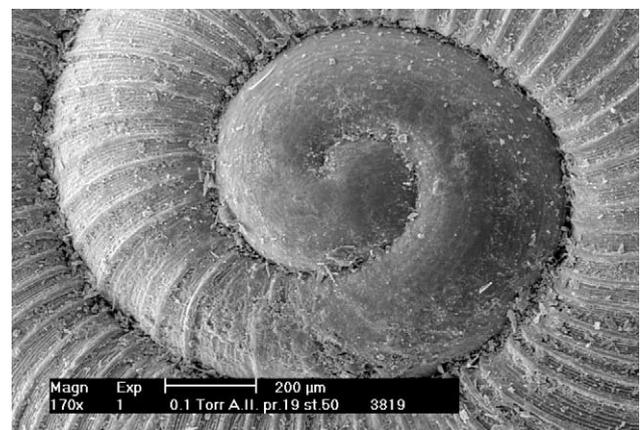


Fig. 51. *Andrefrancia rotunda* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

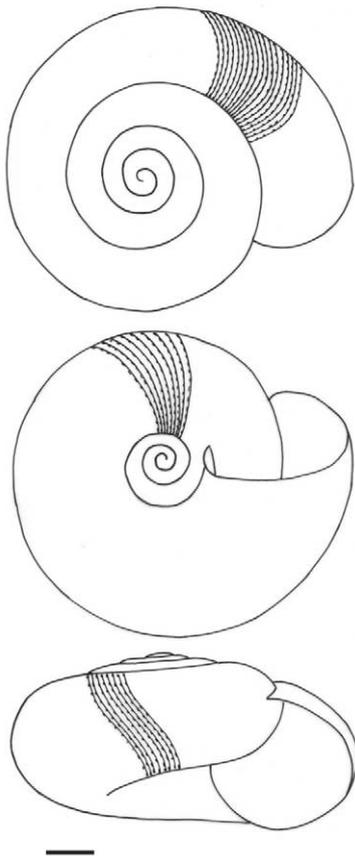


Fig. 52. *Andrefrancia rotunda* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

outer margin of aperture. This species differs from *A. rusticula* in having fewer ribs on the body whorl, more reduced microspirals, rounded body whorl, not arched outer margin of aperture.

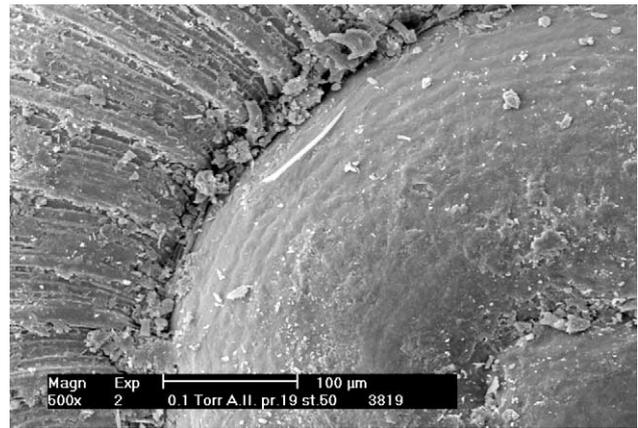


Fig. 54. *Andrefrancia rotunda* n. sp., a paratype from the type locality (MNHN): details of embryonic shell

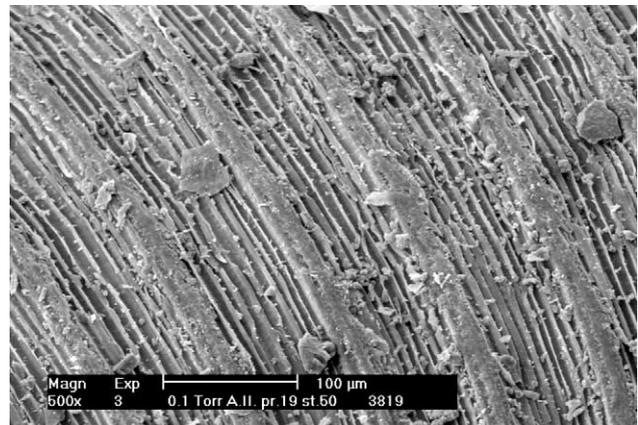


Fig. 55. *Andrefrancia rotunda* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

Description. Shell. Shell diameter 5.10–8.30 mm (holotype 6.80), with $3\frac{5}{8}$ – $5\frac{1}{8}$ (holotype $4\frac{1}{2}$) whorls. Shell height 2.70–4.40 mm (holotype 3.70), H_{sp}/H

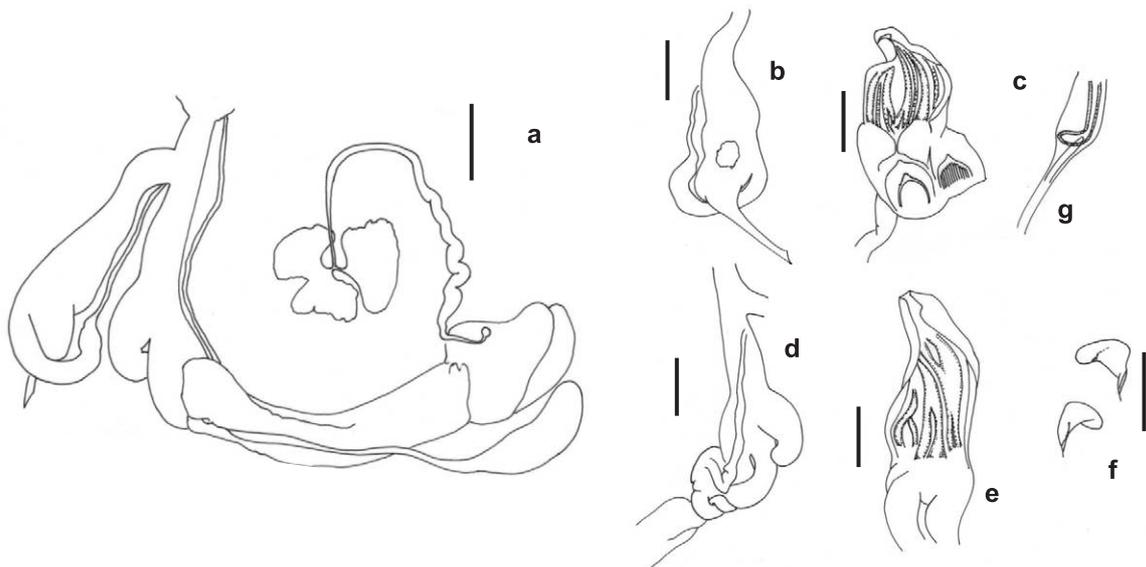


Fig. 53. *Andrefrancia rotunda* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – male genitalia; c – interior of penis; d – female genitalia; e – interior of vagina; f – spermatophores; g – interior of epiphallus and vas deferens entrance; scale bar = 1 mm

ratio 0.03–0.14 (mean 0.07, holotype 0.08), H/D ratio 0.42–0.61 (mean 0.54, holotype 0.54). Protoconch with 1–1½ whorls (holotype 1¼). Apical sculpture of dense spiral lirae. Presence of radial rugosities before teleoconch is not sure because of not well preserved apical shell. Definitive sculpture of 100–167 (mean 124, holotype 145) ribs on the body whorl. Microsculpture typical of the group, traces of spiral cords remaining rather as the buttresses to the microradials. Umbilicus open, 3.93–4.88 times (mean 4.32, holotype 4.25) smaller than shell diameter. Body whorl rounded. Aperture rounded, slightly flattened above periphery, H_a/W_a ratio 0.76–1.17 (mean 0.98, holotype 0.93). W_{bw}/W_{lo} ratio 1.75–2.56 (mean 2.10, holotype 1.83). D/N_w ratio 1.30–1.67 (mean 1.49, holotype 1.51). Colour uniformly brown, dull.

Animal greyish.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct hardly to moderately convoluted with a yellow-golden sheen. Epiphallus shorter than penis, entering it subapically through a large, fleshy globular verge. Internally epiphallus shows two longitudinal pilasters. Vas deferens entrance into epiphallus enhanced and valvular. Penial retractor muscle inserts on the penis subapically, remote from the penis/epiphallus junction; not twisted. Penis medium-length, two-chambered, constricted in one third of its length, basally elongate and tapered to atrium junction. There are 1–3 penial glandulae. Internally, upper chamber with a large fleshy, globular verge, which is the epiphallus outlet. Lower chamber with 8–9 longitudinal pilasters. Between two chambers the walls are very thick, forming fleshy collar constricting the passage between the epiphallic pore and the basal portion of the penis. Vagina shorter than penis, with ca. 6 longitudinal pilasters. At the beginning of the vagina there is a large, conical appendix. Free oviduct and spermathecal shaft twisted. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct shorter than penis, cylindrical. Basal part of spermathecal shaft wider, than gradually narrowing. Spermatophore drop-shaped.

Name derivation. The name refers to the rounded periphery of the body whorl.

Distribution: Goro, Baie Ngo, Bleue River, Mount St. Vincent, New Caledonia.

Andrefrancia planispira n. sp. (Figs 56–60)

Type locality: Bleue River, New Caledonia.

Type material: Bleue River, 160 m a.s.l. Humid forest. November 1988. Holotype a & paratype a (1 dissected), MNHN.

Other material examined: Lac en Y (166°55'42"E 22°15'36"S), 250 m a.s.l. Maquis/ultrabasic rocks. BOUCHET & TILLIER, June 25, 1979. MNHN, 8 a (3 dissected).

Diagnosis. *A. planispira* is most similar to *A. rotunda*. However the latter species has bigger diameter and shell height, has more ribs on the body whorl and rounded body whorl.

Description. Shell. Shell diameter 5.10–7.80 mm (holotype 7.80), with 3¾–4⅞ (holotype 4⅞) whorls. Shell height 2.30–3.60 mm (holotype 3.60), H_{sp}/H ratio 0.03–0.09 (mean 0.06, holotype 0.08), H/D ratio 0.42–0.48 (mean 0.46, holotype 0.46). Protoconch with 1¼–1½ whorls (holotype 1¼). Apical sculpture of dense spiral lirae. Definitive sculpture of 78–110 (mean 92, holotype, 82) ribs on the body whorl. Microsculpture typical of the group. Umbilicus open, 4.17–4.69 times (mean 4.43, holotype 4.59) smaller than shell diameter. Body whorl more or less equally slightly flattened above and below periphery. Aperture roughly widely rounded, flattened above periphery, H_a/W_a ratio 0.78–0.95 (mean 0.87, holotype 0.82). W_{bw}/W_{lo} ratio 1.79–2.67 (mean 2.12, holotype 1.97). D/N_w ratio 1.24–1.62 (mean 1.50, holotype 1.61). Colour uniformly brown, dull.

Animal greyish.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct extensively convoluted with a greenish tint. Epiphallus shorter than penis, entering it laterally through a

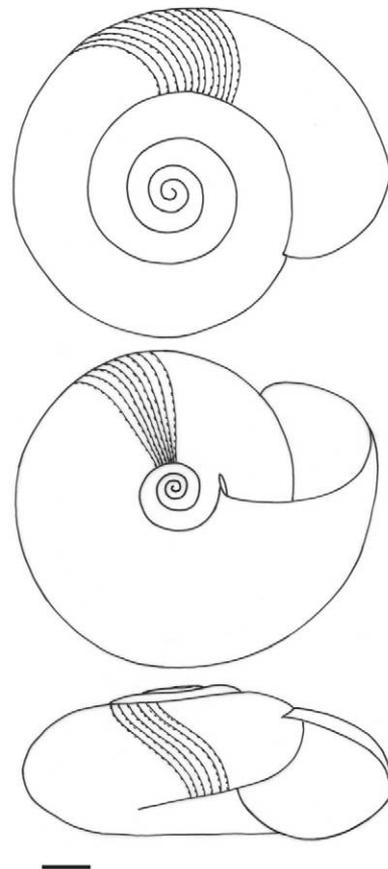


Fig. 56. *Andrefrancia planispira* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

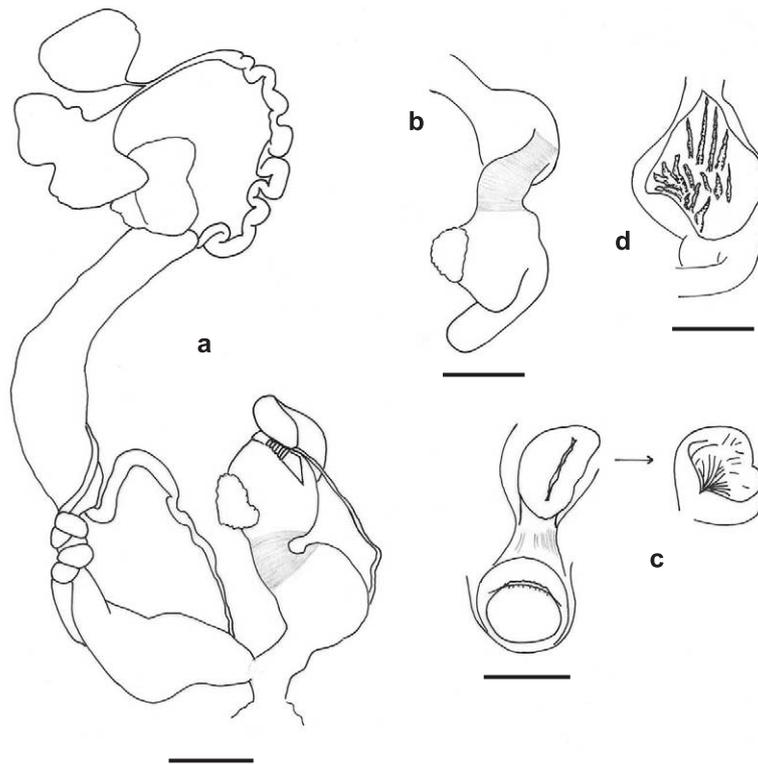


Fig. 57. *Andrefrancia planispira* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – male genitalia; c – interior of penis; d – interior of vagina; scale bar = 1 mm

large, fleshy globular verge. Internally epiphallus shows two longitudinal pilasters. Vas deferens entering epiphallus through a valve. Penial retractor muscle inserts on the penis apically, remote from the penis/epiphallus junction; vas deferens coiled 4–5 times and epiphallus once around penial retractor muscle. Penis moderately long, consists of two chambers separated by a narrow shaft, tapers to atrium junction. The separating tubular shaft encircled by a transverse muscular band. On the first chamber there is one penial gland. Internally upper chamber with a large, fleshy, globular verge, which is an entrance of epiphallus. Lower chamber shows a large funnelled stimulator with its wide part closer to atrium. Internally the walls

of penial stimulator covered with numerous tiny longitudinal folds. Internal walls of penis smooth. Vagina roughly as long as penis, internally with numerous longitudinal pilasters, widening just below free oviduct and spermathecal shaft junction. Free oviduct and spermathecal shaft twisted three times. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct shorter than penis. Initial part of spermathecal shaft wider, than gradually narrowing. Spermatophore not seen.

Name derivation. The name refers to the flattened spire of the shell.

Distribution: Bleue River, Lac en Y, New Caledonia.

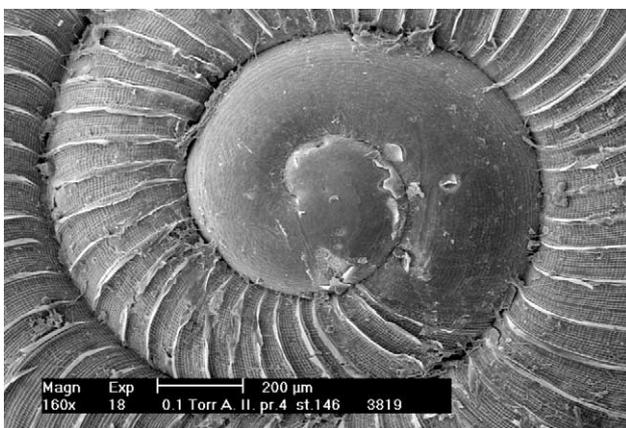


Fig. 58. *Andrefrancia planispira* n. sp., a specimen from Lac en Y (MNHN): apical and early postnuclear sculpture

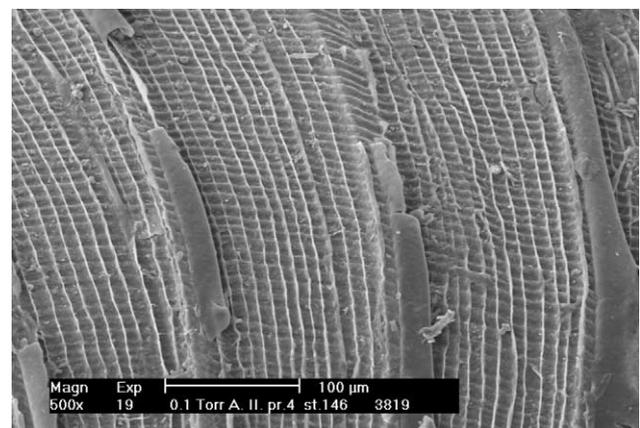


Fig. 59. *Andrefrancia planispira* n. sp., a specimen from Lac en Y (MNHN): sculpture of penultimate whorl

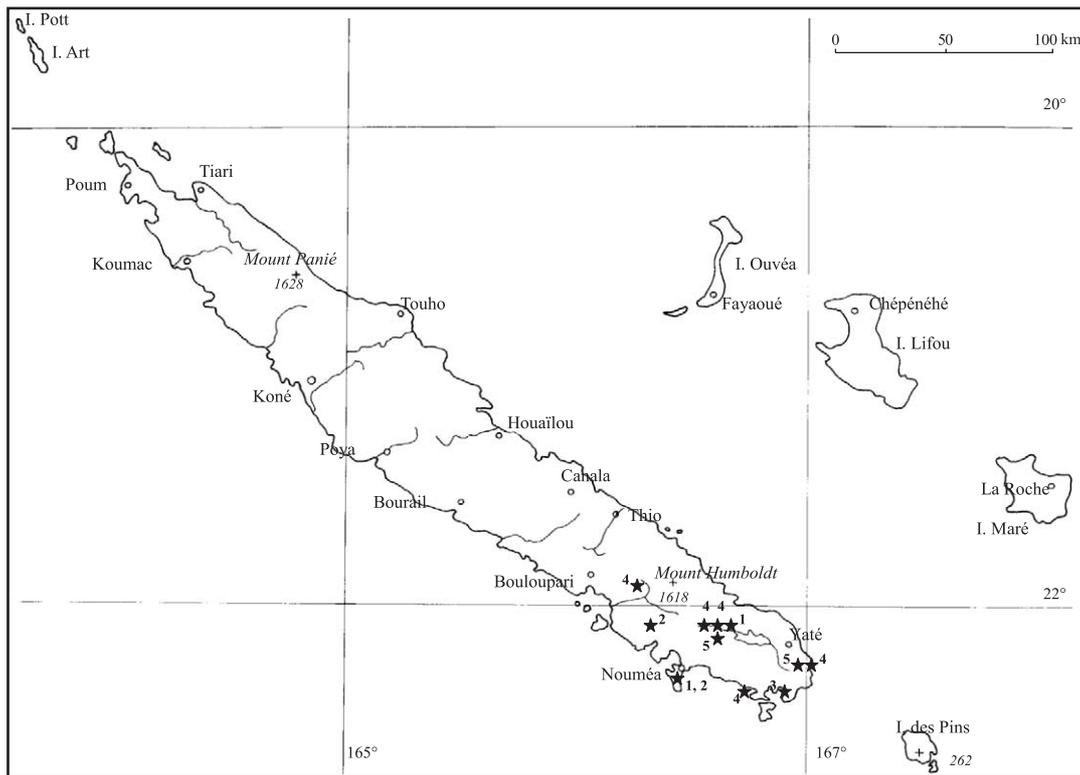


Fig. 60. Distribution map of *Andrefrancia*, group II
 1 – *A. dispersa*, 2 – *A. rusticula*, 3 – *A. calliope*, 4 – *A. rotunda*, 5 – *A. planispira*

GROUP III

Andrefrancia vincentina (Crosse, 1870) (Figs 61–66, 101)

Helix vincentina CROSSE 1870: 238–239, 406–407, pl. 13, fig. 5. Type locality: Saint-Vincent, New Caledonia. Holotype figured by FRANC 1957: pl. 14, fig. 168, The Natural History Museum, London.

Helix vincentina GASSIES 1871: 26.

Charopa vincentina (Crosse) ANCEY 1888: 365.

Endodonta (Thaumatodon) vincentina (Crosse) PILSBRY 1893: 27; CROSSE 1894: 221.

Ptychodon (Thaumatodon) vincentina (Crosse) FRANC 1957: 129, pl. 14, fig. 168 (holotype of *vincentina*).

Andrefrancia vincentina (Crosse) SOLEM 1961: 458.

Material examined: Forest of Thi Hanna, 800 m a.s.l., under bark. MALKIN & RAGEAU, July 16, 1958. CNHM 109353, 1 d; No exact locality. Fischer, leg. MARIE. MNHN, 1 d; Isle of Pines, Entre Wapan et Oupé, (167°28'00"E 22°33'56"S), 15 m a.s.l. BOUCHET, October 22, 1985. MNHN, 6 d; Mount Do (165°59'11"E 21°45'30"S), 950 m a.s.l. Forest, araucarias/ultrabasic rocks. April 16, 1979. MNHN, 2 d; St. Pierre – Thio (166°07'47"E 21°40'22"S), 60 m a.s.l. Humid forest, river drift. BOUCHET, January 20, 1979. MNHN, 2 d; Vallée de la To Ndeu, N slope (166°17'10"E 21°42'23"S), 90–120 m a.s.l. Humid forest. TILLIER,

BOUCHET & TRICLOT, November 04, 1984. MNHN, 4 d; Amieu (165°48'8"E 21°36'0"S), 450–500 m a.s.l. Humid forest. BOUCHET, November 18, 1978. MNHN, 4 d; Montegne des Sources (166°36'10"E 22°08'11"S), 740 m a.s.l., E slope. Maquis. BOUCHET, February 04, 1979. MNHN, 2 d; Goipin (165°16'30"E 21°13'19"S), 50–150 m a.s.l. Humid forest. BOUCHET, May 06, 1979. MNHN, 2 d, 17 a; Nassirah (166°03'15"E 21°47'21"S), 250 m a.s.l. Dry forest on limestone. TILLIER, BOUCHET & TRICLOT, July 07, 1978. MNHN, 10 a; Nassirah (166°03'15"E 21°47'21"S), 100 m a.s.l. Humid forest. BOUCHET, July 08, 1978. MNHN, 4 a; Mé Ori (165°39'18"E 21°31'25"S), 950 m a.s.l. Humid forest and Maquis/ultrabasic rocks. BOUCHET, April 30, 1979. MNHN, 22 a (1 dissected); Mé Ori/Tablo-Unio (165°41'34"E 21°34'09"S). Bouchet, April 30, 1979. MNHN, 7 a (1 dissected); Vallée de la Kuenthio (166°05'38"E 21°44'53"S), S slope, 110 m a.s.l. Second growth forest. TILLIER, BOUCHET & TRICLOT, November 05, 1984. MNHN, 10 a; Mé Maoya (165°20'21"E 21°22'09"S), 1,450 m a.s.l. Humid forest on ultrabasic rocks. BOUCHET & TILLIER, June 13, 1979. MNHN, 10 a; Mount Dzumac (166°27'19"E 22°02'30"S), 950–1,000 m a.s.l. N slope. Humid forest. BOUCHET & TILLIER, June 04, 1979. MNHN, 2 a; Ndé (166°18'00"E 22°08'37"S), 60 m a.s.l. Second growth forest. BOUCHET, July 02, 1978. MNHN, 4 a.

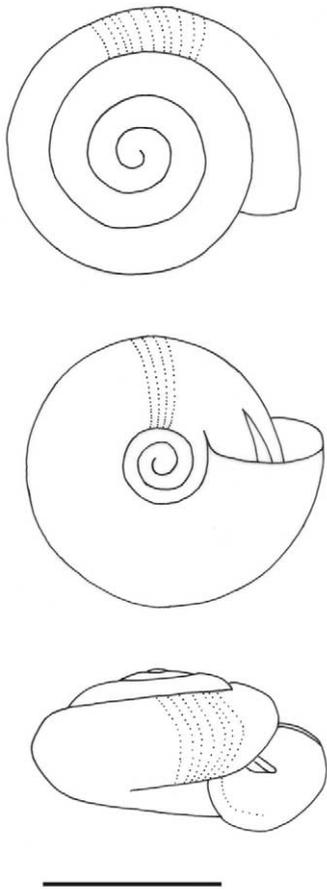


Fig. 61. *Andrefrancia vincentina*: shell of a specimen from forest of Thi Hanna (CNHM 109353)

Diagnosis. In having strongly reduced macrosculpture consisting of very low radial undulations, body whorl shouldered above and strongly flattened below the periphery, aperture ovate, inclined distinctly from shell axis, obsolete radial riblets and continuous, distinct spiral cords in microsculpture, smooth apical sculpture, inconspicuous transition between apical and postapical sculpture, presence of a single barrier, *A. vincentina* is quite a distinctive spe-

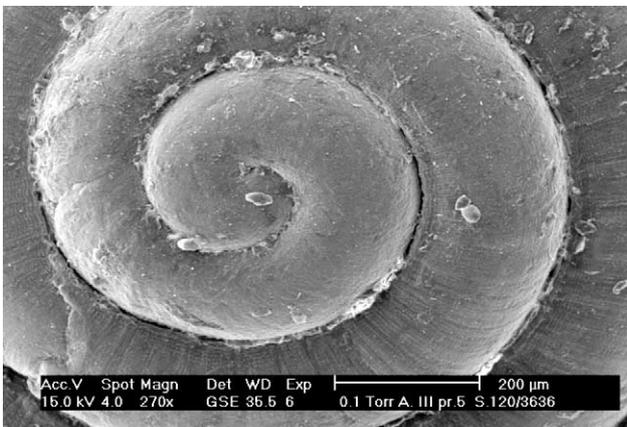


Fig. 62. *Andrefrancia vincentina*, a specimen from St. Pierre – Thio (MNHN): apical and early postnuclear sculpture

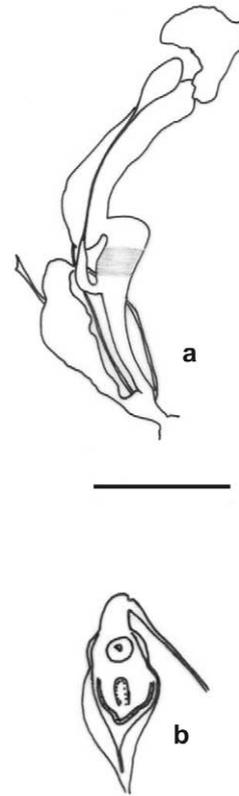


Fig. 63. Reproductive system of a specimen from Mé – Ori/Tablo-Unio (MNHN); scale bar = 1 mm

cies. Most other species of group III differ most obviously in their well developed major ribs, microsculpture consisting of a lattice of radial riblets and spiral cords, spirally sculptured embryonic shell, abrupt transition between apical and postapical sculpture and having more than one barrier. Greatly reduced macrosculpture occurs also in *miracidium*, but in the latter radial ridges are flat, microsculpture without any radials or spirals reduced to naturally rough surface, on the spire shows incised spiral grooves on the body whorl. Keeled body whorl and lack of any barrier of *A. miracidium* discriminate it from *A. vincentina* additionally.

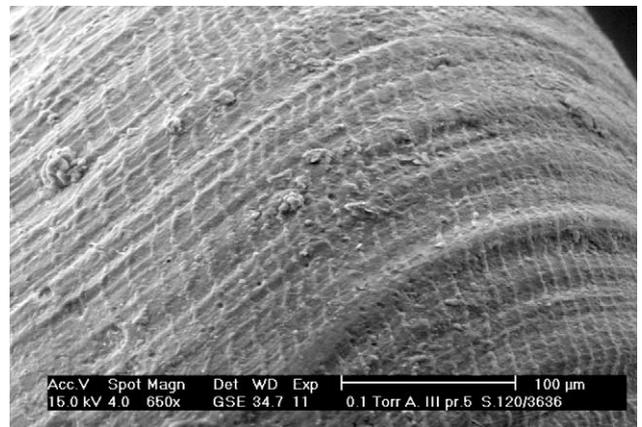


Fig. 64. *Andrefrancia vincentina*, a specimen from St. Pierre – Thio (MNHN): sculpture of body whorl



Fig. 65. *Andrefrancia vincentina*, a specimen from St. Pierre – Thio (MNHN): frontal view of the shell

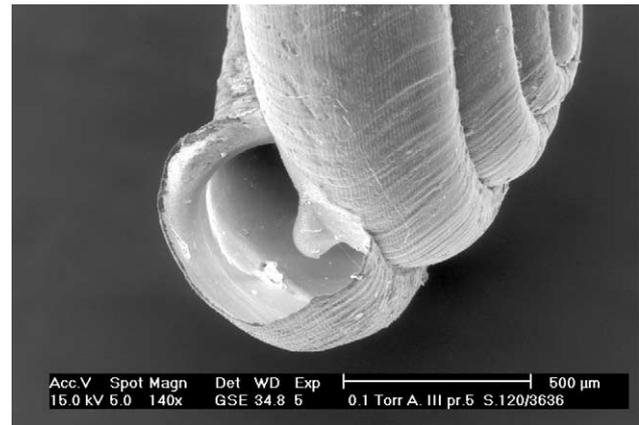


Fig. 66. *Andrefrancia vincentina*, a specimen from St. Pierre – Thio (MNHN): parietal barrier in apertural view

Description. Shell. Shell small, diameter 1.37–2.40 mm, with $3\frac{1}{4}$ – $5\frac{1}{8}$ whorls. Apex and spire moderately and evenly elevated, shell height 0.75–1.58 mm, H_{sp}/H ratio 0.06–0.33 (mean 0.21), H/D ratio 0.48–0.70 (mean 0.59). Body whorl slightly descending. Protoconch with $1\frac{1}{4}$ – $1\frac{1}{2}$ whorls. Apical sculpture smooth. The transition between apical and postapical sculpture inconspicuous. Definitive sculpture strongly reduced, consisting of very low, broad, protractively sinuated radial ridges, becoming more crowded towards the end of body whorl. The strong reduction of the height of the major ribs makes it impossible to count optically their number. Microsculpture of the obsolete radial riblets and continuous, distinct spiral cords with small knobs at the intersections. Umbilicus open, 2.88–3.97 times (mean 3.28) smaller than shell diameter. Suture normal. Body whorl shouldered above and strongly flattened below periphery. Aperture ovate, inclined distinctly from shell axis, columellar and basal margin deflected downwards, H_a/W_a ratio 0.73–1.14 (mean 0.89). W_{bw}/W_{lo} ratio 1.25–2.08 (mean 1.38). D/N_w ratio 0.33–0.52 (mean 0.43). Parietal barrier: single medial, high blade-like lamella with gradual anterior and posterior descension, extending posteriorly about $\frac{1}{8}$ body whorl. Colour uniformly horn.

Animal creamy-white.

Genital system. Apical genitalia not seen. Epiphallus relatively short, entering the penis apically through a fleshy globular verge, internally with two longitudinal pilasters. It was impossible to see apical arrangement of epiphallic pilasters. Penial retractor muscle inserts on the penis/epiphallus junction; not twisted. Penis moderately long, pear-shaped. There are neither penial glandulae nor other accessory structures. Internally penis shows an apical small, bulbous verge with terminal pore, which is the epiphallus outlet. Below, within narrow, horseshoe-like basal pilaster, there is a finger-like stimulator, fixed with its tip closer to atrium. There are no longitudinal pilasters in the penis proper. Vagina cylindrical, as long as pe-

nis. No vaginal pilasters. Free oviduct and spermathecal shaft not twisted. No data on pilasters in free oviduct and spermathecal shaft. Free oviduct short, relatively wide, encircled by a transverse stripe of tight muscular sheath. Spermathecal shaft slightly wider only at the base, than narrow, parallelsided. Spermatophore not seen.

Remarks. The characters of the examined specimens correspond with FRANC's (1957) description of *Ptychodon vincentina*. Tiny spiral rugosities crossing fine radial ribs in his characteristics appeared, in SEM investigation, to be continuous, distinct spiral cords.

Distribution: Forest of Thi Hanna, Isle of Pines, Mount Do, St. Pierre – Thio, Vallée de la To Ndeu, Montagne des Sources, Goipin, Nassirah, Mé Ori/Tablo-Unio, Vallée de la Kuenthio, Mé Maoya, Mount Dzumac, Ndé, New Caledonia. According to FRANC (1957) Saint-Vincent.

Andrefrancia mamieana n. sp. (Figs 67–70, 101)

Type locality: Mamié, New Caledonia.

Type material: Mamié (166°53'15"E 22°03'49"S) 50 m a.s.l. Maquis/ultrabasic rocks. BOUCHET, January 14, 1979. Holotype d, MNHN.

Other material examined: Touaourou (166°58'00"E 22°12'00"S). Humid forest on limestone. BOUCHET, July 19, 1979. MNHN, 2 d; Kuebeni (167°00'07"E 22°16'23"S), 50–80 m a.s.l. Humid forest/ultrabasic rocks. BOUCHET, February 15, 1979. MNHN, 6 a.

Diagnosis. *A. mamieana* and *A. amoana* are similar in having laterally compressed body whorl, relatively high major ribs, two parietal barriers and one palatal, but differ in many other characters. *A. mamieana* can be readily distinguished by its dome-shaped shell, denser, narrower and vertically sinuated radial ribs, much narrower umbilicus, aperture ovate, laterally compressed, higher H/D , H_{sp}/H ratios and slower whorl increment.

Description. Shell. Shell small, diameter 1.25–1.71 mm (holotype 1.71), with $3\frac{3}{4}$ – $4\frac{7}{8}$ (holotype $4\frac{3}{4}$) whorls. Apex and spire moderately and evenly elevated, dome-shaped, shell height 0.76–1.16 mm (holotype 1.16), H_{sp}/H ratio 0.13–0.27 (mean 0.20, holotype 0.24), H/D ratio 0.61–0.71 (mean 0.65, holotype 0.68). Body whorl descending rapidly. Protoconch with $1\frac{1}{4}$ – $1\frac{5}{8}$ whorls (holotype $1\frac{1}{4}$). Apical sculpture of about 11 prominent spiral cords (spiral lirae), wavy in nucleus. Fine and very dense radial rugosities present in embryonic shell except for nucleus. Definitive sculpture of regularly spaced, high, narrow, vertically sinuated radial ribs, with short periostracal blades, 100–114 (mean 110, holotype 114) on the body whorl. Microsculpture typical of the group. Umbilicus relatively narrow, 5.00–5.85 times (mean 5.50, holotype 5.00) smaller than shell diameter. Suture deep. Body whorl laterally compressed. Aperture ovate, laterally compressed. H_a/W_a ratio 0.78–1.00 (mean 0.92, holotype 0.80). W_{bw}/W_{lo} ratio 1.00–1.40 (mean 1.26, holotype 1.00). D/N_w ratio 0.30–0.36 (mean 0.33, holotype 0.36). Parietal barriers: 2, thick, bladelike lamellae; lower parietal higher and lightly more forward in comparison with upper one, slightly twisted upward. Single palatal ridge, very

thick, twice as high as lower parietal, slightly subperipheral in position, pointing between parietal barriers, somewhat recessed. Each barrier with gradual anterior and posterior descension, extending posteriorly about $\frac{1}{8}$ body whorl. In apertural view barriers are well visible. Colour uniformly golden-brown.

Animal creamy-white. Soft parts preserved too badly for dissection and examination of genital system.

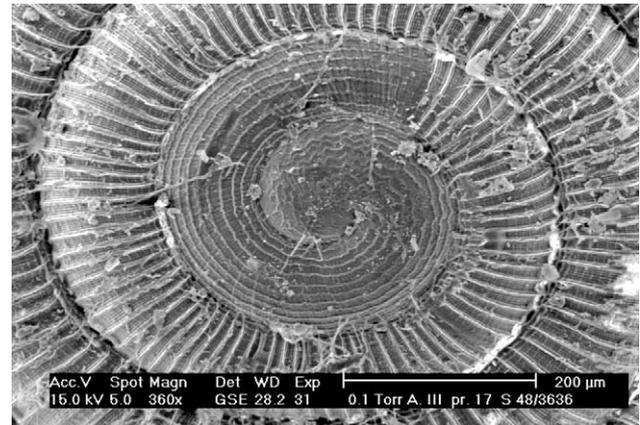


Fig. 68. *Andrefrancia mamieana* n. sp., a specimen from Touaourou (MNHN): apical and early postnuclear sculpture

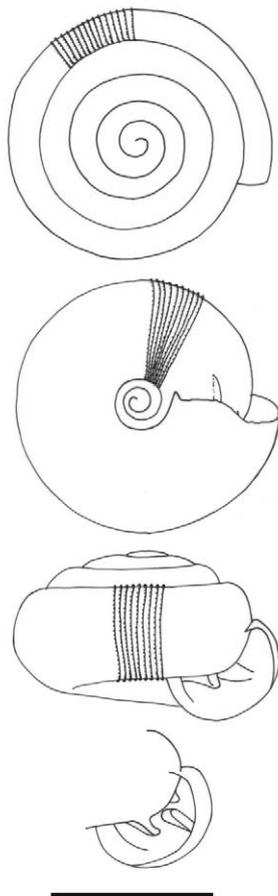


Fig. 67. *Andrefrancia mamieana* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

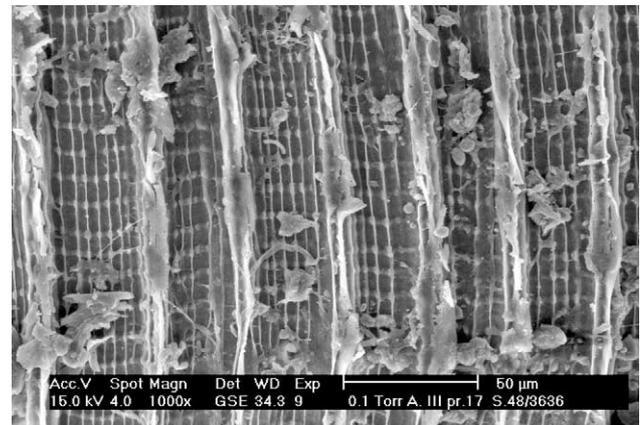


Fig. 69. *Andrefrancia mamieana* n. sp., a specimen from Touaourou (MNHN): sculpture of body whorl

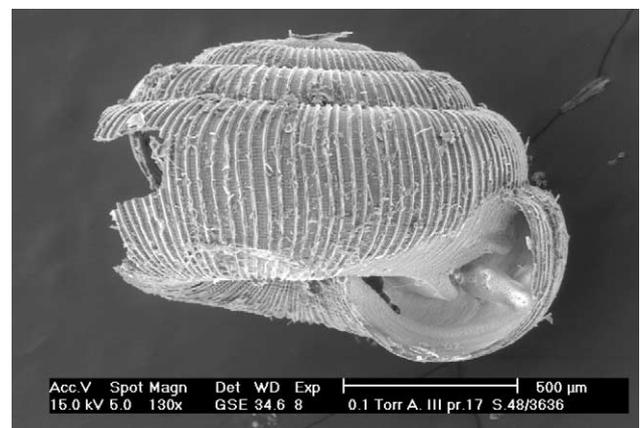


Fig. 70. *Andrefrancia mamieana* n. sp., a specimen from Touaourou (MNHN): frontal view of the shell

Name derivation. The name is coined from the name of the type locality.

Distribution: Mamié, Touaourou, Kuebeni, New Caledonia.

Andrefrancia amoana n. sp. (Figs 71–75, 101)

Type locality: Vallée d’Amoa, New Caledonia.

Type material: Vallée d’Amoa (165°12’12”E 20°58’00”S), 50 m a.s.l. Humid forest, palms. BOUCHET & TILLIER, July 12, 1979. Holotype d & paratypes 8 a, MNHN.

Other material examined: Tchingou (164°59’39”E 20°55’00”S), 960 m a.s.l. Humid forest, palms. BOUCHET, TILLIER & TILLIER, July 13, 14, 1979. MNHN, 9 a.

Diagnosis. *A. amoana* differs from *A. mamieana* in having less elevated spire, fewer, wider and protractively sinuated radial ribs, widely open umbilicus, aperture ovate, flattened above periphery, lower H/D, H_{sp}/H ratios and higher D/N_w ratio.

Description. Shell. Shell small, diameter 1.16–2.05 mm (holotype 1.99), with 3–4½ (holotype 4⅛) whorls. Apex and spire flat or slightly elevated, shell

height 0.55–1.03 mm (holotype 0.96), H_{sp}/H ratio 0.00–0.11 (mean 0.02, holotype 0.07), H/D ratio 0.42–0.50 (mean 0.47, holotype 0.48). Body whorl descending rapidly. Protoconch with 1⅜–1½ whorls (holotype 1½). Apical sculpture of about 5–6 spiral cords (spiral lirae), prominent on the outer half of embryonic shell width, and becoming inconspicuous on the inner half. Very low and dense radial ridges present in the last quarter of protoconch. Definitive sculpture of regularly spaced, high, moderately wide protractively sinuated radial ribs, with short periostracal blades, 58–98 (mean 72, holotype 90) on body whorl. Microsculpture typical of the group. Umbilicus open, contained 2.78–3.22 times (mean 2.92, holotype 3.22) in shell diameter. Suture deeply impressed. Body whorl moderately laterally compressed. Aperture ovate, flattened above periphery. H_a/W_a ratio 0.91–1.33 (mean 1.12, holotype 1.00). W_{bw}/W_{lo} ratio 1.00–1.50 (mean 1.25, holotype 1.27). D/N_w ratio 0.39–0.48 (mean 0.44, holotype 0.48). Parietal barriers: 2, thick, equally high, crescentic, extending about ⅓ body whorl. Palatal wall with one supra-peripheral low crease, somewhat recessed, sometimes barely visible. In apertural view each barrier is well visible. Colour uniformly golden-brown.

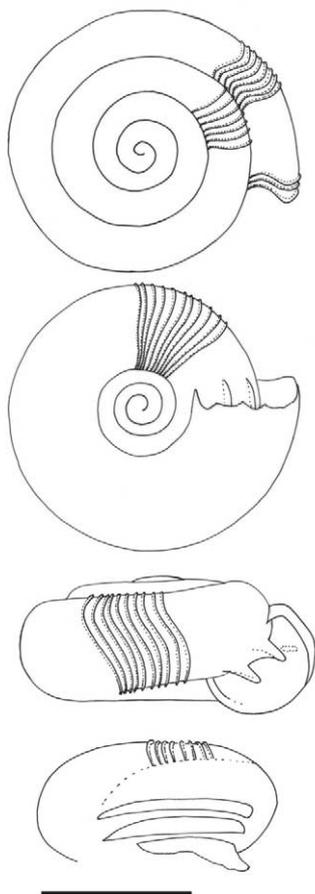


Fig. 71. *Andrefrancia amoana* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

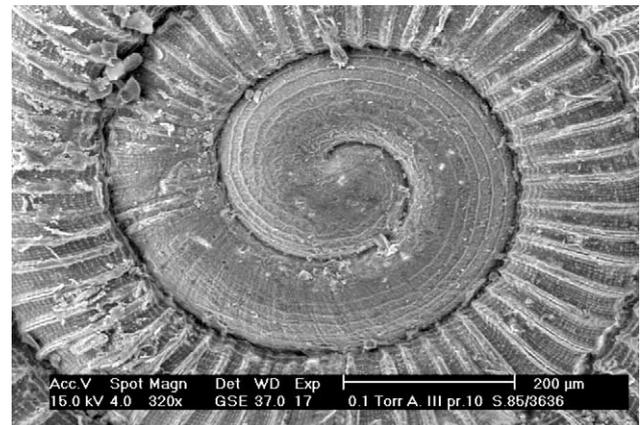


Fig. 72. *Andrefrancia amoana* n. sp., a specimen from Tchingou (MNHN): apical and early postnuclear sculpture

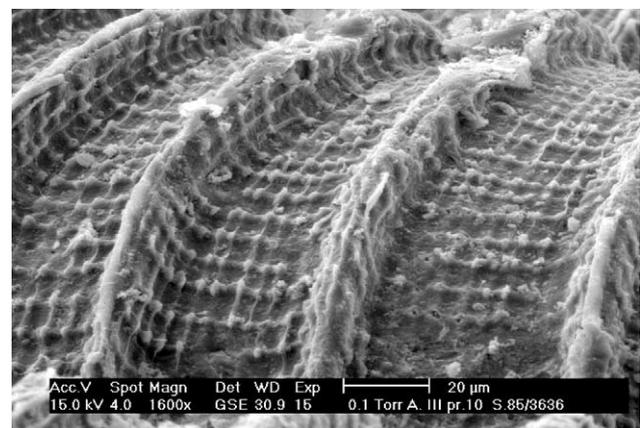


Fig. 73. *Andrefrancia amoana* n. sp., a specimen from Tchingou (MNHN): sculpture of penultimate whorl

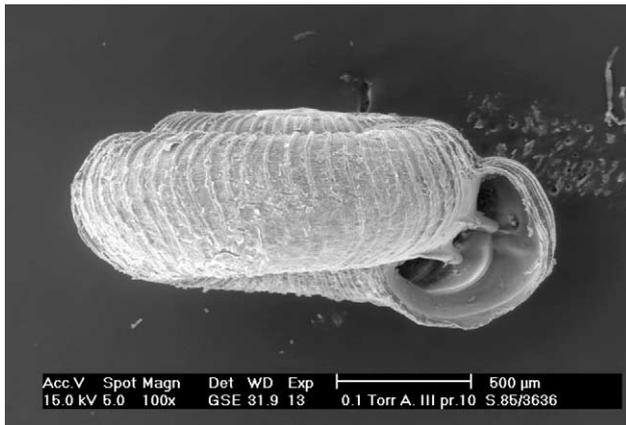


Fig. 74. *Andrefrancia amoana* n. sp., a specimen from Tchingou (MNHN): sculpture of body whorl

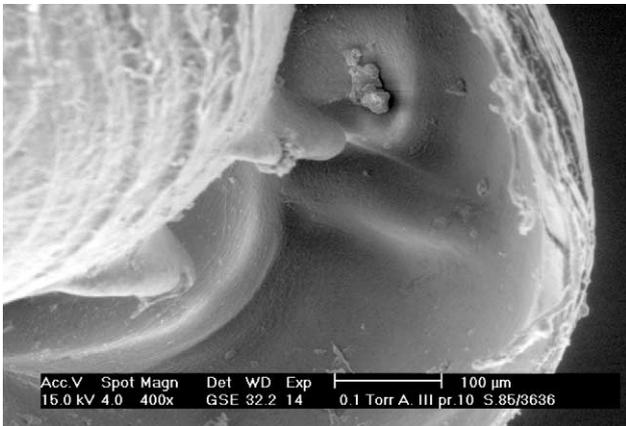


Fig. 75. *Andrefrancia amoana* n. sp., a specimen from Tchingou (MNHN): apertural barriers

Animal creamy-white. No soft parts were preserved well enough for dissection.

Name derivation. The name is coined from the name of the valley where the new species was found.

Distribution: Vallée d'Amoa, Tchingou, New Caledonia.

***Andrefrancia kuenthiana* n. sp.** (Figs 76–81, 101)

Type locality: Vallée de la Kuenthio, New Caledonia.

Type material: Vallée de la Kuenthio (166°05'38"E 21°44'53"S), S slope, 110 m a.s.l. Dry forest, second growth. TILLIER, BOUCHET & TRICLOT, November 05, 1984. Holotype a & paratypes 25 a, MNHN.

Other material examined: Yahoué (166°29'18"E 22°11'40"S), 200 m a.s.l. Dry forest. The slope of Mount Koghi. BOUCHET, November 24, 1978. MNHN, 2 d; Ndé (166°18'00"E 22°08'37"S), 60 m a.s.l. Second growth forest. BOUCHET, July 02, 1978. MNHN, 7 a.

Diagnosis. At first sight *A. kuenthiana* resembles rather much *A. cryptodon* but the former has much wider umbilicus, less elevated spire, slightly lower H_{sp}/H , H/D , W_{bw}/W_{lo} ratios and two parietal barriers.

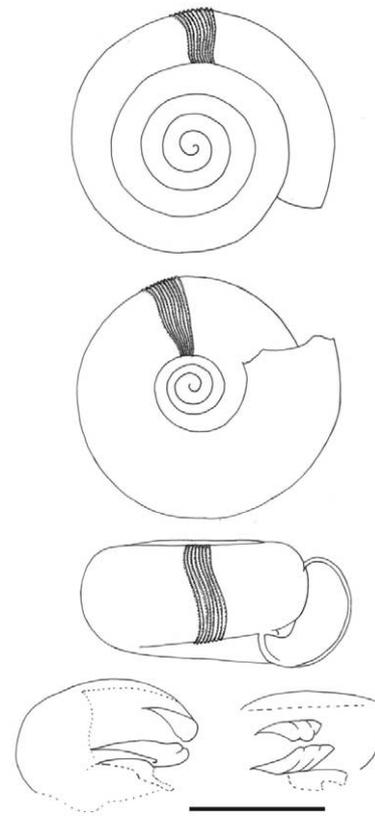


Fig. 76. *Andrefrancia kuenthiana* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

Description. Shell. Shell small, diameter 1.10–2.05 mm (holotype 1.99), with $3\frac{1}{4}$ – $5\frac{1}{8}$ (holotype 5) whorls. Apex and spire flat or slightly elevated, shell height 0.55–1.10 mm (holotype 1.03), H_{sp}/H ratio 0.00–0.13 (mean 0.07, holotype 0.07), H/D ratio 0.44–0.59 (mean 0.52, holotype 0.52). Body whorl descending rapidly. Protoconch with $1\frac{1}{8}$ – $1\frac{1}{2}$ whorls (holotype $1\frac{1}{4}$). Apical sculpture of about 9 spiral lirae. Radial, low growth ridges absent in protoconch. Definitive sculpture of distinct, narrow, numerous, protractively sinuated radial ribs, regularly spaced, 110–160 (mean

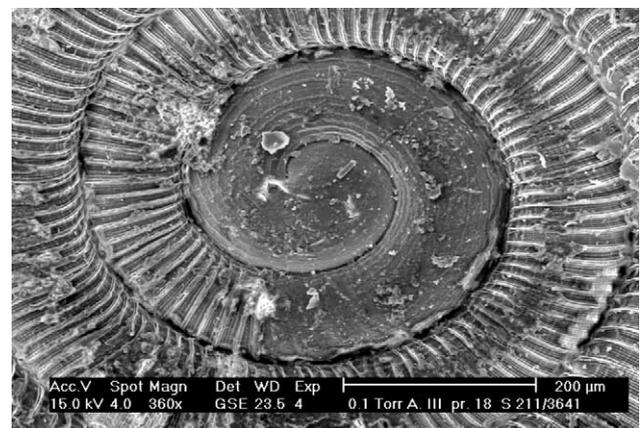


Fig. 77. *Andrefrancia kuenthiana* n. sp.: apical and early postnuclear sculpture of a paratype from the type locality (MNHN)

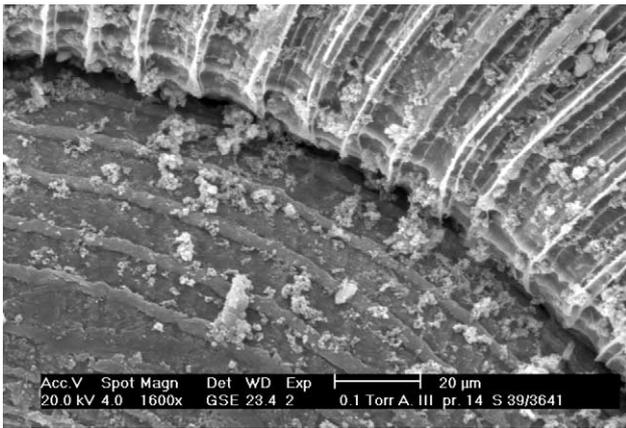


Fig. 78. *Andrefrancia kuenthiana* n. sp.: details of embryonic shell of a specimen from Ndé (MNHN)

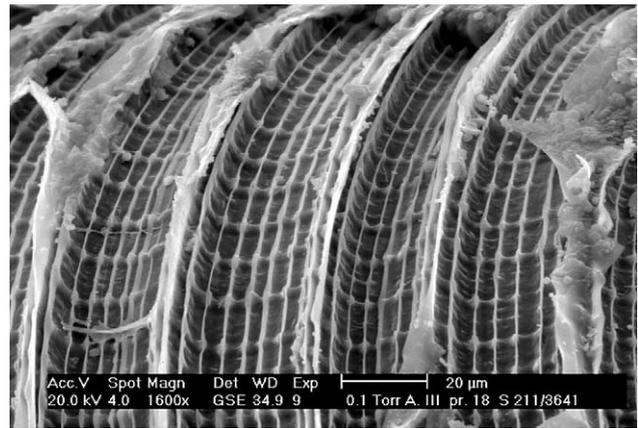


Fig. 80. *Andrefrancia kuenthiana* n. sp.: sculpture of body whorl of a paratype from the type locality

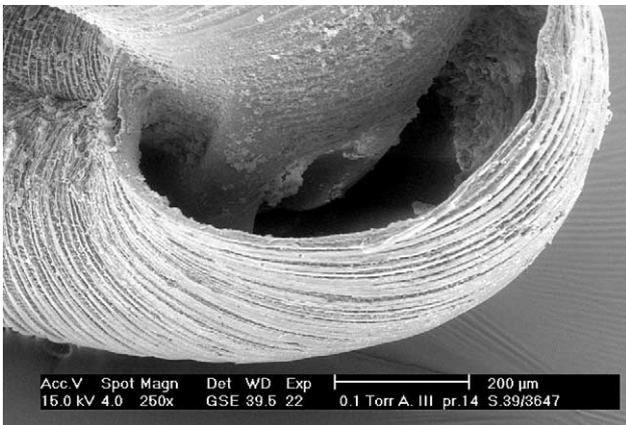


Fig. 79. *Andrefrancia kuenthiana* n. sp.: two parietal barriers deeply recessed of a specimen from Ndé

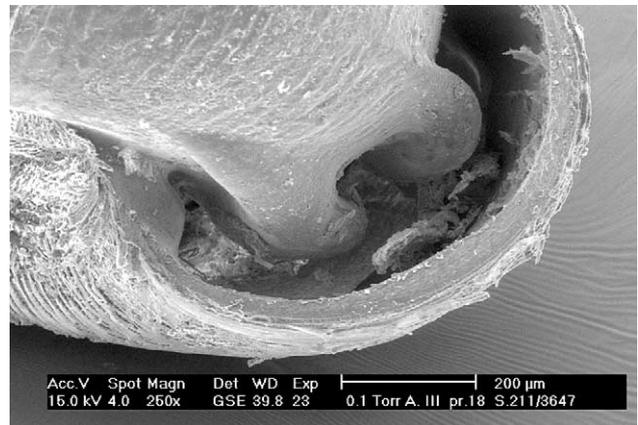


Fig. 81. *Andrefrancia kuenthiana* n. sp.: two parietal barriers deeply recessed of a paratype from the type locality

136, holotype 132) on the body whorl. Short periostracal blades present on major ribs. Microsculpture typical of the group with often greatly reduced spiral cords. If the latter are obsolete on the whorls, then they are pronounced and continuous in the sutures. Umbilicus open, 2.89–3.67 times (mean 3.27, holotype 3.22) smaller than shell diameter. Suture deeply impressed. Body whorl moderately laterally compressed. Aperture ovate. H_a/W_a ratio 0.85–1.20 (mean 1.09, holotype 1.09). W_{bw}/W_{lo} ratio 1.00–1.50 (mean 1.27, holotype 1.25). D/N_w ratio 0.34–0.43 (mean 0.39, holotype 0.40). Parietal wall with two deeply recessed barriers; the upper one recessed more than the lower. Both are thick, trapezium-shaped, slightly indented three times on top, and turned toward each other. The barriers extend posteriorly less than $\frac{1}{4}$ body whorl. In apertural view only the lower one is barely visible. Colour uniform golden-brown.

Animal creamy-white. No genital systems were obtainable for dissection.

Name derivation. The name is derived from the name of the valley which is the type locality.

Distribution: Vallée de la Kuenthio, Yahoué, Ndé, New Caledonia.

Andrefrancia tuberculata n. sp. (Figs 82–86, 101)

Type locality: Mé Ori/Tablo-Unio, New Caledonia.

Type material: Mé Ori/Tablo-Unio (165°41'34"E 21°34'09"S). BOUCHET. Holotype a & paratypes 12 a, MNHN.

Other material examined: Mé Ori (165°39'18"E 21°31'25"S), 950 m a.s.l. Humid forest and maquis/ultrabasic rocks. BOUCHET, April 30, 1979. MNHN, 1 d, 11 a.

Diagnosis. The body whorl shouldered above and strongly flattened below periphery, aperture ovate strongly flattened below periphery, single barriers on parietal, palatal and columellar wall combined with prominent, relatively broad, regularly and widely spaced ribs, and altered microsculpture easily separate *A. tuberculata* from any other species considered in this study. A similarly shaped *A. vincentina* has strongly reduced macrosculpture consisting of very low radial undulations, obsolete radial riblets and continuous, distinct spiral cords in microsculpture, smooth apical sculpture and only one parietal barrier. The same character of major ribs and similar condition of

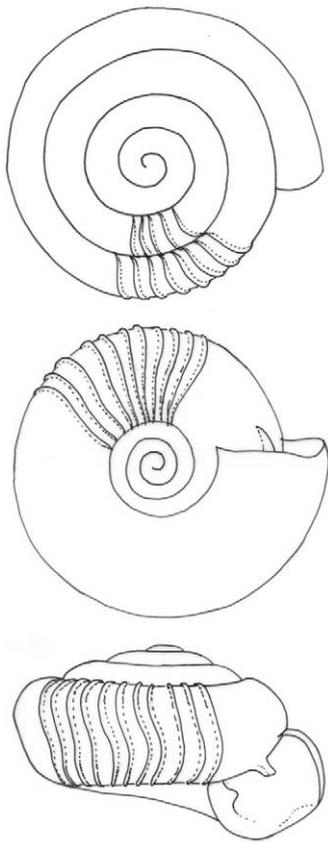


Fig. 82. *Andrefrancia tuberculata* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

microsculpture of fine thread-like riblets and conspicuous spiral cords (but without elongate beads at the intersections) as in *A. tuberculata* has been also observed in an eastern Australian *Egilomen globosa*. However, there are no other similarities between these two species. The tendency to reduce microradials also occurs in several other eastern Australian species (STANISIC 1990: 7).

Description. Shell. Shell small, diameter 1.16–1.71 mm (holotype 1.58), with $3\frac{1}{4}$ – $4\frac{3}{4}$ (holotype $4\frac{1}{4}$)

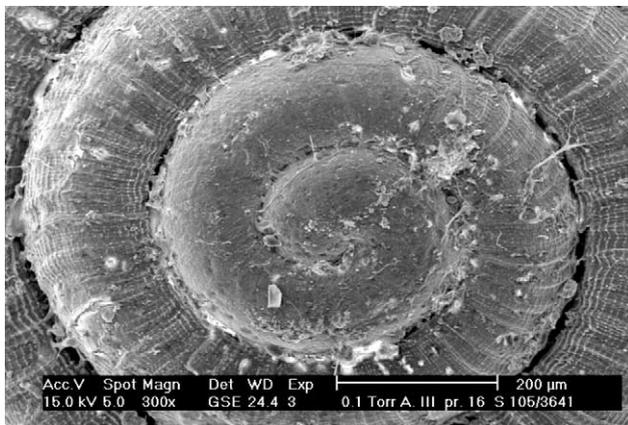


Fig. 83. *Andrefrancia tuberculata* n. sp., a specimen from Mé Ori, 950 m a.s.l. (MNHN): apical and early postnuclear sculpture

whorls. Apex and spire moderately and evenly elevated, shell height 0.68–1.16 mm (holotype 1.03), H_{sp}/H ratio 0.10–0.29 (mean 0.23, holotype 0.27), H/D ratio 0.54–0.68 (mean 0.63, holotype 0.65). Body whorl descending rapidly. Protoconch with $1\frac{1}{4}$ – $1\frac{1}{2}$ whorls (holotype $1\frac{3}{8}$). Apical sculpture malleated. Radial, low growth ridges in embryonic shell absent. Definitive sculpture of prominent, relatively broad, blunt, protractively sinuated radial ribs, regularly and widely spaced, 36–60 (mean 46, holotype 45) on the body whorl. Periostracal blades on the major ribs absent. There are 1–2 low radial rugosities between each pair of major ribs. Microsculpture of dense, exceptionally fine, thread-like radial riblets crossed by spiral cords, which form large beads at the intersection. Such a microsculpture makes the spiral cords look like to be spirally arranged beads. Umbilicus open, 2.71–3.57 times (mean 3.13, holotype 2.88) smaller than shell diameter. Suture deeply impressed. Body whorl shouldered above and strongly flattened below periphery. Aperture ovate strongly flattened below periphery; inclined distinctly from shell axis, H_a/W_a ratio 0.78–1.17 (mean 0.90, holotype 1.00). W_{bw}/W_{lo} ratio 1.00–1.50

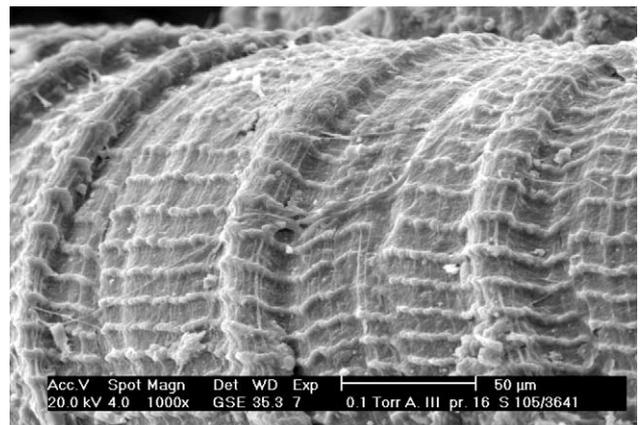


Fig. 84. *Andrefrancia tuberculata* n. sp., a specimen from Mé Ori, 950 m a.s.l. (MNHN): sculpture of body whorl

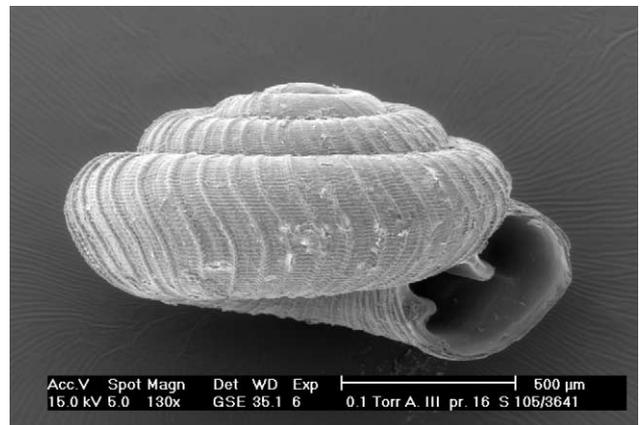


Fig. 85. *Andrefrancia tuberculata* n. sp., a specimen from Mé Ori, 950 m a.s.l. (MNHN): frontal view of the shell

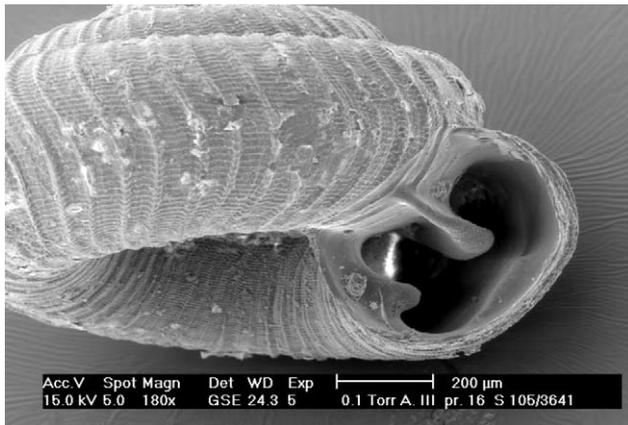


Fig. 86. *Andrefrancia tuberculata* n. sp., a specimen from Mé Ori, 950 m a.s.l. (MNHN): apertures in apertural view

(mean 1.26, holotype 1.33). D/N_w ratio 0.34–0.43 (mean 0.37, holotype 0.37). Parietal barrier: single medial, high blade-like lamella, slightly bulbous on top, with gradual anterior and posterior descension, extending posteriorly about $\frac{1}{4}$ body whorl. Columellar wall with a low, short, ridge. Palatal wall with irregular protuberance, in subperipheral position, somewhat recessed, visible only at high SEM magnification. In apertural view each barrier is visible. Colour uniformly brightly brown.

Animal creamy-white. Dissection of genital systems was too difficult to provide satisfactory results.

Name derivation. The name refers to the shell microsculpture in which tubercles dominate.

Distribution: Mé Ori/Tablo-Unio, Mé Ori, New Caledonia.

Andrefrancia cryptodon n. sp. (Figs 87–92, 101)

Type locality: Baie Tina (Nouméa), New Caledonia.

Type material: Baie Tina (Nouméa) (166°28'43"E 22°15'36"S). Dry, littoral forest. BOUCHET, December 16, 1978. Holotype d & paratypes 7 d, MNHN.

Other material examined: Mount Dore (166°36'16"E 22°16'55"S), 40–80 m a.s.l. Dry forest, stones. BOUCHET, January 27, 1979. MNHN, 4 d.

Diagnosis. *A. cryptodon* is similar to *A. kuenthiana* in having the same shell diameter and number of major ribs and laterally compressed body whorl, but differs from it in having much narrower umbilicus, more elevated spire, slightly higher H_{sp}/H , H/D , W_{bw}/W_{10} ratios and only one parietal barrier.

Description. Shell small, diameter 1.44–2.05 mm (holotype 1.71), with $4\frac{1}{4}$ (holotype $4\frac{5}{8}$) whorls. Apex and spire slightly and evenly elevated, shell height 0.82–1.23 mm (holotype 1.03), H_{sp}/H ratio 0.08–0.18 (mean 0.14, holotype 0.13), H/D ratio 0.54–0.65 (mean 0.59, holotype 0.60). Body whorl not

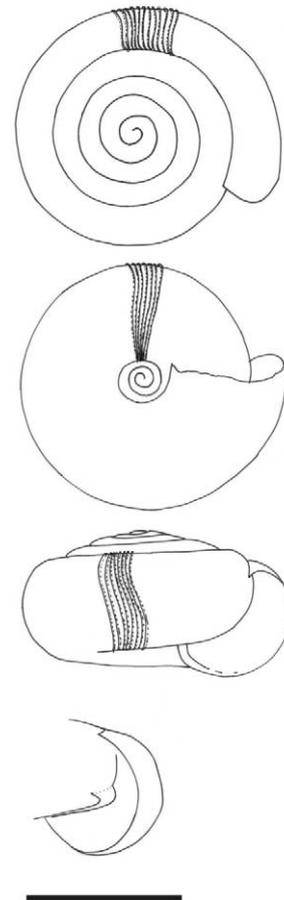


Fig. 87. *Andrefrancia cryptodon* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

descending. Protoconch with $1\frac{3}{8}$ – $1\frac{1}{2}$ whorls (holotype $1\frac{1}{2}$). Apical sculpture of about 10 spiral lirae. Radial, low growth ridges on terminal part of embryonic shell barely visible. Definitive sculpture of distinct, narrow, numerous, protractively sinuated radial ribs, regularly spaced, 130–160 (mean 144, holotype 160) on the body whorl. Short periostracal blades present on major ribs. Microsculpture typical of the group. Umbilicus narrow, 4.40–8.30 times

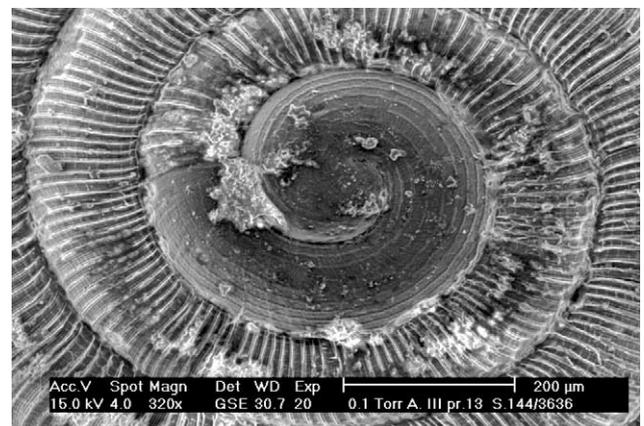


Fig. 88. *Andrefrancia cryptodon* n. sp., a specimen from Mount Dore (MNHN): apical and early postnuclear sculpture

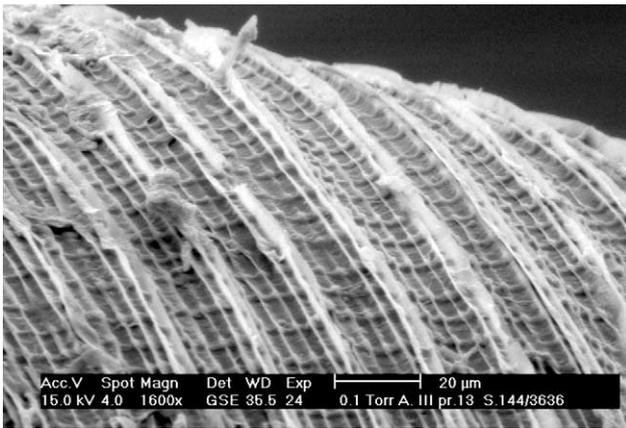


Fig. 89. *Andrefrancia cryptodon* n. sp., a specimen from Mount Dore (MNHN): sculpture of body whorl

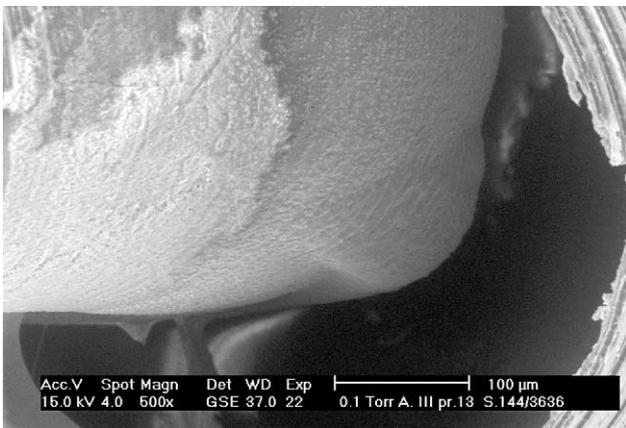


Fig. 90. *Andrefrancia cryptodon* n. sp., a specimen from Mount Dore (MNHN): parietal barrier

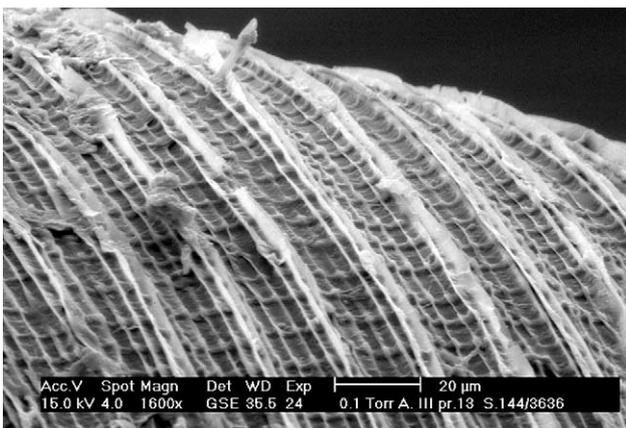


Fig. 91. *Andrefrancia cryptodon* n. sp., a specimen from Mount Dore (MNHN): parietal barrier deeply recessed

(mean 6.25, holotype 6.25) smaller than shell diameter. Suture impressed. Body whorl laterally compressed. Aperture ovate, H_a/W_a ratio 0.91–1.30 (mean 1.06, holotype 0.91). W_{bw}/W_{lo} ratio 1.25–2.50 (mean 1.76, holotype 2.00). D/N_w ratio 0.34–0.39 (mean 0.37, holotype 0.37). Parietal wall with one very low, cord-like ridge, deeply recessed (not visible in apertural view), situated submedially, extending



Fig. 92. *Andrefrancia cryptodon* n. sp., a specimen from Mount Dore (MNHN): apical view of the shell

posteriorly about $\frac{1}{4}$ whorl. Colour uniformly golden-brown.

No alcohol-preserved material was available.

Name derivation. The name refers to the apertural barrier which is deeply recessed and invisible in apertural view.

Distribution: Baie Tina (Nouméa), Mount Dore, New Caledonia.

Andrefrancia quadrilamellata n. sp. (Figs 93–97, 101)

Type locality: Isle of Pines, New Caledonia.

Type material: Isle of Pines, entre Wapan et Oupé (167°28'00"E 22°33'56"S), 15 m a.s.l. BOUCHET, October 22, 1985. Holotype d & paratypes 7 d, MNHN.

Diagnosis. *A. quadrilamellata* differs from the conchologically similar *A. kuenthiana* in having a slightly more elevated spire, somewhat more widely spaced radial ribs, somewhat narrower umbilicus, more numerous and much narrower apertural barriers.

Description. Shell small, diameter 1.58–1.99 mm (holotype 1.71), with $4\frac{1}{8}$ – $5\frac{1}{8}$ (holotype $4\frac{1}{2}$) whorls.

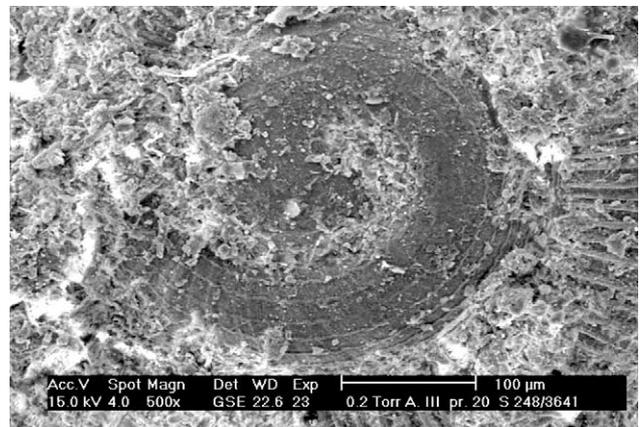


Fig. 93. *Andrefrancia quadrilamellata* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

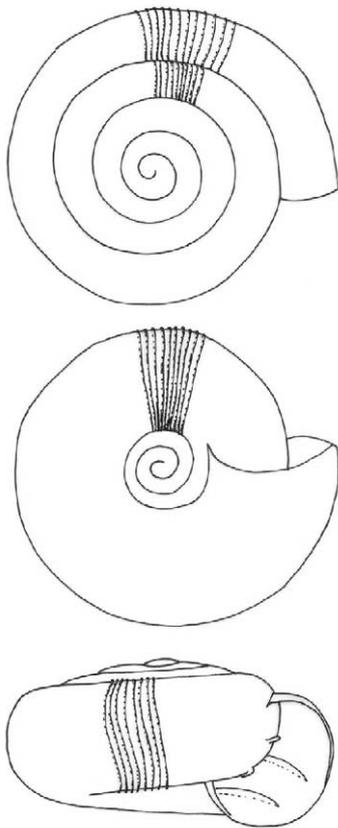


Fig. 94. *Andrefrancia quadrilamellata* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

Apex and spire slightly and evenly elevated, shell height 0.89–1.23 mm (holotype 0.96), H_{sp}/H ratio 0.08–0.19 (mean 0.15, holotype 0.14), H/D ratio 0.54–0.62 (mean 0.58, holotype 0.56). Body whorl slightly descending. Protoconch with $1\frac{1}{4}$ – $1\frac{1}{2}$ whorls (holotype $1\frac{1}{4}$). Apical sculpture of about 8 spiral lirae. Radial, low growth ridges present on terminal part of embryonic shell. Definitive sculpture of relatively narrow, moderately high, blunt, protractively

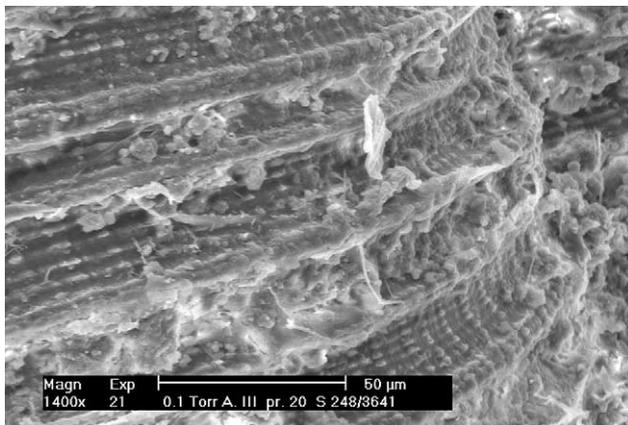


Fig. 95. *Andrefrancia quadrilamellata* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

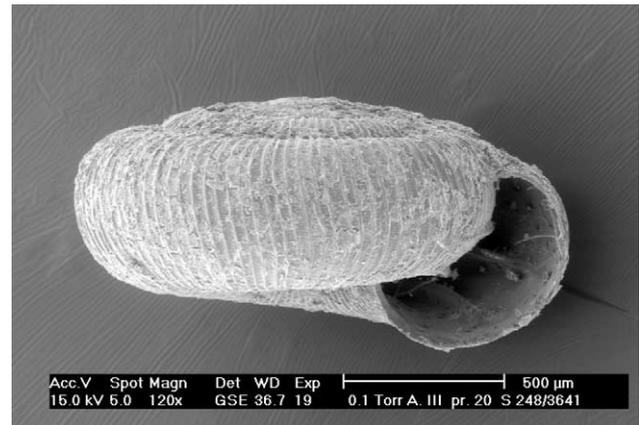


Fig. 96. *Andrefrancia quadrilamellata* n. sp., a paratype from the type locality (MNHN): frontal view of the shell

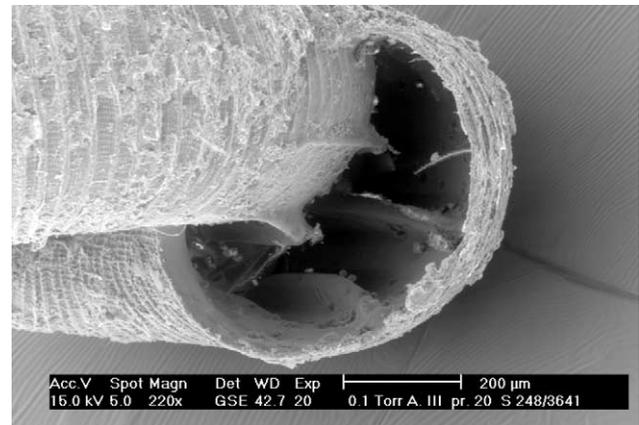


Fig. 97. *Andrefrancia quadrilamellata* n. sp., a paratype from the type locality (MNHN): barriers in apertural view

sinuated radial ribs, regularly spaced, 90–150 (mean 103, holotype 150) on body whorl. Shells are worn off, so periostracal blades on the major ribs seem to be absent. Microsculpture typical of the group with obsolete spiral cords which become conspicuous in the sutures. Umbilicus open, 3.43–4.50 times (mean 3.72, holotype 3.57) smaller than shell diameter. Suture impressed. Body whorl moderately laterally compressed. Aperture ovate, H_a/W_a ratio 0.83–1.11 (mean 0.99, holotype 1.00). W_{bw}/W_{io} ratio 1.25–1.67 (mean 1.34, holotype 1.67). D/N_w ratio 0.36–0.39 (mean 0.38, holotype 0.38). Parietal barriers: 2, blade-like, thin, low, slightly directed downwards. Palatal wall with 2 ridge-like barriers, moderately recessed, but visible in apertural view. All barriers extend posteriorly about $\frac{1}{4}$ body whorl, and gradually descend anteriorly and posteriorly. Colour uniform bright brown.

No alcohol-preserved material was available.

Name derivation. The name refers to the presence of four lamellate barriers in the aperture.

Distribution: Isle of Pines, New Caledonia, known from the type locality only.

***Andrefrancia berlieri* (Crosse, 1875)** (Figs 98, 101)

Helix berlieri CROSSE 1875: 144. Type locality: vicinity of Nouméa, New Caledonia. Holotype figured by FRANC 1957: pl. 14, fig. 166, The Natural History Museum, London.

Helix berlieri CROSSE 1879: 43–44, pl. 2, fig. 3; GASSIES 1880: 30, pl. 1, fig. 18.

Charopa berlieri (Crosse) ANCEY 1888: 366.

Endodonta (Thaumatodon) berlieri (Crosse) PILSBRY 1893: 27; CROSSE 1894: 219.

Ptychodon (Thaumatodon) berlieri (Crosse) FRANC 1957: 128, pl. 14, fig. 166 (holotype of *berlieri*).

Andrefrancia berlieri (Crosse) SOLEM 1961: 459.

Material examined: *A. berlieri* ex 46223 from the Fulton collection. CNHM 62591, 2 d.

Diagnosis. *A. berlieri*, similar to *A. quadrilamellata*, can be discriminated by its much more numerous radial ribs, more widely open umbilicus and arrangement of apertural barriers.

Description. Shell small, diameter 1.92–1.99 mm, with $4\frac{7}{8}$ whorls. Apex and spire slightly and evenly elevated, shell height 0.89–1.03 mm, H_{sp}/H ratio 0.08–0.13 (mean 0.11), H/D ratio 0.46–0.52 (mean 0.49). Body whorl slightly descending. Protoconch with $1\frac{1}{4}$ – $1\frac{3}{8}$ whorls. Apical sculpture of about 10 spi-

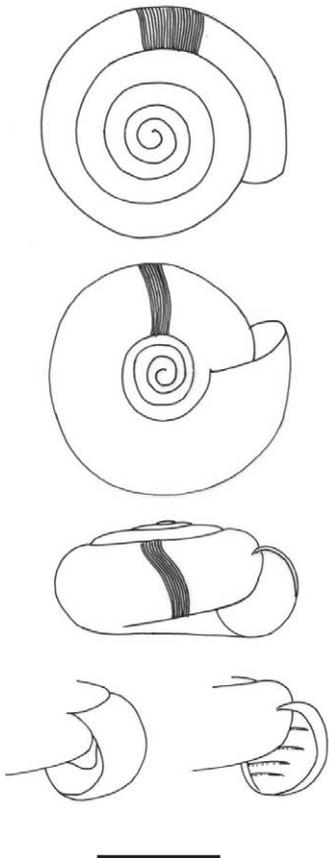


Fig. 98. *Andrefrancia berlieri*: shell of a specimen from an unknown locality in New Caledonia (CNHM 62591); scale bar = 1 mm

ral lirae. Definitive sculpture of fine, very closely set, slightly protractively sinuated radial ribs, regularly spaced, about 250 on body whorl. Shells are worn off, so periostracal blades on the major ribs seem to be absent. Microsculpture typical of the group. Umbilicus widely open, 2.80–2.90 times (mean 2.85) smaller than shell diameter. Suture impressed. Body whorl moderately laterally compressed. Aperture ovate, H_a/W_a ratio 1.00. W_{bw}/W_{lo} ratio 1.25. D/N_w ratio 0.39–0.41 (mean 0.40). Parietal wall with 1 thin and high lamella, set very closely to columellar wall, visible in oblique view of aperture. Palatal barriers: 4, thin and low lamellae, moderately recessed, but visible in apertural view. All palatal barriers extend posteriorly about L body whorl. Colour uniformly horn.

No alcohol-preserved material was available.

Remarks. The characters of the specimens examined in this study, labelled as *A. berlieri*, agree with FRANC's (1957) description of *Ptychodon berlieri* except for the presence of high parietal lamella, which FRANC did not mention. *A. berlieri* needs a SEM investigation to observe more details of apical and postapical microsculpture.

Distribution: Vicinity of Nouméa (Pointe de l'Artillerie), New Caledonia.

***Andrefrancia derbesianus* (Crosse, 1875)** (Figs 99, 101)

Helix derbesianus CROSSE 1875: 143. Type locality: vicinity of Nouméa, New Caledonia. Holotype figured by FRANC 1957: pl. 14, fig. 167, The Natural History Museum, London. Paratype of *E. quadridens* (UMMZ 138324).

Helix derbesianus CROSSE 1879: 44–45, pl. 2, fig. 2; GASSIES 1880: 29, pl. 1 fig. 17.

Charopa derbesiana (Crosse) ANCEY 1888: 365.

Endodonta (Thaumatodon) derbesiana (Crosse) PILSBRY 1893: 27; CROSSE 1894: 220.

Endodonta (Thaumatodon) quadridens (Crosse) GUDE 1905: 13, pl. 4, fig. 9a–d.

Ptychodon quadridens (Crosse) RENSCH 1937: 591.

Ptychodon (Thaumatodon) derbesiana (Crosse) FRANC 1953a: 72, fig. 1; 1957: 128–129, pl. 14, fig. 167 (holotype of *derbesianus*).

Andrefrancia derbesianus (Crosse) SOLEM 1961: 458.

Material examined: Artillery Point, Noumea, New Caledonia ex UMMZ 138324 WALKER (labelled as *A. derbesianus*); Paratype of: *Endodonta (Thaumatodon) quadridens*. CNHM, 62580, 1 d; New Caledonia. CNHM 46223, 1 d (labelled as *Ptychodon (Thaumatodon) derbesianus*).

Diagnosis. *A. derbesianus* differs from *A. cockerelli* in having body whorl laterally compressed, narrower umbilicus, twice more numerous ribs on the body

whorl, fewer parietal barriers, more palatal ones, which are of a different shape and arrangement.

Description. Shell small, diameter 1.71–1.78 mm, with $4\frac{1}{4}$ whorls. Apex and spire slightly and evenly elevated, shell height 0.96–1.03 mm, H_{sp}/H ratio 0.20–0.21, H/D ratio 0.56–0.58. Body whorl slightly descending. Protoconch with $1\frac{3}{8}$ – $1\frac{1}{2}$ whorls. Apical sculpture of about 10 spiral lirae. Definitive sculpture of fine, slightly protractively sinuated radial ribs, regularly spaced, 80 on body whorl. Shells are worn off, so periostracal blades on the major ribs seem to be absent. Microsculpture typical of the group. Umbilicus open, 3.13–3.71 (mean 3.42) smaller than shell diameter. Suture impressed. Body whorl moderately laterally compressed. Aperture ovate, H_a/W_a ratio 1.00. W_{bw}/W_{lo} ratio 1.50. D/N_w ratio 0.40–0.42. Parietal barriers: 2 fusing thick and high lamellae, both distinctly twisted – the upper one upward, the lower one downward. Palatal wall with 8 short barriers: lower at baso-columellar margin, strong, relatively high, subconical; three subsequent very fine, inwards and closely set; 4th longish with the inner end directed to the axis; 5th in medial position, thick, slightly bifurcated; three last, very fine, set close to one another on upper margin. Dentition visible in apertural view. Colour uniformly horn.

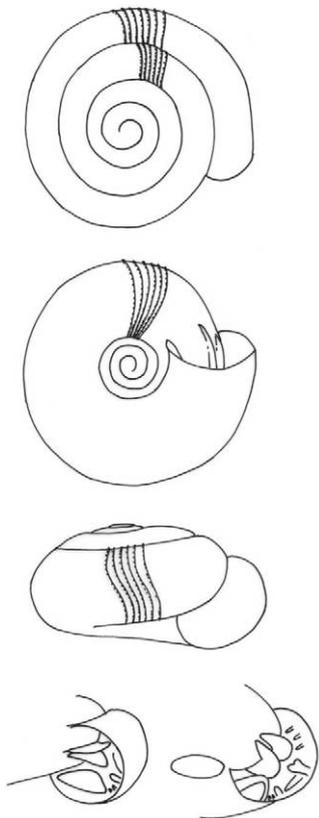


Fig. 99. *Andrefrancia derbesianus*: shell of a specimen from Nouméa (UMMZ 138324); scale bar = 1 mm

No alcohol-preserved material was available.

Remarks. The characters of the specimens examined in this study, labelled as *A. derbesianus*, agree with FRANC's (1957) description of *Ptychodon derbesianus*. This species needs to be examined in SEM to reveal more details of embryonic and postembryonic shell.

Distribution: Artillery Point, Noumea, New Caledonia. According to SOLEM (1961) type locality: vicinity of Noumea, New Caledonia (*derbesianus*), Artillery Point, Nouméa, New Caledonia (*quadridens*).

***Andrefrancia cockerelli* (Solem, 1960)** (Figs 100, 101)

Andrefrancia cockerelli SOLEM 1960: 2–4, figs 4–7. Type locality: River drift at sea coast a few miles from Bourail, New Caledonia. Holotype ANSP 15099. Paratypes ANSP 245441, CNHM 73063.

Material examined: River drift, sea coast nr Bourail, New Caledonia, COCKERELL 1928. Paratopotype. CNHM 73063, 2 d (labelled as *A. cockerelli*).

Diagnosis. *A. cockerelli* can be distinguished from *A. derbesianus* by its body whorl shouldered above and flattened below the periphery, more widely open umbilicus, twice fewer ribs on the body whorl, more numerous parietal barriers, fewer palatal ones, which are of a different shape and arrangement.

Description. Shell small, diameter 1.37–1.71 mm, with $4\frac{1}{4}$ – $4\frac{1}{2}$ whorls. Apex and spire slightly and evenly elevated, shell height 0.75–0.82 mm, H_{sp}/H ratio 0.17–0.18, H/D ratio 0.48–0.55. Body whorl slightly descending. Protoconch with $1\frac{3}{8}$ whorls. Apical sculpture of a few spiral lirae. Definitive sculpture of relatively low, slightly protractively sinuated radial ribs, regularly spaced, 40 on body whorl. The shells are worn off, so periostracal blades on the major ribs seem to be absent. Microsculpture typical of the group. Umbilicus widely open, 2.78–2.86 times smaller than shell diameter. Suture impressed. Body whorl shouldered above and flattened below periphery. Aperture ovate, H_a/W_a ratio 0.88. W_{bw}/W_{lo} ratio 1.00–1.33. D/N_w ratio 0.32–0.38. Parietal wall with 3 lamellae: the lowest short and tuberculately swollen, middle one distinctly twisted downward. Palatal wall with about 6 tuberculate barriers, moderately recessed: 3 at baso-columellar margin and 3 outer somewhat. Denticles visible in apertural view. Colour uniformly horn.

No alcohol-preserved material was available.

Remarks. *A. cockerelli* needs a SEM examination to observe more details of apical and postapical microsculpture. The exact number of palatal barriers is unknown because of the minute size and fragility of the shells.

Distribution: Bourail, New Caledonia.

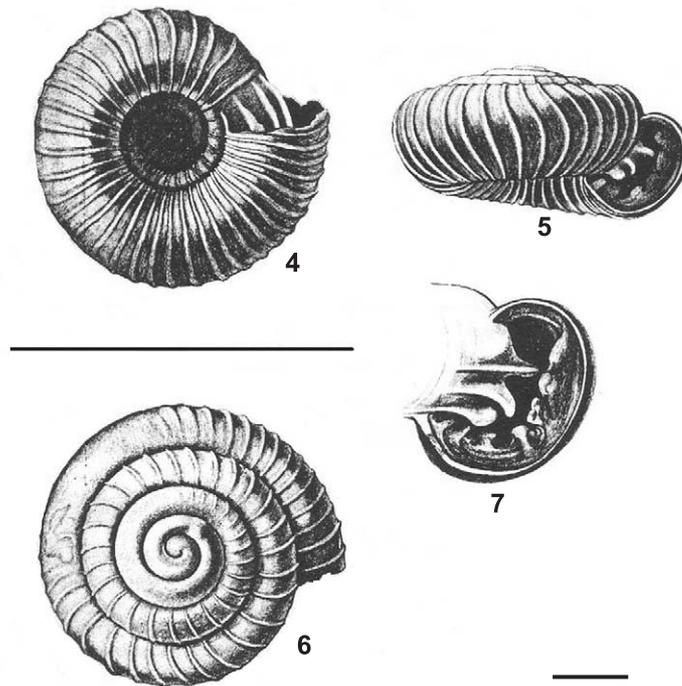


Fig. 100. *Andrefrancia cockerelli*: shell of the holotype (ANSP 150999), after Solem 1960; scale bar = 2 mm

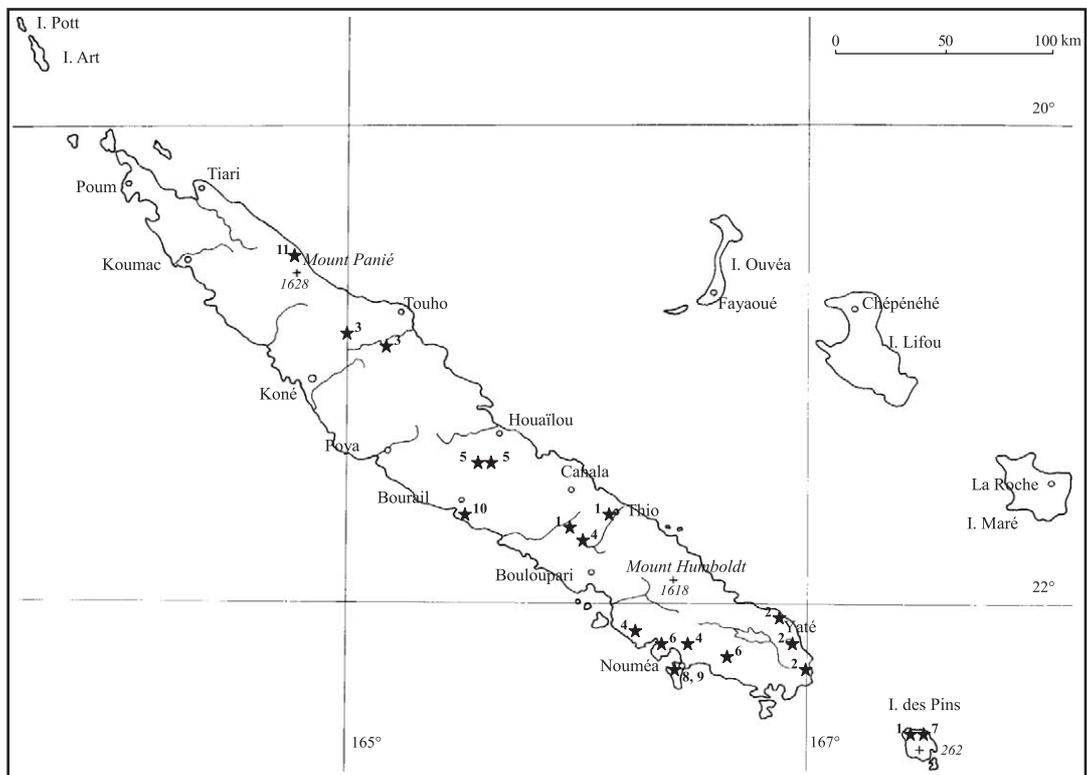


Fig. 101. Distribution map of *Andrefrancia*, groups III and VII
 1 - *A. vincentina*, 2 - *A. mamieana*, 3 - *A. amoana*, 4 - *A. kuanthiana*, 5 - *A. tuberculata*, 6 - *A. cryptodon*, 7 - *A. quadrilamellata*, 8 - *A. berlieri*, 9 - *A. derbesianus*, 10 - *A. cockerelli*, 11 - *A. miracidium*

GROUP IV

***Andrefrancia ostiolum* (Crosse, 1870)** (Figs 102–106, 113)

Helix ostiolum CROSSE 1870: 240–241. Type locality: New Caledonia. Holotype figured by FRANC 1957: pl. 11, fig. 145, The Natural History Museum, London.

Helix ostiolum CROSSE 1873: 341–342, pl. 14, fig. 5; GASSIES 1871: 48.

Patulastra stiolum (Crosse) ANCEY 1882: 86.

Charopa ostiolum (Crosse) ANCEY 1888: 367; PILSBRY 1893: 33; CROSSE 1894: 226.

Helix morosula (Crosse) GASSIES 1871: 48–49, pl. 7, fig. 18.

Helix koutoumensis (Crosse) GASSIES 1871: 182.

Charopa ostiolum (Crosse) FRANC 1957: 114–115, pl. 11, fig. 145 (holotype of *ostiolum*).

Andrefrancia ostiolum (Crosse) SOLEM 1961: 459.

Material examined: New Caledonia. Caillot. MNHN, 3 d. No exact locality; New Caledonia. DENIS (labelled as *A. ostiolum*). MNHN, 2 d. No exact locality; Nouméa, pointe de l'Artillerie. Savès leg. GASSIES (loc. Type: Conception pres de Nouméa; labelled as

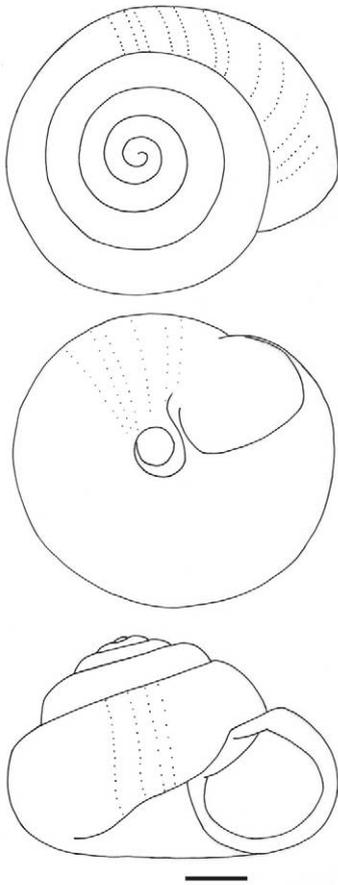


Fig. 102. *Andrefrancia ostiolum*: shel of a specimen from an unknown locality in New Caledonia (MNHN); scale bar = 1 mm

A. morosula ex. *autens*). MNHN, 2 d ; Baie du Sud leg. Mus.de Bordeaux, 1871 (labelled as *A. morosula* ex. *autens*). MNHN, 4 d; New Caledonia. Caillot (labelled as *A. ostiolum*). MNHN, 9 d; Nouméa (labelled as *A. koutoumensis*) WALKER, Caziot ex UMMZ 138287, 1 d.

Diagnosis. *A. ostiolum* can be distinguished from *A. melaleucarum* by its irregularly spaced ribs, lack of keel on the body whorl, narrower umbilicus showing only the penultimate whorl inside and rounded aperture.

Description. Shell diameter 4.20–6.00 mm, with $4\frac{1}{4}$ – $5\frac{1}{4}$ whorls. Apex and spire moderately and evenly elevated, dome-shaped, shell height 3.10–5.00 mm, H_{sp}/H ratio 0.17–0.36 (mean 0.22), H/D ratio 0.70–1.00 (mean 0.80). Body whorl descending rapidly. Protoconch with $1\frac{1}{4}$ – $1\frac{1}{2}$ whorls. Apical sculpture smooth. Radial growth ridges on terminal part of embryonic shell hardly visible. Definitive sculpture of strongly reduced, protractively sinuated radial ridges, visible rather as increment lines, irregularly spaced 90–137 (mean 114) on the body whorl. Microsculpture of irregularly spaced radial ridges, more or less pronounced, and low, closely set spiral cords; no

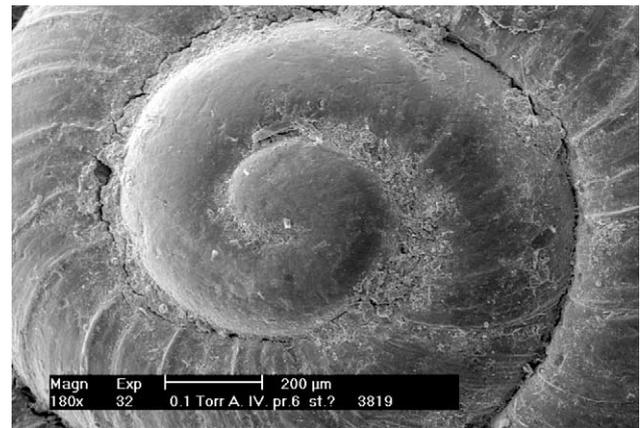


Fig. 103. *Andrefrancia ostiolum*, a specimen from an unknown locality in New Caledonia (MNHN): apical and early postnuclear sculpture

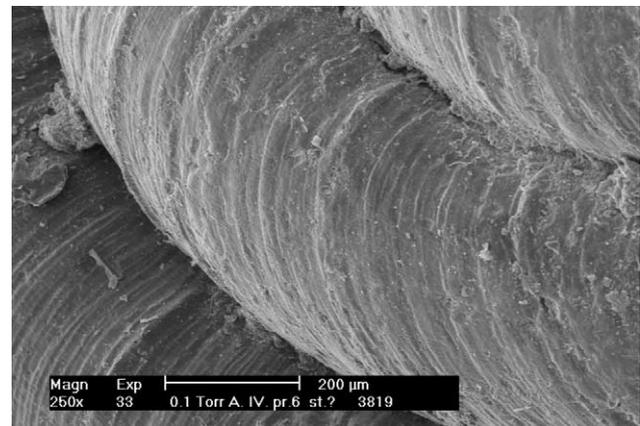


Fig. 104. *Andrefrancia ostiolum*, a specimen from an unknown locality in New Caledonia (MNHN): macrosculpture of the shell

knobs at their intersection. Umbilicus narrow 6.00–10.00 (mean 8.18) times smaller than shell diameter, only penultimate whorl can be seen in umbilicus. Body whorl laterally compressed, no keel. Aperture rounded and sometimes slightly flattened above periphery, H_a/W_a ratio 0.84–1.00 (mean 0.92). W_{bw}/W_{lo} ratio 1.60–2.50 (mean 2.08). D/N_w ratio 0.98–1.17 (mean 1.08). Columellar and basal margin of aperture somewhat deflected, often slightly covering umbilicus. Colour faded, milky, monochrome, shells sometimes shiny.

No alcohol-preserved animal was available.

Remarks. The examined specimens correspond to the description of *Charopa ostiolum* (FRANC 1957). SOLEM (1961) mentioned spirally sculptured apical whorls of fresh specimens. The SEM examination at high magnification has shown no traces of spiral elements. I have found no conchological differences between such forms as *Helix ostiolum*, *H. morosula*, *H. koutoumensis* and *Charopa ostiolum*, which confirms the synonymy proposed by SOLEM (1961). According to SOLEM (1961) the type localities are: New Caledonia (*A. ostiolum*), Conception near Noumea, New Caledo-

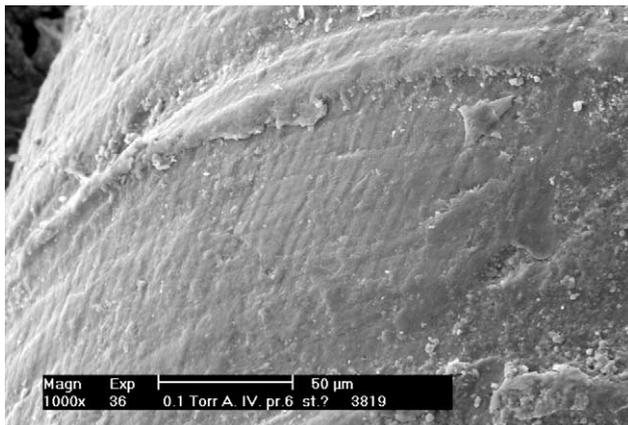


Fig. 105. *Andrefrancia ostiolum*, a specimen from an unknown locality in New Caledonia (MNHN): microsculpture of inner whorl

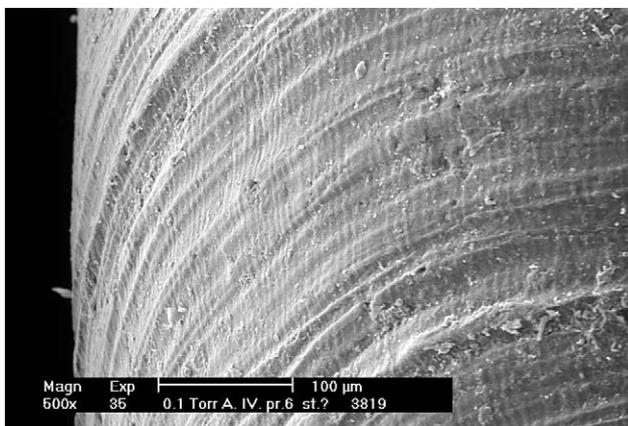


Fig. 106. *Andrefrancia ostiolum*, a specimen from an unknown locality in New Caledonia (MNHN): sculpture of body whorl

nia (*A. morosula*), and Koutoumo Island, New Caledonia (*A. koutoumensis*).

Distribution: Nouméa, pointe de l'Artillerie Don Savès, Baie du Sud, New Caledonia.

***Andrefrancia melaleucarum* (Gassies, 1872)** (Figs 107, 113)

Helix melaleucarum GASSIES 1872: 336–337. Type locality: Nou Island, New Caledonia (SOLEM 1961). Holotype figured by FRANC 1957: pl. 11, fig. 146, The Natural History Museum, London.

Helix melaleucarum GASSIES 1873: 337, pl. 14, fig. 7; 1880: 27, pl. 1, fig. 15.

Charopa melaleucarum (Gassies) ANCEY 1888: 367; PILSBRY 1893: 33; CROSSE 1894: 226; FRANC 1957: 115, pl. 11, fig. 146 (holotype of *melaleucarum*).

Andrefrancia melaleucarum (Gassies) SOLEM 1961: 459.

Material examined: Semifossil on top of hill, Nouméa. COCKERELL 1928 (labelled as *A. melaleucarum*). CNHM 72838, 1 d.

Diagnosis. *A. melaleucarum* differs from *A. ostiolum* in having quite regularly spaced, relatively broad radial ribs, wider umbilicus showing all whorls inside, bluntly keeled body whorl, and ovate aperture.

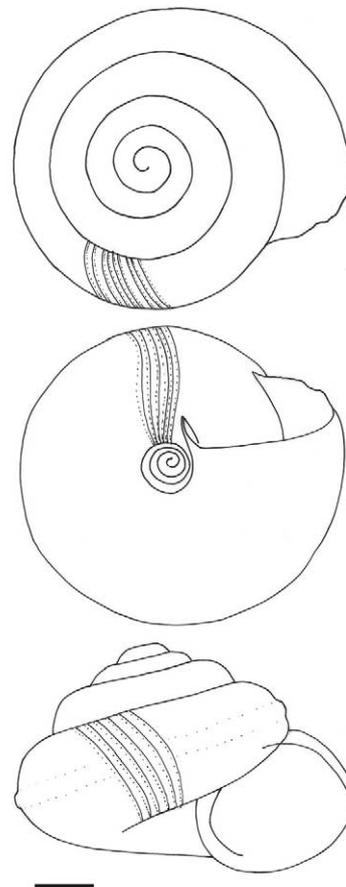


Fig. 107. *Andrefrancia melaleucarum*: shell of a specimen from Nouméa (MNHN 72838); scale bar = 1 mm

Description. Shell diameter 5.40 mm, with $4\frac{1}{2}$ whorls. Apex and spire moderately and evenly elevated, dome-shaped, shell height 4.10 mm, H_{sp}/H ratio 0.24, H/D ratio 0.76. Body whorl descending rapidly. Protoconch with $1\frac{1}{4}$ whorls. Apical sculpture smooth. Definitive sculpture of very low, relatively broad, blunt, slightly protractively sinuated radial ribs, quite regularly spaced, 120 on the body whorl. Microsculpture of spiral cords (ridges?). Umbilicus narrow, 6.75 times smaller than shell diameter, all whorls are visible inside. Body whorl laterally compressed with low, broad and blunt keel. Aperture ovate, H_a/W_a ratio 0.84. W_{bw}/W_{lo} ratio 1.70. D/N_w ratio 1.20. Columellar margin of aperture slightly deflected but not covering umbilicus. Colour faded, yellowish – milky, monochrome.

No alcohol-preserved material was available.

Remarks. To see more details of micro- and macro-sculpture an SEM examination is necessary. The following differences have been found compared to the description of *Charopa melaleucarum* given by FRANC (1957): body whorl barely descending and not keeled; suture deep; shell colour bright chestnut. On the other hand, the diagnosis by GASSIES (1880) refers to body whorl descending more rapidly and keeled; deep suture and obscure dark chestnut shell colour. According to FRANC (1957) *Ch. melaleucarum* resembles *Ch. ostiolum* in its narrow umbilicus and the way of whorl coiling, but differs in macrosculpture. However, in the museum's collection intermediate forms can be found, with barely ribbed shells and lower spire, like in *A. ostiolum*.

Distribution: Nouméa, New Caledonia. Distribution according to FRANC (1957): Bondé; Ile Nou, à la base des Niaoulis.

***Andrefrancia bourailensis* (Gassies, 1872)** (Figs 108, 113)

Helix bourailensis GASSIES 1872: 336–337. Type locality: Bourail, New Caledonia. Holotype figured by SOLEM 1960: figs 1–3. Holotype ANSP 60066.

Helix bourailensis GASSIES 1873: 336, pl. 14, fig. 4.

Andrefrancia bourailensis (Gassies) SOLEM 1960: 4.

Material examined: Bourail, river drift at sea coast (labelled as *A. bourailensis*). COCKERELL 1928 ex Acad. Nat. ci. Philadelphia. CNHM 97408, 1 d.

Diagnosis. Lower H/D , H_a/W_a , D/N_w ratios, narrower umbilicus, body whorl rounded and slightly flattened below the periphery, aperture ovate and steeply declined separate *A. bourailensis* from *A. ostiolum*.

Description. Shell diameter 2.95 mm, with $3\frac{1}{2}$ relatively tightly coiled whorls. Apex and spire slightly elevated, shell height 1.51 mm, H_{sp}/H ratio 0.09, H/D ratio 0.51. Body whorl descending rapidly. Protoconch with $1\frac{1}{4}$ whorls. Apical sculpture eroded. Definitive sculpture of strongly reduced, uncountable radial ribs, irregularly spaced. Microsculpture of radial riblets and spiral cords. Umbilicus narrow, 14.33 times smaller than shell diameter, all whorls can be seen in it. Body whorl rounded and slightly flattened below periphery, no keel. Aperture ovate, steeply declined, H_a/W_a ratio 0.80. Because the shell is damaged it was not possible to measure W_{bw}/W_{lo} ratio. D/N_w ratio 0.84. Columellar margin of aperture

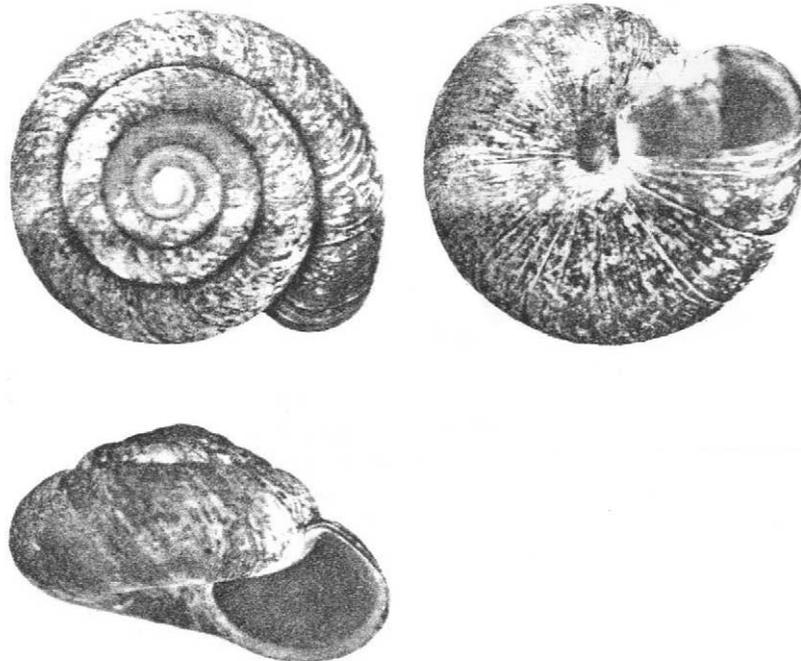


Fig. 108. *Andrefrancia bourailensis*: shell of a specimen from Bourail (CNHM 97408), after SOLEM 1961

slightly deflected but not covering umbilicus. Colour faded, yellowish horn, monochrome.

No alcohol-preserved material was available.

Remarks. *A. bourailensis* omitted by FRANC (1957), was rediscovered in the material collected by T. D. A. COCKERELL and redescribed by SOLEM (1960). The specimen in SOLEM's diagnosis is bigger: shell diameter 6 mm, number of whorls $5\frac{1}{4}$, height 3.8 mm, H/D ratio 6.35 (0.35?), umbilicus 9 times smaller than shell diameter. To observe more details of micro- and macrosculpture an SEM examination is required.

Distribution: Bourail, river drift at sea coast, New Caledonia.

Andrefrancia vaoana n. sp. (Figs 109–113)

Type locality: Vao; Ile des Pins, New Caledonia.

Type material: Vao; Ile des Pins ($167^{\circ}29'10''\text{E}$, $22^{\circ}09'36''\text{S}$). BOUCHET, July 15, 1978. MNHN, 35 d.

Diagnosis. This species differs from *A. ostiolum* in having smaller and lower shell, conical spire, body whorl rounded, wider umbilicus, and less reduced radial ribs.

Description. Shell diameter 2.00–3.00 mm (holotype 2.70 mm), with $3\frac{1}{8}$ –4 (holotype $3\frac{7}{8}$) whorls. Apex and spire moderately and evenly elevated, shell height 1.25–2.05 mm (holotype 1.85), H_{sp}/H ratio 0.07–0.18 (mean 0.10, holotype 0.14), H/D ratio 0.57–0.69 (mean 0.60, holotype 0.69). Body whorl slightly descending. Protoconch with $1\frac{1}{8}$ – $1\frac{3}{8}$ whorls (holotype

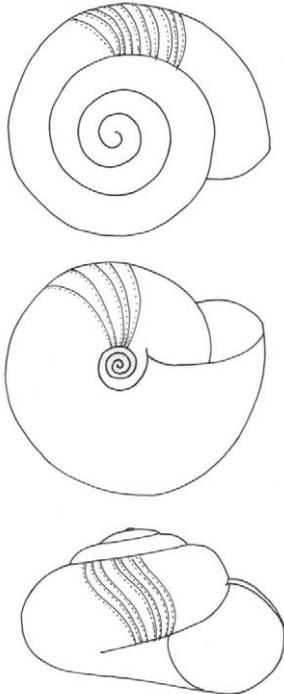


Fig. 109. *Andrefrancia vaoana* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

$1\frac{1}{4}$). Apical sculpture of spiral ridges, one by one. Several radial ridges, fine and irregularly spaced before teleoconch. Definitive sculpture of reduced, low, blunt, protractively sinuated radial ribs irregularly spaced 40–70 (mean 56, holotype 63) on the body whorl. Microsculpture of radial riblets and spiral cords, which form barely knobs. Umbilicus relatively narrow, 4.80–6.00 (mean 5.30, holotype 6.00) smaller than shell diameter. Body whorl rounded, sometimes

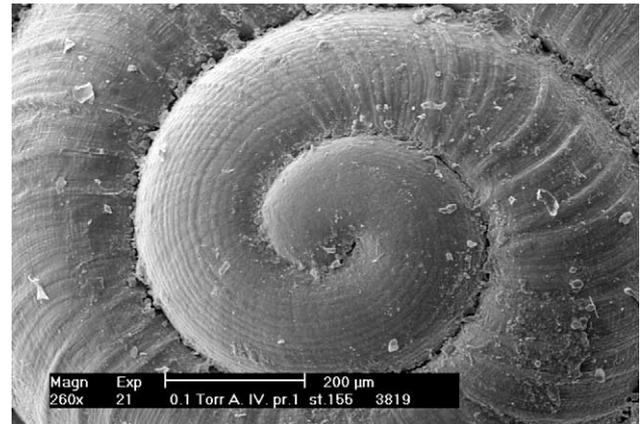


Fig. 110. *Andrefrancia vaoana* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

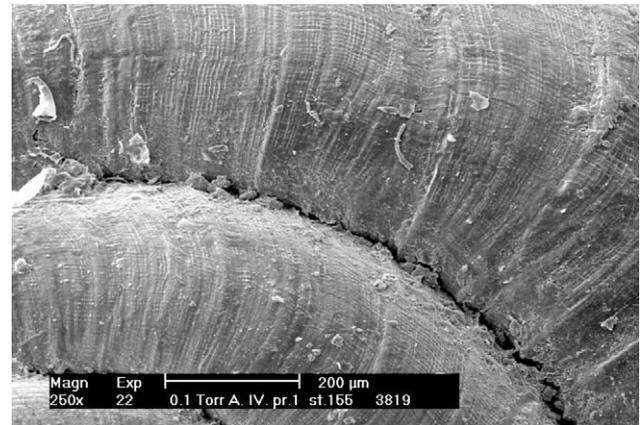


Fig. 111. *Andrefrancia vaoana* n. sp., a paratype from the type locality (MNHN): sculpture of inner whorls

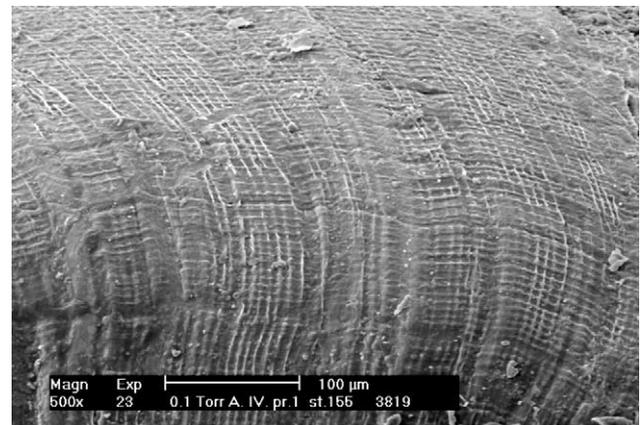


Fig. 112. *Andrefrancia vaoana* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

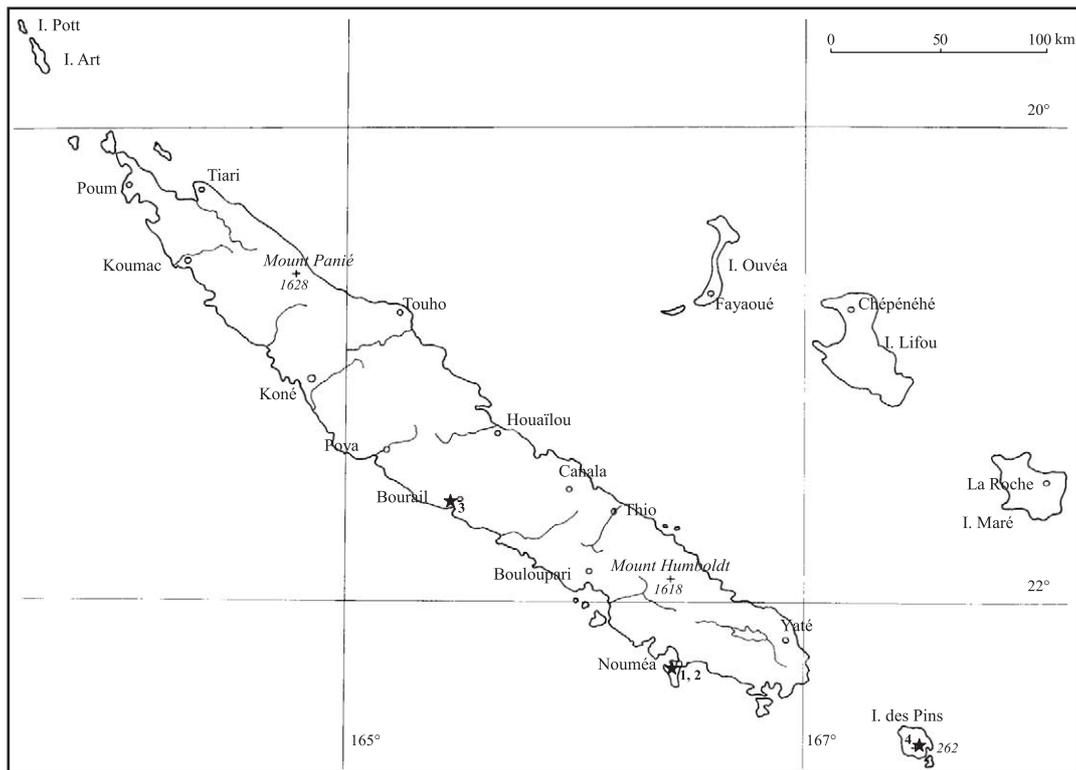


Fig. 113. Distribution map of *Andrefrancia*, group IV: 1 – *A. ostiolum*, 2 – *A. melaleucarum*, 3 – *A. bourailensis*, 4 – *A. vaoana*

slightly flattened above periphery, no keel. Aperture rounded, barely flattened above periphery, H_a/W_a ratio 0.87–1.05 (mean 1.00, holotype 1.00). W_{bw}/W_{1o} ratio 1.60–2.25 (mean 1.90, holotype 1.80). D/N_w ratio 0.62–0.77 (mean 0.70, holotype 0.70). Colour mostly leached, locally brightly horn, probably monochrome.

No alcohol-preserved material was available.

Name derivation. The name was coined from the name of the village which is the type locality.

Distribution: Isle of Pines, Vao, New Caledonia, known from the type locality only.

GROUP V

Andrefrancia tandjiana n. sp. (Figs 114–117, 172)

Type locality: Mount Tandji, New Caledonia.

Type material: Mount Tandji (164°55'12"E 20°57'14"S), N ridge, 820 m a.s.l. Humid forest. TILLIER & TILLIER, November 16, 1988. Holotype a & paratypes 17 a (3 dissected), 6 d, MNHN.

Diagnosis. *A. tandjiana* is conchologically very similar to *A. cressoniana*, *A. setosa*, *A. incipiens*, *A. goanna*, *A. memaoyana*; it differs from them in some characters. This species can be distinguished from *A. cressoniana* by its body whorl more flattened above and below the periphery, lower number of radial ribs and spirally sculptured embryonic shell. *A. setosa* has reduced, very low major ribs, closer set, with periostracal setae and suture

not detached on the last two whorls. *A. incipiens* has body whorl partially keeled, spiral cords wavy in nucleus and indistinct flammulations. *A. goanna* differs from *A. tandjiana* in having rounded body whorl and more rounded aperture. In comparison with *A. tandjiana*, *A. memaoyana* is larger and has broader flammulated zigzags.

Description. Shell. Shell large, diameter 3.00–6.20 mm (holotype 5.60 mm), with 4–5 $\frac{5}{8}$ (holotype 5) whorls. Shell height 1.70–3.70 mm (holotype 3.00 mm), H_{sp}/H ratio 0.07–0.19 (mean 0.12, holotype 0.07), H/D ratio 0.49–0.60 (mean 0.53, holotype 0.54). Body whorl descending rapidly. Protoconch with 1 $\frac{1}{8}$ –1 $\frac{1}{2}$ whorls (holotype 1 $\frac{3}{8}$). Apical sculpture of several, fine, closely set spiral lirae, gradually fading up on the inner half of protoconch width, and of a few weak radial growth ridges just before teleoconch. Definitive sculpture of moderately high and wide, blunt, protractively sinuated radial ribs, regularly spaced 39–64 (mean 52, holotype 61) on the body

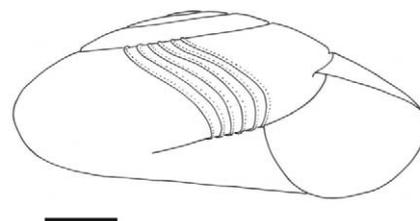


Fig. 114. *Andrefrancia tandjiana* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

whorl. Microsculpture typical of the group. Umbilicus open, 3.40–4.00 (mean 3.80 holotype 4.00) smaller than shell diameter. Suture impressed, detached on the two last whorls; spire whorls hardly rounded or even flat. Body whorl strongly flattened above periphery, and slightly more mildly flattened below, no keel. Aperture roughly subquadrate, strongly flattened above and below periphery with slightly rounded basal margin, H_a/W_a ratio 0.75–1.09 (mean 0.89, holotype 0.75). W_{bw}/W_{lo} ratio 1.67–2.50 (mean 2.12, holotype 2.10). D/N_w ratio 0.73–1.10 (mean 0.99, holotype 1.10). Colour light yellow horn with more or less regular reddish flammulations, joining together.

Animal creamy white.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct extensively convoluted with a greenish tint. Epiphallus shorter than penis, entering it subapically through a simple pore surrounded by a semicircular thick fold. Internally epiphallus shows two longitudinal pilasters. The vas deferens entrance into epiphallus enlarged, valvular with characteristic pilaster arrangement (Fig. 115e). Penial retractor muscle inserts on the penis subapically, adjacent to the penis/epiphallus junction;

not twisted. Penis moderately long, pear-shaped with a small apical bulb and a lower chamber that is swollen medially, tapered to atrium junction. There are neither penial glandulae nor other accessory structures. Internally upper chamber shows a semicircular fold and small circular pad surrounding epiphallic entrance. Just below them there are some longitudinal pilasters. Lower chamber shows a large conical stimulator with its apex directed towards atrium and section along side. Surrounding walls slightly sculptured with tiny longitudinal folds. Vagina ca. as long as penis, internally with some fine longitudinal pilasters; just below free oviduct and spermathecal shaft junction there are some thick transverse thickenings. Free oviduct looped around spermathecal shaft. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct shorter than penis. Basal part of spermathecal shaft wider, then gradually narrowing. Spermatophore unusual, comma-shaped with one end twisted, the other end with a „tail”. On spermatophore a crest extending along its entire length.

Name derivation. The name is derived from the name of the mountain where the new species was found.

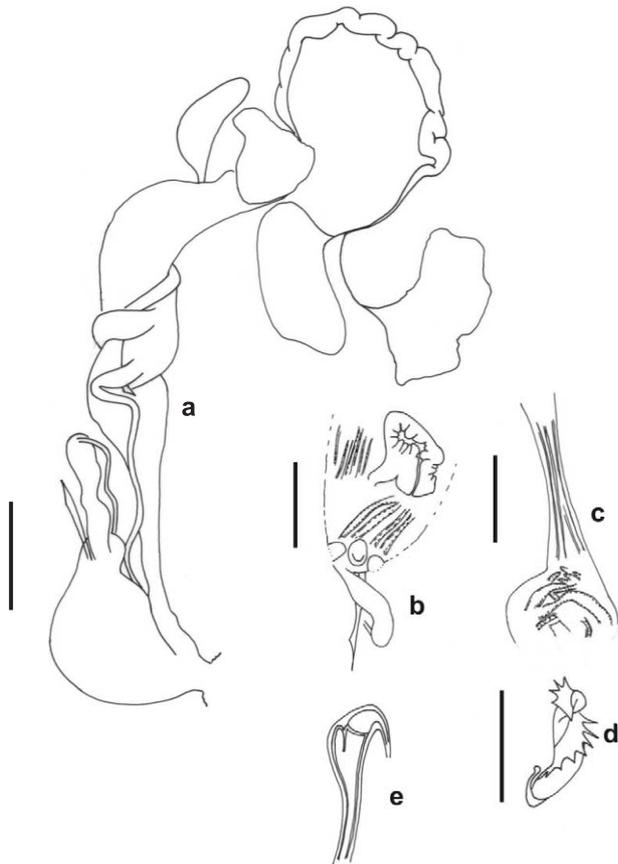


Fig. 115. *Andrefrancia tandjiana* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – interior of penis; c – interior of vagina; d – spermatophore; e – interior of epiphallus and vas deferens entrance; scale bar = 1 mm

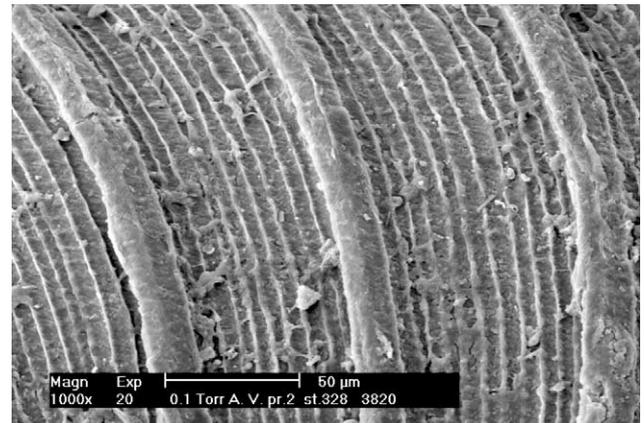


Fig. 116. *Andrefrancia tandjiana* n. sp., a paratype from the type locality (MNHN): sculpture of penultimate whorl

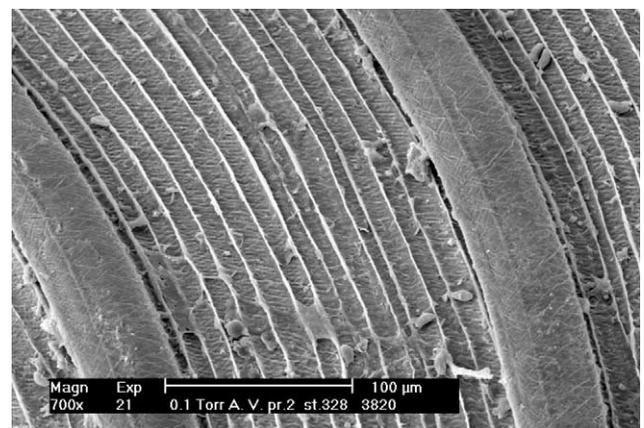


Fig. 117. *Andrefrancia tandjiana* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

Distribution: Mount Tandji, New Caledonia, known from the type locality only.

Andrefrancia cressoniana n. sp. (Figs 118–121, 172)

Type locality: Le Cresson, New Caledonia.

Type material: Le Cresson (164°18'36"E 20°29'00"S). Dry forest on limestone. MORDAN, TILLIER & TILLIER, January 29, 1981 and June 30, 1979. Holotype a & paratypes 21 a (3 dissected), 7 d, MNHN.

Diagnosis. This species is distinct in having smooth apical sculpture. It has smaller rib counts in comparison with *A. csetosa* and no setae, like in the latter. *A. incipiens* differs from *A. cressoniana* in having partially keeled body whorl, subquadrate aperture and spiral cords wavy on embryonic whorls. In comparison with *A. goanna*, *A. cressoniana* has a more flattened body whorl above and below periphery, and somewhat higher number of ribs. It is smaller than *A. memaoyana* and has narrower flammulations.

Description. Shell. Shell relatively large, diameter 3.50–5.00 mm, with $4\frac{1}{6}$ – $5\frac{1}{8}$ whorls. Shell height 1.60–2.60 mm, H_{sp}/H ratio 0.05–0.15 (mean 0.10), H/D ratio 0.43–0.54 (mean 0.47). Body whorl descending rapidly. Protoconch with $1-1\frac{1}{2}$ whorls. Apical sculpture naturally rough without any spiral or radial elements. Definitive sculpture of moderately high and wide, blunt, protractively sinuated radial ribs, regularly spaced 53–82 (mean 68) on the body whorl. Microsculpture typical of the group. Umbilicus open, 2.94–4.00 (mean 3.25) times smaller than shell diameter. Suture gradually deeper and deeper to become detached on the body whorl; spire whorls hardly rounded. Body whorl flattened above periphery, and rounded or slightly flattened below, no keel. Aperture roughly subquadrate, flattened above and below periphery, with slightly rounded basal margin, H_a/W_a ratio 0.76–1.12 (mean 0.93). W_{bw}/W_{lo} ratio 1.67–2.50 (mean 2.03). D/N_w ratio 0.84–1.08 (mean 0.96). Colour light yellow horn with more or less regular and coalescing reddish flammulations.

Animal creamy white.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct extensively convoluted with a golden-yellow sheen. Epiphallus as long as penis, entering it apically

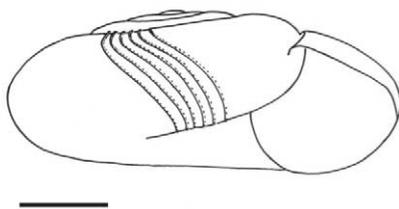


Fig. 118. *Andrefrancia cressoniana* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

through a large fleshy globular verge. Internally epiphallus shows two longitudinal pilasters. The vas deferens entrance into epiphallus enlarged, valvular with characteristic pilaster arrangement (Fig. 140c). Penial retractor muscle inserts on the penis apically on the penis/epiphallus junction; twisted twice around epiphallus. Penis moderately long, consists of two chambers separated by a constricting muscular collar. Upper chamber bulbous with a large globular

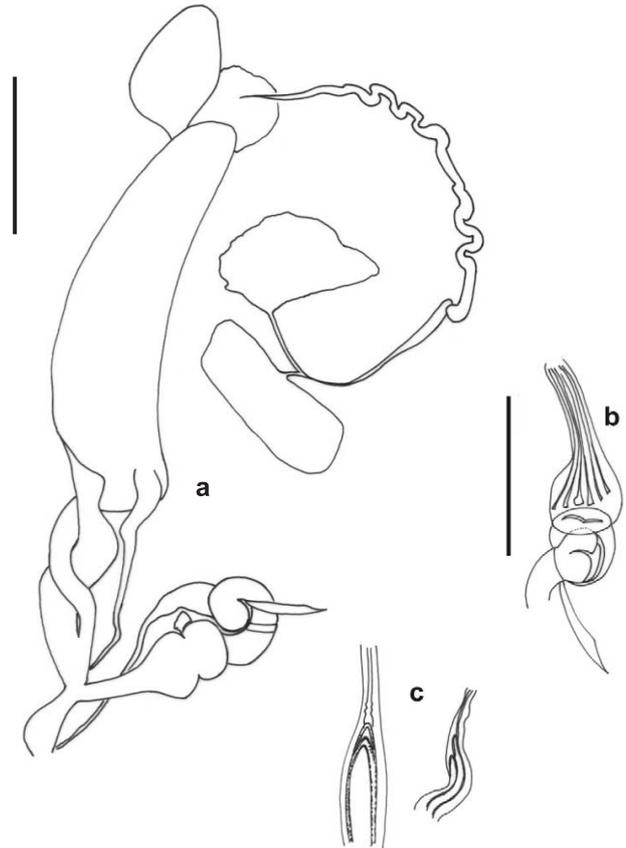


Fig. 119. *Andrefrancia cressoniana* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – interior of penis; c – interior of epiphallus and vas deferens entrance; scale bar = 1 mm

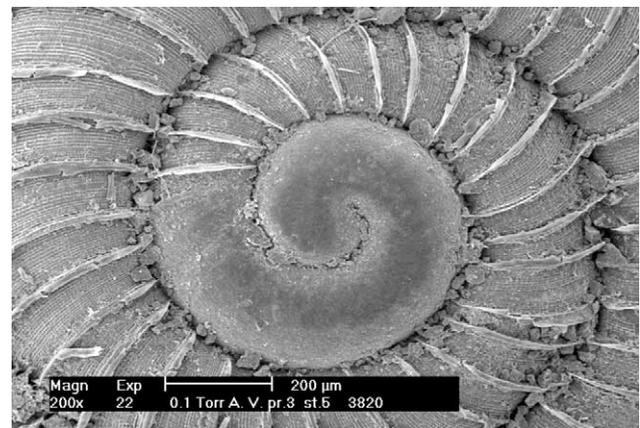


Fig. 120. *Andrefrancia cressoniana* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear whorl

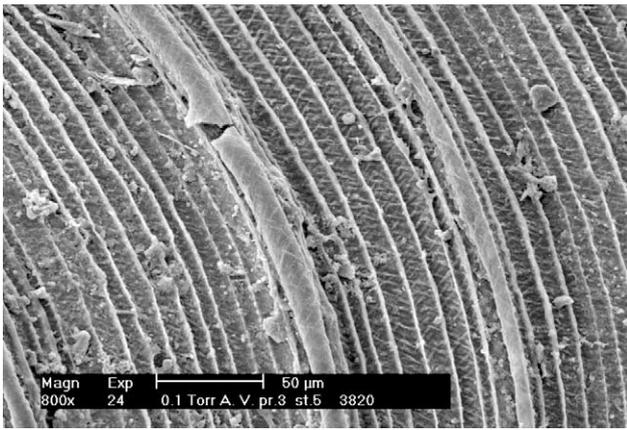


Fig. 121. *Andrefrancia cressoniana* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

verge. Lower chamber bulbous at the beginning, then abruptly tapered and cylindrical. The lower penial part shows longitudinal pilasters. There is one penial gland in the penial narrow. Vagina shorter than penis, internally with several fine longitudinal pilasters. Free oviduct and spermathecal shaft looped. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct shorter than penis. Initial part of spermathecal shaft wider, than gradually narrowing. Spermatophore not seen.

Name derivation. The name is derived from the name of the type locality.

Distribution: Le Cresson, New Caledonia, known from the type locality only.

***Andrefrancia setosa* n. sp.** (Figs 122–127, 172)

Terra typica: New Caledonia. For this species only “terra typica” can be given. The label is illegible, and no information could be obtained from the collectors.

Type material: New Caledonia. Dry forest second growth. TILLIER, BOUCHET & TRICLOT. Holotype a & paratypes 7 a (1 dissected), MNHN.

Diagnosis. This species differs from *A. incipiens*, *A. goanna* and *A. memaoyana*, in having much lower and denser major ribs with periostracal setae, impressed suture but not detached on the last whorls. *A. incipiens* has body whorl partially keeled and in *goanna* it is rounded.

Description. Shell. Shell large, diameter 3.00–5.20 mm (holotype 4.30 mm), with $3\frac{3}{4}$ – $4\frac{5}{6}$ (holotype $4\frac{1}{6}$) whorls. Apex and spire flat or slightly elevated, shell height 1.40–2.50 mm (holotype 2.00 mm), H_{sp}/H ratio 0.00–0.09 (mean 0.05, holotype 0.05), H/D ratio 0.43–0.50 (mean 0.47, holotype 0.47). Body whorl descending rapidly. Protoconch with $1\frac{1}{8}$ – $1\frac{3}{8}$ whorls (holotype $1\frac{1}{8}$). Apical sculpture of very fine spiral ridges, that fade up towards the inner suture. Numerous, weak radial ridges on the inner half of protoconch width, on its last quarter. Definitive sculpture

of very low and narrow, protractively sinuated radial ribs, regularly spaced 56–120 (mean 80, holotype 86) on the body whorl. There are long, fragile periostracal setae regularly spaced along the major ribs. Microsculpture typical of the group. Umbilicus open, 3.58–4.09 (mean 3.85 holotype 3.58) times smaller than shell diameter. Suture impressed, not detached; spire whorls hardly rounded. Body whorl equally flattened above and below periphery, no keel. Aperture roundly lunate and flattened above periph-

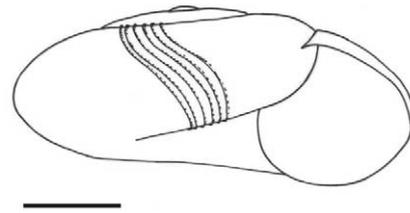


Fig. 122. *Andrefrancia setosa* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

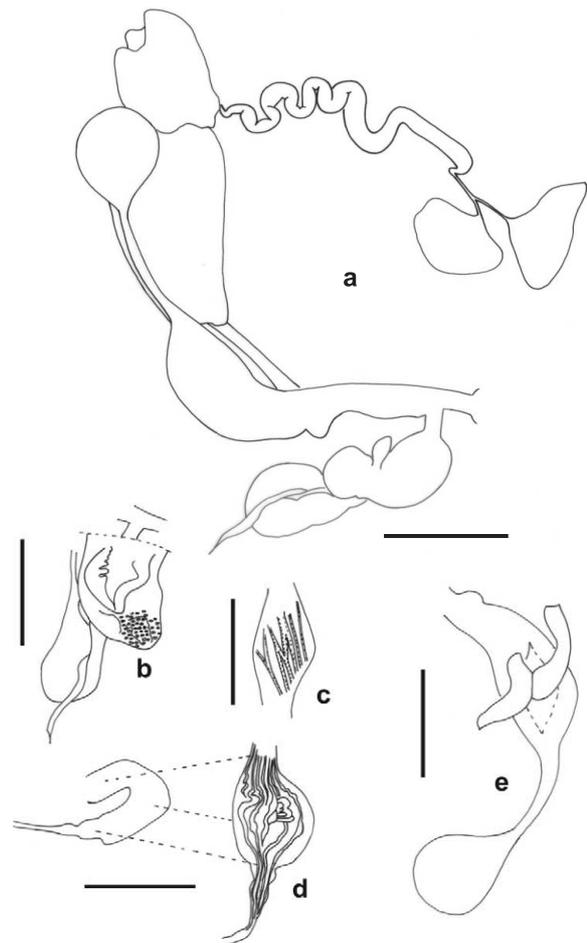


Fig. 123. *Andrefrancia setosa* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – interior of penis; c – interior of vagina; d – interior of epiphallus and vas deferens entrance; e – spermatophore; scale bar = 1 mm

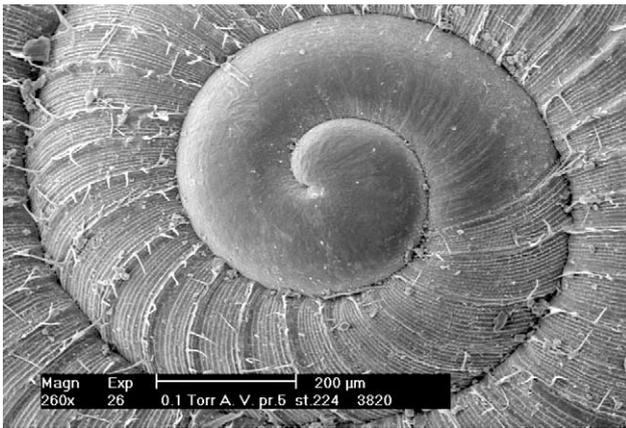


Fig. 124. *Andrefrancia setosa* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear whorl

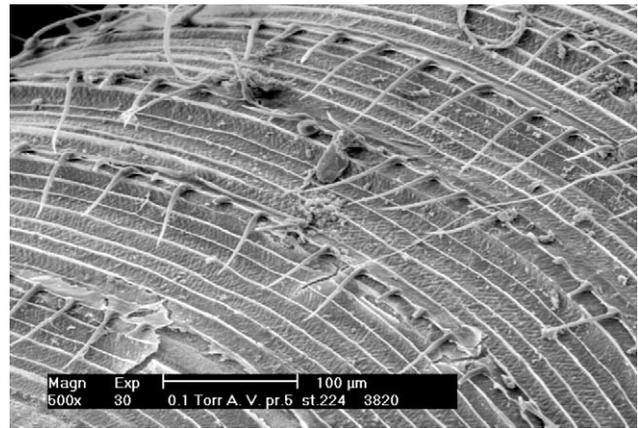


Fig. 127. *Andrefrancia setosa* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

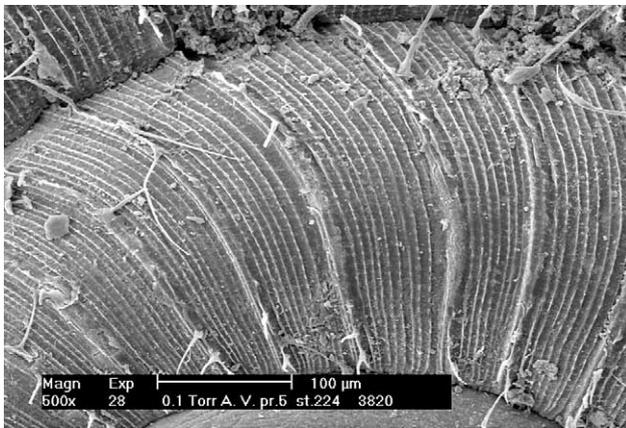


Fig. 125. *Andrefrancia setosa* n. sp., a paratype from the type locality (MNHN): sculpture of first postnuclear whorl

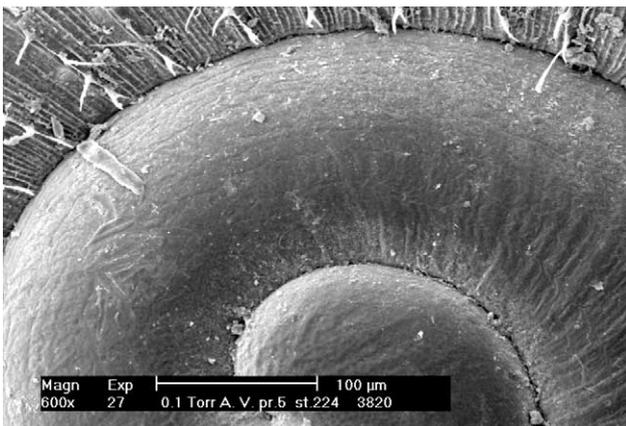


Fig. 126. *Andrefrancia setosa* n. sp., a paratype from the type locality (MNHN): details of embryonic shell

ery, H_a/W_a ratio 0.85–0.95 (mean 0.92 holotype 0.85). W_{bw}/W_{10} ratio 2.00–2.80 (mean 2.38, holotype 2.00). D/N_w ratio 0.80–1.08 (mean 0.94 holotype 1.03). Colour light yellow horn with more or less regular reddish flammulations, joining together, pale and fading up on shell base.

Animal creamy white.

Genital system. Ovistestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct extensively convoluted with a golden-yellow sheen. Epiphallus as long as penis, entering it laterally through a simple pore. Internally epiphallus shows several longitudinal pilasters. The vas deferens entrance into epiphallus enlarged, valvular with characteristic pilaster arrangement (Fig. 123d). Penial retractor muscle inserts on the penis laterally on the penis/epiphallus junction; not twisted. Penis moderately long, peanut-shaped. Upper chamber bulbous, internally with one thickening and general wall sculpture of spongy pustulations. Lower chamber bulbous at the beginning, then abruptly tapered and cylindrical. The lower penial part shows a large conical stimulator with its apex directed towards epiphallic entrance and section along side. There is one finger-like appendix in the penial narrow. Vagina shorter than penis, internally with several longitudinal pilasters. Free oviduct and spermathecal shaft not looped. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct shorter than penis. Basal part of spermathecal shaft wide, then abruptly narrowing. Spermatophore in the shape of two commas joined together.

Name derivation. The name refers to the setae on the major ribs of the shell.

Distribution: New Caledonia.

Andrefrancia incipiens n. sp. (Figs 128–131, 172)

Type locality: Aoupinié – Goa, New Caledonia.

Type material: Aoupinié – Goa (165°18'43"E 21°9'36"S), 450 m a.s.l. Humid forest. MORDAN, TILLIER & TILLIER, January 16, 1981. Holotype a & paratypes 6 a (2 dissected), MNHN.

Diagnosis. This species is characterised by partially keeled body whorl, subquadrate aperture and spiral cords wavy on embryonic whorls, which clearly separates it from *A. goanna* and *A. memaoyana*.

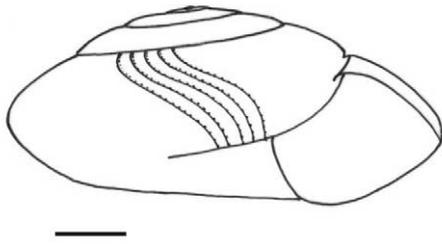


Fig. 128. *Andrefrancia incipiens* n. sp.: shell of the holotype (MNHN)

Description. Shell. Shell large, diameter 5.20–6.80 mm (holotype 6.80 mm), with $4\frac{3}{4}$ – $5\frac{1}{2}$ (holotype $5\frac{1}{2}$) whorls. Shell height 2.40–3.70 mm (holotype 3.50), H_{sp}/H ratio 0.13–0.19 (mean 0.15, holotype 0.14), H/D ratio 0.46–0.57 (mean 0.52, holotype 0.51). Body whorl descending rapidly. Protoconch with $1\frac{1}{4}$ – $1\frac{1}{2}$ whorls (holotype $1\frac{1}{2}$). Apical sculpture of about 9 fine spiral lirae visible on the outer half of protoconch width and wavy in nucleus. Few, weak radial riblets just before teleoconch. Definitive sculpture of moderately low and narrow, protractively sinuated radial ribs, regularly and relatively widely spaced 45–59 (mean 53, holotype 59) on the body whorl. Microsculpture typical of the group. Umbilicus open, 3.47–4.06 (mean 3.79, holotype 3.58) times smaller than shell diameter. Suture impressed, detached on the body whorl; spire whorls hardly rounded. Body whorl equally strongly flattened above and below periphery, partially keeled. Aperture subquadrate, strongly flattened above and below angled periphery, H_a/W_a ratio 0.81–0.92 (mean 0.86, holotype 0.85). W_{bw}/W_{1o} ratio 2.00–2.55 (mean 2.30, holotype 2.42). D/N_w ratio 1.09–1.25 (mean 1.19, holotype 1.24). Colour light yellow horn with pale, more or less regular and coalescing reddish flammulations.

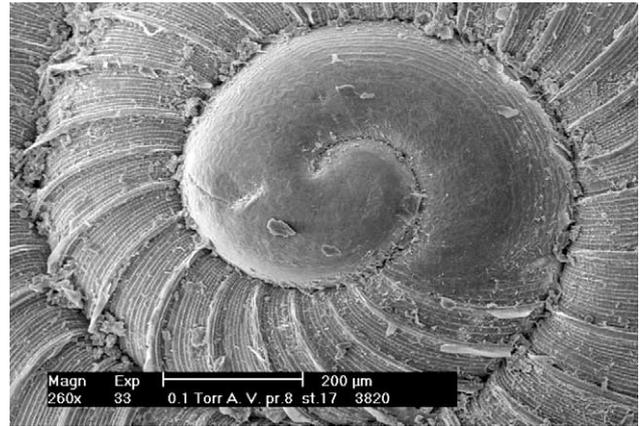


Fig. 130. *Andrefrancia incipiens* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear whorl

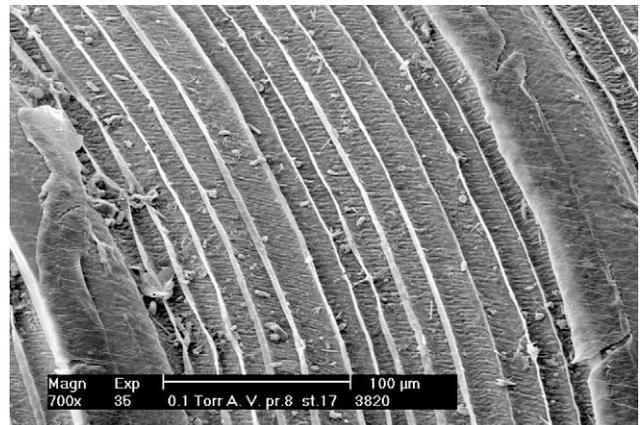


Fig. 131. *Andrefrancia incipiens* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

Animal creamy white.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct slightly convoluted with a golden-yellow sheen. Epiphallus shorter than penis, entering it laterally through a large, fleshy globular verge. Internally

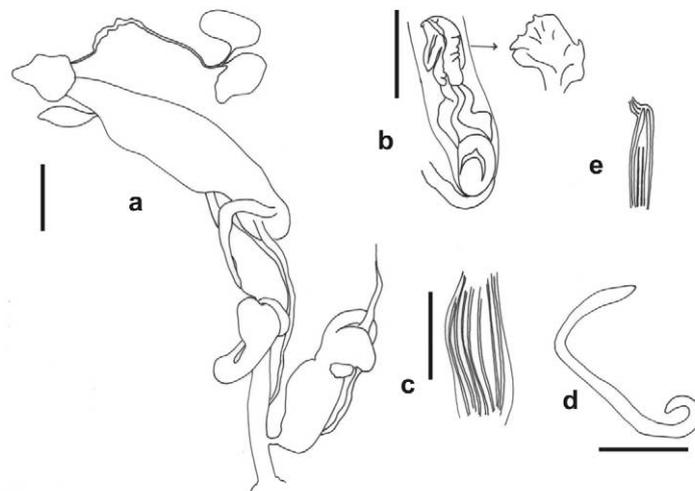


Fig. 129. *Andrefrancia incipiens* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – interior of penis; c – interior of vagina; d – spermatophore; e – interior of epiphallus and vas deferens entrance; scale bar = 1 mm

epiphallus shows four longitudinal pilasters. The vas deferens entrance into epiphallus valvular with characteristic pilaster arrangement (Fig. 129e). Penial retractor muscle inserts on the penis apically, remote from the penis/epiphallus junction; not twisted. Penis moderately long, peanut-shaped, narrowed in the middle with one gland here. Upper chamber internally shows a large, globular verge. Lower chamber with a large conical stimulator with its apex directed towards atrium and section along side. Very thick walls constricting the passage between the epiphallic pore and conical stimulator. Penial walls smooth. Vagina shorter than penis, internally with several fine longitudinal pilasters. Free oviduct and spermathecal shaft twisted. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct as long as penis. Basal part of spermathecal shaft wide, than abruptly narrowing. Spermatophore comma-shaped.

Name derivation. The name refers to the incipient keel on the shell of the new species.

Distribution: Aoupinié – Goa, New Caledonia.

***Andrefrancia perspectiva* n. sp.** (Figs 132–136, 172)

Type locality: Cap Bocage, New Caledonia.

Type material: Cap Bocage (165°33'38"E 21°09'33"S), N slope, 0–50 m a.s.l. Maquis on peridotites. TILLIER, TILLIER, BOUCHET & TRICLOT, November 20, 1984. Holotype a & 8 a (2 dissected), MNHN.

Diagnosis. Its relatively low H/D ratio, body whorl equally strongly flattened above and below periphery, widely open umbilicus, suture not detached, make this species distinct and not easily confused with the others.

Description. Shell. Shell large, diameter 4.00–6.00 mm (holotype 5.50 mm), with $4\frac{1}{6}$ – $5\frac{1}{2}$ (holotype $5\frac{1}{8}$) whorls. Shell height 1.60–2.60 mm (holotype 2.30 mm), H_{sp}/H ratio 0.13–0.22 (mean 0.16, holotype 0.17), H/D ratio 0.40–0.46 (mean 0.43, holotype 0.42). Body whorl suture straight. Protoconch with $1\frac{1}{8}$ – $1\frac{3}{8}$ whorls (holotype $1\frac{3}{8}$). Apical sculpture of a few very fine and closely set spiral lirae, visible only on the outer half of protoconch width. Several weak radial ridges on the last quarter of protoconch. Definitive sculpture of moderately high and narrow, protractively situated radial ribs, regularly spaced 59–110 (mean 76, holotype 74) on the body whorl. Microsculpture typical of the group. Umbilicus widely open, 2.24–2.61 (mean 2.44, holotype 2.29) smaller than shell diameter. Suture impressed, not detached; spire whorls hardly rounded. Body whorl almost equally strongly flattened above and below periphery, no keel. Aperture subquadrate, strongly flattened above and below periphery, H_a/W_a ratio 0.78–0.94 (mean 0.86, holotype 0.88). W_{bw}/W_{lo} ratio 1.75–2.29

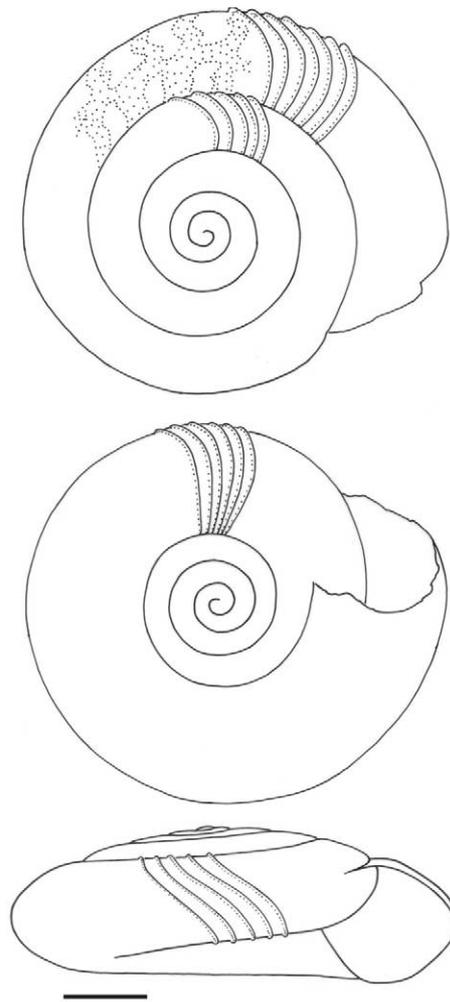


Fig. 132. *Andrefrancia perspectiva* n. sp.: shell of the holotype (MNHN)

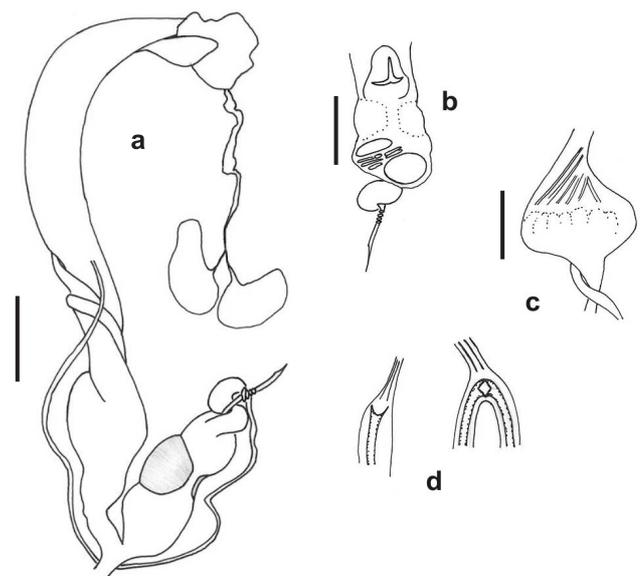


Fig. 133. *Andrefrancia perspectiva* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – interior of penis; c – interior of vagina; d – interior of epiphallus and vas deferens entrance; scale bar = 1

(mean 1.98, holotype 1.78). D/N_w ratio 0.96–1.12 (mean 1.05, holotype 1.07). Colour light yellow horn with broad, regular reddish flammulations, joining together, vague on shell base.

Animal creamy white.

Genital system. Otestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct

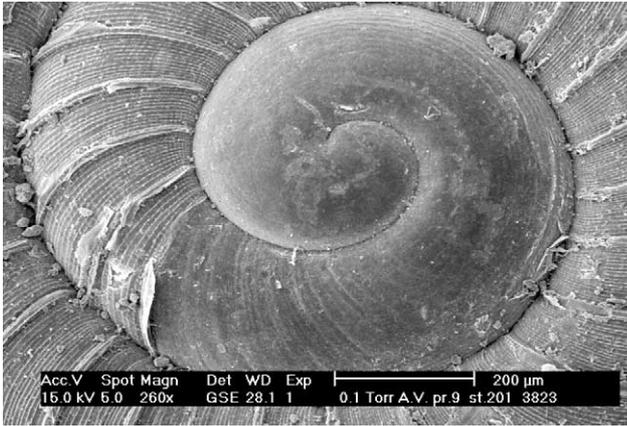


Fig. 134. *Andrefrancia perspectiva* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

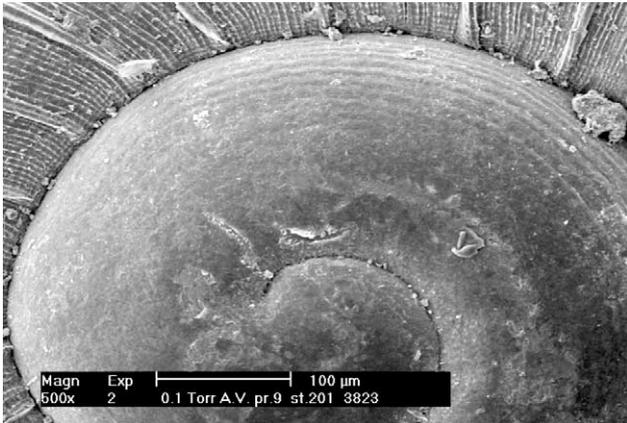


Fig. 135. *Andrefrancia perspectiva* n. sp., a paratype from the type locality (MNHN): details of embryonic shell

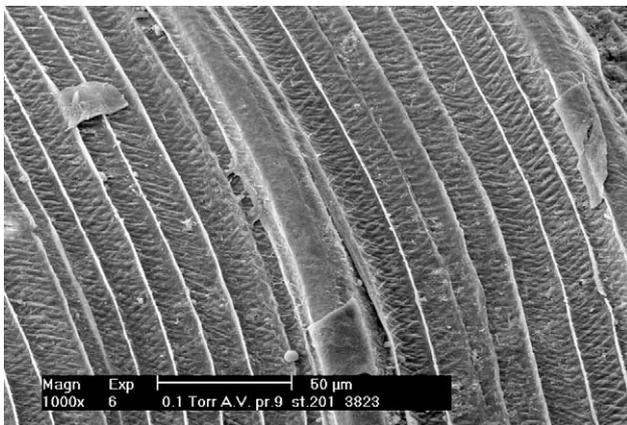


Fig. 136. *Andrefrancia perspectiva* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

slightly convoluted with a golden-yellow sheen. Epiphallus shorter than penis, entering it subapically through a simple pore. Internally epiphallus shows two longitudinal pilasters. The vas deferens entrance into epiphallus valvular with characteristic pilaster arrangement (Fig. 133d). Penial retractor muscle inserts on the penis subapically on the penis/epiphallus junction; epiphallus coiled once and vas deferens four times around penial retractor muscle. Penis peanut shaped, of moderate length. Upper chamber internally with epiphallic entrance surrounded by transverse short folds and two circular pads. Lower chamber with a large conical stimulator with its apex directed towards atrium and anchor-like section. There is no penial gland. In the middle of penis the walls very thick, externally encircled by a wide strand of tight muscular sheath, which ends do not contact. Vagina shorter than penis, internally with several fine longitudinal pilasters. Just below free oviduct and spermathecal shaft junction the walls very thick. Free oviduct and spermathecal shaft twisted. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct shorter than penis. Basal part of spermathecal shaft wide, then abruptly narrowing. Spermatophore not seen.

Name derivation. The name refers to the very wide umbilicus in which all the whorls are visible.

Distribution: Cap Bocage, New Caledonia, known from the type locality only.

***Andrefrancia goanna* n. sp.** (Figs 137–142, 172)

Type locality: Aoupinié-Goa, New Caledonia.

Type material: Aoupinié (165°15'42"E 21°10'42"), summit, 1,000 m a.s.l. Humid forest. MORDAN, TILLIER & TILLIER, January 16, 1981. Holotype a & paratypes 23 a (2 dissected), MNHN.

Diagnosis. This species differs from *A. memaoyana* in being smaller, having rounded body whorl and narrower reddish flammulations.

Description. **Shell.** Shell large, diameter 2.70–6.70 mm (holotype 6.00 mm), with $3\frac{1}{2}$ – $5\frac{4}{7}$ (holotype $5\frac{4}{7}$) whorls. Shell height 1.20–3.70 mm (holotype 3.60 mm), H_{sp}/H ratio 0.04–0.19 (mean 0.12, holotype 0.19), H/D ratio 0.44–0.60 (mean 0.52, holotype 0.60). Body whorl descending rapidly. Protoconch

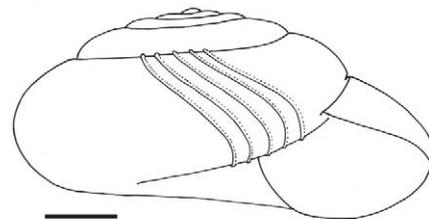


Fig. 137. *Andrefrancia goanna* n. sp.: shell of the holotype (MNHN)

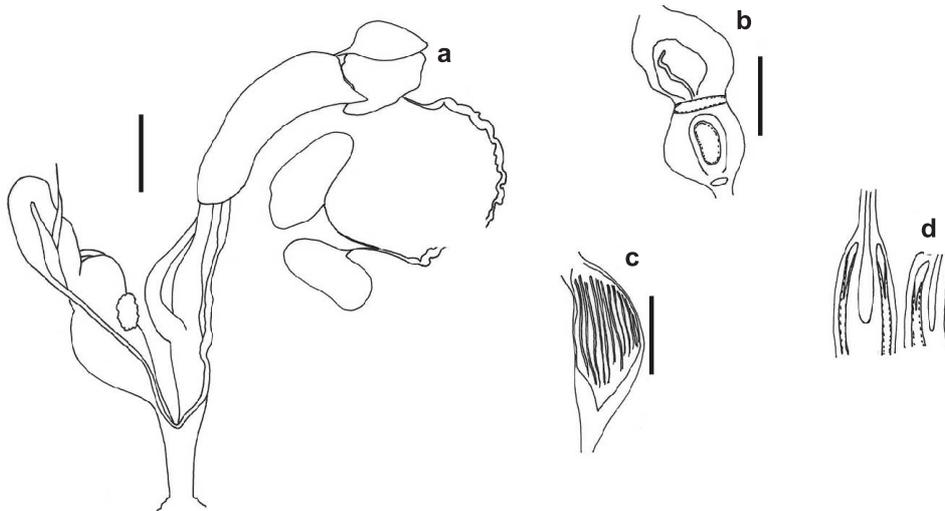


Fig. 138. *Andrefrancia goanna* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – interior of penis; c – interior of vagina; d – interior of epiphallus and vas deferens entrance; scale bar = 1 mm

with $1\frac{1}{8}$ – $1\frac{3}{5}$ whorls (holotype $1\frac{1}{2}$). Apical sculpture of several very fine and closely set spiral lirae, present only on the outer half of protoconch width. Few weak radial riblets just before teleoconch. Definitive sculpture of moderately high and wide, protractively

sinuated radial ribs, regularly and relatively widely spaced 27–62 (mean 40, holotype 48) on the body whorl. Microsculpture typical of the group. Umbilicus open, 3.20–4.14 (mean 3.63, holotype 3.33) times smaller than shell diameter. Suture impressed, de-

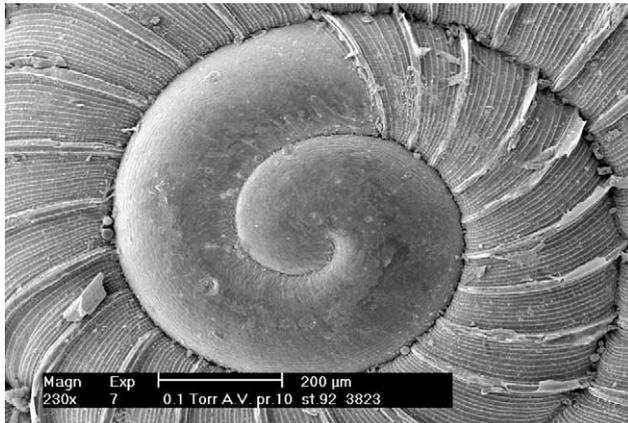


Fig. 139. *Andrefrancia goanna* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

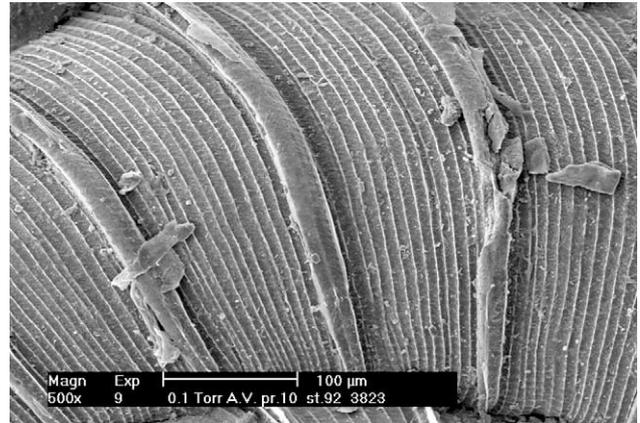


Fig. 141. *Andrefrancia goanna* n. sp., a paratype from the type locality (MNHN): sculpture of first postnuclear whorl

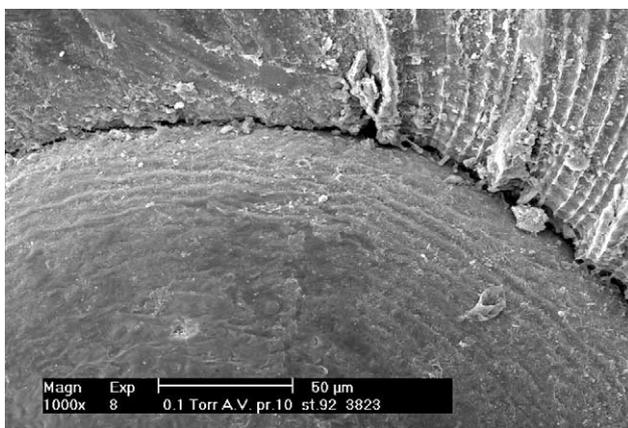


Fig. 140. *Andrefrancia goanna* n. sp., a paratype from the type locality (MNHN): details of embryonic shell

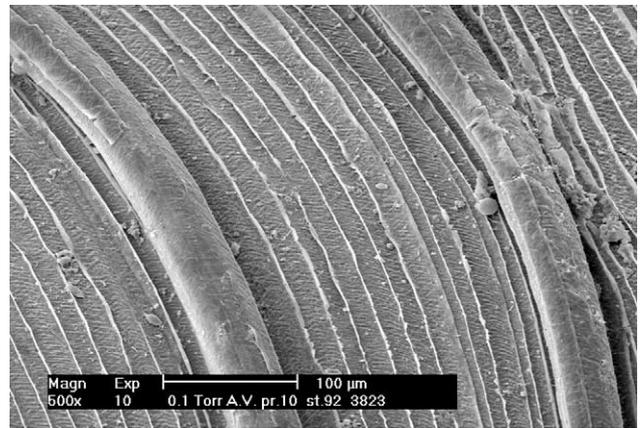


Fig. 142. *Andrefrancia goanna* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

tached on the body whorl; spire whorls gently rounded. Body whorl rounded, very slightly flattened above periphery, no keel. Aperture roundly lunate and flattened above periphery, H_a/W_a ratio 0.79–1.08 (mean 0.94, holotype 0.87). W_{bw}/W_{lo} ratio 2.00–3.00 (mean 2.32, holotype 2.00). D/N_w ratio 0.77–1.20 (mean 1.00, holotype 1.08). Colour light yellow horn with more or less regular and coalescing reddish flammulations, fading up towards shell base.

Animal creamy white.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct extensively convoluted with a golden-yellow sheen. Epiphallus as long as penis, entering it subapically through a simple pore. Internally epiphallus shows two longitudinal pilasters. The vas deferens entrance into epiphallus valvular with characteristic pilaster arrangement. Penial retractor muscle inserts on the penis apically, slightly remote from the penis/epiphallus junction; coiled once around epiphallus. Penis peanut-shaped, of moderate length. Upper chamber internally with ovate pad surrounded by very thick walls. Lower chamber shows a large conical stimulator with its apex directed towards atrium and section along side. Penial

chambers separated by constricting muscular collar. There is one penial gland in the penial narrow. Vagina much shorter than penis, internally with several fine longitudinal pilasters. Free oviduct and spermathecal shaft not twisted. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct shorter than penis. Basal part of spermathecal shaft wider, then abruptly narrowing. Spermatophore not seen.

Name derivation. The name is derived from the second part of the name of the type locality.

Distribution: Aoupinié, New Caledonia, known from the type locality only.

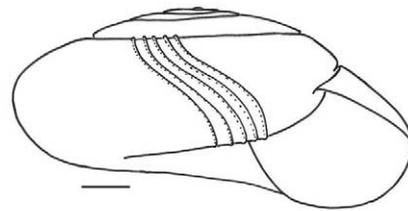


Fig. 143. *Andrefrancia memaoyana* n. sp.: shell of the holotype (MNHN)

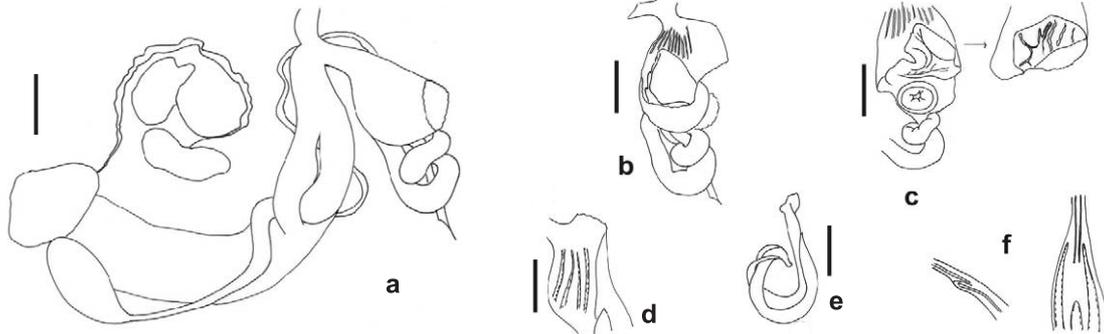


Fig. 144. *Andrefrancia memaoyana* n. sp.: reproductive system of a paratype from the type locality (MNHN): a – genitalia; b – male genitalia; c – interior of penis; d – interior of vagina; e – spermatophore; f – epiphallus and vas deferens entrance; scale bar = 1 mm

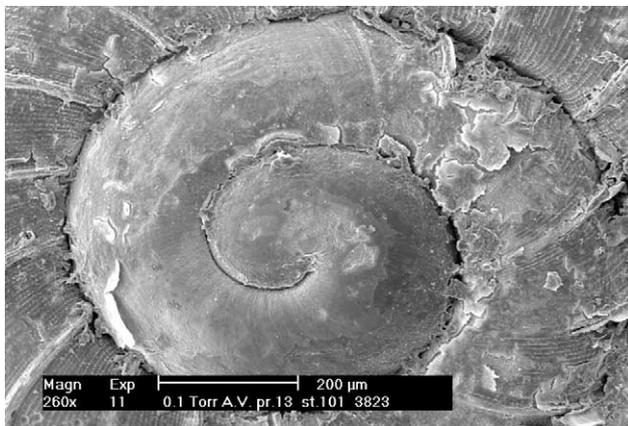


Fig. 145. *Andrefrancia memaoyana* n. sp., a specimen from Mé Maoya, 1450–1480 m a.s.l. (MNHN): apical and early postnuclear sculpture

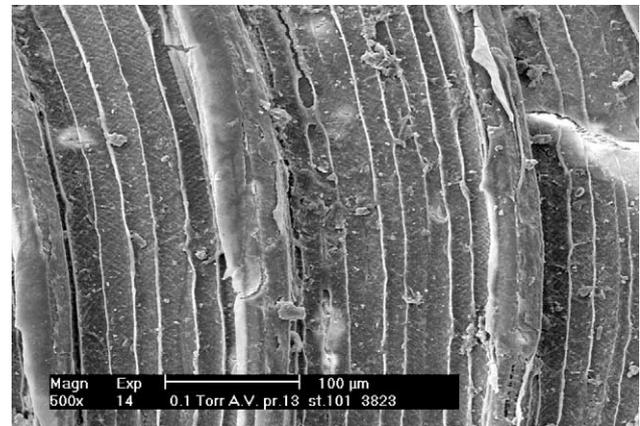


Fig. 146. *Andrefrancia memaoyana* n. sp., a specimen from Mé Maoya, 1450–1480 m a.s.l. (MNHN): sculpture of body whorl

Andrefrancia memaoyana n. sp. (Figs 143–149, 172)

Type locality: Mé Maoya, New Caledonia.

Type material: Mé Maoya (165°20'21"E 21°22'09"S), 1250 m a.s.l. Humid forest on ultrabasic rocks. BOUCHET & TILLIER, June 11, 1979. Holotype a & paratypes 8 a (3 dissected), 6 d, MNHN.

Other material examined: Mé Maoya (165°20'21"E 21°22'09"S), 1,450–1,480 m a.s.l. Humid forest on ultrabasic rocks. BOUCHET & TILLIER, June 12, 1979. MNHN, 5 a (1 dissected); Ouinnané (166°09'24"E 21°55'00"S), 100 m a.s.l. Dry forest second growth. TILLIER, BOUCHET & TRICLOT, October 31, 1984. MNHN, 23 a (2 dissected).

Diagnosis. This species can be distinguished from *A. cressoniana* by its larger size, major ribs relatively wider spaced, presence of spiral cords in apical sculpture and broader zigzags.

Description. Shell. Shell large, diameter 2.20–8.00 mm (holotype 7.70 mm), with $3\frac{3}{8}$ – $5\frac{5}{6}$ (holotype $5\frac{5}{6}$) whorls. Shell height 1.00–4.70 mm (holotype 4.70 mm), H_{sp}/H ratio 0.05–0.19 (mean 0.12, holotype 0.15), H/D ratio 0.45–0.61 (mean 0.52, holotype 0.61). Body whorl descending rapidly. Protoconch with $1\frac{1}{8}$ – $1\frac{7}{8}$ whorls (holotype $1\frac{1}{8}$). Apical sculpture of several dense and very fine spiral lirae, conspicuous on the outer half of protoconch width. Few weak radial riblets just before teleoconch. Definitive sculpture of moderately high and wide, protractively sinuated radial ribs, regularly spaced 35–87 (mean 64, holotype 73) on the body whorl. Microsculpture typical of the group. Umbilicus open, 3.17–4.27 (mean 3.87, holotype 4.05) times smaller than shell diameter. Suture impressed, gradually becoming detached; spire whorls hardly rounded. Body whorl moderately flattened above and below periphery, no keel. Aperture roughly subquadrate, flattened above periphery, basal margin gently rounded, H_a/W_a ratio

0.70–1.00 (mean 0.87, holotype 0.78). W_{bw}/W_{lo} ratio 1.57–3.60 (mean 2.24, holotype 2.31). D/N_w ratio 0.65–1.45 (mean 1.14, holotype 1.32). Colour light yellow horn with broad more or less regular reddish flammulations, joining together.

Animal creamy white.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct convoluted with a greenish tint. Epiphallus as long as penis, entering it apically through a simple pore. Internally epiphallus shows three longitudinal pilasters. The vas deferens entrance into epiphallus valvular with characteristic pilaster arrangement (Fig. 144f). Penial retractor muscle inserts on the penis apically on the penis/epiphallus junction; coiled twice around epiphallus. Penis of moderate length, pouch-shaped with one gland. Internally penis shows epiphallic pore surrounded by some fine thickness. Just below there is a large flower bud-shaped stimulator with its apex directed towards atrium and section along side. Surrounding walls sculptured with fine longitudinal pilasters. Vagina shorter than penis, internally with several fine longitudinal pilasters. Free



Fig. 147. *Andrefrancia memaoyana* n. sp., a specimen from Mé Maoya, 1450–1480 m a.s.l. (MNHN): apical view of the shell

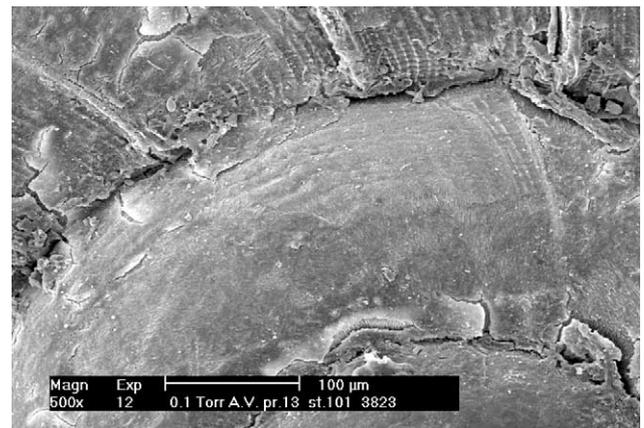


Fig. 148. *Andrefrancia memaoyana* n. sp., a specimen from Mé Maoya, 1450–1480 m a.s.l. (MNHN): details of embryonic shell

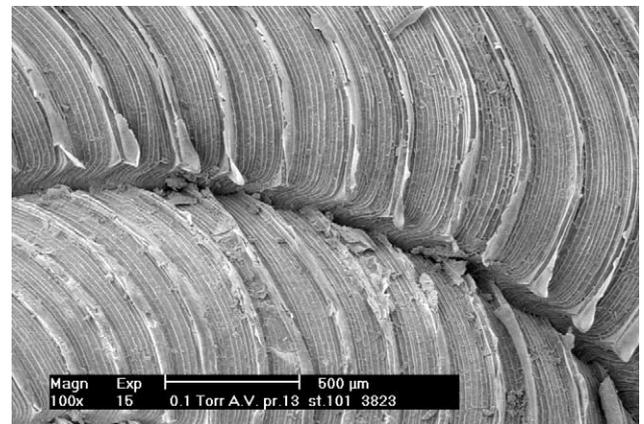


Fig. 149. *Andrefrancia memaoyana* n. sp., a specimen from Mé Maoya, 1450–1480 m a.s.l. (MNHN): suture impressed-detached

oviduct and spermathecal shaft not twisted. Internally spermathecal shaft and free oviduct show longitudinal pilasters. Free oviduct shorter than penis. Basal part of spermathecal shaft wider than abruptly narrowing. Spermatophore unusual, hook-shaped.

Name derivation. The name was coined from the name of the type locality.

Distribution: Mé Maoya, Ouinnané, New Caledonia.

Andrefrancia bazini (Crosse, 1874) (Figs 150–155, 172)

Helix bazini CROSSE 1874: 105 et 180–181, pl. 4, fig. 1.
Type locality: Baie du Sud, New Caledonia.
Holotype figured by FRANC 1957: pl. 11, fig. 147, The Natural History Museum, London.

Helix bazini (Crosse) GASSIES 1880: 27, pl. 1, fig. 16.

Rhytida bazini (Crosse) ANCEY 1882: 86; TRYON 1885: 121, pl. 28, fig. 35–36.

Charopa bazini (Crosse) ANCEY 1888: 368; CROSSE 1894: 232.

Endodonta (*Charopa*) *bazini* (Crosse) PILSBRY 1893: 33.

Charopa bazini (Crosse) FRANC 1957: 115–116, pl. 11, fig. 147 (holotype of *bazini*).

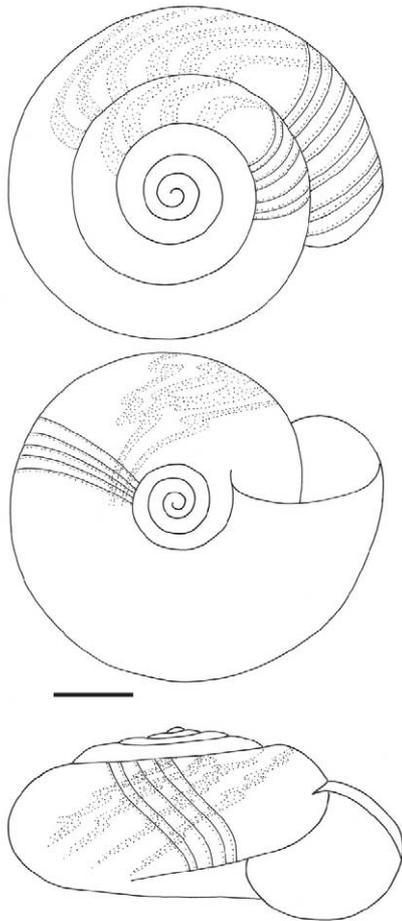


Fig. 150. *Andrefrancia bazini*: shell from an unknown locality in New Caledonia (MNHN); scale bar = 1 mm

Andrefrancia costulifera (Pfeiffer, 1854) SOLEM 1961: 460.

Helix pinicola GASSIES 1863 et seq. (not Pfeiffer, 1854), p. 27, pl. 1, fig. 10.

Material examined: Caillot. MNHN, 10 d. No exact locality. (labelled as *Andrefrancia/Charopa bazini*); Nouméa. Pointe de l'artillerie. DENIS. MNHN, 16 d (labelled as *Andrefrancia/Charopa bazini*); Nouville (166°22'54"E 22°15'23"S). Dry forest, half-natural. BOUCHET & CHEREL, August 02, 1978. MNHN, 30 d.

Diagnosis. *A. bazini* can be distinguished from *A. costulifera* by its smaller size, nearly twice reduced number of ribs on the body whorl, not detached suture, presence of discontinuing spiral striae on embryonic shell, nature of reduced major ribs, alternated microsculpture, the same on each whorl, consisting of reduced radials and conspicuous spiral cords, lack of microcreases crossing obliquely, more rounded body whorl and aperture and more regular characteristic pattern of flammulated zigzags.

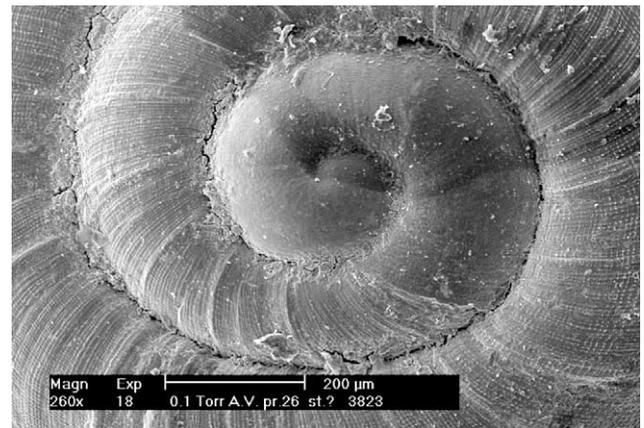


Fig. 151. *Andrefrancia bazini*, a specimen from an unknown locality in New Caledonia (MNHN): apical and early postnuclear sculpture

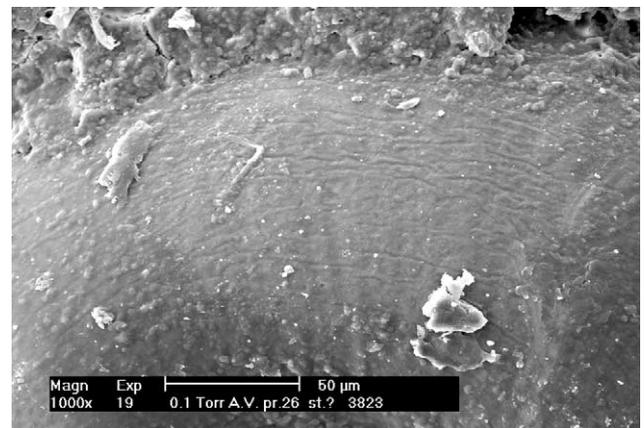


Fig. 152. *Andrefrancia bazini*, a specimen from an unknown locality in New Caledonia (MNHN): details of embryonic shell

Description. Shell medium-sized, diameter 2.20–4.70 mm, with $3\frac{3}{8}$ – $5\frac{1}{4}$ whorls. Shell height 1.15–2.55 mm, H_{sp}/H ratio 0.06–0.25 (mean 0.12), H/D ratio 0.45–0.62 (mean 0.53). Body whorl descending rapidly. Protoconch with $1\frac{1}{8}$ – $1\frac{7}{8}$ whorls. Apical sculpture

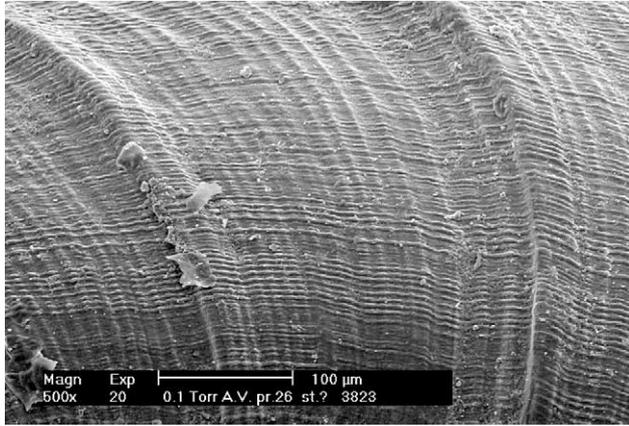


Fig. 153. *Andrefrancia bazini*, a specimen from an unknown locality in New Caledonia (MNHN): sculpture of inner whorl

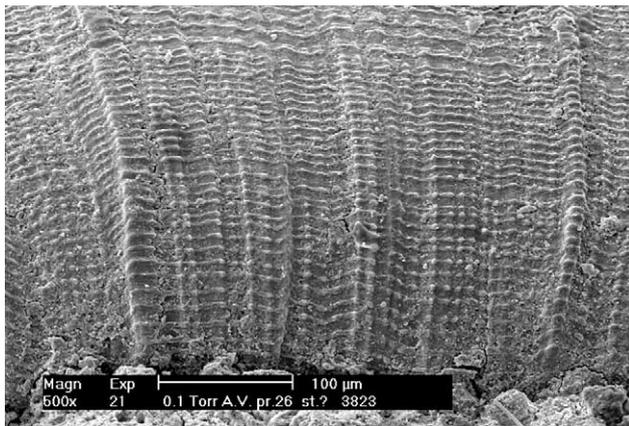


Fig. 154. *Andrefrancia bazini*, a specimen from an unknown locality in New Caledonia (MNHN): sculpture of body whorl



Fig. 155. *Andrefrancia bazini*, a specimen from an unknown locality in New Caledonia (MNHN): apical view of the shell

of very fine discontinuing spiral striae/grooves. Radial riblets before teleoconch invisible. Definitive sculpture of reduced, very low and relatively broad protractively sinuated radial ribs, not regularly and very widely spaced 24–70 (mean 38) on the body whorl. Microsculpture of low, sometimes obscure, radial ridges not regularly spaced, and conspicuous, also irregularly spaced and sometimes reduced, spiral cords, which form fine knobs at their intersection. Umbilicus open, 3.42–4.53 (mean 4.05) times smaller than shell diameter. Body whorl slightly flattened above and rounded below periphery. Aperture roundly lunate and mildly flattened above periphery, H_a/W_a ratio 0.77–1.00 (mean 0.87). W_{bw}/W_{lo} ratio 1.43–2.50 (mean 1.87). D/N_w ratio 0.64–0.93 (mean 0.81). Colour light yellow horn with very regular pattern of flammulations. In apical view they are widening stripes set in a row just below the suture, then becoming acutely curved towards whorl increment. The stripes become zigzags on periphery and shell base, coalescing on shell base, sometimes on periphery.

No alcohol-preserved material was available.

Remarks. The examined specimens correspond to the description of *Helix bazini* given by GASSIES (1880). Very closely set major ribs (probably microriblets) and body whorl not descending are the only differences compared to his diagnosis. According to this author *Charopa bazini* is closely related to *Helix costulifera*, but differs from the latter in having lower shell, which is more flattened and discoid; closely set ribs; vague ribs not resembling typical ones and particular pattern of regular, more distinct flammulations, acutely curved towards whorl increment. The shell examined by GASSIES, preserved in alcohol, was covered with setae, visible especially on periphery. None of the specimens examined in my study had setae on shells.

Distribution: Nouméa. Pointe de l'artillerie, Nouville, New Caledonia.

Andrefrancia reduculpta n. sp. (Figs 156–161, 172)

Type locality: Monéo, New Caledonia.

Type material: Monéo (165°29'31"E 21°09'36"S). Humid forest. BOUCHET, May 15, 1978. Holotype & paratypes 29 d, MNHN.

Diagnosis. This species can be easily discriminated by its greatly reduced macrosulpture and modified microsculpture, narrow umbilicus, suture not detached, aperture roundly lunate, very brightly coloured, fine and transparent shell.

Description. Shell relatively large, diameter 3.70–4.50 mm (holotype 4.30 mm), with $4\frac{3}{8}$ (holotype $4\frac{1}{4}$) whorls. Shell height 2.10–2.80 mm (holotype 2.50 mm), H_{sp}/H ratio 0.08–0.18 (mean 0.13, holotype

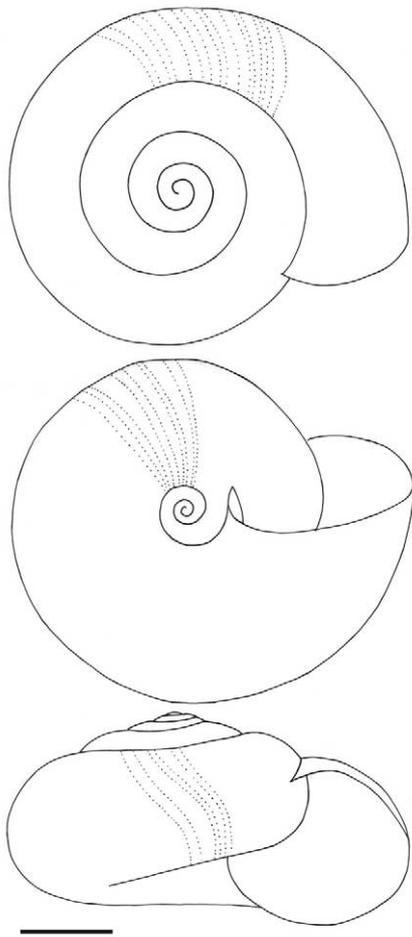


Fig. 156. *Andrefrancia reducisculpta* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

0.16), H/D ratio 0.55–0.67 (mean 0.60, holotype 0.58). Body whorl slightly descending. Protoconch with $1\frac{1}{6}$ – $1\frac{3}{8}$ whorls (holotype $1\frac{1}{4}$). Apical sculpture of traces of spiral ridges, often partly to completely eroded. There are numerous, very fine and closely set radial ridges on the last quarter of protoconch. Definitive sculpture greatly reduced, consists of very low,

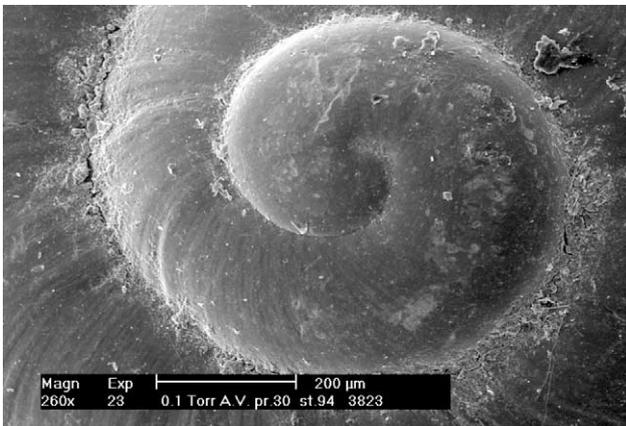


Fig. 157. *Andrefrancia reducisculpta* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

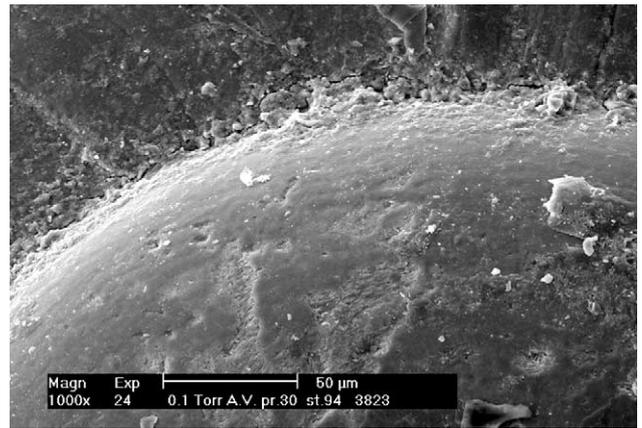


Fig. 158. *Andrefrancia reducisculpta* n. sp., a paratype from the type locality (MNHN): details of embryonic shell

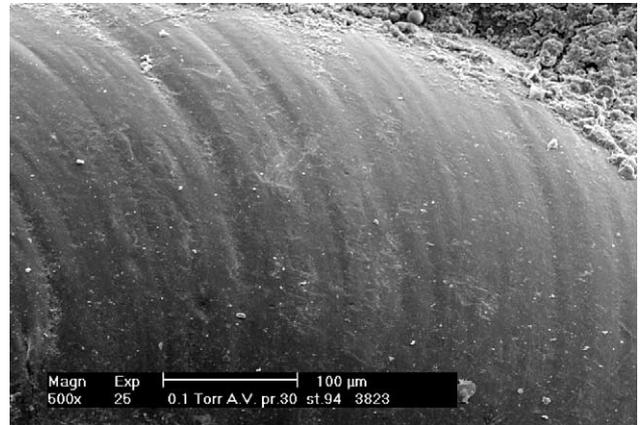


Fig. 159. *Andrefrancia reducisculpta* n. sp., a paratype from the type locality (MNHN): sculpture of inner whorl

protractively sinuated radial undulations, closely but irregularly spaced. Microsculpture remarkably reduced to randomly set, fine, oblique grooves, sometimes crossing here and there. There are neither radials nor spirals. Umbilicus narrow, 5.38–6.50 (mean 6.07, holotype 6.14) times smaller than shell diameter. Body whorl slightly flattened above and rounded

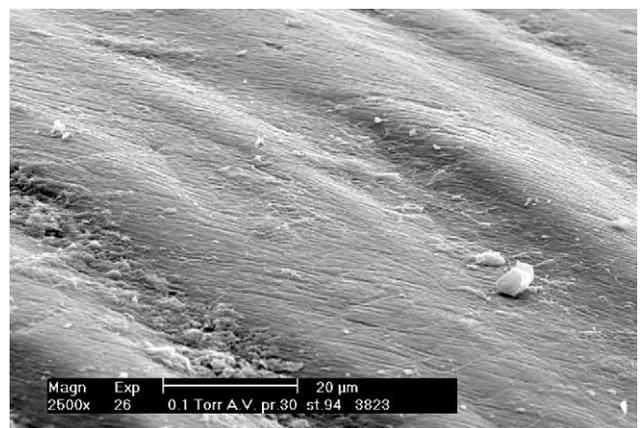


Fig. 160. *Andrefrancia reducisculpta* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl



Fig. 161. *Andrefrancia reduculpta* n. sp., a paratype from the type locality (MNHN): apical view of the shell

below periphery. Aperture roundly lunate and mildly flattened above periphery, H_a/W_a ratio 0.76–1.00 (mean 0.86, holotype 0.85). W_{bw}/W_{lo} ratio 1.50–2.33 (mean 1.90, holotype 2.14). D/N_w ratio 0.89–1.04 (mean 0.96, holotype 1.01). Colour very bright yellowish horn with barely visible flammulations, often leached; shell very fine and transparent.

No alcohol-preserved material was available.

Remarks. In its general appearance this species shows many similarities to the Fijian *Simploeya recurva* (SOLEM 1983: 149). Spire elevation, shell shape, spirally sculptured protoconch, greatly reduced macrosculpture, and even vague colour pattern are the same. *S. recurva* differs in its slightly smaller size, vague traces of microreticulations on the upper spire and fine, crowded secondary spiral cords on the body whorl, slightly narrower umbilicus and sutures impressed. According to SOLEM (1983) so greatly reduced ribbing is frequent in New Caledonian, Australian and New Zealand taxa, but no other Polynesian or Micronesian Charopidae, except for *S. recurva*, shares this characteristic feature.

Name derivation. The name refers to the reduced shell sculpture of the new species.

Distribution: Monéo, New Caledonia, known from the type locality only.

Andrefrancia canaliculata n. sp. (Figs 162–166, 172)

Type locality: Louneou, Lifou, New Caledonia.

Type material: Louneou, Lifou (167°19'31"E 20°56'18"S). Endemic palm forest. BOUCHET, TILLIER & WARÈN, July 17, 1979. Holotype d & paratypes 34 d, MNHN.

Other material examined: Natchaom/Doking, Lifou, (167°11'37"E 20°42'35"S). Dry forest/limestone. TILLIER & TILLIER, July 20, 1979. MNHN, 5 d.

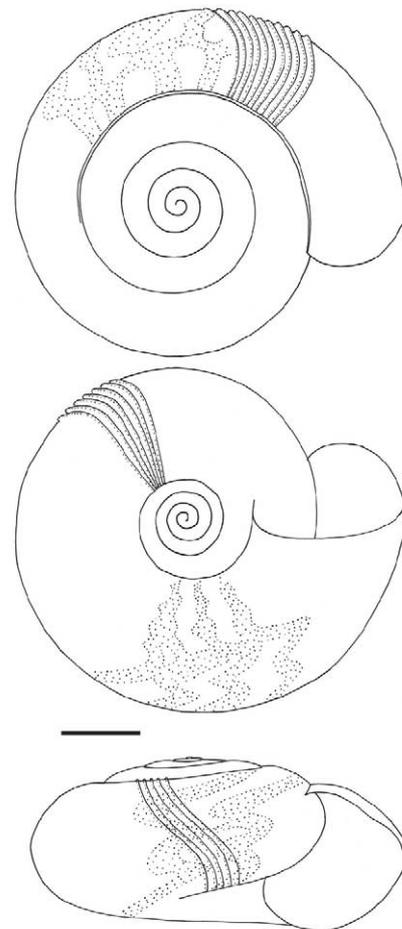


Fig. 162. *Andrefrancia canaliculata* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

Diagnosis. At first sight *A. canaliculata* is conchologically quite similar to *A. cressoniana*, but differs from it in having channelled suture, relatively tightly coiled whorls, slightly protruding upper margin of aperture and spiral cords in embryonic shell.

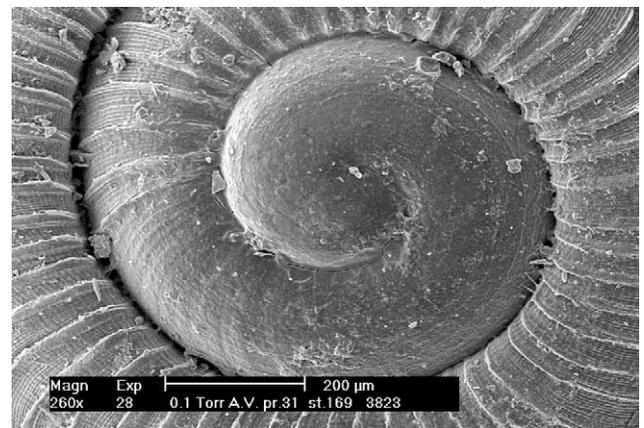


Fig. 163. *Andrefrancia canaliculata* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

Description. Shell diameter 3.20–5.50 mm (holotype 4.80 mm), with 4–5 $\frac{1}{3}$ (holotype 5) relatively tightly coiled whorls. Shell height 1.50–2.90 mm (holotype 2.50 mm), H_{sp}/H ratio 0.04–0.17 (mean 0.10, holotype 0.08), H/D ratio 0.46–0.57 (mean 0.52, 0.52). Body whorl descending rapidly. Protoconch

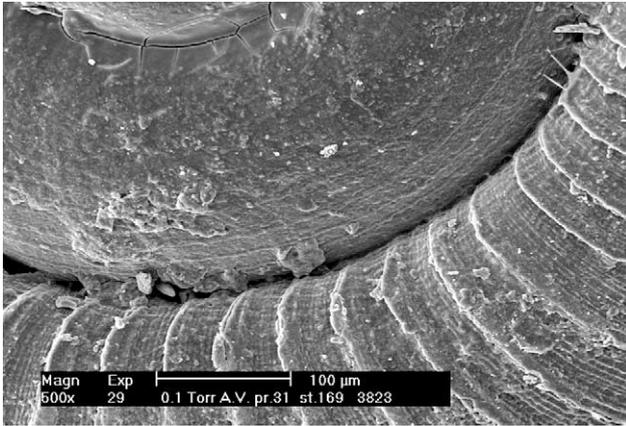


Fig. 164. *Andrefrancia canaliculata* n. sp., a paratype from the type locality (MNHN): details of embryonic shell

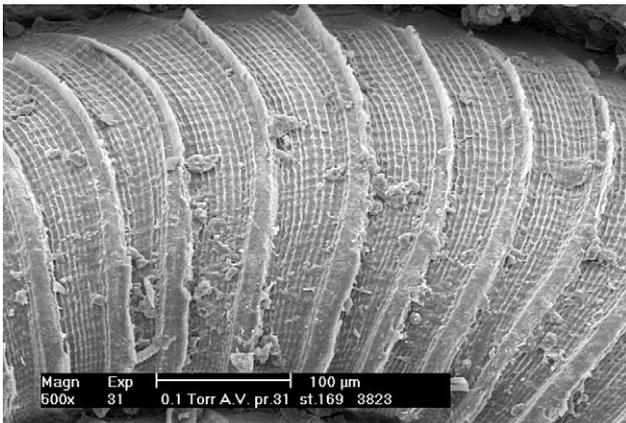


Fig. 165. *Andrefrancia canaliculata* n. sp., a paratype from the type locality (MNHN): sculpture of penultimate whorl



Fig. 166. *Andrefrancia canaliculata* n. sp., a paratype from the type locality (MNHN): apical view of the shell

with 1–1 $\frac{3}{4}$ whorls (holotype 1 $\frac{3}{8}$). Apical sculpture of some fine spiral lirae. Several fine radial ridges before teleoconch. Definitive sculpture of moderately high, protractively sinuated radial ribs, regularly spaced, 70–107 (mean 93, holotype 92) on the body whorl. Microsculpture of two first postembryonic whorls of narrow radial riblets and low spiral cords, which form elongate beads at their intersection. On the next whorls, between microriblets, fine and crowded creases, crossing obliquely. One microriblet on both sides of major ribs strongly protruding. Umbilicus open, 3.20–3.75 (mean 3.48, holotype 3.69) times smaller than shell diameter. Suture channelled, spire whorls gently rounded. Body whorl slightly flattened above and rounded below periphery, no keel. Aperture roundly lunate and mildly flattened above and below periphery, H_a/W_a ratio 0.81–1.13 (mean 0.97, holotype 0.95). W_{bw}/W_{lo} ratio 1.50–2.14 (mean 1.83, 1.86). D/N_w ratio 0.80–1.09 (mean 0.98, holotype 0.96). Upper margin of aperture slightly protruding. Colour light yellow horn with more or less regular pattern of coalescing flammulated zigzags.

No alcohol-preserved material was available.

Name derivation. The name refers to the channelled suture of the new species.

Distribution: Louneou and Natchaom/Doking, Lifou, New Caledonia.

Andrefrancia costulifera (Pfeiffer, 1854) (Figs 167–170, 172)

Helix costulifera PFEIFFER 1854, pl. 201, fig. 1418. Type locality: Isle of Pines, New Caledonia. Holotype in The Natural History Museum, London.

Helix costulifera GASSIES 1863: 26, pl. 1, fig. 9.

Andrefrancia costulifera (Pfeiffer) SOLEM 1961: 460.

Material examined: Bonde Musee de Bordeaux 1873, 11 d. No exact locality (labelled as *Helix costulifera*); Canala. Caillot. MNHN, 47 d (labelled as *Helix/Charopa costulifera*); New Caledonia. Caillot. MNHN, 9 d. No exact locality (labelled as *H. (Rhytida) costulifera*); Nouméa, Anse Vata. Saves MNHN, 4 d (labelled as *H. costulifera*).

Diagnosis. Smaller shell, lower whorl increment, smooth apical sculpture, major ribs closer set, presence of periostracal setae and the pattern of narrow zigzags separate *A. costulifera* from *A. pinicola*.

Description. Shell large, diameter 4.20–7.20 mm, with 4 $\frac{1}{3}$ –5 $\frac{1}{3}$ whorls. Shell height 1.70–3.50 mm, H_{sp}/H ratio 0.04–0.18 (mean 0.09), H/D ratio 0.40–0.54 (mean 0.47). Body whorl descending rapidly. Protoconch with 1 $\frac{1}{8}$ –1 $\frac{5}{8}$ whorls. Apical sculpture smooth. Few, weak radial ridges before teleoconch present. Definitive sculpture of low and blunt, protractively sinuated radial ribs, regularly spaced 50–138 (mean 76) on the body whorl. Fragile periostracal

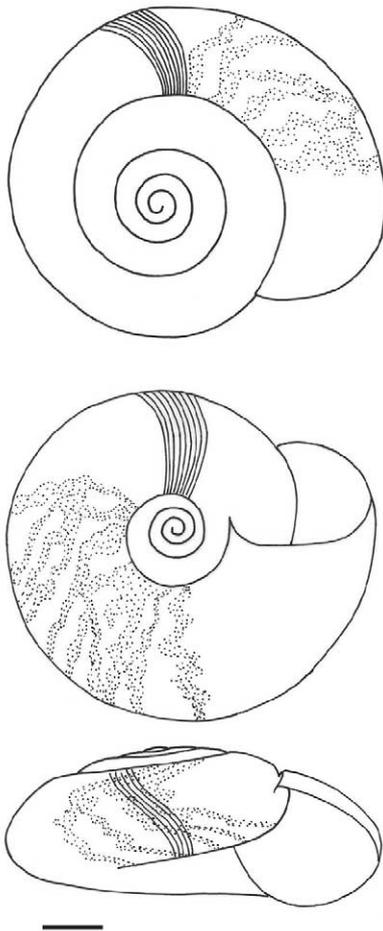


Fig. 167. *Andrefrancia costulifera*: shell of a specimen from an unknown locality in New Caledonia (MNHN); scale bar = 1 mm

setae regularly spaced along the major ribs. Microsculpture of two first postembryonic whorls consists of radial riblets and obscure spiral cords, which form small knobs at their intersection. On the next whorls between microriblets are fine, crowded creases, crossing obliquely. Umbilicus open, 3.20–4.07 (mean 3.53) times smaller than shell diameter. Suture impressed, on the body whorl detached; spire whorls hardly rounded. Body whorl stronger flattened above periphery and more gently below, no keel. Aperture roughly subquadrate, flattened above and below periphery, H_a/W_a ratio 0.72–1.22 (mean 0.86). W_{bw}/W_{lo} ratio 1.67–2.57 (mean 2.06). D/N_w ratio 0.86–1.44 (mean 1.15). Colour light yellow horn with irregular reddish flammulations, joining together on shell base.

No alcohol-preserved material was available.

Remarks. The examined specimens correspond to the description of *Helix costulifera* given by GASSIES (1863).

Distribution: Canala, Nouméa, New Caledonia.

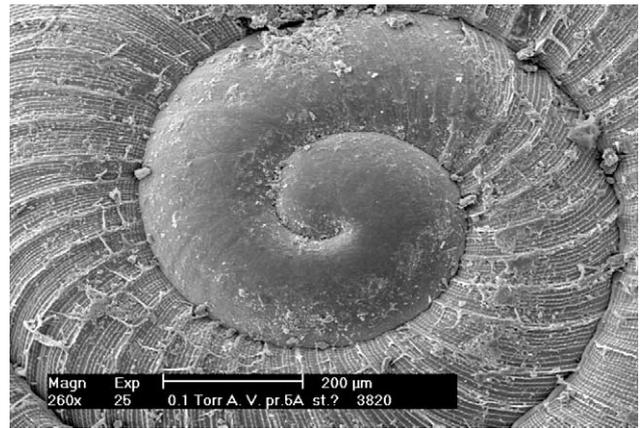


Fig. 168. *Andrefrancia costulifera*, a specimen from an unknown locality in New Caledonia (MNHN): apical and early postnuclear sculpture

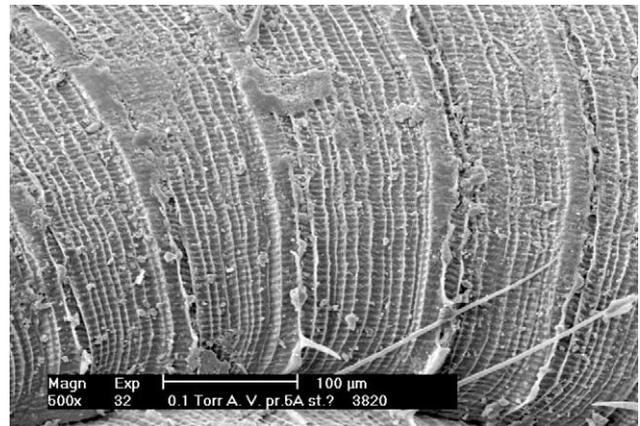


Fig. 169. *Andrefrancia costulifera*, a specimen from an unknown locality in New Caledonia (MNHN): sculpture of second postnuclear whorl

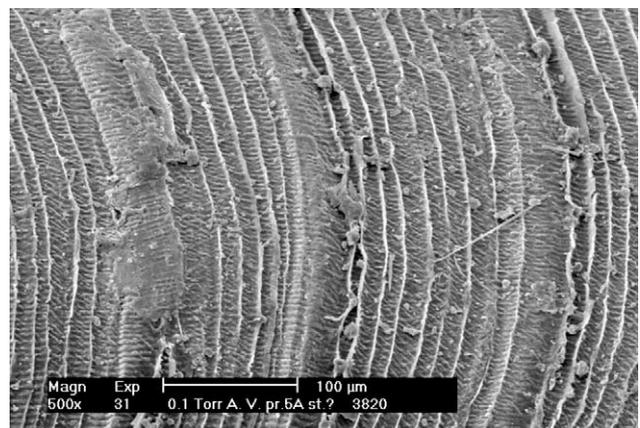


Fig. 170. *Andrefrancia costulifera*, a specimen from an unknown locality in New Caledonia (MNHN): sculpture of body whorl

Andrefrancia pinicola (Pfeiffer, 1854) (Figs 171–172)

Helix pinicola PFEIFFER 1854, pl. 201, fig. 1413. Type locality: Isle of Pines, New Caledonia. Holotype in The Natural History Museum, London.

Helix pinicola Pfeiffer SOLEM 1961: 461.

Material examined: Ile Art. Fischer leg. MONTROUZIER 1872. MNHN, 2 d (labelled as *Helix pinicola*).

Diagnosis. *A. pinicola* can be distinguished from *A. costulifera* by its larger shell, higher whorl increment, spirally sculptured embryonic shell, radial ribs more widely spaced and the pattern of alternate wide and narrow zigzags in apical view.

Description. Shell large, diameter 6.70–9.00 mm, with $4\frac{4}{7}$ –5 whorls. Shell height 3.10–4.20 mm, H_{sp}/H ratio 0.03–0.07 (mean 0.05), H/D ratio 0.46–0.47 (mean 0.46). Body whorl suture straight. Protoconch with $1\frac{1}{4}$ whorls. Apical sculpture of about 17 spiral lirae. Few, weak radial ridges before teleoconch present. Definitive sculpture of low and blunt, protractively sinuated radial ribs, regularly spaced 73–85 (mean 79) on the body whorl. Microsculpture typical of the group. Umbilicus open, 3.53–3.75 (mean 3.64) smaller than shell diameter. Suture impressed, on the body whorl detached; spire whorls hardly rounded. Body whorl equally slightly flattened above and below periphery, no keel. Aperture roundly lunate flattened

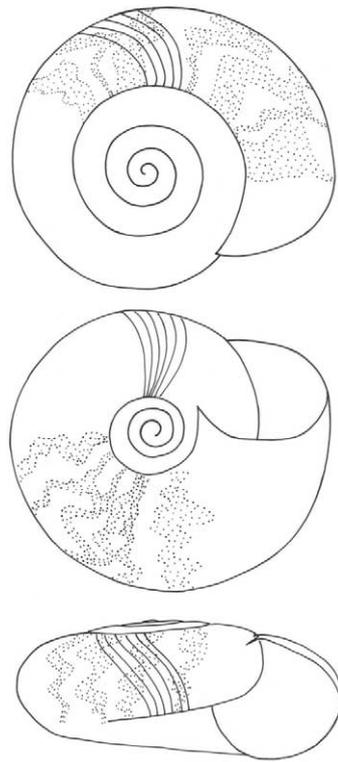


Fig. 171. *Andrefrancia pinicola*: a specimen from Ile Art (MNHN); scale bar = 1 mm

above periphery, with basal margin gently rounded, H_a/W_a ratio 0.86–0.96 (mean 0.91). W_{bw}/W_{lo} ratio

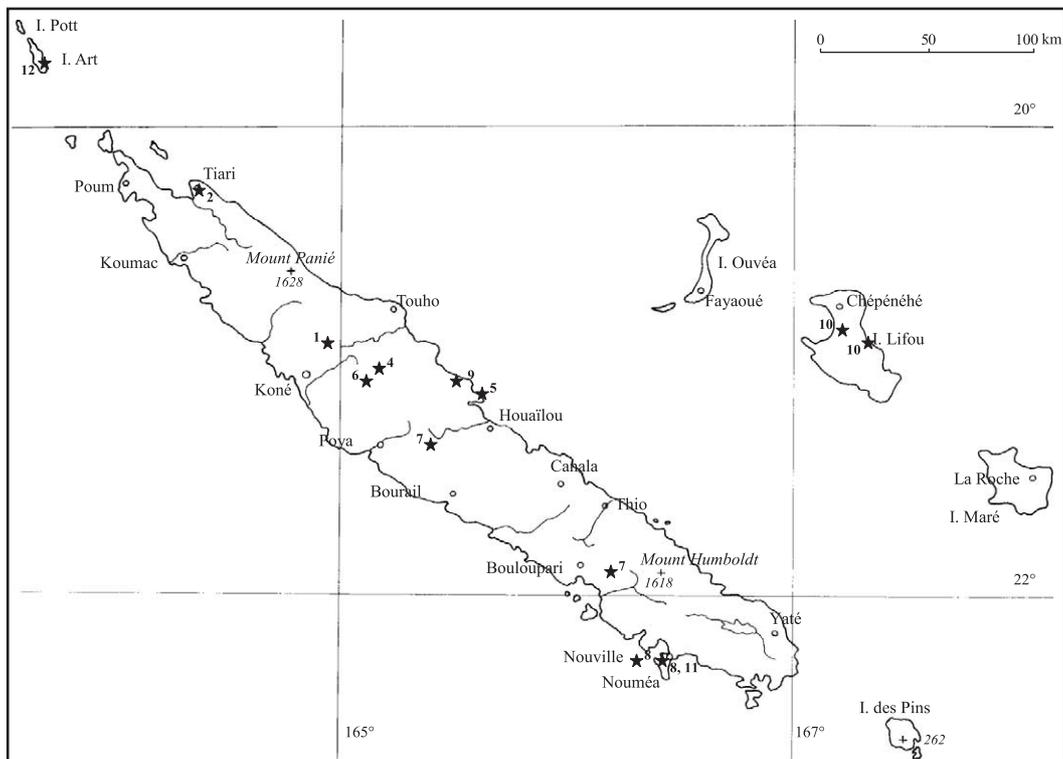


Fig. 172. Distribution map of *Andrefrancia*, group V
1 – *A. tandjiana*, 2 – *A. cressoniana*, 3 – *A. setosa*, 4 – *A. incipiens*, 5 – *A. perspectiva*, 6 – *A. goanna*, 7 – *A. memaoyana*, 8 – *A. bazini*, 9 – *A. reducisculpta*, 10 – *A. canaliculata*, 11 – *A. costulifera*, 12 – *A. pinicola*

2.38–2.70 (mean 2.54). D/N_w ratio 1.46–1.78 (mean 1.62). Colour light yellow horn with more or less regular reddish flammulations, joining together on shell base. The pattern of alternate wide and narrow zig-zags in apical view. Only one of two examined specimens had well preserved colour pattern.

No alcohol-preserved material was available.

Remarks. SOLEM (1961) placed *Helix pinicola* Pfeiffer, 1854 as incertae sedis, suggesting that it might be a member of the *A. costulifera* complex, and emphasised the necessity of critical re-examination of the types in the British Museum. GASSIES (1863) provided quite short description of the species that corresponds well with my examination of the two available shells.

Distribution: Ile Art, New Caledonia.

GROUP VI

Andrefrancia vetula (Gassies, 1858) (Figs 173–177, 200)

Helix vetula GASSIES 1858: 69–70. Type locality: New Caledonia.

Helix vetula GASSIES 1863: 29, pl. 1 fig. 13.

Rhytida vetula (Gassies) ANCEY 1882: 86.

Charopa vetula (Gassies) ANCEY 1886: 366; PILSBRY 1893: 33; CROSSE 1894: 228.

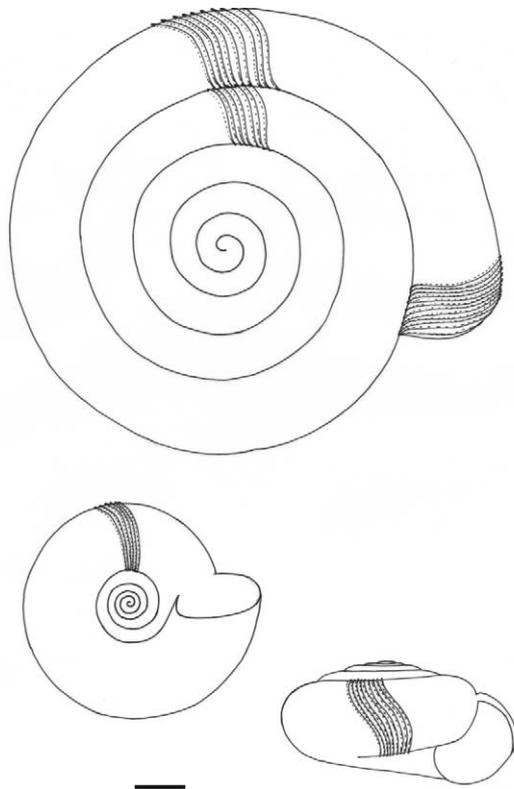


Fig. 173. *Andrefrancia vetula*: shell of a specimen from Ile des Pins (MNHN)

Endodonta (Charopa) vetula (Gassies) DAUTZENBERG 1923: 141.

Charopa vetula (Gassies) FRANC 1957: 124, pl. 12, fig. 162 a (holotype of *vetula*), pl. 13, fig. 162.

Andrefrancia vetula (Gassies) SOLEM 1961: 461.

Helix rhizophorarum GASSIES 1865: 211; GASSIES 1871: 23, pl. 1, fig. 11.

Patulastra rhizophorarum (Gassies) ANCEY 1882: 86.

Charopa rhizophorarum (Gassies) ANCEY 1888: 366; PILSBRY 1893: 33; CROSSE 1894: 235.

Endodonta (Charopa) rhizophorarum (Gassies) DAUTZENBERG 1923: 142.

Charopa rhizophorarum (Gassies) FRANC 1957: 124–125, pl. 13, fig. 163.

Andrefrancia rhizophorarum (Gassies) SOLEM 1961: 462.

Material examined: Dge, Ouen Id., COCKERELL 1928. CNHM 72845, 5 d (labelled as *A. vetula*); No exact locality. Nelson coll. CNHM 91201, 4 d (labelled as *A. vetula*); Ile Art, Fischer coll., MONTROUZIER leg., 1872. MNHN, 20 d (labelled as *Helix vetula*); No exact locality. DENIS MNHN, 30 d (labelled as *End. (Charopa) vetula*); Noumea. CNHM 1280, 13 d (labelled as *A. rhizophorarum*); No exact locality. Button coll. CNHM 91850, 5 d (labelled as *A. rhizophorarum*); No exact locality. Button coll. CNHM 91864, 7 d (la-

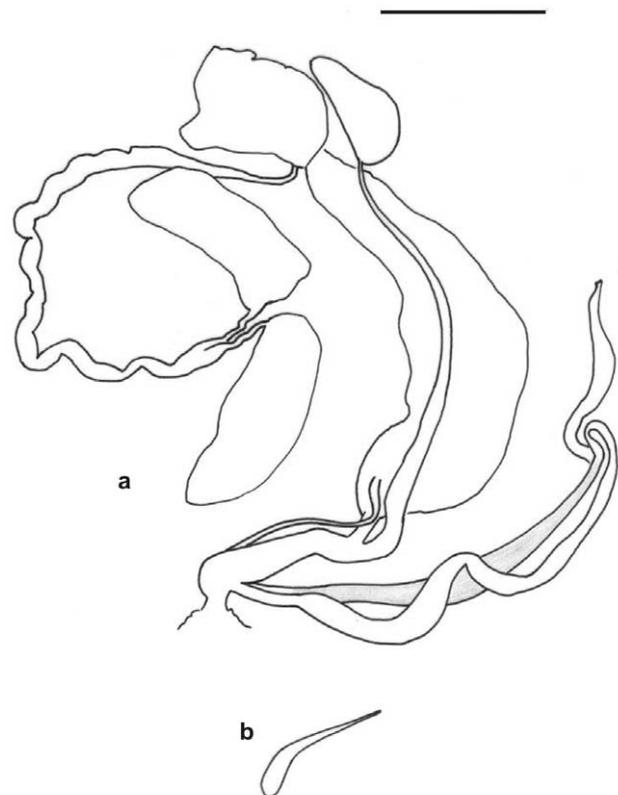


Fig. 174. *Andrefrancia vetula*: reproductive system of a specimen from Mount Koghi: a – genitalia; b – spermatophore; scale bar = 1 mm

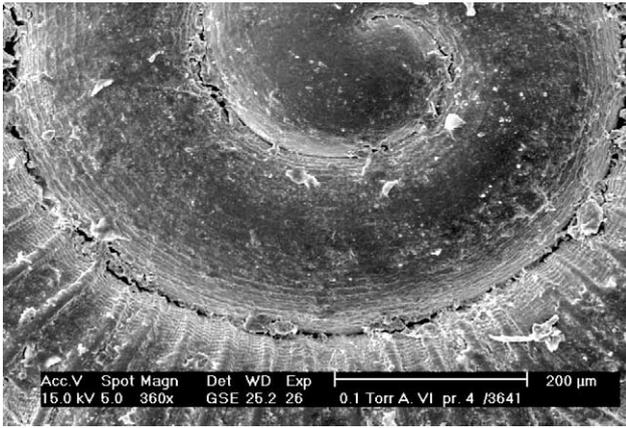


Fig. 175. *Andrefrancia vetula*, a specimen from an unknown locality in New Caledonia (CNHM 91850): apical and early postnuclear sculpture

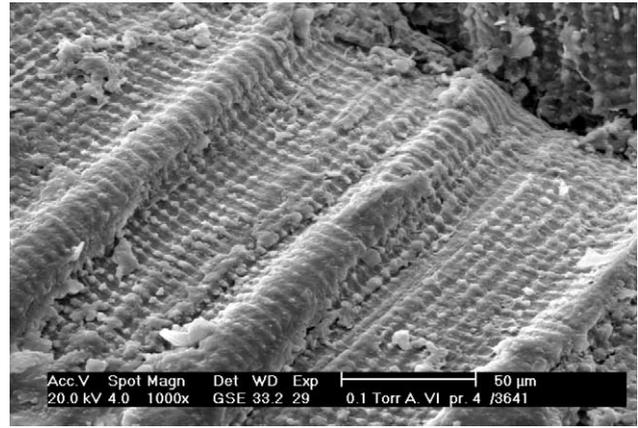


Fig. 177. *Andrefrancia vetula*, a specimen from an unknown locality in New Caledonia (CNHM 91850): sculpture of body whorl

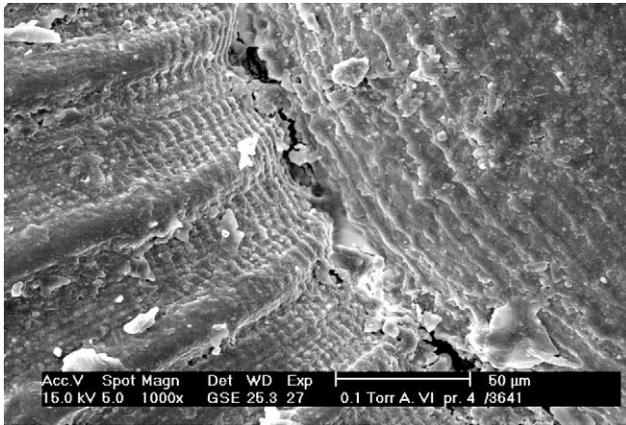


Fig. 176. *Andrefrancia vetula*, a specimen from an unknown locality in New Caledonia (CNHM 91850): details of embryonic shell

belled as *A. rhizophorarum*); Vao; Ile des Pins (167°29'10"E 22°09'36"S). BOUCHET, July 15, 1978. MNHN, 28 d; Ile des Pins. Caillot. MNHN, 30 d; Gossana-Ognat. Ouvéa (166°38'15"E 20°27'26"S). Humid forest/risen reef. BOUCHET, May 06, 1978. MNHN, 15 a (4 dissected), 30 d; Ndé (166°18'00"E 22°08'37"S), 60 m a.s.l. Second growth forest. BOUCHET, July 02, 1978. MNHN, 12 d; Mount Koghi (166°30'21"E 22°10'35"S), 450 m a.s.l. Humid forest/ultrabasic rocks. TILLIER & TILLIER, May 22, 1987. MNHN, 4 a (1 dissected); Mont Dzumac (166°27'19"E 22°02'30"S), 950–1,000 m a.s.l. N slope. Humid forest. BOUCHET & TILLIER, June 04, 1979. MNHN, 5 a (1 dissected).

Diagnosis. This species can be distinguished from *A. coerulea* by being larger, having a slightly narrower umbilicus, umbilical margin contours rounded, twice more numerous ribs on the body whorl, higher D/N_w .

Description. Shell. Shell diameter 2.10–6.10 mm, with $3\frac{3}{4}$ – $6\frac{3}{8}$ whorls. Apex and spire flat or barely elevated, height of shell 1.00–3.10 mm, H_{sp}/H ratio 0.00–0.25 (mean 0.11), H/D ratio 0.40–0.61 (mean

0.52). Body whorl slightly descending. Protoconch with $1-1\frac{3}{4}$ whorls. Apical sculpture of about 20 very dense and fine spiral cords. Fine radial rugosities before teleoconch present. Definitive sculpture of low, blunt, more or less regularly spaced, protractively sinuated radial ribs, 90–152 (mean 115) on the body whorl. Ribs sickle-shaped on the apex view, in older shells becoming gradually closer set towards the aperture. Microsculpture typical of the group. Umbilicus open, 2.69–3.71 times (mean 3.20) smaller than shell diameter, umbilical margin contours rounded. Suture deep. Body whorl evenly rounded. Aperture ovate, slightly oblique, sometimes with barely protruding upper margin, H_a/W_a ratio 0.80–1.36 (mean 1.01). Sometimes callus present on columellar margin, W_{bw}/W_{lo} ratio 1.20–2.50 (mean 1.73). D/N_w ratio 0.53–1.03 (mean 0.84). Upper margin of aperture normal.

Animal creamy-white.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct distinctly coiled with a greenish tint. Epiphallus slightly shorter than penis, tubular, within tight muscle sheath, entering it apically through a simple pore. Two longitudinal pilasters extend in one third of epiphallus length. Penial retractor muscle inserts on the penis/epiphallus junction; not twisted. Penis tubular, very long and narrow. There are neither penial glandulae nor other accessory structures. Internally penis without any sculpture. Vagina tubular, ca. one third of penis length. Internal walls of vagina smooth. Free oviduct and spermathecal shaft not twisted. No pilasters in free oviduct and spermathecal shaft. Free oviduct short. Spermathecal shaft narrow on entire length. Spermatophore tadpole-shaped.

Remarks. FRANC (1957) distinguished two species: *Charopa vetula* and *Ch. rhizophorarum*. SOLEM (1961) did not synonymise them. According to FRANC (1957) *C. vetula* (holotype) has ribs sickle-shaped in apical view and denser towards the aperture; body whorl

slightly descending; crescentic aperture angulated on top and rounded on basal margin, the upper margin slightly protruding; columellar callus quite pronounced, shell diameter 5 mm and $6\frac{1}{2}$ whorls. It is distributed in the Ile des Pins (common), Gomen, Ouaco, Canala, Nouméa, Baie du Sud, Ile Art, Ile Yandé, Ile Néba, Oubatche; Loyalty: Lifou; Chépénéhé; Ouvéa: Fayaoué. On the contrary, *C. rhizophorarum* has very regular ribs, not crowding towards the aperture; body whorl not descending; lunate and slightly oblique aperture, columellar callus barely present, shell diameter 5 mm and 6 whorls. It is found in Nouméa, Pouembout, Téremba, presqu'île Ducos and Pointe de l'Artillerie; Koné. FRANC (1957) emphasized that these two species are very similar and closely related. Totally, I examined 14 samples (208 specimens), among which four were labelled as *Andrefrancia vetula* and three as *A. rhizophorarum*. Nevertheless, I could not detect any clear conchological difference that would allow for unambiguous distinction of these two species. The characters indicated above as the key ones can be found in every examined specimen. These features are within a variation range, in which one can come upon the extreme forms as well as the intermediate ones.

Distribution: According to FRANC (1957): Ile des Pins (common), Gomen, Ouaco, Canala, Nouméa, Baie du Sud, Ile Art, Ile Yandé, Ile Néba, Oubatche; Loyalty: Lifou; Chépénéhé; Ouvéa: Fayaoué; Pouembout (*vetula*); Téremba, presqu'île Ducos and Pointe de l'Artillerie; Koné (*rhizophorarum*). Dge, Ile Art, Noumea. Vao; Ile des Pins, Gossana-Ognat, Ndé, Mount Koghi, Mont Dzumac.

***Andrefrancia coerulea* n. sp.** (Figs 178–181, 200)

Type locality: Bleue River, New Caledonia.

Type material: Bleue River (166°39'16"E 22°06'13"S), 160 m a.s.l. Humid forest/alluvia. MORDAN, TILLIER & TILLIER, April 30, 1987. MNHN, 4 d.

Other material examined: Bleue River (166°40'01"E 22°05'59"S), 170 m a.s.l. Humid forest/slope of ultrabasic rocks. TILLIER & TILLIER, March 16, 1987. MNHN, 5 d; Bleue River (166°40'01"E 22°05'59"S), 170 m a.s.l. Humid forest/slope of ultrabasic rocks. TILLIER & TILLIER, January 16, 1987. MNHN, 2 d; Bleue River (166°40'01"E 22°05'59"S), 170 m a.s.l. Humid forest/slope of ultrabasic rocks. TILLIER & TILLIER, October 27, 1988. MNHN, 3 a (1 dissected).

Diagnosis. This species is conchologically very similar to *A. khedeigneana* but differs from it in having a slightly wider umbilicus; rounded body whorl; slightly ovate aperture; lower W_{bw}/W_{lo} ratio. Although the shells of these two species can be easily confused, their anatomy allows for secure separation. This spe-

cies also seems to be very similar conchologically to *A. taslei*. According to FRANC (1957) *Charopa taslei* has a slightly lower spire and smooth embryonic shell. There are no data on the genital system of *A. taslei* in the literature. The examined specimens resemble also *A. confinis*. They can be distinguished by smaller shell size of the latter, deep detached suture, slightly protruding upper margin of aperture on right side and somewhat curved on left side (FRANC 1957).

Description. Shell. Shell diameter 2.70–3.25 mm (holotype 3.20 mm), with $4\frac{2}{3}$ – $5\frac{1}{3}$ (holotype 5) whorls. Apex and spire flat or barely elevated, shell height 1.30–1.70 mm (holotype 1.70 mm), H_{sp}/H ratio 0.04–0.18 (mean 0.11, holotype 0.18), H/D ratio 0.43–0.53 (mean 0.50, holotype 0.53). Body whorl descending rapidly. Protoconch with $1\frac{1}{4}$ – $1\frac{3}{4}$ whorls (holotype $1\frac{3}{8}$). Apical sculpture of about 7 spiral cords. Fine radial rugosities before teleoconch present. Definitive sculpture of narrow, regularly spaced, protractively sinuated radial ribs 63–85 (mean 73, holotype 82) on the body whorl. Microsculpture typical of the group. Umbilicus open, 2.73–3.10 times (mean 2.93, holotype 2.91) smaller than shell diameter, umbilical margin contours bluntly angulated around umbilicus. Suture deep. Body whorl evenly rounded. Aperture slightly ovate, H_a/W_a ratio

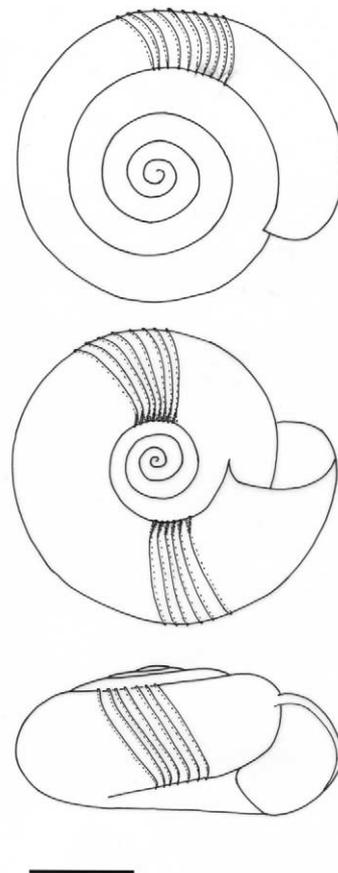


Fig. 178. *Andrefrancia coerulea* n. sp.: shell of the holotype (MNHN)

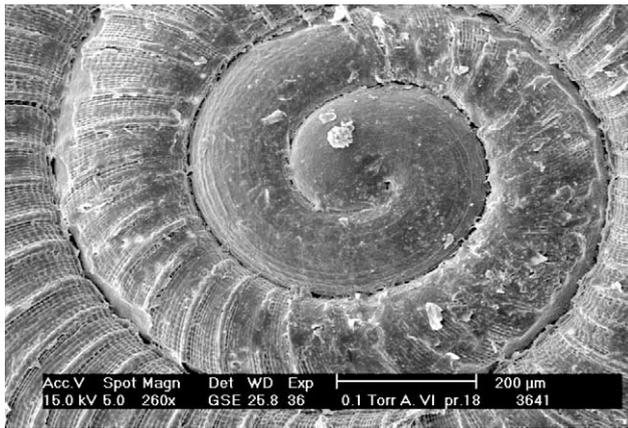


Fig. 179. *Andrefrancia coerulea* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

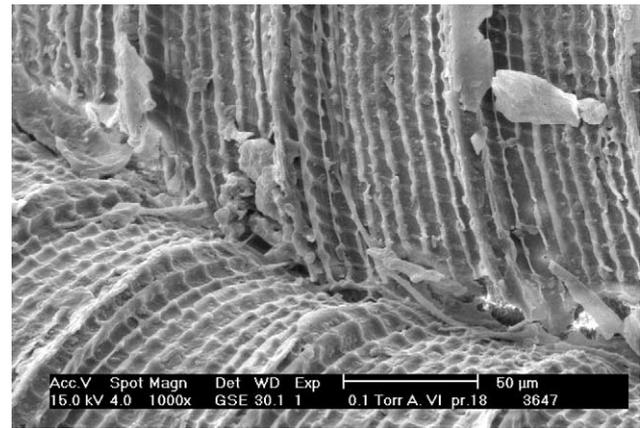


Fig. 180. *Andrefrancia coerulea* n. sp., a paratype from the type locality (MNHN): sculpture of penultimate and body whorl

1.00–1.22 (mean 1.11, holotype 1.10). W_{bw}/W_{lo} ratio 1.60–2.22 (mean 1.81, holotype 2.00). D/N_w ratio 0.58–0.65 (mean 0.62, holotype 0.64). Upper margin of aperture normal.

Animal creamy-white.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct not convoluted with a greenish tint. Epiphallus slightly shorter than penis, entering it apically through a simple pore. No data on pilasters inside epiphallus. Penial retractor muscle inserts on the penis/epiphallus junction and enfolds vas deferens. Penis of moderate length, two-chambered, strongly narrowed in the middle, tapering to atrium junction. There are neither penial glandulae nor other accessory structures. There is one transverse, short and thick fold in the upper chamber. Lower chamber has a tight circular collar. No longitudinal pilasters. Vagina cylindrical, as long as penis with 3–4 longitudinal, fine pilasters inside. Free oviduct and spermathecal shaft not twisted. No data on pilasters in free oviduct and spermathecal shaft. Free oviduct very short. Spermathecal shaft wide only at the base, then equally narrow. Spermatophore not seen.

Name derivation. The name is derived from the Latin for blue [=bleue] – the name of the river at which the new species was found.

Distribution: Bleue River, New Caledonia.

***Andrefrancia tondeuana* n. sp.** (Figs 182–187, 200)

Type locality: Vallée de la To Ndeu, New Caledonia.

Type material: Vallée de la To Ndeu (166°17'10"E 21°42'23"S), N slope, 90–120 m a.s.l. Humid forest on peridotites. TILLIER, BOUCHET & TRICLOT, November 04, 10, 1984. Holotype a & paratypes 19 a (2 dissected), 3 d, MNHN.

Diagnosis. In its general appearance this species is similar to *A. kouvneleana* but differs from it in having a smaller diameter, lower spire unevenly elevated, body whorl shouldered above and flattened below periphery, aperture rounded and flattened above periphery, slightly protruding upper margin of aperture, umbilical margin contours rounded, lower W_{bw}/W_{lo} and D/N_w ratios, distinctly protruding microriblet on one side of each major ribs.

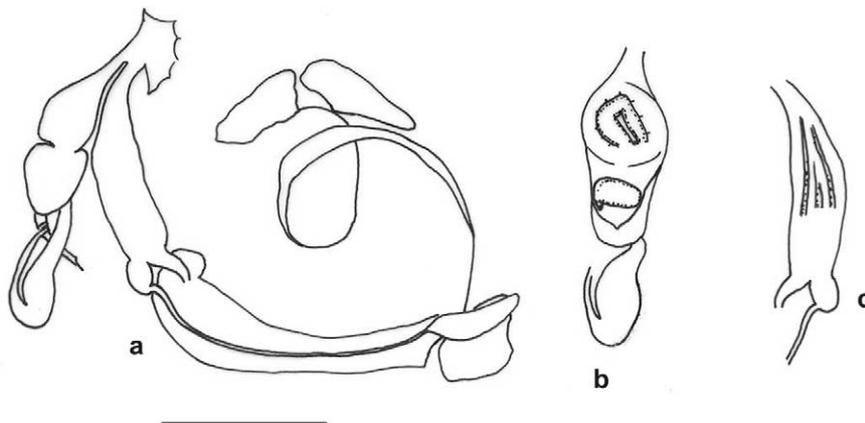


Fig. 181. *Andrefrancia coerulea* n. sp.: reproductive system of a specimen from Bleue River (MNHN): a – genitalia; b – interior of penis; c – interior of vagina; scale bar = 1 mm

Description. Shell. Shell diameter 3.00–3.90 mm (holotype 3.60 mm), with $4\frac{1}{4}$ –6 (holotype $5\frac{1}{2}$) whorls. Spire barely and unevenly elevated, shell height 1.20–1.80 mm (holotype 1.60 mm), H_{sp}/H ratio 0.00–0.17 (mean 0.08, holotype 0.13), H/D ratio 0.39–0.47 (mean 0.42, holotype 0.44). Body whorl descending rapidly. Protoconch with $1\frac{1}{8}$ – $1\frac{1}{2}$ whorls (holotype $1\frac{3}{8}$). Apical sculpture of several spiral cords. Radial rugosities before teleoconch absent. Definitive sculpture of regularly spaced, distinct, protractively sinuated radial ribs, with relatively long periostracal blades, 50–66 (mean 57, holotype 60) on the body whorl. Microsculpture of narrow radial riblets and obscure spiral cords, which form tiny beads at their intersection. On one side of each major rib there is one riblet distinctly protruded. Umbilicus widely open, 2.06–2.73 times (mean 2.29, holotype 2.40) smaller than shell diameter, umbilical margin contours rounded. Suture deep. Body whorl shouldered above and flattened below periphery. Aperture rounded and more or less flattened above periphery, upper margin slightly protruding, H_a/W_a ratio 0.91–1.38 (mean 1.08 holotype 0.91). W_{bw}/W_{lo} ratio 1.60–2.00 (mean 1.72, holotype 1.60). D/N_w ratio 0.59–0.71 (mean 0.64, holotype 0.65).

Animal creamy-white.

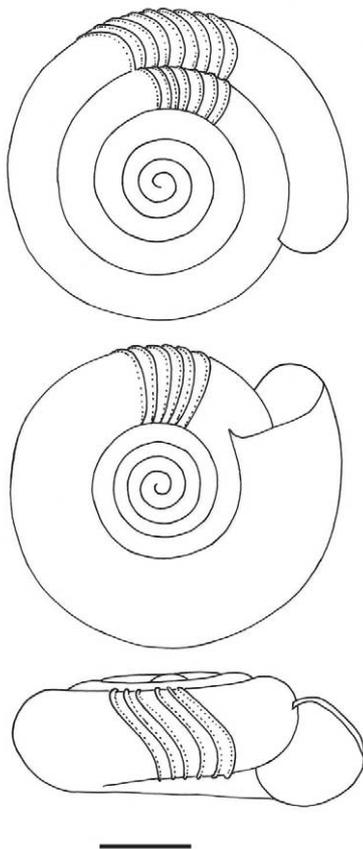


Fig. 182. *Andrefrancia tondeuana* n. sp.: shell of the holotype (MNHN)

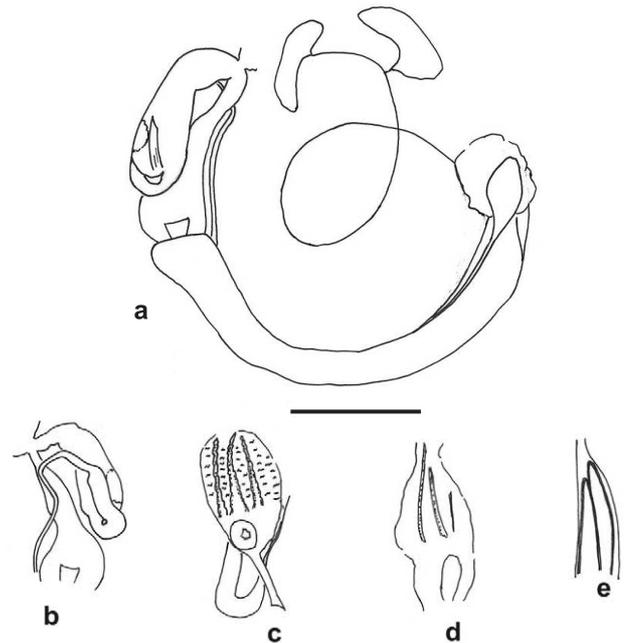


Fig. 183. *Andrefrancia tondeuana* n. sp.: reproductive system of a paratype from type locality (MNHN): a – genitalia; b – part of genitalia; c – interior of penis; d – interior of vagina; e – interior of epiphallus and vas deferens entrance; scale bar = 1 mm

Genital system. Ovotestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct not convoluted with a greenish tint. Epiphallus slightly shorter than penis, entering it subapically through a fleshy globular verge. Three longitudinal pilasters extend inside of epiphallus. Penial retractor muscle inserts on the penis/epiphallus junction, subapically; not twisted. Penis pouched-shaped, of moderate length, tapering to atrium junction. There is one penial gland situated close to penial retractor muscle. Internally penis shows three longitudinal, corrugated pilasters and tiny, transverse corrugations in between. Vagina cylindrical, as long as penis with few longitudinal, fine pilasters inside. Free oviduct and spermathecal shaft not twisted, internally show longitudinal pilasters. Free ovi-

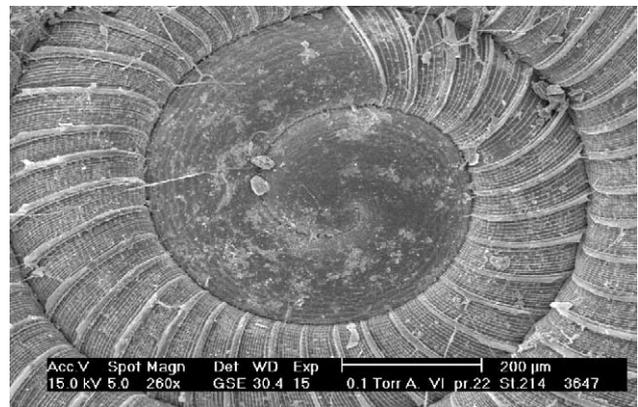


Fig. 184. *Andrefrancia tondeuana* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

duct very short. Spermathecal shaft almost evenly narrow on entire length. Spermatophore not seen.

Name derivation. The name is derived from the name of the type locality.

Distribution: Vallée de la To Ndeu, New Caledonia, known from the type locality only.

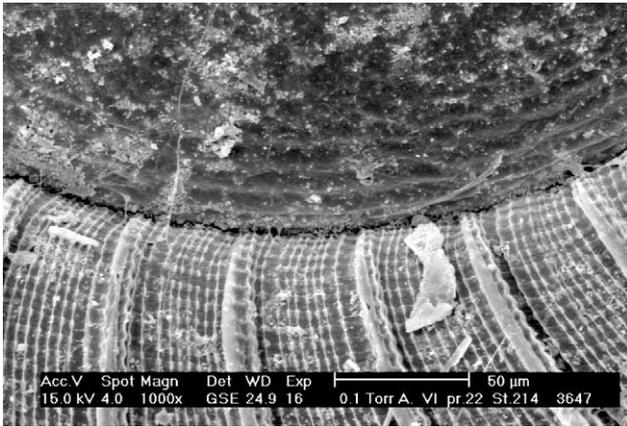


Fig. 185. *Andrefrancia tondeuana* n. sp., a paratype from the type locality (MNHN): details of embryonic shell

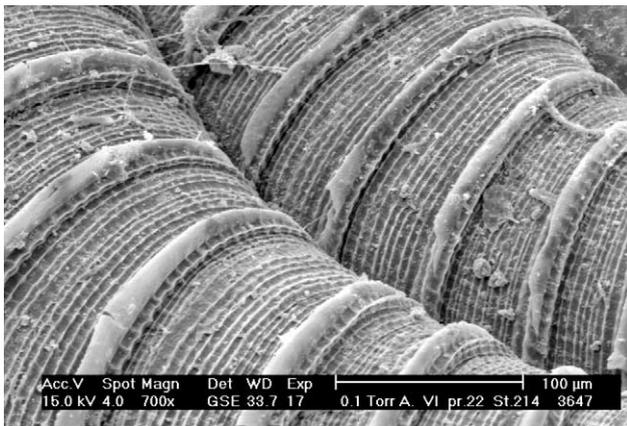


Fig. 186. *Andrefrancia tondeuana* n. sp., a paratype from the type locality (MNHN): sculpture of inner whorl

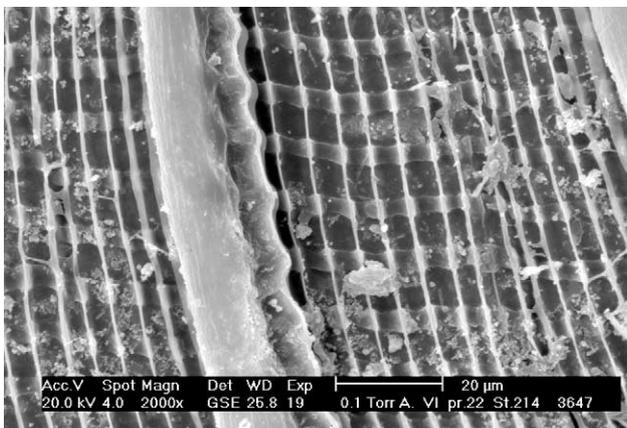


Fig. 187. *Andrefrancia tondeuana* n. sp., a paratype from the type locality (MNHN): details of microsculpture

***Andrefrancia kouvneleana* n. sp.** (Figs 188–191, 200)

Type locality: Mount Kouvnélè, New Caledonia.

Type material: Mount Kouvnélè (166°26'56"E 22°05'26"S), E slope, 660 m a.s.l. Humid forest. TILLIER, TILLIER, BOUCHET & TRICLOT, November 25, 1984. Holotype d & paratypes 5 d, MNHN.

Diagnosis. *A. kouvneleana* is bigger than *A. tondeuana*, has a higher and evenly elevated spire, body whorl equally flattened above and below periphery, aperture roughly subovate, flattened above mildly rounded below periphery, with vertical columellar margin, umbilical margin contours shouldered, higher W_{bw}/W_{lo} and D/N_w ratios. Moreover it does not have protruding upper margin of aperture and distinct microriblet on major ribs.

Description. Shell diameter 4.10–4.70 mm (holotype 4.30 mm), with $5\frac{3}{8}$ – $6\frac{1}{6}$ (holotype $5\frac{1}{2}$) whorls. Apex and spire slightly and evenly elevated, shell height 1.80–2.30 mm (holotype 1.80 mm), H_{sp}/H ratio 0.11–0.25 (mean 0.18, holotype 0.11), H/D ratio 0.42–0.49 (mean 0.46, holotype 0.42). Body whorl descending rapidly. Protoconch with $1\frac{1}{4}$ – $1\frac{3}{8}$ whorls (holotype $1\frac{1}{4}$). Apical sculpture of about 7 spiral cords.

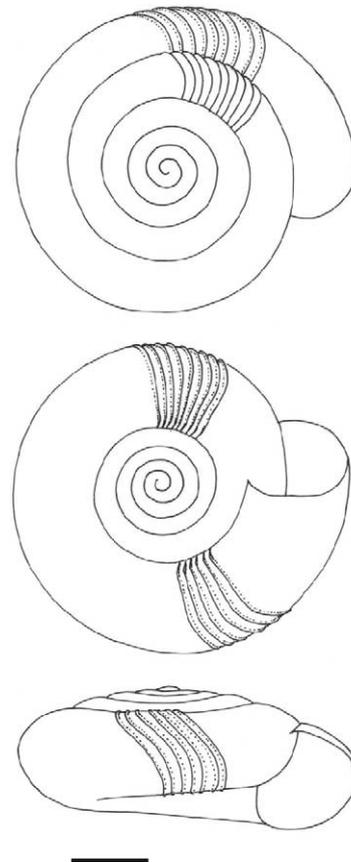


Fig. 188. *Andrefrancia kouvneleana* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

Radial rugosities before teleoconch absent. Definitive sculpture of regularly spaced, distinct, protractively sinuated radial ribs, with relatively long periostracal blades, 55–70 (mean 65, holotype 69) on the body whorl. Microsculpture of first whorls consists of narrow radial riblets and remnants of spiral cords, which form

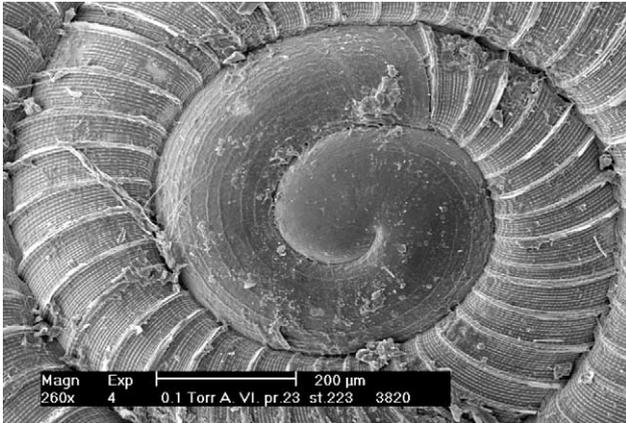


Fig. 189. *Andrefrancia kouvneleana* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture



Fig. 190. *Andrefrancia kouvneleana* n. sp., a paratype from the type locality (MNHN): suture embryonic/postembryonic shell

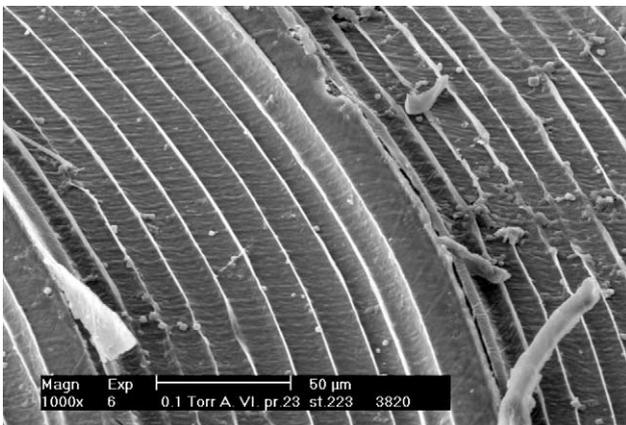


Fig. 191. *Andrefrancia kouvneleana* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

elongate knobs at their intersection. On the next whorls between radial ribs there are very low and dense spiral cords but without any knobs. Umbilicus widely open, 2.19–2.50 times (mean 2.31, holotype 2.26) smaller than shell diameter, umbilical margin contours bluntly angulated (shouldered) around umbilicus. Suture deep. Body whorl equally flattened above and below periphery. Aperture roughly subovate, flattened above periphery, mildly rounded below it, with vertical columellar margin, H_a/W_a ratio 0.87–1.08 (mean 0.97, holotype 1.00). W_{bw}/W_{lo} ratio 2.00–2.60 (mean 2.32, holotype 2.40). D/N_w ratio 0.76–0.80 (mean 0.78, holotype 0.78). Upper margin of aperture normal.

No alcohol-preserved material was available.

Name derivation. The name was coined from the name of the type locality.

Distribution: Mount Kouvnélè, New Caledonia, known from the type locality only.

Andrefrancia khedeigneana n. sp. (Figs 192–196, 200)

Type locality: Khedeigne (Lifou), New Caledonia.

Type material: Khedeigne (Lifou) (167°13'29"E 21°04'41"S). Maquis with araucarias/risen reef. BOUCHET, PONDER, TILLIER & WARÈN, July 2, 1979. Holotype a & paratypes 12 a (2 dissected), MNHN.

Other material examined: Cap des Pins (Lifou) (167°27'00"E 21°03'16"S). Forest with araucarias. BOUCHET, TILLIER & TILLIER, July 22, 1979. MNHN, 18 a (2 dissected); Illegible label, MNHN, 23 a (4 dissected).

Diagnosis. This species can be distinguished conchologically from *A. coerulea* by its narrower umbilicus, body whorl flattened above periphery, rounded aperture and higher W_{bw}/W_{lo} ratio. *A. khedeigneana* also seems to be very similar conchologically to *A. taslei*. According to FRANC (1957) *Charopa taslei* is slightly bigger and has smooth embryonic shell. There are no data on the genital system of *A. taslei* in the literature.

Description. Shell. Shell small, diameter 1.70–3.20 mm (holotype 3.20 mm), with $3\frac{1}{8}$ – $4\frac{1}{3}$ (holotype $4\frac{1}{3}$) whorls. Apex and spire flat or barely elevated, shell height 0.85–1.75 mm (holotype 1.75), H_{sp}/H ratio 0.00–0.14 (mean 0.07, holotype 0.09), H/D ratio 0.45–0.59 (mean 0.51, holotype 0.55). Body whorl descending rapidly. Protoconch with $1\frac{1}{8}$ – $1\frac{1}{2}$ whorls (holotype $1\frac{3}{8}$). Apical sculpture of about 9 spiral cords (spiral lirae). Radial rugosities before teleoconch absent. Definitive sculpture of narrow, regularly spaced, protractively sinuated radial ribs, 50–80 (mean 62, holotype 80) on the body whorl. Microsculpture typical of the group. Umbilicus open, 3.31–4.75 times (mean 4.06, holotype 3.76) smaller than shell diameter, umbilical margin contours

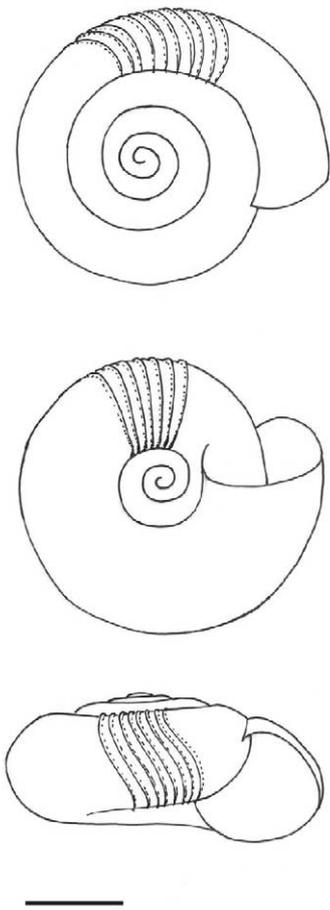


Fig. 192. *Andrefrancia khedeigneana* n. sp.: shell of the holotype (MNHN)

bluntly angulated around umbilicus. Suture deep. Body whorl flattened above and rounded below pe-

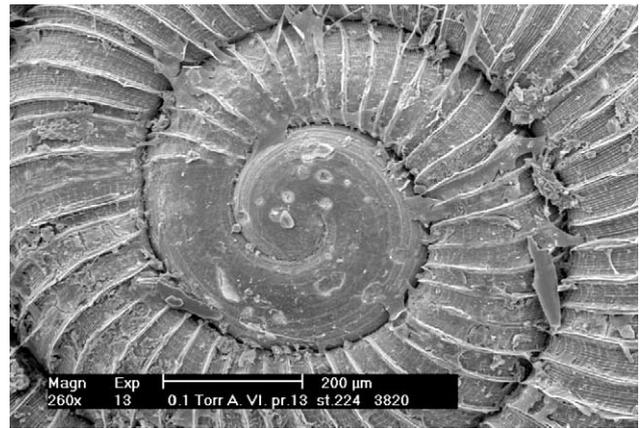


Fig. 194. *Andrefrancia khedeigneana* n. sp., a specimen from an unknown locality in New Caledonia (MNHN): apical and early postnuclear sculpture

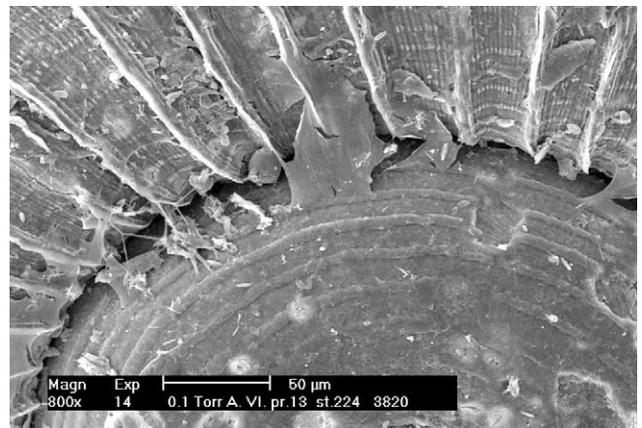


Fig. 195. *Andrefrancia khedeigneana* n. sp., a specimen from an unknown locality in New Caledonia (MNHN): suture embryonic/postembryonic shell

riphery. Aperture rounded, slightly flattened above periphery. H_a/W_a ratio 0.83–1.29 (mean 0.97,

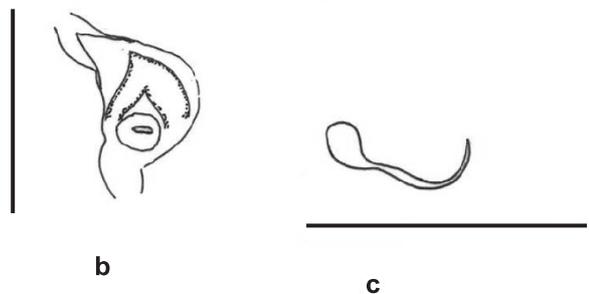


Fig. 193. *Andrefrancia khedeigneana* n. sp.: reproductive system of a specimen from Cap des Pins (Lifou) (MNHN): a – genitalia; b – interior of penis; c – spermatophore; scale bar = 1 mm

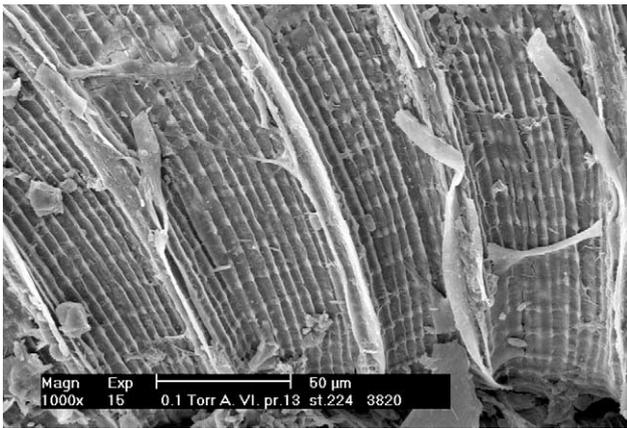


Fig. 196. *Andrefrancia khedeigneana* n. sp., a specimen from an unknown locality in New Caledonia (MNHN): sculpture of inner whorl

holotype 1.00). W_{bw}/W_{lo} ratio 1.67–2.57 (mean 2.04, holotype 2.00). D/N_w ratio 0.48–0.74 (mean 0.61, holotype 0.74). Upper margin of aperture normal.

Animal creamy-white.

Genital system. Ootestis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct weakly coiled with a greenish tint. Epiphallus slightly shorter than penis, entering it subapically through a fleshy globular verge. Dissection of epiphallus failed. Penial retractor muscle inserts on the penis/epiphallus junction; not twisted. Penis of moderate length, swollen apically and tapered to atrium junction. There are neither penial glandulae nor other accessory structures. Internally, immediately below the verge, which is an entrance of epiphallus, penis shows two thick folds coalescing and forming the letter V. Vagina extremely short, without pilasters. Free oviduct and spermathecal shaft not twisted. Internally spermathecal shaft shows pilasters, free oviduct does not. Free oviduct as long as penis, tubular, within tight muscle sheath. Lower half of free oviduct covered by tissue. Basal part of spermathecal shaft wider, then gradually narrowing. Spermatophore tadpole-shaped.

Name derivation. The name is derived from the name of the type locality.

Distribution: Khedeigne, Cap des Pins (Lifou), New Caledonia.

Andrefrancia webbi n. sp. (Figs 197, 200)

Terra typica: New Caledonia. Because of imprecise label data, only terra typica can be given.

Type material: New Caledonia ex 46259 Walter F. Webb Collection. No exact locality. Holotype d, CNHM 62592 (labelled as *A. decreta*).

Diagnosis. This species is quite similar to *A. tondeuana* and *A. koumeleana* in general appearance but differs from them in having bigger shell diameter, rounded

body whorl, lower spire, twice more numerous ribs on the body whorl and higher whorl increment.

Description. Shell diameter 4.93 mm, with $5\frac{1}{2}$ whorls. Apex and spire barely elevated, shell height 2.05 mm, H_{sp}/H ratio 0.07, H/D ratio 0.42. Body whorl barely descending. Protoconch with $1\frac{3}{4}$ whorls. Apical sculpture of about 18 spiral lirae. Fine radial ridges before teleoconch. Definitive sculpture of regularly spaced, relatively high, narrow, gently protractively sinuated radial ribs, 117 on the body whorl. Microsculpture consists of narrow radial riblets and spiral cords. Umbilicus widely open, 2.18 times smaller than shell diameter, umbilical margin contours bluntly angulated around umbilicus. Suture deep. Body whorl rounded. Aperture ovately lunate, H_a/W_a ratio 1.00. W_{bw}/W_{lo} ratio 1.70. The whorls regularly increasing, D/N_w ratio 0.90. Upper margin of aperture normal.

No alcohol-preserved material was available.

Remarks. The examined specimen labelled as *Andrefrancia decreta* does not agree with the diagnosis of the holotype of *Charopa decreta* given by FRANC (1957). According to FRANC *C. decreta* is much smaller: shell diameter 2 mm, height 1 mm, number of whorls 5, and it has distinctly angulated aperture. Most probably the specimen from the collection of CNHM has been misidentified. SEM examination is required to find out more details of micro- and macrosculpture.

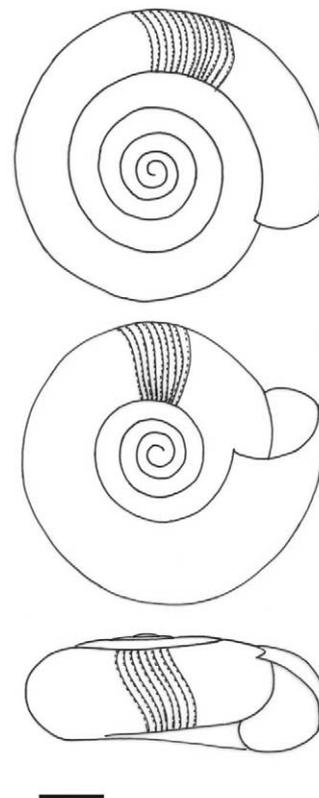


Fig. 197. *Andrefrancia webbi* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

Name derivation. The name is derived from the name of the collector.

Distribution: New Caledonia.

Andrefrancia lenis n. sp. (Figs 198, 200)

Terra typica: New Caledonia. Because of imprecise label data, only terra typica can be given.

Type material: New Caledonia, COCKERELL 1928. Holotype d & paratypes 3 d, CNHM 72848. (labelled as *A. lifuana*).

Diagnosis. This species can be distinguished from *A. noumeensis* by its body whorl laterally compressed, wider umbilicus, aperture subovate with upper margin slightly protruding, higher major ribs not crowding towards the aperture, deep suture, presence of spiral cords on embryonic shell, lower W_{bw}/W_{lo} ratio.

Description. Shell diameter 3.22–3.97 mm (holotype 3.63 mm), with $5\frac{1}{2}$ – $5\frac{3}{4}$ (holotype $5\frac{5}{8}$) whorls. Apex and spire flat or barely elevated, shell height 1.71–2.05 mm (holotype 1.85 mm), H_{sp}/H ratio 0.07–0.12 (mean 0.10, holotype 0.11), H/D ratio 0.51–0.53 (mean 0.50, holotype 0.51). Body whorl not descending. Protoconch with $1\frac{1}{2}$ – $1\frac{3}{4}$ whorls (holotype $1\frac{1}{2}$). Apical sculpture of about 15 spiral lirae. Very fine radial rugosities before teleoconch. Definitive sculpture of regularly spaced, relatively high, narrow, slightly protractively sinuated radial ribs, 110–126 (mean 122, holotype 126) on the

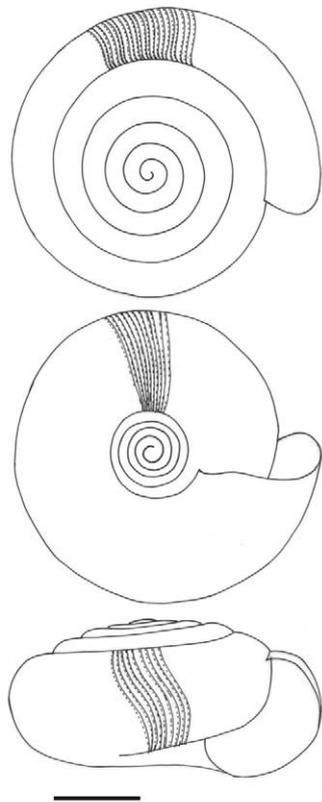


Fig. 198. *Andrefrancia lenis* n. sp.: shell of the holotype (MNHN); scale bar = 1 mm

body whorl. Microsculpture consists of narrow radial riblets and spiral cords. Umbilicus open, 3.22–3.62 times (mean 3.40, holotype 3.31) smaller than shell diameter, umbilical margin contours rounded. Suture deep. Body whorl laterally compressed. Aperture subovate with upper margin slightly protruding, H_a/W_a ratio 0.95–1.06 (mean 1.00, holotype 1.00). W_{bw}/W_{lo} ratio 1.50–1.71 (mean 1.60, holotype 1.67). The whorls slowly and regularly increasing, D/N_w ratio 0.59–0.71 (mean 0.60, holotype 0.65).

No alcohol-preserved material was available.

Remarks. The examined specimens labelled as *Andrefrancia lifuana* show two departures from the diagnosis of the holotype of *Charopa lifuana* given by FRANC (1957). According to FRANC the umbilicus of the latter is contained almost 2 times in the diameter and the umbilical margin contours are obtusely angulated. The distribution according to FRANC (1957) is Lifou. GASSIES (1863) described *Helix lifuana* with maximum shell diameter 11 mm, shell height 7 mm and 5 whorls. SEM examination is required to see more details of micro- and macrosculpture.

Name derivation. The name refers to the slow whorl increment of the new species.

Distribution: New Caledonia.

Andrefrancia noumeensis (Crosse, 1870) (Figs 199–200)

Helix noumeensis CROSSE 1870: 241. Type locality: vicinity of Noumea, New Caledonia. Holotype figured by FRANC 1957: pl. 11, fig. 148, The Natural History Museum, London.

Helix noumeensis GASSIES 1871: 22; CROSSE 1874: 100, pl. 3, fig. 6.

Charopa noumeensis (Crosse) ANCEY 1888: 366; PILSBRY 1893: 33; CROSSE 1894: 231; FRANC 1957: 116–117, pl. 11, fig. 148 (holotype of *noumeensis*).

Andrefrancia noumeensis (Crosse) SOLEM 1961: 462.

Material examined: Vicinity of Nouméa, New Caledonia. CAILLOT. MNHN, 1 d (labelled as *A. noumeensis*).

Diagnosis. *A. noumeensis* differs from *A. lenis* in having body whorl laterally compressed and flattened above periphery, narrower umbilicus, aperture subovate flattened above periphery with normal upper margin, lower sickle-shaped major ribs, normal suture, smooth apical shell, higher W_{bw}/W_{lo} ratio.

Description. Shell diameter 4.50 mm, with 6 whorls. Apex and spire slightly and evenly elevated, shell height 2.60 mm, H_{sp}/H ratio 0.12, H/D ratio 0.58. Body whorl barely descending rapidly. Protoconch with $1\frac{1}{2}$ whorls. Apical sculpture seems to be smooth. Definitive sculpture of more or less regularly spaced, fine, low, blunt, protractively sinuated, sickle-shaped radial ribs, crowding towards the aperture, 110 on the body whorl. In apical view ribs are sickle-shaped.

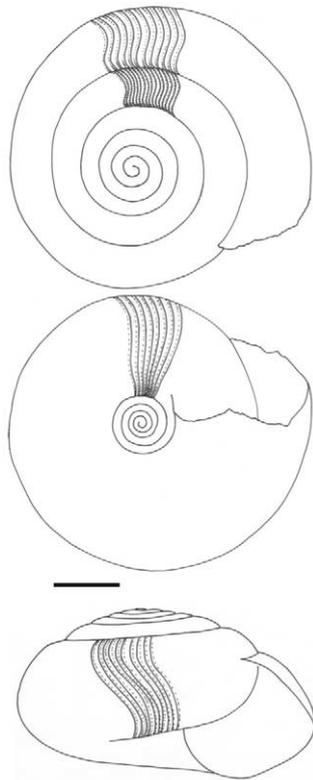


Fig. 199. *Andrefrancia noumeensis*: vicinity of Nouméa (MNHN); scale bar = 1 mm

Periostracal blades absent. Microsculpture consists of radial riblets and spiral cords. Umbilicus open, 5.00 smaller than shell diameter, umbilical margin contours rounded. Suture normal. Body whorl laterally compressed, flattened above periphery. Aperture subovate, flattened above periphery, H_a/W_a ratio 0.95. W_{bw}/W_{lo} ratio 1.88. Five whorls regularly and slowly increasing, the last one more rapidly, D/N_w ratio 0.75.

No alcohol-preserved material was available.

Remarks. The features of the observed specimen, labelled as *Andrefrancia noumeensis* agree with the diagnosis of the holotype of *Charopa noumeensis* given by FRANC (1957). One departure from FRANC's description is subangulated body whorl and aperture, which I did not observe. SEM examination is required to see more details of micro- and macrosculpture.

Distribution: Vicinity of Nouméa, New Caledonia.

***Andrefrancia decreta* (Gassies, 1871)**

Helix decreta GASSIES 1871: 180. Type locality: Nou Island, New Caledonia. Holotype figured by FRANC 1957: pl. 12, fig. 154, repository unknown.

Helix decreta GASSIES 1873: 47, pl. 2, fig. 3.

Patulastra decreta (Gassies) ANCEY 1882: 86.

Charopa decreta (Gassies) ANCEY 1888: 366; PILSBRY 1893: 33; CROSSE 1894: 229.

?*Helix subtersa* GASSIES 1878: 330; 1880: 26, pl. 1, fig. 14.

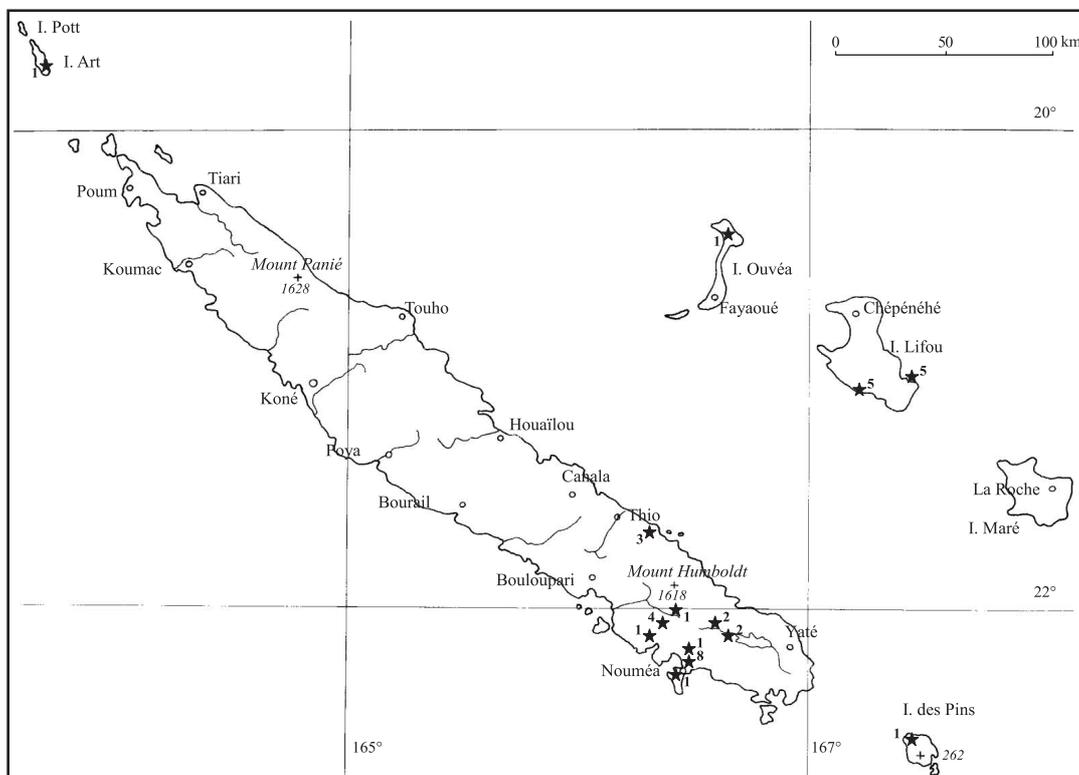


Fig. 200. Distribution map of *Andrefrancia*, group VI
1 – *A. vetula*, 2 – *A. coerulea*, 3 – *A. tondeuana*, 4 – *A. koumeleana*, 5 – *A. khedeigneana*, 6 – *A. webbi*, 7 – *A. lenis*, 9 – *A. noumeensis*

Charopa decreta (Gassies) FRANC 1957: 119, pl.12, fig. 154 (holotype of *decreta*).

Andrefrancia decreta (Gassies) SOLEM 1961: 462.

Material examined: *A. decreta* was not examined during the study. The description follows FRANC (1957).

Description. “Shell very small, depressed, lenticular, with widely open umbilicus; radial ribs fine, protractively sinuated; shell colour pale horn, yellow-brown, slightly shiny, monochrome; the spire consists of 5 whorls quite convex, compressed, increasing regularly; body whorl slightly descending; suture normal, slightly impressed; an apex flat, yellow shiny. Aperture semi-crescentic, with angulated periphery, rounded below it; lip simple, columellar margin not deflected. Maximum diameter 2 mm, height 1 mm”.

Distribution: According to FRANC (1957): Nou Island, Koutoumo Island and Isle of Pines – fossil, Nouméa, Lifou, New Caledonia. According to SOLEM 1961: type locality: Nou Island, New Caledonia (*C. decreta*), vicinity of Nouméa, New Caledonia (*C. subtersa*).

Andrefrancia taslei (Crosse, 1874)

Helix taslei CROSSE 1874: 107, 181, pl. 4, fig. 2. Type locality: Nou Island, New Caledonia. Holotype figured by FRANC 1957: pl. 12, fig. 154, repository unknown.

Helix taslei GASSIES 1880: 23, pl. 1, fig. 12.

Charopa taslei (Crosse) ANCEY 1888: 336; CROSSE 1894: 236.

Charopa ochracea (Crosse) GUDE 1905: 13, pl. 4, fig. 8 a-c.

Charopa taslei (Crosse) FRANC 1957: 121–122, pl. 13, fig. 158.

Andrefrancia taslei (Crosse) SOLEM 1961: 462.

Material examined: *A. taslei* was not examined during the study. The description follows FRANC (1957).

Diagnosis. “This species is very similar to *Charopa vetula* in having the same type of ribbing, but *taslei* has ribs more widely spaced and whorl increment is much more gradual – five whorls, diameter 3 mm, and in *vetula* five whorls and almost 4 mm”.

Description. “Shell with umbilicus contained 3 times in diameter, nucleus well visible; shell lenticular, quite thin, transparent, slightly shiny; radial ribs fine, rather widely spaced, slightly sinuous; shell unicoloured, fade brightly horn. Spire slightly convex with flat apex. Suture well marked. Five whorls slightly convex, increasing quite slowly. Embryonic shell completely smooth, transparent, occupying $\frac{3}{4}$ of the whorl. Last whorl becoming more bright, slightly flattened basally, gently descending. Aperture oblique, semi-crescentic, mildly flattened; lip simple with margins joining though a transparent layer, columellar margin slightly broadened. Maximum diameter 3.5 mm; height 1.25 mm”.

Distribution: According to FRANC 1957: vicinity of Nouméa, New Caledonia. According to SOLEM 1961: type locality: vicinity of Nouméa, New Caledonia (*A. taslei*), Artillery Point, Nouméa, New Caledonia (*A. ochracea*).

Andrefrancia saburra (Gassies, 1874)

Helix saburra GASSIES 1874: 207–209. Type locality: Art Island, New Caledonia. Holotype figured by FRANC 1957: pl. 13, fig. 153, repository unknown.

Helix saburra GASSIES 1880: 24.

Charopa saburra (Gassies) ANCEY 1888: 366; PILSBRY 1893: 33; CROSSE 1894: 236; FRANC 1953a: 72, fig. 1; 1957: 118–119, pl. 13, fig. 153 (holotype of *saburra*)

Andrefrancia saburra (Gassies) SOLEM 1961: 462.

Material examined: *A. saburra* was not examined during the study. The description follows FRANC (1957).

Description. “Shell very small, subglobular, slightly elevated, thin with radial ribs very fine and regular, slightly flexuous, separated by intervals of width equal to that of the ribs. Colour horn, a bit shiny, monochrome. Spire with apex somewhat protruding, suture well marked. Number of whorls five (according to Gassies four) increasing very regularly, body whorl rounded, not descending. Periphery rounded, basal margin convex. Umbilicus deep and narrow, contained less than 5 times in shell diameter. Aperture rounded; lip simple with margins remote. Columellar margin narrow; callus invisible. Maximum diameter 1.75 mm”.

Distribution: According to FRANC 1957: Art Island and Nouméa, New Caledonia.

Andrefrancia confinis (Gassies, 1875)

Helix confinis GASSIES 1875: 227–228. Type locality: Nou Island, New Caledonia. Holotype figured by GASSIES 1880: 25, pl. 1, fig. 13, repository unknown.

Charopa confinis (Gassies) GASSIES 1880: 25, pl. 1, fig. 13; ANCEY 1888: 366; PILSBRY 1893: 33; CROSSE 1894: 229; FRANC 1957: 123–124.

Andrefrancia confinis (Gassies) SOLEM 1961: 462.

Material examined: *A. confinis* was not examined during the study. The description follows FRANC (1957).

Description. “Shell very small, largely and deeply umbilicate, more than $\frac{1}{3}$ of shell diameter, giving the view of embryonic shell; discoid, sculptured with radial ribs very fine and regular; shell colour uniform, chestnut. Spire hardly elevated, slightly convex below. Protoconch with $1\frac{3}{4}$ whorls almost transparent, sculptured with very fine spiral riblets. Suture deep, well separating five whorls, which increase gradually. Body whorl slightly widened, descending invisibly. Aperture ovate; lip simple, with upper right margin gently protruded and left margin slightly arched. Umbilicus very finely carinated. Maximum diameter 2.5 mm”.

Distribution: According to FRANC 1957: Nou Island, Saint-Vincent, New Caledonia.

***Andrefrancia lifuana* (Gude, 1905)**

Charopa lifuana GUDE 1905: 12, pl. 4, fig. 6 a–c. Type locality: Lifu, Loyalty Islands. Holotype figured by FRANC 1957: pl. 12, fig. 161, repository unknown. *Charopa lifouana* FRANC 1957: 123, pl. 12, fig. 161 (holotype of *lifuana*). *Andrefrancia lifuana* (Gude) SOLEM 1961: 463.

Material examined: *A. lifuana* was not examined during the study. The description follows FRANC (1957).

Diagnosis. “*C. lifuana* is similar to *C. vetula*, but more widely umbilicated. The specimens described below are older and have $6\frac{1}{4}$ whorls. Umbilicus is much larger than in *C. vetula* reaching almost $\frac{1}{2}$ of shell diameter. All whorls are well visible in umbilical view. On the other hand the pattern of ribbing is the same as in *C. vetula*”.

Description. “Shell with umbilicus reaching almost $\frac{1}{2}$ of shell diameter; shell discoid, sculptured with fine radial ribs; dull, opaque, steady; spire flattened, suture quite deep. Five whorls slowly increasing, convex above, rounded on periphery, inflated below; umbilicus bluntly angulated. Aperture hardly oblique, subrounded with margins closely set. Lip simple, sharp, sinuous, upper margin arched, columellar margin protruded, not broadened. Diameter 3.5 mm; height 1.5 mm”.

Distribution: According to FRANC 1957: Lifou, Loyalty Islands.

***Andrefrancia gwendolinae* (Preston, 1907)**

Charopa gwendolinae PRESTON 1907a: 218, fig. 3. Type locality: New Caledonia. Holotype figured by FRANC 1957: pl. 12, fig. 149, repository unknown. Paratype ANSP 98198.

Andrefrancia gwendolinae (Preston) SOLEM 1961: 463.

Material examined: *A. gwendolinae* was not examined during the study. The description follows FRANC (1957).

Diagnosis. “Readily separable from other New Caledonian *Charopa* with its concave spire and whorls tightly coiled. This species seems to be similar to *C. noumeensis*”.

Description. “Shell globular with traces of brown periostracum. Spire concave, 5–6 whorls quite tightly coiled, sculptured with fine dense radial ribs, arched, body whorl descending abruptly. Suture impressed. Umbilicus deep, moderately large. Lip simple, aperture crescentic. Maximum diameter 6 mm, height 3 mm. Aperture height 3 mm, width 1 mm”.

Distribution: According to FRANC 1957: New Caledonia.

GROUP VII

***Andrefrancia miracidium* n. sp.** (Figs 101, 201–206)

Type locality: Mount Panié, New Caledonia.

Type material: Mount Panié (164°45'38"E 20°34'53"S), E slope, 1,350 m a.s.l. Humid forest. *Agathis*/schist. TILLIER, TILLIER & BOUCHET, November 03, 1988. Holotype 1 d & paratypes 10 d, MNHN.

Other material examined: Mount Panié (164°45'57"E 20°35'27"S), summit, 1,620 m a.s.l. Maquis *Agathis/Araucaria*. TILLIER & TILLIER, November 19, 1986. MNHN 10 a (2 dissected).

Diagnosis. *A. miracidium* is immediately recognizable by its strongly reduced postnuclear macrosculpture, keeled body whorl, shiny, brightly amber shell and lack of any apertural barriers. Its microsculpture without any radials or spirals reduced to naturally rough surface on the spire showing incised, spiral grooves on the body whorl and normally coiled whorls separates it clearly from any other species examined in this study. *A. vincentina* has also greatly reduced major ribs but they are broader ridges. Microsculpture with

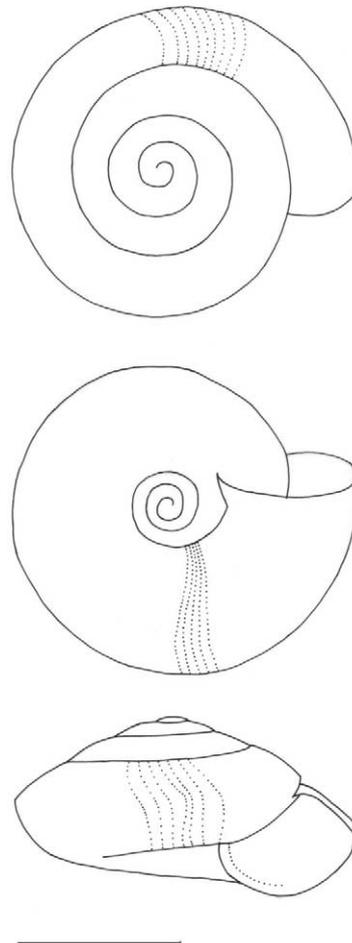


Fig. 201. *Andrefrancia miracidium* n. sp.: shell of the holotype (MNHN)

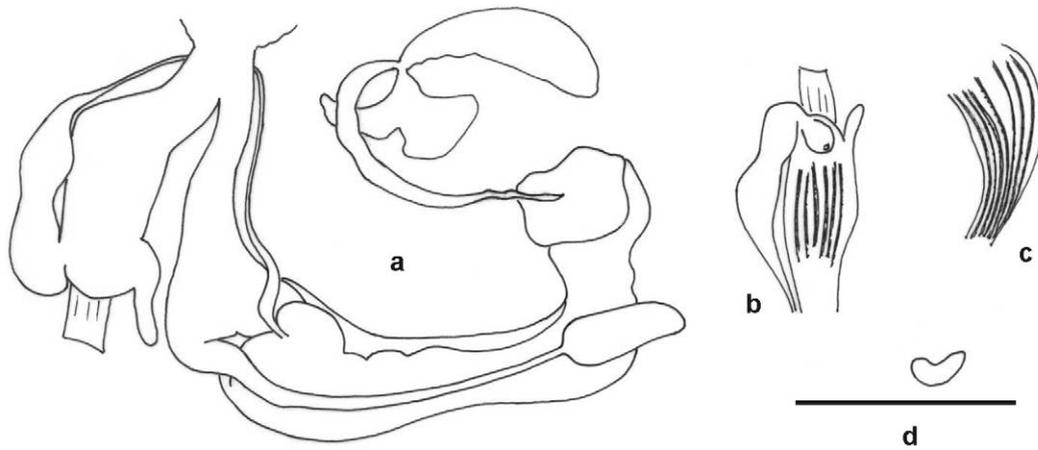


Fig. 202. *Andrefrancia miracidium* n. sp.: reproductive system of a specimen from Mount Panié, summit, 1620 m a.s.l. (MNHN): a – genitalia; b – interior of penis; c – interior of vagina; d – spermatophore; scale bar = 1 mm

obsolete radial riblets and distinct spiral cords, body whorl not keeled and one parietal barrier of *A. vincentina* readily distinguish these two species. *A. miracidium* agrees in its general shell characters with an eastern Australian genus *Ngairia*, except size. Species of *Ngairia* are large to very large (diameter 5.46–7.40 mm, with $4\frac{1}{8}$ – $5\frac{7}{8}$ whorls). Moreover, the colour of the animal is creamy-white with orange-grey speckling on the sides of the foot and on the mantle collar. *A. miracidium* shows many similarities, especially to *N. corticicola*, in strongly reduced postnuclear sculpture, lack of microradials and microspirals, presence of incised spiral grooves, keeled body whorl and aperture shape. However, *A. miracidium* is much smaller, has smooth protoconch, incised spiral lines present only on body whorl, and no flammulations. Fijian *S. angularis* is the same size as *A. miracidium*, has similar keeled periphery, but differs in having spiral cords in apical sculpture, microradials, microspirals, low but countable major ribs and narrower umbilicus.

Description. Shell. Shell small, diameter 1.71–2.26 mm (holotype 2.05), with $3\frac{1}{2}$ – $4\frac{1}{2}$ (holotype 4) normally coiled whorls. Apex and spire moderately and evenly elevated, shell height 0.82–1.23 mm (holotype 1.03), H_{sp}/H ratio 0.07–0.24 (mean 0.16, holotype 0.07), H/D ratio 0.46–0.61 (mean 0.53, holotype 0.50). Body whorl slightly descending. Protoconch with $1\frac{1}{4}$ – $1\frac{1}{2}$ (holotype $1\frac{1}{2}$) whorls. Apical sculpture smooth with very fine radial ridges in the last $\frac{1}{4}$ whorl. Transition between apical and postapical sculpture visible but not abrupt. Postnuclear sculpture strongly reduced, of very low, flat, protractively sinuated radial ridges, becoming more crowded in the last part of body whorl. The strong reduction in the height of the major ribs makes it impossible to count optically their number. Microsculpture of the spire reduced to naturally rough surface without any radial or spiral elements. Body whorl microsculpture of incised spiral grooves (spiral striae). The grooves are very fine and dense above the keel; just after it, there are a few more distinct and widely spaced spiral incised lines,



Fig. 203. *Andrefrancia miracidium* n. sp., a paratype from the type locality (MNHN): apical and early postnuclear sculpture

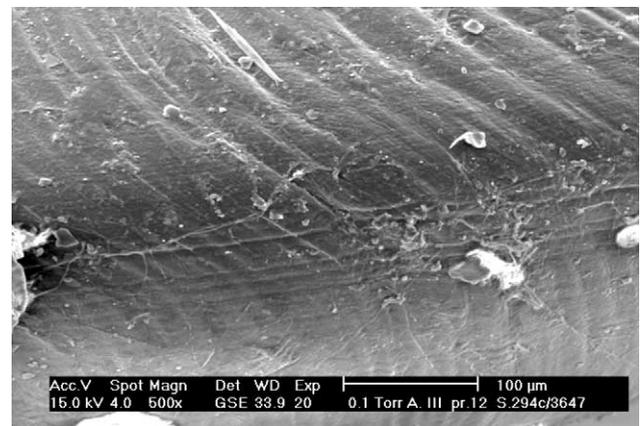


Fig. 204. *Andrefrancia miracidium* n. sp., a paratype from the type locality (MNHN): sculpture of body whorl

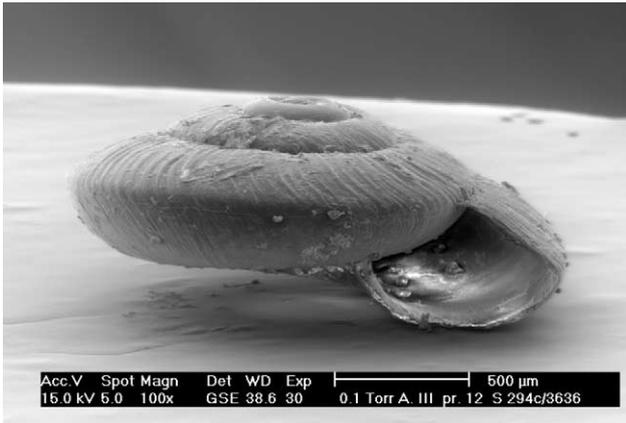


Fig. 206. *Andrefrancia miracidium* n. sp., a paratype from the type locality (MNHN): frontal view of the shell



Fig. 205. *Andrefrancia miracidium* n. sp., a paratype from the type locality (MNHN): apical view of the shell

which became gradually finer and more crowded again towards umbilicus. Umbilicus open, 3.71–4.57 times (mean 4.21, holotype 4.29) smaller than shell diameter; umbilical margin contours rounded. Suture normal, spire whorls almost flat. Body whorl keeled, strongly flattened above obtusely angulated periphery, and flattened below it. Aperture ovately lunate, strongly flattened above periphery, H_a/W_a ratio 0.75–1.00 (mean 0.82, holotype 0.83). W_{bw}/W_{lo} ratio 1.17–1.60 (mean 1.39, holotype 1.50). D/N_w ratio 0.47–0.59 (mean 0.54, holotype 0.51). Aperture unarmed. Lip simple, not sinuated. Colour monochrome brightly amber, shiny.

Animal creamy-white.

REFERENCES

- ANCEY C. F. 1882. Classification des formes helicoides de la Nouvelle-Calédonie. *Le Naturaliste* 4: 85–87.
- ANCEY C. F. 1888. Catalogue raisonné des Mollusques Néo-Calédoniens publiés jusqu'à ce jour et compris par les auteurs dans les genres *Hyalinia*, *Helix*, *Dimplomphalus* etc. *Bull. Soc. Malac. Fr.* 5: 357–376.
- BAUER A. M., SADLER R. A. 2000. The herpetofauna of New Caledonia. Paris.
- CAMERON R. A. D., POKRYSZKO B. M., WELLS F. E. 2005. Alan Solem's work on the diversity of Australasian land snails: an unfinished project of global significance. *Rec. Western Aust. Mus., Suppl.* 68: 1–10.

Genital system. Ovocystis consists of two clusters of palmately clavate alveoli. Hermaphroditic duct slightly convoluted with a greenish tint. Epiphallus shorter than penis, entering the penis subapically through a fleshy globular verge, internally with two longitudinal pilasters. Penial retractor muscle inserts on the penis apically on the penis/epiphallus junction; not twisted. Penis pouch-shaped, tapering to atrium junction. There are no penial glandulae. In subapical position there is one accessory penial structure – finger-like appendix. Internally penis shows an apical small, bulbous verge with terminal pore, which is the epiphallus outlet. Below there are few longitudinal pilasters in the penis proper. Vagina conical, as long as penis, internally with few longitudinal pilasters. Free oviduct and spermathecal shaft not twisted. No data on pilasters in free oviduct and spermathecal shaft. Free oviduct short, relatively wide. Spermathecal shaft slightly wider only at the base, than narrow, parallelsided. Spermatophore comma-shaped.

Name derivation. *Miracidium* is Latin for “a weird creature”, “an oddity”. The name refers to the unusual shell shape of the new species.

Distribution: Mount Panié, New Caledonia.

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- CLIMO F. M. 1969. Classification of New Zealand Arionacea (Mollusca: Pulmonata) II. A revision of *Charopa* subgenus *Ptychodon* Ancey, 1888. Rec. Dominion Mus. Wellington 6: 175–258.
- CLIMO F. M. 1970. Classification of New Zealand Arionacea (Mollusca: Pulmonata) III. A revision of the genera *Charopa* Albers, 1860 (excluding subgenus *Ptychodon* Ancey, 1888), *Phenacharopa* Pilsbry, 1893 and *Flammocharopa* n. gen. (Endodontidae: Endodontinae). Rec. Dominion Mus. Wellington 6: 285–366.
- CLIMO F. M. 1978. Classification of New Zealand Arionacea (Mollusca: Pulmonata) VI. A review of the New Zealand charopinae snails with lamellate apertures. Nat. Mus. New Zeal. Rec. 1: 177–201.
- CLIMO F. M. 1980. Classification of New Zealand Arionacea (Mollusca: Pulmonata) VII. The genera *Aeschrodomus* Pilsbry and *Pulchridomus* n. gen. (Charopidae). Nat. Mus. New Zeal. Rec. 1: 293–303.
- CLIMO F. M. 1981. Classification of New Zealand Arionacea (Mollusca: Pulmonata) VIII. Notes on some charopid species, with description of new taxa (Charopidae). Nat. Mus. New Zeal. Rec. 2: 9–15.
- CLIMO F. M. 1983. Classification of New Zealand Arionacea (Mollusca: Pulmonata) IX. The new genus *Paracharopa* (Charopidae). Nat. Mus. New Zeal. Rec. 2: 151–161.
- CLIMO F. M. 1985. Classification of New Zealand Arionacea (Mollusca: Pulmonata) XI. The new genus *Chaureopa* of *Paracharopa* Climo (Charopidae). New Zeal. J. Zool. 12: 283–296.
- COLEMAN P. J. 1980. Plate tectonics background to biogeographic development in the southwest Pacific over the last 100 million years. Palaeogeogr. Palaeoclimat. Palaeoecol. 31: 105–121.
- CROSSE H. 1869. Diagnoses Molluscorum Novae Caledoniae incolarum. J. de Conch. 17: 413–414.
- CROSSE H. 1870. Diagnoses Molluscorum Novae Caledoniae incolarum. J. de Conch. 18: 238–248.
- CROSSE H. 1873. Description d'un *Helix* inédit provenant de la Nouvelle-Calédonie. J. de Conch. 21: 341–342.
- CROSSE H. 1874a. Descriptions de Mollusques inédits provenant de la Nouvelle-Calédonie. J. de Conch. 22: 97–103;
- CROSSE H. 1874b. Diagnoses Molluscorum Novae Caledoniae incolarum. J. de Conch. 22: 104–112;
- CROSSE H. 1874c. Descriptions d'espèces de Mollusques inédits provenant de la Nouvelle-Calédonie. J. de Conch. 22: 180–186.
- CROSSE H. 1875. Diagnoses Molluscorum Novae Caledoniae incolarum. Journ. de Conch. 23: 143–144.
- CROSSE H. 1879. Descriptions de Mollusques terrestres inédits provenant de la Nouvelle-Calédonie. J. de Conch. 27: 43–45.
- CROSSE H. 1894. Faune malacologique terrestre et fluviatile de la Nouvelle-Calédonie et de ses dépendances. J. de Conch. 24: 161–473.
- DAUTZENBERG P. 1923. Mollusques terrestre de la Nouvelle-Calédonie et des Iles Loyalty. (F. Sarasin et J. Roux) Nova Caledonia Zool. 3: 135 – 156.
- FISCHER P. 1871. Sur l'anatomie des Bulimes néo-calédoniens du groupe *Placostylus*. J. de Conch. 19: 161–166.
- FISCHER P. 1873. Sur l'anatomie des Hélices carnassières de la Nouvelle-Calédonie. J. de Conch. 21: 1–13.
- FRANC A. 1953. Mollusques terrestres de Nouvelle-Calédonie. I. La famille des Endodontidae. J. de Conch. 101: 70–75.
- FRANC A. 1957. Mollusques terrestres et fluviatiles de l'archipel Neo-Caledonien. Mem. Mus. Natl. Hist. Nat. Serie A. Zoologie 13: 1–200.
- GASSIES J. B. 1858. Descriptions de coquilles terrestres et fluviatiles de la Nouvelle-Calédonie (2^e article). J. de Conch. 7: 67–72.
- GASSIES J. B. 1859. Descriptions d'espèces nouvelles de l'Archipel Calédonien. J. de Conch. 7: 368–372.
- GASSIES J. B. 1863–1880. Faune conchyliologique terrestre et fluviolacustre de la Nouvelle-Calédonie: I (1863), II (1871), III (1880). Paris.
- GASSIES J. B. 1865. Diagnoses d'espèces provenant de la Nouvelle-Calédonie. J. de Conch. 13: 211–213.
- GASSIES J. B. 1870. Diagnoses d'espèces inédites provenant de la Nouvelle-Calédonie. J. de Conch. 18: 140–153.
- GASSIES J. B. 1872. Diagnoses d'espèces inédites provenant de la Nouvelle-Calédonie. J. de Conch. 20: 336–337, 367.
- GASSIES J. B. 1873a. Description des mollusques terrestres provenant de la Nouvelle-Calédonie. J. de Conch. 21: 46–54.
- GASSIES J. B. 1873b. Description d'espèces terrestres et fluviatiles provenant de la Nouvelle-Calédonie. J. de Conch. 21: 335–341.
- GASSIES J. B. 1874. Description des mollusques terrestres et fluviatiles provenant de la Nouvelle-Calédonie. J. de Conch. 22: 27–216.
- GASSIES J. B. 1875. Description des mollusques terrestres et fluviatiles provenant de la Nouvelle-Calédonie. J. de Conch. 23: 227–232.
- GASSIES J. B. 1878. Diagnoses d'espèces inédites provenant de la Nouvelle-Calédonie. J. de Conch. 26: 330–347.
- GASSIES J. B. 1881. Descriptions d'espèces terrestres provenant de la Nouvelle-Calédonie. J. de Conch. 29: 336–337.
- GUDE G. K. 1905. Description on nine new species of helioid land shells. J. Malac. 12: 11–14.
- GUILLON J. H. 1969. Données nouvelles sur la composition et la structure du grand massif péridotitique du sud de la Nouvelle-Calédonie. Cah. ORSTOM, Sér. Géol. 1: 7–25.
- GUILLON J. H. 1975. Les massifs péridotitiques de Nouvelle-Calédonie. Mém. ORSTOM 76: 1–120.
- GUILLON J. H., ROUTHIER P. 1971. Les stades d'évolution et de mise en place des massifs ultrabasiques de Nouvelle-Calédonie. Bull. B. R. G. M., sér. 2, sect. IV, 2: 5–38.
- HAASE M., BOUCHET P. 1998. Radiation of crenobiontic gastropods on an ancient continental island: the *Hemistomia*-clade in New Caledonia. Hydrobiologia 367: 44.
- HEDLEY CH. 1898. Description of new Mollusca, chiefly from New Caledonia. Proc. Linn. Soc. NSW 13: 97–105.
- JAFFRÉ T., MORAT Ph., VEILLON J.-M., MACKEE H. S. 1987. Changements dans la végétation de la Nouvelle-



- Calédonie au cours du Tertiaire: la végétation et la flore des roches ultrabasiqes. Bull. Mus. Natl. Hist. Nat., Paris, Sér. 4, sect. B, Adansonia 9: 365–391.
- LATHAM M. 1975a. Géomorphologie d'un massif de roches ultrabasiqes de la côte ouest de Nouvelle-Calédonie: le Boulinda. Cah. ORSTOM, Sér. Géol. 7: 17–37.
- LATHAM M. 1975b. Les sols d'un massif de roches ultrabasiqes de la côte ouest de Nouvelle-Calédonie: le Boulinda. Généralités. Répartition des sols dans le massif. Les sols à accumulation humifère. Cah. ORSTOM, Sér. Pédol. 13: 27–35.
- LATHAM M. 1975c. Les sols d'un massif de roches ultrabasiqes en Nouvelle-Calédonie: le Boulinda. Les sols à accumulation ferrugineuse relative. Cah. ORSTOM, Sér. Pédol. 13: 150–172.
- LATHAM M. 1981. Pédologie. Pl. 14, Atlas de la Nouvelle-Calédonie. ORSTOM, Paris.
- LATHAM M. 1986. Altération et pédogenèse sur roches ultrabasiqes en Nouvelle-Calédonie. Coll. Etudes et Thèses ORSTOM, Paris.
- MOORES E. M. 1973. Plate tectonic significance of alpine peridotite types. In: Implications of Continental Drift to Earth Sciences (TARLING D. M., RUNCORN S. K., eds.), vol. 2, pp. 963–973. Academic Press, London and New York.
- PAIN T. 1955. Notes on some New Caledonian *Placostylus*. J. Conch. 95: 11–19.
- PAIN T. 1958. On a new sub-species of *Placostylus fibratus* (Martyn) from New Caledonia. J. Conch. 24: 276–277.
- PARIS J. P., ANDREIEFF P., COUDRAY J. 1979. Sur l'âge Eocène supérieur de la mise en place de la nappe ophiolitique de Nouvelle-Calédonie. Compt. Rend. Acad. Sci. Paris, Sér. B 288: 1659–1661.
- PILSBRY H. A. 1893–1895. Manual of Conchology (2), 9. Philadelphia.
- PFEIFFER L. 1853. Monographia Heliceorum viventium. 3. Lipsiae.
- PRESTON H. B. 1907. Description of nine new species of land shells from New Caledonia. Ann. Mag. Nat. Hist. 7: 217–221.
- SAINT SIMON M. A. DE 1880. Note sur l'*Helix chelonitis*. Les Hélices carnassiers et phytophages de la Nouvelle-Calédonie. Bull. Soc. Hist. Nat. Toulouse: 171–174.
- SOLEM A. 1960. New Caledonian non-marine snails collected by T. D. A. Cockerell in 1928. Notulae Naturae 338: 1–9.
- SOLEM A. 1961. New Caledonian land and fresh – water snails, an annotated check list. Fieldiana: Zool. 41: 415–501.
- SOLEM A. 1970. Malacological applications of scanning electron microscopy, I. Introduction and shell surface features. Veliger 12: 394–400.
- SOLEM A. 1976. Endodontoid land snails from Pacific Islands (Mollusca: Pulmonata: Sigmurethra). Part I. Family Endodontidae. Field Museum of Natural History, Chicago.
- SOLEM A. 1983. Endodontoid land snails from Pacific Islands (Mollusca: Pulmonata: Sigmurethra). Part II. Families Punctidae and Charopidae, Zoogeography. Field Museum of Natural History, Chicago.
- STANISIC J. 1990. Systematics and biogeography of eastern Australian Charopidae (Mollusca, Pulmonata) from the subtropical rainforests. Memoirs Queensland Mus. 30: 1–241.
- SYKES E. R. 1895. Notes on the terrestrial Fauna of New Caledonia. J. Malac. 4: 1–3.
- TRESCASES J. J. 1969. Premières observations sur l'altération des péridotites en Nouvelle-Calédonie. Pédologie, Géochimie, Géomorphologie. Cah. ORSTOM, Sér. Géol., 1: 27–57.
- TRESCASES J. J. 1975. L'évolution géochimique supergène des roches ultrabasiqes en zone tropicale. Mém. ORSTOM 78: 1–259.
- TRYON G. W. 1885. Manual of Conchology 1. Philadelphia.
- TRYON G. W. 1886. Manual of Conchology 2. Philadelphia.
- TRYON G. W. 1893. Manual of Conchology 9. Philadelphia.

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