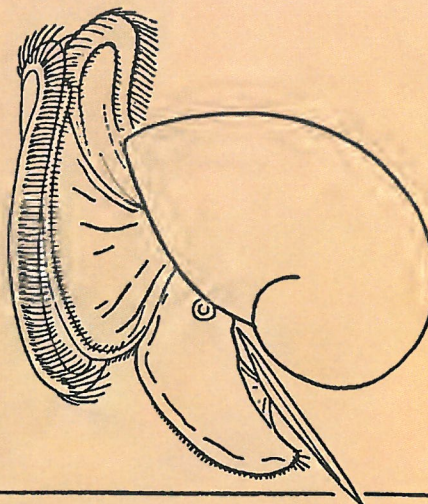


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The Mitridae of Fiji

BY

WALTER OLIVER CERNOHORSKY

Vatukoula, Fiji

(Plates 13 to 23; 11 Text figures; 1 Map)

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INTRODUCTION

THIS FAUNAL STUDY is an attempt to record all species of Mitridae from Fiji waters to date, and to list pertinent data on ecology, variability and distribution, and to supply morphometric measurements and animal descriptions wherever known.

All the material available for study has been obtained through dredging in shallow and deeper water to about 17 fathoms, and hand-collecting and dredging in the intertidal zone. The majority of specimens has been gathered from the coastal reefs of Viti Levu and outlying islands, while smaller lots were collected at the Yasawa group and the Lau Islands. Only specimens collected by local residents and the author have been taken into consideration; species reported by other authors from Fiji have been shown under a separate heading.

The actual occurrence of mitrid species in Fiji is rather difficult to evaluate from unillustrated faunal lists, or accounts which lack bibliographic annotations. A species may have been interpreted by subsequent authors in a different way than was actually intended by the original describer. The collection of additional material, however, may very well contain species presently treated as unconfirmed reports.

The majority of species have an Indo-West Pacific distribution, ranging from the Red Sea and Persian Gulf throughout the Indian and Pacific Oceans to Polynesia and Hawaii; only a few species are confined to the Pacific, while two species reach as far as Clipperton Island.

Notes on the geography of the Fiji Islands and other pertinent data have been given in a previous publication (CERNOHORSKY, 1964).

HABITAT AND VARIATION

Members of the family Mitridae are mostly tropical, and species of the various generic groups occupy a distinct ecological niche in Fiji waters, and possibly elsewhere. About 45% of all species recorded from Fiji are sand-burrowers, inhabiting sand banks and sandy lagoons with an average amount of sea-weed substrate. The remaining species are found under coral boulders, exposed or partially buried in sand, or in crevices of solid reef flats. The large species of *Mitra*, *Vexillum*, *Pterygia* and *Swainsonia* become active at the turn of the incoming tide; they move one-half inch to one inch below the surface, and leave well-defined tracks which are rarely straight. Ecologic intertidal zonation is evident in some species. *Strigatella paupercula* (LINNAEUS) lives near the high-tide mark in large colonies, in crevices of basalt boulders.

Variation within the species of Mitridae has been greatly underrated. Intrapopulation and ecophenotypic variants of some species may be pronounced to such an extent as to create the false impression that one is dealing with two distinct species. Specimens of *Vexillum deshayesi* (REEVE) inhabiting areas of clean sand substrate grow approximately 35% larger than their counterparts from



muddy sand localities. They also differ in colour and number of axial ribs. Specimens of *Mitra (Cancilla) clathrus* (GMELIN) from shallow water, are appreciably larger in size than those from deeper water. Examination of a long series of shells of any given species will make it appear obvious that no single individual conforms to the type concept. These individuals are rather representatives of a given population of a species, with all its inherent or acquired variabilities of colour, sculpture and size.

Although most species of Fijian Mitridae have been collected over a number of years, no structural shell modifications were apparent which would be attributable to seasonal influences. A moderately short life-cycle of Mitridae is suspected, but the actual life-span was impossible to determine.

Juvenile shells are appreciably different in form than are adults, and have a far greater width-index. The body whorl is more bulbous, the outer lip is thin and unformed, and convexly rounded. The protoconch is usually well preserved in juveniles, and averages one to one and one-half more nuclear whorls than in fully grown adults; consequently the number of fully formed whorls is smaller in juveniles than in adult shells.

DIAGNOSTIC CHARACTERS

Certain morphological characters are less reliable for specific identification than others, while some are subject to changes in individuals of certain species. The general shape and form of the shell is more constant in *Vexillum* species than it is in species of the genus *Strigatella*. The ratio of width to length, expressed in percent, will generally vary from 4 to 7 per cent in *Vexillum* species, but as much as 14 per cent in certain species of *Strigatella*. The length of aperture in relation to spire length can differ by as much as 18 per cent; certain species will be represented by individuals whose aperture may be equal in length to that of the spire, or considerably longer than the spire.

One hundred years ago it was not unusual to name a specimen as a new species if it possessed two more columellar folds than a similar species already named. Considerable confusion has been created by writers who believed the number of columellar folds to be constant; some writers were even less particular in counting the number of folds, and often omitted to include the last two anterior folds which may have been weakly developed. The number of columellar folds is possibly the least reliable feature of the shell, as it will generally vary ± 1 fold from the mean, or up to 3 folds in individuals of the same species.

The number of labral lirae, in species where they are usually present, is another highly unreliable diagnostic

feature, since this number can vary from 0 to 20 in a series of shells of a species.

The form and sculpture of the whorls have been found to be fairly reliable characteristics in a good many species, but by no means in all. In certain species the sides of the whorls were flattened in some individuals, but moderately convex in others; the whorls were either rounded at the sutures or even subangulate.

The number of fully formed whorls may vary up to 4 whorls in adult shells, while the nuclear whorls were found to vary by 2 at the most.

The interstitial sculpture is generally a fairly reliable feature, but also subject to changes in certain species. In some *Vexillum* species the interstitial transverse grooves may be short in some individuals, but continuous and overriding axial ribs in others; the same applies to shells with a sculpture consisting of axial ribs or striae.

The width, colour and placement of pattern stripes are a variable feature in species bearing such ornamentation. The colour and pattern of Mitridae are of course highly variable; it should be pointed out, however, that three-quarters of the species recorded from Fiji were rather variable in colour, the remainder were surprisingly constant in this respect.

The sculpture of the outer lip is the only constant character which can be relied upon with confidence. Adult specimens of species with a smooth outer lip will never include individuals with a crenulate lip, and vice versa.

The reliability of interpretation of one or several diagnostic features will depend solely on the individual species, whose particular characters may be of a fairly constant nature, or highly variable.

In contrast to the Cypraeidae, juvenile shells of Mitridae when only one quarter of the size of the adults have a completed colour pattern, sculpture and columellar folds; the latter, however, are sharper, more elevated and less callous than is the case in adults. Statistics compiled from Fiji specimens have shown that the number of axial ribs does not increase nor decrease with maturity. This is also the case with the ratio of aperture height to spire height, which remains unchanged throughout development from juvenile to adult. Although the aperture in juveniles is generally wider and more convexly rounded, the spire is also proportionately shorter, with a flatter apical angle.

THE ANIMAL

The structure of the animal is similar to that of other gastropods, consisting of a body and foot, siphon, tentacles, eyes, proboscis, sexual and internal organs; an operculum is absent.

The foot is generally oval or cylindrical, broad and truncated anteriorly, narrowing posteriorly. Locomotion is achieved by waves of contractions along the foot, and directed anteriorly; this rapid undulating rippling of the foot is also visible on the anterior dorsal part of the foot. The speed of forward movement on sand substrate is moderately rapid; specimens one inch in length covered a distance of 32 mm in 10 seconds.

The siphon is either long or short, and smooth at the distal end. Tentacles are slender, long or short, and commence from a thickened base which merges into the anterior part of the animal's body. The eyes are situated at the junction of the thickened base and slender tentacles, and not on the tip of the tentacles as stated by H. & A. ADAMS (1853). The eyes are slightly offset to the left, and in the shape of a simple pupil which is occasionally ringed with a lighter colour. The eyes are well developed in sand-living Mitridae, especially those of the genus *Vexillum*, but smaller in *Mitra* species inhabiting reef substrate.

The proboscis is generally short in the smaller species, but fairly long in the larger species, e. g. *Mitra mitra* (LINNAEUS). In the latter species the proboscis is bulb-shaped at the distal end, horizontally wrinkled and often protruding.

The animals are hermaphroditic, and the male verge has been found to attain almost half the size of the shell in some species.

Mitridae are carnivorous in feeding habits, similar to the Muricacea, Volutacea and other Neogastropoda. From observations conducted on Fijian Mitridae, it would appear that the feeding habits of the various generic groups are diverging, a view partly confirmed by ecology and radula pattern. Sand-dwelling species, particularly those of *Vexillum*, are not only attracted to carrion, but also to living and freshly dead flesh. The osphradium of these species is most probably well developed, and assists in the detection of food. Sandy lagoons in front of native villages are often densely populated with *Vexillum* species, which is due, no doubt, to the frequent discard of food particles into the sea; some distance away from the food source the same species are rare. The well developed anterior canal, osphradium, longer siphon, well developed eyes and modified radula appear to be in direct relation to their sand-burrowing habits. The first fully formed rows of central teeth of the radula are hardly ever worn in *Vexillum*, but the hooked pointed laterals are often missing. This would suggest a cutting and shredding method of feeding to which this radula pattern would be particularly suited. *Mitra* species inhabiting coral boulders and reef substrate have generally a short anterior canal, shorter siphon, less developed eyes and a radula pattern adapted for sweeping and rasping. It is probable that coral-dwelling species of

Mitridae may be grazing on detritus layers of the substrate and encrusting animals.

The sand-living *Vexillum* species have, size for size, a somewhat larger foot than coral-dwelling *Mitra* species; they have been observed to envelop and smother their prey with the foot, very much in the same fashion as the Olividae.

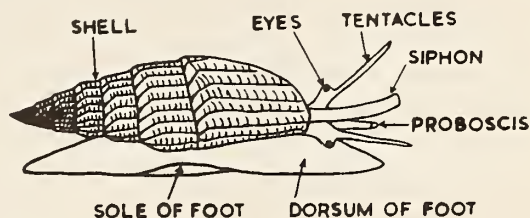


Figure 1

Lateral View of *Mitra* Animal and Shell

Certain species of *Mitra*, e. g. *M. mitra* (LINNAEUS), *M. papilio* (LINK), and *M. cardinalis* (GMELIN), discharge, when disturbed, a dark purple protective mucus, which has considerable staining properties but does not appear harmful to human beings. Attacks upon species of Mitridae are fairly frequent, and are possibly the work of Muricidae; shells have neat, perfectly round holes drilled into the inner whorls; the largest hole observed measured 3 mm in diameter.

It has been found in numerous *Vexillum* species upon breaking the shell that the columellar folds continue as

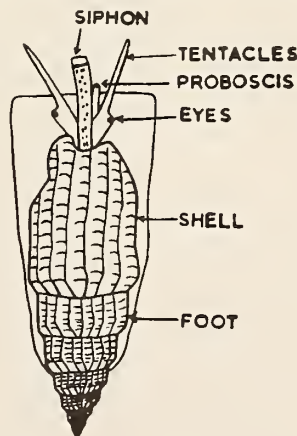


Figure 2

Dorsal View of *Mitra* Animal and Shell

finely elevated spiral ridges on the interior wall of the whorls, almost extending to the apex. This feature is obviously of advantage to the animal for obtaining a good slip-free traction; it also assists in the withdrawal and extension of the animal.

The various animals of Mitridae examined during this study possessed an individual pattern peculiar to the species. Variability of animal pattern within a species is slight indeed, and far less subject to changes than the shell itself. The living animal-pattern was found to be invaluable in the elucidation of relationships of morphologically similar species.

The radula is of the rachiglossan type, with only three teeth per row; the number of rows in specimens examined varied from approximately 20 to 80 rows per ribbon. The length of the ribbon varied from 7 to 15% of shell-length. Radulae were either colourless and translucent, or amber to brown in colour; one species, i. e. *Mitra papilio* (LINK), had reddish-brown opaque central teeth with a definite metallic lustre. This may indicate a ferrous compound capping of the denticles, which has been observed in other groups of mollusks (LOWENSTAM, 1962).

GENERA OF MITRIDAE

Since the beginning of organized binominal nomenclature, the family Mitridae has undergone a considerable division and subdivision into genera and subgenera. LINNAEUS, 1758, placed all *Mitra* species in the genus *Voluta*, with the exception of *Mitra scabricula* (LINNAEUS), which was placed under *Buccinum* in the tenth edition but removed to *Voluta* in the twelfth edition of the "Systema naturae." This taxonomic arrangement persisted in the literature to about the time of WOOD (1828). RÖDING (1798), however, was the first writer to separate the group from *Voluta* by establishing the genera *Mitra*, *Vexillum* and *Pterygia*. RÖDING's genera in the "Museum Boltenianum" appear to be frequently overlooked, since papers published as late as 1964 omit RÖDING's authorship of *Mitra* and *Pterygia*. The genus *Mitra* was widely accepted at the beginning of the 19th century, due no doubt to LAMARCK's writing efforts; this author used *Mitra* consistently in both of his works on the genus (1811, 1822). The group was further subdivided by SWAINSON (1821 - 1840), H. & A. ADAMS (1853 - 1858), and IREDALE (1929). WENZ (1940) arranged the species of Mitridae in 10 genera, and COTTON (1957) placed the Australian species of Mitridae in 4 subfamilies and 26 genera. SPHON (1961) on the other hand, pointed out the close relationship in morphological characters of all the species of Mitridae and advocated the use of the single genus *Mitra*, with other established groups as possible subgenera. COTTON's arrangement of genera

was based purely on shell-characters, and consequently this arrangement appears unnatural and artificial. Furthermore, little is gained by extensive splitting of Mitridae into unnatural groups of genera, which tends to obscure the close natural affinities and relationships of members of the family. To combine 500 to 600 recent species under one single genus is not practicable either, since certain groups are well-defined morphologically, ecologically and anatomically. The radular patterns of *Mitra* and *Vexillum* are so dissimilar that a subfamilial separation is warranted. In Mitrinae, the central teeth of the radula are squarish to slightly oblong, with 3 - 10 prong-like denticles; the laterals are broad, comb-like and multicuspid. In Vexillinae, the centrals are very broad, crescent-shaped and comb-like and multicuspid, while the laterals are curved and hook-shaped. Forty-five percent of *Mitra* species in Fiji are found in sand substrate, and the remainder inhabit the underside of coral boulders, and reef substrate; all the species from Fiji assigned to *Vexillum* are primarily sand-dwellers. The two groups are in addition well defined morphologically, and only the correct generic assignment of the various species needs to be confirmed anatomically.

Most species of the genus *Pusia* have well-defined morphological characters, but their habitat varies from sand substrate to coral reef substrate. Their phylogenetic relationship lies with *Vexillum*, but the centrals of the radula are tricuspid, not multicuspid. In this genus, however, the distinct gap (based on morphological characters) separating some of the species of *Pusia* from those of *Vexillum* is either negligible or ill-defined. Assignment of species to the genera *Strigatella*, *Imbricaria*, *Swainsonia* and *Pterygia* has been made purely on the basis of morphological characters and habitat. Members of the genus *Strigatella* are confined to the reef zone, inhabiting the underside of coral boulders, and sand pockets and crevices of reef flats. Species of the remaining three genera are well defined morphologically and inhabit sand substrate of coral pockets and lagoons. The taxonomic validity of these genera, however, should be substantiated with the results of anatomical studies.

Cancilla has been accepted in this paper as a subgenus of *Mitra s. str.*; this may need revision, however, in view of the radular pattern which indicates centrals similar to *Vexillum* and laterals similar to those of *Mitra*. The genus *Cancilla* would appear to fill the broad gap separating *Mitra* from *Vexillum*. *Cancilla* species live in clean sand pockets of coral reefs, and sandy coral rubble substrate beyond the reef edge.

The group of species comprising *Mitra cucumerina* LAMARCK, *M. tabanula* LAMARCK, and *M. chrysalis* REEVE has generally been assigned to *Chrysame* H. & A. ADAMS; they have been retained in this paper in *Mitra s. str.* The

radula and anatomy show a phylogenetic relationship with *Mitra* rather than with other genera (PEILE, 1937).

It was found during the course of this faunal study that most species of the Mitridae from Fiji could be assigned to the various genera without much difficulty. Their specific characters readily fell into seven natural, moderately well defined genera, as shown in the table below.

only one tenth of all Recent species were described. Matters improved somewhat at the beginning of the 19th century, and LAMARCK's monograph on the genus *Mitra* (1811) was the first work to offer a comprehensive account of the family as far as known at that date. SWAINSON (1821 - 1840), WOOD (1828) and QUOY & GAIMARD (1833) all contributed to the knowledge of the group

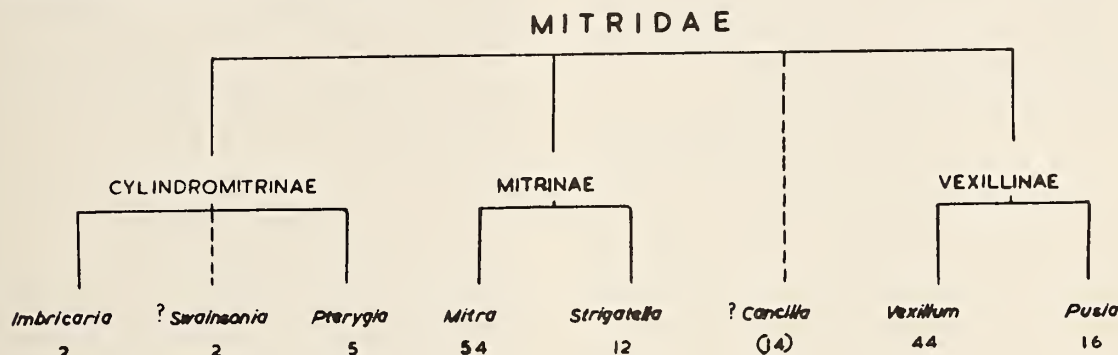


Figure 3

Table Showing Generic Arrangement of Fijian Mitrid Species

It should be pointed out, however, that the majority of species recorded in this paper, has been assigned to the respective genera mainly on the basis of morphology, ecology and animal pattern wherever observed. It is realized therefore, that several generic assignments may have to be revised once the anatomy and radula pattern are known.

The delimitation and further subdivision of established genera will largely be a matter of personal opinion of the workers concerned, and results will vary accordingly. Those morphological characters which appear to be of subgeneric importance should be supported by modification in either anatomy or radular pattern before subgeneric division is undertaken.

TAXONOMY

The family Mitridae has not enjoyed such an immense popularity as other groups of Gastropoda, e. g. Cypraeidae, Conidae or Volutidae. While a few species of *Mitra* are large and colourful, the majority is small, often one inch in length or less. The natural history cabinets and private museums of 17th and 18th century collectors were not liberally stocked with small insignificant marine specimens, but rather with the larger, colourful mollusks, which were more likely to offer "delight to eye and soul." Consequently there was little material available for description, and it is not surprising that by the close of the 18th century

with descriptions and illustrations. The first illustrated account of the family was the monograph by KIENER, 1839, which was shortly after followed by the monograph on the genus *Mitra* of REEVE, 1844 - 1845. SOWERBY's monographic treatment of the genus, 1874, remained the last comprehensive fully illustrated monograph of this family to date. Other accounts of a few species of *Mitra* are scattered throughout the literature, and can be usually found in the various proceedings of zoological and natural history societies, and journals of conchological societies; the various editions of the "Conchylien Cabinet" and accounts of exploratory voyages are other sources of material on the family. It is regrettable that the descriptions of new species of Mitridae contained in various proceedings, e. g. BRODERIP, 1836, A. ADAMS, 1853, DOHRN, 1860, were not illustrated, as the descriptions are in many instances pitifully brief and ambiguous. Subsequent iconographers (REEVE and SOWERBY) sometimes illustrated species of authors which bore little resemblance to either the original diagnoses or the type specimen.

Most engraved and coloured plates contained in *Mitra* monographs are satisfactorily executed, and as fine as could be expected from artists of the day; the depicted figures, however, rarely show the important details of minute sculpture of interstices, form of spiral ridges and nuclear whorls.

Validly established *Mitra* names exceed 1500, but it is highly doubtful that all represent valid species. It is often

found that one species occurs in literature under many different names, and infrasubspecific forms have been assigned varietal names. The greater the variability of a species, the more names it has usually received in literature. Species of Mitridae are just as plastic as those of other molluscan groups and rarely run true to the "type" or are "typical," although the majority of specimens of a species will share similar characteristics. The numerous taxa established for colour, size, and sculptural variants should be recognized for what they really are: nongenetic ecophenotypes and intrapopulation variants.

Identification of the species has been based on the earliest available name and description applicable to the form in question. The original type figures and descriptions were consulted whenever available and compared with the material on hand. Since a species usually appeared in literature under various synonyms, the selection of the oldest validly established name and compilation of pertinent synonymy was an arduous task. The process was further complicated by the often too short and equivocal descriptions of established species. A species may have been described by its author as a species with few axial ribs and an interstitial sculpture consisting of short spiral striae; upon examination of a series of specimens of the respective species, the axial ribs were found to vary from few to numerous, and interstitial striae to be either short or overriding the ribs. Once again we find that descriptions were usually based on a single specimen, and not on a representative series of shells of a species.

In a case where the correct interpretation of a species was suspect, every effort has been made to trace the type specimen; to have arrived, however, at a really reliable and positive interpretation, all extant type specimens should have been consulted for comparison. Such a thorough revision should be only practicable in preparation for a complete monographic treatment of the group, and is outside the scope of a faunal monograph; it would have, however, assisted in the elucidation of the status of such species which may have been open to dispute. Nevertheless it is hoped that misidentifications will not exceed 5% of all species recorded; all morphometric measurements and ecological data will remain applicable to the species illustrated in the event of a taxonomic revision.

The species of Mitridae recorded from Fiji have been assigned to the appropriate genera; consequently certain specific names have been retained which would, if combined under one single genus *Mitra*, become secondary homonyms under Article 59(b) of the Code of I. C. Z. N.

In the family Mitridae, the stage of simple systematics is still very much in evidence. Little work has been done on functional morphology, embryology, physiology and anatomy in general; little evidence of the early larval

stage of this group of Neogastropods can be produced, as despite diligent search for a number of years in Fiji, no egg masses have been discovered.

No geographical races or subspecies have been recognized among the Fijian mitrid material. One would hardly expect geographical subspecies to occur in such a geographically restricted region as the Fiji Islands. Furthermore, the splitting of species into geographical races or subspecies is clearly the result of specialization, a stage not yet reached in the study of the Mitridae. Thus only those forms have been treated as full species which do not exhibit any evidence of intergradation with the next closely related species.

BIBLIOGRAPHY

Various works and monographs dealing with the family Mitridae have often been cited in literature with different dates of publication; the notes that follow will deal mainly with those writings which have a bearing on the family treated in this monograph:

Neues Systematisches Conchylien-Cabinet: This colour plate work was begun by F.H.W. MARTINI in 1769; MARTINI's authorship ceased with the publication of Volume 3 in 1778. MARTINI died in the same year, and the series of the "Conchylien-Cabinet" was carried on by J.H. CHEMNITZ, whose Volume 4 appeared in 1780. CHEMNITZ's authorship terminated with the appearance of Volume 11 in 1795. GMELIN (1791) refers to MARTINI, Volume 4 of the Conchylien-Cabinet, whereas the actual author should be cited as CHEMNITZ.

Index Rerum Naturalium Musei Caesarei Vindobonensis; pars I, Testacea: This work authored by IGNATZ VON BORN bears the date 1778 on the title page. IREDALE (1929, p. 281) questioned the authenticity of the printed date and suggested the year 1780 as the conclusive date of publication. IREDALE pointed out that since the "Index" of 1778 and the "Testacea" of 1780 quoted each other, and contained references to the 4th Volume of the "Conchylien Cabinet," both works must have been prepared simultaneously.

KOHN (1964) advanced several indications which prove IREDALE's conclusions incorrect. KOHN mentioned the possibility of BORN having received the plates of the fourth Volume of the "Conchylien-Cabinet" two years in advance. He went on to say that J.S. WITTENBACH received a copy of the "Index" in 1779. Conclusive proof that the year 1778 is indeed the correct date of publication of the "Index" may be found in HELBLING, 1779. HELBLING (l. c., p. 111) refers to BORN's *Patella miniata* and to the "Index" in which the description appeared.

Tablcau encyclopédique et méthodique des trois règnes de la nature: The fascicle containing plates 287 to 390 (*Mitra* plates 369 to 377) was published in 1798 under the authorship of LAMARCK (*vide* SHERBORN & WOODWARD, 1906). My own copy bears the inscription "Par Lamarck" on the title page to plates 287 - 390, and the publication date is given as "An VI de la République." The French Republican year VI extended from the 22nd September 1797 to the 21st September 1798 (GODECHOT, 1951). No day or month of the year is cited on the title page to indicate when these plates appeared; in the absence of further external evidence, the last day of the particular year, i. e. September 21, 1798 has to be accepted as the date of publication under Article 21b(ii) of the Code of the I. C. Z. N. Plate 369 of this fascicle is headed "Mitre - *Mitra*," and illustrates *Mitra mitra* (LINNAEUS), *M. cardinalis* (GMELIN), and *M. eremitarum* RÖDING. In accordance with Article 16a(vii) of the Code of the I. C. Z. N., plate headings in Latin in connection with an illustration can be interpreted as a valid indication even if the recognizable figures lack specific names. LAMARCK therefore established the genus *Mitra* in 1798 and not in 1799 as generally quoted.

Museum Boltenianum sive Catalogus cimeliorum; Pars secunda: The authorship of this work is to be attributed to P. F. RÖDING and not to J. F. BOLTEN (Direction 48, November 1956, I. C. Z. N.). No date of publication appears on the title page; however, the introduction by A. LICHTENSTEIN is dated 10th September 1798, which date should be accepted as the earliest date demonstrated by evidence. The genera *Mitra*, *Vexillum* and *Pterygia* were for the first time validly introduced into literature in the "Museum Boltenianum" by RÖDING. The genus *Mitra* RÖDING thus has 11 days priority over *Mitra* LAMARCK.

The Proceedings of the Zoological Society of London for 1835 were published April 8, 1836. The author of all newly described species of *Mitra* in this publication was W. J. BRODERIP, and not W. SWAINSON.

Spécies général et iconographie des coquilles vivantes: There is no publication date on any of the separate fascicles. DAUTZENBERG & BOUGE (1923) cited dates ranging from 1837 to 1840 for various *Mitra* species listed by KIENER. KIENER's monograph on the families *Mitra* and *Voluta* KIENER's monograph on the genera *Mitra* and *Voluta* may be the third volume of the series, and was published between 1839 and 1841 (*vide* SHERBORN & WOODWARD, 1901). The date 1839 has been accepted for KIENER's *Mitra* species throughout this paper.

Various papers read before the Boston Natural History Society in 1845 were published in volume 2 of the Pro-

ceedings of the Boston Natural History Society in the year 1848 (Dr. J. P. E. Morrison, *in litt.*).

The zoology of the voyage of "H. M. S. Samarang":

The account was written by A. ADAMS and L. REEVE, and appeared in three parts. Part I, dated 1848, contains pages 1 - 24 and plates 1 - 9; parts II and III, containing pages 25 - 44, plates 10 - 17 and pages 45 - 87, plates 18 - 24 respectively, were published in 1850.

The Proceedings of the Zoological Society of London for 1851 (pp. 129 - 160) were not published until June 29, 1853; thus all the *Mitra* species described by A. ADAMS from the Cumingian collection (*l. c.*, pp. 132 - 141) date from 1853.

The Genera of recent Mollusca arranged according to their organization: The authors of the two volumes of text and one volume of plates were H. and A. ADAMS, and the publication date has been cited as 1853 or 1858. The various parts and sections appeared at different dates, but the *Mitra* section and *Voluta* section appeared in 1853 (*vide* p. 661 in Vol. 2).

The "Marine Mollusks of Hawaii" by H. A. PILSBRY appeared in the Proceedings of the Academy of Natural Sciences of Philadelphia in November, 1920. These Proceedings, however, were not issued until January 5, 1921.

The "Mitridés de la Nouvelle-Calédonie et de ses Dépendances" by DAUTZENBERG & BOUGE appeared in the Journal de Conchyliologie, Volume 67, parts 2 and 3. Although received for publication in 1922, part 2 was not published until February 15, 1923, and part 3 on May 10, 1923.

METHODS AND OBSERVATIONS

Large series of specimens of most *Mitra* species were available for study, with the exception of rare species, usually represented by only two to five specimens in local collections. The range listed for these rare species does not represent a true indication of the actual limits of variation.

All morphometric measurements were executed twice, since an error of up to one per cent in the index was experienced from single measurement calculations. All measurements and results of computations were meaned, and the accuracy of all indices kept within $\pm \frac{1}{2}\%$. Only fully mature specimens were used for measurements, since juvenile shells would have inflated the width index by as much as 10% in some instances.

The descriptions of the living animal of species observed were based on average samples of the respective species from various localities. Only animals of species displaying rather similar shell characters were observed more often.

as verification of constant differences in animal pattern between the two similar species were required.

The minima and maxima of height, width and length of aperture were recorded. The abbreviations used have the following meanings:

L = Length of shell from apex to base in millimeters

W = Maximum width of shell expressed in per cent of length

A = Length of aperture from the junction to the base, expressed in per cent of length

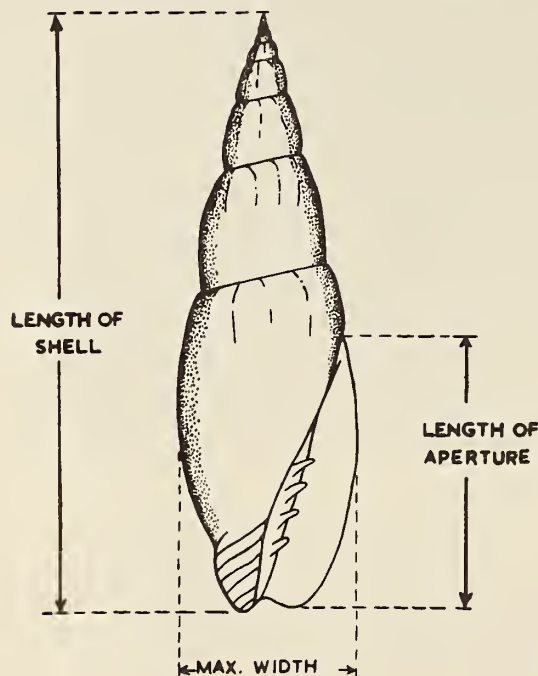


Figure 4

View of *Mitra* Shell Showing Dimensions Recorded

Other data recorded and incorporated in the descriptions of the species are as follows:

The extreme range in the number of whorls, axial ribs and spiral ridges or grooves, interstitial grooves or striae, columellar folds and labral lirae. In all instances the minima and maxima have been recorded, and the mean between these figures will represent average individuals from the Fiji region.

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The assistance and helpful advice received from various malacologists in connection with the preparation of this faunal monograph has been greatly appreciated.

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I would like to express my appreciation to Mrs. Jean Cate, Los Angeles, for pertinent information and references which she has kindly made available to me; to Dr. R. Stohler I offer my thanks for his encouragement and editorial assistance.

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INDEX OF SPECIES

(* denotes synonym, homonym or *nomen nudum*; (I) = *Imbricaria*; (M) = *Mitra*; (Pt) = *Pterygia*; (P) = *Pusia*; (St) = *Strigatella*; (S) = *Swainsonia*; (V) = *Vexillum*)

* <i>abbatis</i> PERRY	98	* <i>cercula</i>	102	* <i>cyri</i>	82
* <i>abbatis</i> DILLWYN	84	<i>chrysalis</i> (M)	83	* <i>dactyloidea</i>	154
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* <i>leucosticta</i>	104	* <i>olivellaeformis</i>	154	* <i>rugata</i>	140
* <i>limbifera</i> TRYON	110	* <i>ossea</i>	156	<i>rugosum</i> (V)	134
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* <i>lineatus</i>	154	* <i>papalis</i> GMELIN	95, 98	* <i>scabricula</i> GMELIN	105
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* <i>subtruncata</i>	131	* <i>toleranda</i>	151	<i>variegata</i> (M)	100
* <i>subulata</i>	121	<i>tornata</i> (M)	100	* <i>venosa</i>	112
* <i>sulcata</i>	148	* <i>tortulosa</i>	124	* <i>vermiculosa</i>	82
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DESCRIPTION OF SPECIES

VOLUTACEA

MITRIDAE

Mitrinae

Mitra RÖDING, 1798

Type species by absolute tautonymy and subsequent designation (WINKWORTH, 1945) *Voluta mitra* LINNAEUS, 1758 = *Mitra mitra* (LINNAEUS, 1758).

1798. *Mitra* RÖDING, Mus. Bolten., p. 135
 1798. *Mitra* LAMARCK, Tabl. Encycl. méth., pl. 369
 1815. *Mitraria* RAFINESQUE, Anal. Nat., p. 262
 1831. *Tiara* SWAINSON, Zool. Illust., ser. 2, 2: pl. 50
 1840. *Thiarella* SWAINSON, Treat. Malac., 127: 319
 1840. *Nebularia* SWAINSON, Treat. Mala., 127: 319
 1840. *Scabricola* SWAINSON, Treat. Malac., 127: 319
 1843. *Scabricula* SOWERBY, Man. Conch., ed. 2, p. 251 (emend. pro *Scabricola* SWAINSON, 1840)
 1853. *Chrysame* H. & A. ADAMS, Gen. rec. Moll., 1: 171
 1853. *Isara* H. & A. ADAMS, Gen. rec. Moll., 1: 171
 1853. *Mutyca* H. & A. ADAMS, Gen. rec. Moll., 1: 172
 1853. *Aidone* H. & A. ADAMS, Gen. rec. Moll., 1: 172
 1853. *Ziba* H. & A. ADAMS, Gen. rec. Moll., 1: 179
 1865. *Mitroidea* PEASE, Proc. Zool. Soc. London, for 1865: 514
 1869. *Mauritia* H. ADAMS, Proc. Zool. Soc. London for 1869: 273 (non TRÜSCHEL, 1861)
 1915. *Papalaria* DALL, U. S. Nat. Mus. Bull. 90: 60
 1929. *Vicimitra* IREDALE, Austr. Zool. 5: 343

Characteristics: Shell elongate-ovate or fusiform, moderately thick, spire acuminate, sutures plain or crenulate, whorls smooth or spirally ridged and striate, aperture broad or narrow, aperture thick or thin and smooth or crenulate, interior of aperture smooth, columella obliquely plicate, anterior canal moderately short or slightly produced. Shell generally covered with a thick or thin epidermis.

1. *Mitra ambigua* SWAINSON, 1832

(Plate 13; Figures 4, 4 a)

1832. *Mitra ambigua* SWAINSON, Zool. Illust., ser. 2, plt. 30, fig. 2

1935. *Mitra* (*Nebularia*) *limosa* var. *brevis* DAUTZENBERG, Mém. Mus. Roy. Hist. Nat., 2 (17): 74

Shell: Shell large, elongate-ovate, solid and heavy; fulvous brown to dark brown or tan in colour, generally ornamented with a moderately broad light-coloured transverse band anteriorly to the sutures; in some individuals this band is ill defined or even obsolete. Sutures prominent, whorls flattened, numbering from 7 - 9 apart from cream-coloured nuclear whorls which are usually eroded. Spiral grooves encircle the shell, grooves close-set, shallow and punctate, numbering from 25 - 34 on the body whorl and from 5 - 8 on the penultimate whorl; early whorls longitudinally crenate at the sutures, crenations small on the body whorl which is occasionally ornamented with scattered small white spots. Whorls axially striate, striae rather fine and sometimes obsolete. Aperture longer than spire, outer lip fairly straight, slightly constricted centrally, thickened and prominently crenulate; interior of aperture bluish-white or fulvous-brown. Columella calloused, with 5-6 whitish oblique folds; anterior canal straight, calloused and spirally corded, occasionally stained purplish-grey, base of shell somewhat constricted at this point.

L: 35 to 69 mm; W: 34 to 39%; A: 55 to 62%

Type locality: None.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Moderately uncommon.

Distribution: Throughout the Fiji Islands - From the Red Sea through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: The light transverse band below the suture is not a constant feature; however, it is prevalent in most specimens.

Mitra coffea SCHUBERT & WAGNER, 1829, has often been confounded with *M. ambigua*; the former is cylindrically-ovate, uniformly coffee brown in colour and lacking the transverse bands, the aperture is shorter than the spire and the outline of the body whorl also differs from that of *M. ambigua*. The small white spots which are usually prominent in *M. coffea*, also appear on individuals of *M. ambigua*, and both species are prominently crenulate at the outer lip.

2. *Mitra boissaci* MONTROUZIER, 1858

(Plate 15; Figure 27)

1858. *Mitra boissaci* MONTROUZIER, Journ. Conchyl., 7: 373
 1859. *Mitra boissaci* MONTROUZIER, Journ. Conchyl., 8: 218; pl. 2, fig. 6
 1860. *Mitra cyri* DOHRN, Proc. Zool. Soc. London, pt. 28: 367
 1874. *Mitra boissaci* SOWERBY, Thes. Conch., 4: 10; pl. 25, fig. 574

Shell: Shell small, fusiform, light in weight, spire slender and pointed; ivory-white in colour, ornamented with 10 to 12 spiral rows of small squarish chestnut-brown spots on the body whorl, and three rows of spots on the penultimate whorl. Sutures moderately impressed, whorls convex, rounded at sutures, numbering from 7-9 apart from protoconch of 3 glassy-brown nuclear whorls; finely incised punctate spiral grooves encircle the shell, grooves occasionally obsolete centrally on body whorl, numbering from 8-11 on the body whorl and from 2-3 on the penultimate whorl. Anteriorly to the suture on the body whorl is a distinct and more prominent spiral ridge, which is generally preceded by a prominent spiral groove; spire acuminate, early whorls stained with light brown. Aperture longer than the spire, narrow and elongate, outer lip moderately thickened, faintly undulate and spotted with brown, pointedly rounded towards the base; interior of aperture porcelain-white.

Columella slightly calloused, concave, with 4-5 sharply sculptured oblique folds; anterior portion of body whorl spirally corded.

L: 15 to 21 mm; W: 32 to 38%; A: 55 to 62%

Type locality: Île Pot, New Caledonia.

Habitat: In clean sand substrate from 4-10 fathoms.

Moderately rare.

Distribution: West and South Viti Levu. - New Caledonia, Fiji.

Discussion: TRYON (1882) and DAUTZENBERG & BOUGE (1923) considered this species to be a variant of *Mitra fulgetrum* REEVE, 1844. The latter species has a different shell-texture than *M. boissaci* (which has the appearance of white porcelain), and is reddish-brown in colour with white waxy axial streaks, and widely spaced shallow punctate spiral grooves.

3. *Mitra cardinalis* (GMELIN, 1791)

(Plate 13; Figure 2)

1791. *Voluta cardinalis* GMELIN, Syst. Nat., ed. 13, p. 3458
 1798. *Mitra monachialis* RÖDING, Mus. Bolten., p. 136
 1817. *Voluta pertusa* DILLWYN, Desc. cat. rec. shells, 1: 558 (non LINNAEUS, 1758)
 1845. *Mitra vermiculosa* CHENU, Univ. Conch., p. 27; pl. 36, fig. 2 a

Shell: Shell moderately large, elongate-ovate, solid and heavy; white to cream in colour, ornamented with 10-15 spiral rows of irregular orange-brown spots, some of which occasionally coalesce into larger zones especially at the sutures. Sutures prominent, whorls convex and rounded at sutures, numbering from 8-10 apart from the white nuclear whorls which are usually eroded. Spiral rows of moderately deep punctures encircle the whorls, numbering from 22-30 on the body whorl and from 8 to 10 on the penultimate whorl. Axial striae cross whorls, striae generally more prominent at the sutures and towards the base of the shell, which is spirally corded. Aperture longer than the spire, broad, outer lip thickened, prominently dentate, and convexly elongate; interior of aperture uniformly creamy-white to pale fawn. Columella calloused, creamy-white, with 5 prominent oblique folds; anterior canal distinctly calloused and spirally corded.

L: 20 to 70 mm; W: 40 to 45%; A: 58 to 65%

Type locality: Oceano indico.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Moderately uncommon.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia.

Explanation of Plate 13

- Figure 1: *Mitra mitra* (LINNAEUS). Fiji (x 0.5) Figure 2: *Mitra cardinalis* (GMELIN). Fiji (x 0.9) Figure 3: *Mitra eremitarum* RÖDING. Fiji (x 0.8) Figure 4: *Mitra ambigua* SWAINSON. Fiji (x 0.8) Figure 4a: *Mitra ambigua* SWAINSON. Chukwani, Zanzibar (x 1.0) Figure 5: *Mitra puncticulata* LAMARCK. Fiji (x 1.2) Figure 6: *Mitra scabricula* (LINNAEUS). Fiji (x 1.25) Figure 7: *Mitra ferruginea* LAMARCK. Fiji (x 1.2) Figure 7a: *Mitra ferruginea* LAMARCK, broad variant. Fiji (1.35) Figure 8: *Mitra nubila* (GMELIN) Fiji (x 1.0) Figure 8a: *Mitra nubila* (GMELIN), juvenile specimen, Fiji (x 1.4) Figure 9: *Mitra contracta* SWAINSON. Fiji (x 1.0) Figure 10: *Strigatella crassa* (SWAINSON). Fiji (x 1.2)

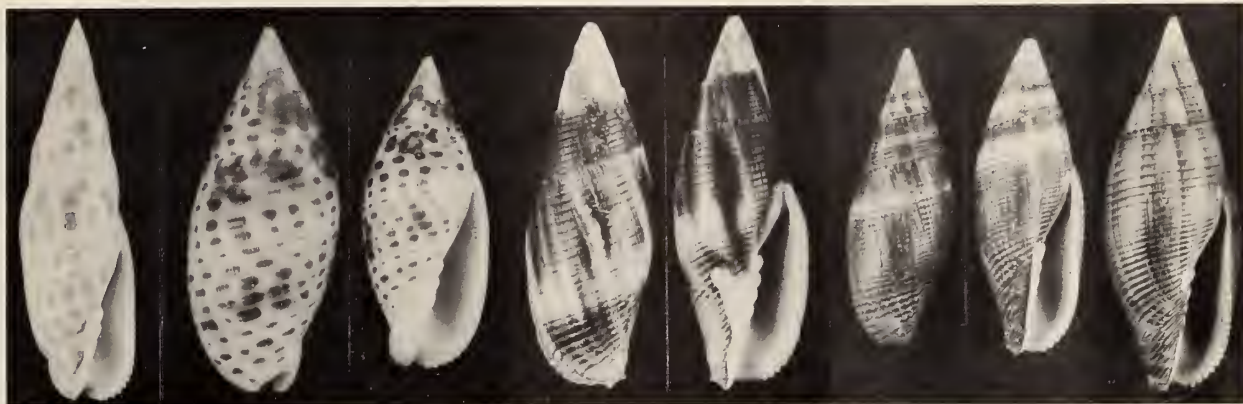


Figure 1

Figure 2

Figure 3

Figure 4

Figure 4a

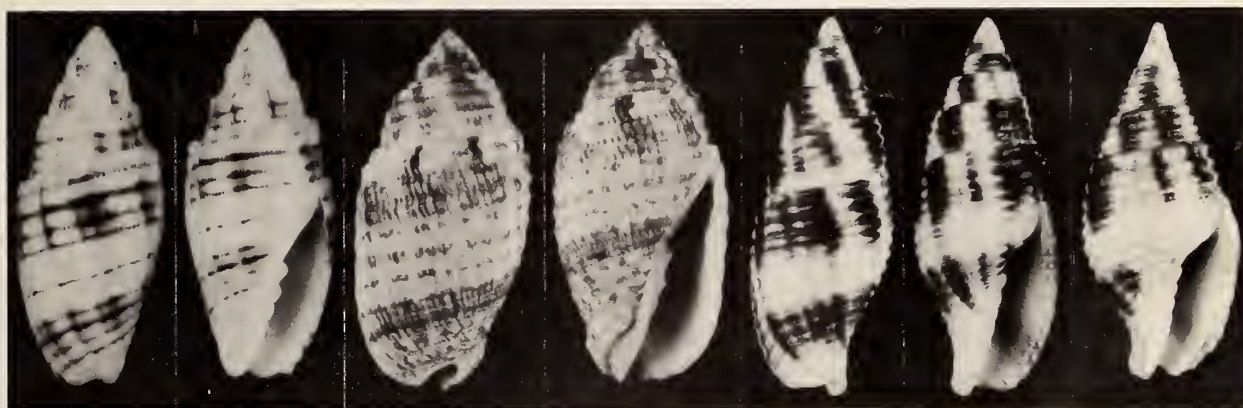


Figure 5

Figure 6

Figure 7

Figure 7a



Figure 8



Figure 8a

Figure 9



Figure 10



Discussion: *Mitra archiepiscopalis* LAMARCK, 1811 is possibly a synonym of *M. cardinalis* in part. LAMARCK referred for illustrations to GUALTIERI (1742, pl. 54, figs. H, L); figure H has been referred to by LINNAEUS, 1758 and GMELIN, 1791 for *Voluta pertusa* LINNAEUS, which is a *species dubium*.

4. *Mitra chrysalis* REEVE, 1844

(Plate 17; Figures 51, 51 a)

1844. *Mitra chrysalis* REEVE, Conch. Icon., pl. 25, sp. 200

1853. *Mitra caledonica* RÉCLUZ, Journ. Conchyl., 4: 248; pl. 7, fig. 7

1923. *Mitra (Chrysame) fraga* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: pl. 2, figs. 1, 2 (non QUOY & GAIMARD, 1833)

Shell: Shell small, roundly ovate to cylindrically-ovate, solid, spire rounded; dark orange to orange-brown in colour, ornamented with a moderately broad interrupted whitish band on the body whorl, and occasionally a few small white spots or axial streaks. Sutures weakly impressed and ill-defined, whorls convex and numbering from 6 - 7 apart from the protoconch which is usually eroded; moderately deep, narrow and pitted spiral grooves encircle the shell, numbering from 13 - 16 on the body whorl and from 2 - 4 on the penultimate whorl; the intervening spiral cords are broad and flatly rounded. Aperture longer than the spire, convexly elongate and rounded basally, outer lip thick and crenulate; interior of aperture orange-brown. Columella orange-brown, calloused and with 3 - 5 prominent oblique folds; base of shell is spirally ridged, anterior canal calloused, short and straight.

L: 9 to 22 mm; W: 52 to 60%; A: 56 to 74%

Animal: Sole of foot cream to light fawn, profusely spotted with white; dorsum of foot creamy-white. Siphon yellowish, tentacles yellowish, base of tentacles cream and spotted with white; eyes black.

Type locality: None.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Common.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: Although cylindrically-ovate specimens are predominant, some individuals resemble *Mitra cucumerina* LAMARCK in form. The latter species is dark reddish-brown in colour, slightly more slender and with a shorter aperture. The most constant differentiating feature is the sculpture of the shells: in *M. cucumerina* it consists of elevated angulate spiral ridges, with moderately broad "V-shaped" interstices and axial striae; in *M. chrysalis* the interstices appear only as narrow spiral grooves, and

the resulting ridges are broad, slightly rounded to flat. For further discussion on this species see below under *M. cucumerina*.

5. *Mitra chrysostoma* BRODERIP, 1836

(Plate 14; Figure 18)

1836. *Mitra chrysostoma* BRODERIP, Proc. Zool. Soc. London, pt. 3: 194

1839. *Mitra contracta* KIENER, Spéc. Gén. Icon. Coq. Viv., p. 24; pl. 9, fig. 25 (non SWAINSON, 1821)

Shell: Shell moderate in size, broadly elongate-ovate, solid and heavy; white to cream in colour, ornamented with irregular dark brown blotches and streaks, usually interrupted by a pale central transverse zone on the body whorl. Sutures prominent, whorls flattened to slightly convex, numbering from 8 - 9 apart from protoconch which is generally eroded. Shallow spiral grooves encircle the shell, grooves number about 4 on the penultimate whorl, but become obsolete on the body whorl especially on the ultimate half of the whorl; the spiral ridges are bisected by axial grooves, which become obsolete on the body whorl. Aperture longer than spire, outer lip constricted, thickened and smooth; interior of aperture golden orange. Columella calloused, yellowish in colour, with 5 to 6 moderately weak oblique folds; base of shell constricted, anterior canal slightly recurved.

L: 30 to 43 mm; W: 42 to 44%; A: 57 to 62%

Type locality: Island of Annaa (Anaa Island, Tuamotu Archipelago).

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Rare.

Distribution: West and South Viti Levu. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: The species superficially resembles *Mitra feruginea* LAMARCK, the latter species has a different colour pattern, the spiral ridges continue on the body whorl right to the edge of the outer lip, which is nodulose crenulate, and the aperture is shorter than in *M. chrysostoma*.

The apertural features of *Mitra chrysostoma* are similar to those of some *Strigatella* species, and the species has been assigned interchangeably to *Strigatella* and *Mitra*; the correct generic placement needs confirmation.

6. *Mitra coffea* SCHUBERT & WAGNER, 1829

(Plate 14; Figure 12)

1829. *Mitra coffea* SCHUBERT & WAGNER, Conch. Cab., 12: 83; pl. 225, figs. 3096, 3097

1831. [?] *Mitra punctata* SWAINSON, Zool. Illust., ser. 2, pl. 30,

fig. 3 (non *Conoelix punctatus* SWAINSON, 1821)

1832. *Mitra fulva* SWAINSON, Zool. Illust., ser. 2, pl. 30, fig. 1

1839. *Mitra ambigua* KIENER, Spéc. Gén. Icon. Coq. Viv., p. 40; pl. 6, fig. 16 (non SWAINSON, 1832)

1844. *Mitra attenuata* REEVE, Conch. Icon., pl. 6, sp. 45 (non REEVE, 1844, pl. 16, sp. 124)

1921. *Mitra thaenumiana* PILSBRY, Proc. Acad. Nat. Sci. Phila. 72: 313; pl. 12, fig. 21

Shell: Shell cylindrically-ovate, moderate in size, solid and heavy; light coffee-brown to fulvous-brown throughout, irregularly spotted with minute white dots, becoming slightly larger towards the base. Sutures moderately impressed, whorls flattened to slightly convex, numbering from 5 - 6 apart from the protoconch which is broad and blunt and contains 2 white nuclear whorls. Shell spirally grooved, grooves close-set, moderately deep and punctate, becoming wider and deeper towards the base; spiral grooves number from 27 to 34 on the body whorl and from 7 - 11 on the penultimate whorl; the sutures are minutely crenulate. Aperture longer than the spire, narrow, contracted and widening towards the base; outer lip thickened, orange-brown and crenulate with elevated transverse white ridges; interior of aperture orange-brown to fulvous-brown. Columella whitish, with 5 - 6 prominent oblique folds; body whorl ventricose, distinctly convex about mid-way, contracting sharply towards the anterior. L: 30 to 50 mm; W: 37 to 41%; A: 56 to 61%
Type locality: None.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Rare.

Distribution: West and South Viti Levu. - From East Africa through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: The species has often been confused with *Mitra ambigua* SWAINSON; it differs from the latter in having fewer whorls, being uniformly coffee-brown in colour, and the body whorl is distinctly ventricose and convex.

Juvenile specimens are generally chocolate-brown, faintly longitudinally striate, striae more prominent on the penultimate and earlier whorls.

7. *Mitra contracta* SWAINSON, 1821

(Plate 13; Figure 9)

1811. *Mitra ferruginea* var B LAMARCK, Ann. Mus. Hist. Nat. 17: 200

1817. *Mitra abbatis* DILLWYN, Desc. Cat. rec. shells, 1: 557 (non PERRY, 1811)

1821. *Mitra contracta* SWAINSON, Zool. Illust., ser. 1, pl. 18, top and bottom figures

1844. [?] *Mitra ustulata* REEVE, Conch. Icon., pl. 13, sp. 89

1962. *Mitra kamehameha* "PILSBRY" (MS name), CATE, The Veliger 4(3): 142; pl. 33, fig. 1 (as *Mitra ustulata* REEVE, 1844)

Shell: Shell moderately large, narrowly elongate, solid and heavy; whitish to cream in colour, rarely yellowish, ornamented with irregular reddish-brown to chestnut-brown blotches generally arranged in two to three transverse rows upon the body whorl and two rows on earlier whorls. These blotches tend to coalesce, forming either large brown zones, axial streaks or irregular transverse bands. Sutures moderately impressed, whorls flattened or slightly convex, contiguous, numbering from 9 to 11 apart from the protoconch which is always eroded; fine or coarse slightly elevated spiral ridges encircle the shell, ridges irregular, prominent basally and numbering from 17 - 36 on the body whorl and from 6 - 11 on the penultimate whorl. The entire body whorl is microscopically cancellate with fine axial striae, striae being slightly more prominent on the penultimate whorl. Aperture slightly shorter or longer than the spire, moderately narrow, outer lip thickened and simple, contracted near point of commencement and slightly reflected and constricted basally; interior of aperture uniformly cream or pale orange. Columella calloused, cream in colour, occasionally stained with orange anteriorly and with 5 - 7 prominent oblique folds; anterior canal generally longer than the aperture and somewhat recurved.

L: 39 to 53 mm W: 29 to 35% A: 47 to 55%

Type locality: None.

Habitat: Dredged from coral-rubble and sand bottom, in deep water.

Rare.

Distribution: South Viti Levu. - From the Red Sea through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: The species is rather variable in the ratio of height:aperture and prominence of spiral ridges, which often appear as spiral striae in specimens with narrow interstices. The species has had a rather confused taxonomic history, mainly because of its comparative rarity and high degree of variability. The species was first mentioned and figured by CHEMNITZ as *Voluta Mitra-abbatis* (1795, Vol. 11, pl. 177; figs. 1709, 1710). DILLWYN (1817) validated CHEMNITZ's non-binominal *Mitra abbatis*. The two CHEMNITZ figures consist of a dorsal and ventral view of the species, and can be described as finely executed. The figures depict a narrowly-elongate shell with contiguous whorls, and the colour pattern on the body whorl is composed of two well-defined rows of bands and blotches (a third row near the suture is indicated by a few blotches and streaks). On the earlier whorls the blotches have coalesced into axial streaks and transverse short zones. Since *Mitra abbatis* has been inter-

puted by some writers as a shell with an obese body whorl and a very short aperture, it has been found necessary to record the index of width and aperture of CHEMNITZ's type figures. The width index computed from measurements of the length and width of figure 1709 (dorsal view) is 31%, and that from figure 1710 (ventral view) is 30%. The index for the aperture in relation to the length of the shell computed from figure 1710 is 44%; by using the length of figure 1709 the index is 46% of the length. Thus the width and length of aperture of *M. abbatis* are almost identical to those of *M. ustulata* REEVE (W: 30% of L; A: 45% of L).

LAMARCK (1811) cited the two CHEMNITZ figures for his variation B of *Mitra ferruginea*. DILLWYN's name, however, is preoccupied by *Mitra abbatis* PERRY, 1811, which is a synonym of *Mitra stictica* (LINK, 1807). The next available junior synonym is *M. contracta* SWAINSON, which is conceded to be a variant of *M. abbatis*. *Mitra contracta* represents a variant with finer and more numerous spiral ridges or striae, and an aperture slightly longer than the spire.

Mitra ustulata REEVE, although identical in proportions to *M. abbatis* (= *M. contracta*), is referred to the synonymy of the latter species with a query. REEVE's remark "the shell is encircled with rather distant brown hairlines" does not apply to *M. contracta*. It is suggested, however, that the appearance of the brown hairlines may be due to the imbedded remains of the brown epidermis in the spiral striae, a feature often observed in *M. ambigua*, *Strigatella crassa* and others. These brown hairlines are not visible in the illustrations of *M. ustulata* REEVE, supplied by J. CATE (1962; pl. 33, fig. 1).

REEVE's illustration of *Mitra abbatis* (1844; pl. 13, sp. 91) does not bear a great resemblance to the type-figures of the species, but may possibly represent another variant of this highly variable species. Both CHEMNITZ (1795) and REEVE (*l. c.*) mention four columellar plaits on *Mitra abbatis*; the CHEMNITZ figure 1710 distinctly shows five columellar plaits, and a sixth ill-defined fold may be hidden anteriorly.

8. *Mitra coronata* LAMARCK, 1811

(Plate 17; Figures 55, 55a, 55b, 55c)

1795. *Voluta coronata* "CHEMNITZ," Conch. Cab., 11: 24; pl. 178, figs. 1719, 1720 (non binominal)
 1811. *Mitra coronata* LAMARCK, Ann. Mus. Hist. Nat., 17: 214, 215
 1828. *Voluta coronata*, WOOD, Ind. Testac., ed. 2, pl. 21, fig. 146 (non HELBLING, 1779)
 1839. *Mitra coronata* KIENER, Spéc. Gén. Icon. Coq. Viv., p. 61; pl. 18, fig. 60
 1841. *Mitra coronata*, KÜSTER, Conch. Cab., ed. 2, p. 88; pl. 26, figs. 5, 6

1844. *Mitra coronata*, REEVE, Conch. Icon., pl. 14, sp. 104 a, 104 b
 1853. *Mitra tiarella* A. ADAMS, Proc. Zool. Soc. London, pt. 19: 133 (not figured)
 1874. *Mitra tiarella*, SOWERBY, Thes. Conch., 4: 20; pl. 5, fig. 56; pl. 13, fig. 215
 1874. *Mitra coronata*, SOWERBY, Thes. Conch., 4: 20; pl. 13, figs. 217, 219, 220
 1923. *Mitra (Chrysame) tiarella*, DAUTZENBERG & BOUGE, Journ. Conchyl. 67(2): 133 - 135 (*sensu* LAMARCK)
 1923. *Mitra (Chrysame) tiarella* var. *deleta* DAUTZENBERG & BOUGE, Journ. Conchyl., 67(2): 136
 1962. *Mitra tiarella*, J. CATE, The Veliger, 4(3): 132; pl. 29, fig. 3

Shell: Shell small, elongate-ovate, fairly solid; orange-brown, reddish-brown or dark brown in colour, generally ornamented with a distinct narrow white transverse band just anteriorly to the sutures, and white, longitudinally oriented coronations, which are often connected with the white spiral band; in some specimens examined, the white band and coronations were light yellow and extremely pale. Sutures moderately to distinctly impressed, whorls flattened to slightly convex, angulate or subangulate at sutures, numbering from 6 - 7 apart from protoconch which is not discernible in adult specimens. Elevated and rounded spiral cords encircle the shell, numbering from 11 - 16 on the body whorl and from 2 - 6 on the penultimate whorl; on dead-collected specimens the spiral cords are somewhat worn away, and only spiral rows of deep pits are visible. Deep, pitted axial grooves bisect spiral ridges and number from 20 - 37 on the body whorl and from 19 - 29 on the penultimate whorl; the nodulose appearance of the shell depends on the density and closeness of the spiral ridges and prominence of axial grooves. Some specimens examined were distinctly axially plicate, plicae broad and angled, numbering from 11 - 14 on the body whorl and from 12 - 14 on the antepenultimate and penultimate whorl. Aperture equal in height or longer than the spire, straight or convexly rounded, constricted anteriorly, outer lip moderately thick and crenulate; interior of aperture white, bluish-white or greyish brown. Columella calloused, whitish in colour, with 5 - 6 oblique folds; anterior canal slightly calloused, straight or faintly recurved.

L: 16 to 29 mm W: 37 to 44% A: 48 to 60%

Type locality: None.

Habitat: Under coral rocks on sand substrate, in crevices of coral boulders, 1 - 20 fathoms.

Uncommon.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands through the tropical Pacific to Polynesia and Hawaii.

Discussion: The species is variable in the colour arrangement of the transverse white band and the delicate white coronations as well as the degree of prominence of spiral sculpture. A single specimen dredged from 20 fathoms at

Malolo Lailai, Mamanuca group (leg. A. Jennings) had a definite olive-green cast and sparse white coronations. Specimens dredged from the Bay of Islands, Suva (leg. M. Freitag) were distinctly axially plicate, and the spiral band and coronations were very pale.

Mitra coronata LAMARCK, 1811, was first mentioned in literature as "*Voluta coronata*" CHEMNITZ, 1795 (Vol. 11; pl. 178, figs. 1719, 1720). Figure 1720 (ventral view) clearly depicts a shell ornamented with five delicate, axially oriented crenules which descend from the sutures onto the narrow light-coloured transverse band. The works of MARTINI & CHEMNITZ have been placed on the Official Index of rejected and invalid works in zoological nomenclature (1958, Direction 1 of 21st April 1954); the species was validly established by LAMARCK (1811), who accepted CHEMNITZ's name and figures in his citation. The author also referred to the "Encyclopédie méthodique" (1798, pl. 371, figs. 6a, 6b) for additional illustrations. LAMARCK's original description of *Mitra coronata* is as follows:

"*M. Ovato-fusiformis, fulva vel spadicea; anfractum limbo albo subcrenato; striis transversis excavato punctatis; columella quinqueplicata.*

Habite . . . Encore une espèce bien distincte, à tours bordés de blanc sous les sutures. Celle-ci est ovale-fusiforme, moins bombée que la précédente [*Mitra amphorella*], et d'une couleur rousse presque rouge-brun. Sa surface présente partout des stries transverse, munies de points enfoncés, et chaque tour paroît couronné, son bord supérieur étant un peu crénelé et blanc; cinq plis blancs à la columelle.

Longueur, 25 à 26 millimètres. Mon Cabinet."

LAMARCK's phrases "*albo subcrenato*" and "et chaque tour paroît couronné, son bord supérieur étant un peu crénelé et blanc," are significant for the species under discussion; his description together with the figures cited, disassociate the species from a shell similar to *Mitra lugubris* SWAINSON; the latter is more inflated, with a very broad, solid white subsutural band and coarse, axially elongated coronated folds, rather than small delicate crenules. LAMARCK's original diagnosis in conjunction with the figures cited, is characteristic and fully adequate to identify *M. coronata* of LAMARCK, and of subsequent authors.

WOOD (1828), KIENER (1839), KÜSTER (1841), and REEVE (1844), all illustrate *Mitra coronata sensu* LAMARCK. REEVE (*l. c.*, pl. 14, sp. 104a, 104b) depicts and describes the species as "generally encircled with a single narrow yellowish belt beneath the white crenules of the coronated edge." ARTHUR ADAMS (1853, p. 133) redescrines the species as *Mitra tiarella*, and his description is almost identical to that of LAMARCK, with the exception

of the phrase "*longitudinaliter subplicata*;" obsoletely axially plicate specimens are occasionally found in populations of *M. coronata*. ADAM's English summary "The small, brown-coloured species is beautifully crowned in adult specimens, with a diadem of white nodules at the sutures of the whorls," leaves little doubt about his new species' conspecificity with *M. coronata* LAMARCK.

SOWERBY (1874) illustrated both *Mitra coronata* LAMARCK and *M. tiarella* A. ADAMS, believing the latter to be a principal variant of the former. His figure of *M. tiarella* (*l. c.*, pl. 5, fig. 56), the first to be published of the species, is rather similar to the CHEMNITZ figures of *Voluta coronata* cited by LAMARCK.

DAUTZENBERG & BOUGE (1923, pp. 133 - 136) discussed the taxonomy of *Mitra coronata* ("CHEMNITZ") and *M. tiarella* A. ADAMS in detail. They regarded *Voluta coronata* "CHEMNITZ" and *Mitra coronata* LAMARCK to be homonyms of *Voluta coronata* HELBLING, 1779 (= *Vexillum coronatum* HELBLING), and adopted *Mitra tiarella* A. ADAMS as a substitute name. *Voluta coronata* HELBLING is placed by most modern authors in the genus *Vexillum* and *Mitra coronata* LAMARCK under *Mitra* s. str.; under the present rules of homonymy of the Code of the I. C. Z. N. (1961) they are not to be regarded as secondary homonyms.

DAUTZENBERG & BOUGE (*l. c.*) remarked upon the great variability of the species ("Le *Mitra tiarella* est très variable") and admitted the identity of *M. coronata* LAMARCK and *M. tiarella* A. ADAMS. The author's new variety *M. tiarella* var. *amplificata* (*l. c.*, p. 135) is probably better associated with *M. aurora* DOHRN, 1861, which appears to be a distinct species. *Mitra aurora* is similar to *M. coronata* in form and sculpture of the sutural crenules, but differs in being dark rusty-red in colour, ornamented with large, irregular white blotches at the sutures, and a few unevenly distributed small white spots on the body whorl; the spiral ridges are almost obsolete on the body whorl, as the central area is usually smooth. The species, which appears to have a Pacific Ocean distribution, has not been recorded from Fiji.

LAMARCK's holotype of *Mitra coronata* is extant in the Muséum d'Histoire Naturelle in Geneva. It was not possible to obtain photographs of the type specimen, as the Museum is moving to new buildings and the photographic installation is out of order. Dr. Binder, however, was kind enough to compare photographs of various variants of *M. tiarella* A. ADAMS with LAMARCK's type specimen of *M. coronata*, and he had the following comments to make: "We have undoubtedly Lamarck's type-specimen, the length of which is 26 mm, and greatest width 10.5 mm. It resembles most, indeed very much, your smaller specimen of *M. tiarella* A. Adams, smoother

form [see Plate 17, Figure 55c]. Proportions, contours and sculpture are the same; only the outer lip of the aperture is more evenly curved, not depressed. The colour is light brown, with a continuous white band along the suture."

9. *Mitra cucumerina* LAMARCK, 1811

(Plate 17; Figures 50, 50a)

1811. *Mitra cucumerina* LAMARCK, Ann. Mus. Hist. Nat., 17: 215
 1817. *Voluta ferrugata* DILLWYN, Desc. Cat. rec. shells, 1: 535
 1852. *Mitra globosa* MÖRCH, Cat. Yoldi, 1: 83
 1923. *Mitra* (*Chrysame*) *cucumerina* var. *pallida* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 119 (non REEVE, 1844)

Shell: Shell small, globose, solid and heavy, pointed at spire and base; reddish-orange to reddish-brown in colour, ornamented with a moderately broad, often interrupted white central transverse band on the body whorl. Whorls flattened, numbering from 8-9 apart from protoconch which is usually eroded in adult specimens; elevated and angulate spiral ridges encircle the shell, ridges slightly rounded on the summits and numbering from 11-15 on the body whorl and from 3-4 on the penultimate whorl. Interstices of spiral ridges moderately "V"-shaped and cancellate with numerous close-set and elevated axial striae; on some specimens the spiral ridges on the spire are marked with a few white spots, and rare individuals are streaked with white upon the summits of the axial ridges. Aperture longer than the spire, very narrow, convexly rounded, outer lip very thick and crenulate, first 4-5 crenulations pale yellow or cream in colour and usually larger than the rest; interior of aperture light brown, with a pale transverse band. Columella orange-brown, with 3-4 prominent oblique folds; anterior canal calloused, often recurved, apex of spire whitish, sutures hardly visible.

L: 10 to 26 mm W: 48 to 54% A: 56 to 62%

Type locality: None.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Common.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: The species has been frequently misidentified in literature and collections. LAMARCK's description is clear and comprehensive, and the first reference to figures cited was to the Encyclopédie méthodique (1798; pl. 375, fig. 1). LAMARCK's type specimen is extant in the Muséum d'Histoire Naturelle in Geneva, and measures 27 mm; it agrees in diagnostic characters with Fiji specimens (Dr. Binder, personal communication).

The species is often assigned to the genus *Chrysame* H. & A. ADAMS. PEILE (1937) studied the radula and confirmed COOKE's original placement of the species in the genus *Mitra*. The radula of the species is of the typical *Mitra* pattern, with 2-4 main cusps on the median and 6-10 cusps on the laterals.

LAMARCK's second reference to figures for his *Mitra cucumerina* was to CHEMNITZ (1780, Vol. 4; pl. 150, figs. 1398, 1399). There appears to be some doubt that this figure represents the species *M. cucumerina* as defined by LAMARCK's original diagnosis, his reference to the figure in the Encyclopédie méthodique (*l. c.*) and his preserved type specimen. The CHEMNITZ figure shows a shell which is spirally grooved, with the resulting ridges being rope-like and so close-set that the narrow interstices are only groove-like. *Mitra cucumerina* is a shell with elevated spiral ridges, and broad, axially striate "V"-shaped interstices; the CHEMNITZ figures show a greater affinity with the species *Mitra chrysalis* REEVE, 1844, and were referred to by DILLWYN (1817) as *Voluta ferrugata*.

10. *Mitra eremitarum* RÖDING, 1798

(Plate 13; Figure 3)

1791. *Voluta pertusa* GMELIN (pars), Syst. Nat., ed. 13, p. 3458 (non LINNAEUS, 1758)
 1798. *Mitra eremitarum* RÖDING, Mus. Bolten., p. 136
 1811. *Mitra adusta* LAMARCK, Ann. Mus. Hist. Nat., 17: 201
 1811. *Mitra flavofusca* LAMARCK, Ann. Mus. Hist. Nat., 17: 201
 1817. *Voluta ruffina* DILLWYN, Desc. Cat. rec. shells, 1: 545 (non LINNAEUS, 1767)

Shell: Shell moderately large, slender, heavy and solid; cream to pale yellow in colour, ornamented with tan or dark rusty-brown longitudinal streaks, which become often interrupted on the body whorl by a transverse pale zone. Sutures moderately impressed, whorls slightly convex, numbering from 6-8, inclusive of the nuclear whorls which cannot be distinguished in adult specimens; whorls are almost continuous and the sutures are adorned with short oblique axial riblets. Shell spirally striate, grooves punctate and shallow, spiral ridges broad and flat, numbering from 26-38 on the body whorl and from 6-11 on the penultimate whorl; spiral ridges are crossed by fine axial striae, which are generally more prominent on smaller specimens than on larger ones, especially on the earlier whorls. The fine spiral striae appear to be stained with brown, an effect due to the imbedded periostracum; the two nuclear whorls are almost white, and also more prominent in smaller specimens. The aperture is longer than the spire, outer lip thick and calloused, crenulate and dentate anteriorly, crenations sometimes streaked with brown; interior of aperture highly enamelled, uniformly cream to pale fawn in colour. Columella heavily calloused,

golden fawn in colour, with 4-6 oblique folds; base of shell slightly constricted, spirally corded, anterior canal calloused and straight.

Juvenile shells have distinct and angulate transverse ridges; longitudinal striae are numerous and distinct, the brown axial streaks appear as broad brown bands at the sutures, and the first four nuclear whorls are pure white.

L: 32 to 80 mm W: 33 to 38% A: 52 to 58%

Type locality: None.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Moderately common.

Distribution: Throughout the Fiji Islands. - From Malaysia through the tropical Pacific to Polynesia and Hawaii.

Discussion: This species may just possibly be *Mitra ruffina* (LINNAEUS, 1767). LINNAEUS' description is too short and ambiguous for a positive identification, and is regarded as a *nomen dubium* following DODGE (1955, p. 108).

Giant specimens of *Mitra eremitarum* closely resemble *M. terebralis* LAMARCK, 1811, as illustrated by SOWERBY (1874). LAMARCK's *M. terebralis* cannot be identified from the description alone and no references to figures had been cited. Some writers have associated *M. terebralis* LAMARCK with *M. incompta* (SOLANDER in LIGHTFOOT, 1786), a somewhat equivocal identification in view of the absence of figures accompanying LAMARCK's description.

11. *Mitra ferruginea* LAMARCK, 1811

(Plate 13; Figures 7, 7a)

1811. *Mitra ferruginea* LAMARCK (pars), Ann. Mus. Hist. Nat., 17: 200

1817. *Voluta vitulina* DILLWYN, Desc. Cat. rec. shells, 1: 553

1874. *Mitra clara* SOWERBY, Thes. Conch., 4: 11; pl. 28, fig. 652

Shell: Shell moderate in size, slender and elongate or stout and elongate-ovate, solid and heavy, anteriorly constricted; whitish to cream in colour, ornamented with moderately broad, longitudinal rusty-brown blotches and streaks, which are usually interrupted by a pale central zone on the body whorl. Sutures moderately impressed, whorls slightly convex, numbering from 9-10 inclusive of nuclear whorls; spire acuminate, especially in smaller specimens, early whorls angulate at the sutures. Shell encircled by prominent elevated spiral ridges, generally flattened or slightly rounded on the summits, intervening grooves moderately "V"-shaped; spiral ridges number from 16-21 on the body whorl and from 3-4 on the penultimate whorl, becoming distinctly undulate on earlier whorls. Interstices of spiral ridges with fine axial riblets which become almost obsolete on the penultimate and body whorl. Aperture equal in height to spire, truncated anteriorly, outer lip thick and prominently denticulate, interior of aperture golden brown; columella calloused,

flesh-coloured, with about 5 oblique folds. Anterior canal slightly produced, straight or recurved, often slightly longer than the outer lip.

Juvenile specimens are obese, more distinctly constricted towards the base, with the blotches on the body whorl usually larger and darker brown; the interstitial striae are more prominent and the lower half of the body whorl is pale fawn, while the remainder is chestnut-brown.

L: 23 to 56 mm W: 37 to 45% A: 47 to 54%

Type locality: None.

Habitat: Under coral rocks on sand and reef substrate, in shallow and deeper water.

Distribution: Throughout the Fiji Islands - From the Red Sea throughout the Indo-Pacific to Polynesia, Hawaii and Clipperton Island.

Rare.

Discussion: *Mitra clara* SOWERBY, 1874 is the more slender and elongate variant of the species and not at all unusual in certain populations.

LAMARCK's *Mitra ferruginea* was a composite species; for his var. B, LAMARCK cited the figures from CHEMNITZ (1795, Vol. 11; figs. 1709, 1710), which represent *Voluta abbatis* DILLWYN, 1817 (= *Mitra contracta* SWAINSON, 1821).

Certain morphological features suggest a relationship with members of the genus *Strigatella*, and the assignment of this species in the genus *Mitra* needs confirmation.

12. *Mitra floridula* SOWERBY, 1874

(Plate 17; Figure 52; Text figure 5)

1874. *Mitra floridula* SOWERBY, Thes. Conch., 4: 20; pl. 16, fig. 283; pl. 27, fig. 611

1882. *Mitra (Chrysame) coronata* TRYON (pars), Man. Conch. 4: 148; pl. 44, fig. 283 (non LAMARCK, 1811)

Shell: Shell moderate in size, elongate-ovate, solid and heavy; reddish-brown in colour, ornamented with a narrow cream-coloured transverse band just anteriorly to the sutures, and irregular, large and small white blotches and streaks; in some specimens the white blotches are arranged in an ill-defined band just above the base of the shell. Sutures moderately impressed, finely crenulate, whorls flattened and angulate at sutures, numbering from 8-9 inclusive of the protoconch; broad and rounded spiral ridges encircle the shell and number from 13-16 on the body whorl and from 4-5 on the penultimate whorl. Interstices of spiral ridges are cancellate with elevated, short axial riblets and moderately deep pits. Aperture equal in height or longer than spire, outer lip elongate, thick and crenulate; interior of aperture bluish-white or light grey. Columella heavily calloused, whitish basally, with 5-6 prominent oblique folds; base of shell constricted, anterior canal calloused and slightly recurved.

L: 20 to 45 mm W: 38 to 43% A: 50 to 62%
Radula: The specimen examined measured 41.0 mm in length and the animal was a female. The radular ribbon is of the *Mitra* pattern and light amber in colour; it measured 3.8 mm in length and 0.8 mm in width. The fully-formed rows numbered 60 (plus 5 nascentes), and the first two to three rows of the radula were worn in an arc-like manner. The centrals are roughly elliptical, broader than they are long, and have 7 moderately long main cusps; the accessory denticles at the top of the plate

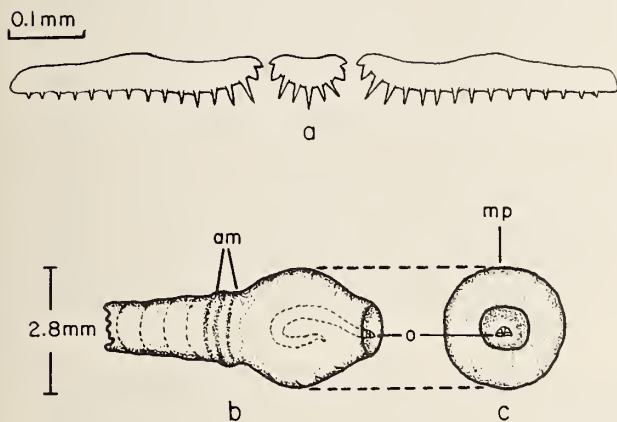


Figure 5

Mitra floridula SOWERBY. Fiji Islands

- a: one row of radular teeth b: lateral view of proboscis
 am = annular muscles o = exposed odontophore
 c: front view of proboscis
 mp = mouth of proboscis

are almost obsolete in some rows of the same ribbon. The laterals are very broad and short, $3\frac{1}{4}$ times the width of the centrals and have 16 main cusps which are distributed over almost the entire width of the plate.

The proboscis had a length of 20.8 mm (after preservation), with a maximum width at the distended end of 2.8 mm. The entire length of the proboscis is coarsely wrinkled, with the exception of the bulb-like distension and the area between the annular muscles. The position and attachment of the odontophore within the proboscis are the same as in *Strigatella crassa* (SWAINSON).

Egg-deposition has been observed in a specimen 55.0 millimeters in length (A. Jennings, personal communication). Egg-cases are vase-shaped, measuring 6 mm to 7 mm in height, and fully transparent; 18 egg-capsules

were scattered over an area of one and one-half inches. The egg-cases can be clearly seen through the envelope, and are round, light yellow in colour and numerous.

Type locality: Mauritius.

Habitat: Under coral rocks on sand and reef substrate, in shallow and deeper water.

Moderately rare.

Distribution: West and South Viti Levu. – From Mauritius through the tropical Indo-Pacific to Fiji.

Discussion: In some specimens the white coronations are quite prominent, in others they are very small and almost obsolete, while in rare individuals the small coronations are arranged in a double row near the suture.

SOWERBY's second figure of *Mitra floridula* (1874; fig. 611) appears to be a most unusual variant of this species.

13. *Mitra fraga* QUOY & GAIMARD, 1833

(Plate 16; Figure 42)

1833. *Mitra fraga* QUOY & GAIMARD, Voy. Astrol., 2: 660; pl. 45 bis, figs. 28, 29

1844. *Mitra peregra* REEVE, Conch. Icon., pl. 24, sp. 186

1957. *Mitra fraga* COTTON, Roy. Soc. South Austral. Mal. Sect., 12: 2

Shell: Shell small, elongate-ovate to roundly-ovate, fairly solid; dark red to reddish-brown in colour, ornamented with small, close-set orange spots on the spiral ridges. Sutures weakly impressed, whorls flattened to slightly convex, slightly angulate at sutures, numbering from 6 - 8 apart from protoconch of 2 glassy-white nuclear whorls; elevated and rounded spiral ridges encircle the shell, ridges close-set or wide-spaced, numbering from 10 - 13 on the body whorl and from 3 - 4 on the penultimate whorl. Interstices of spiral ridges "V"-shaped and cancellate with elevated axial striae which are either confined to the interstices or overriding spiral ridges. Aperture equal in height or longer than the spire, narrow, outer lip convexly rounded, thickened and crenulated; interior of aperture light grey or brownish-grey. Columella calloused basally, reddish-brown or orange-brown in colour, with 4 - 5 prominent oblique folds; anterior canal straight or recurved.

L: 12 to 30 mm W: 41 to 51% A: 52 to 61%

Animal: Sole of foot pale yellow, sparsely spotted with light fawn; dorsum of foot creamy-yellow, spotted with a lighter shade of cream. Siphon translucent white; tentacles short, white, base white, eyes black.

Type locality: Philippine Islands.

Habitat: Under coral rocks, on reef and sand substrate, and on coral-rubble bottom, from 0 - 4 fathoms.

Uncommon.

Distribution: Throughout the Fiji Islands – From the

Seychelles Islands through the tropical Indo-Pacific to Polynesia.

Discussion: Certain specimens have undulate spiral ridges, and in several specimens examined the white or orange spots upon the spiral ridges were nodulose.

REEVE (1844) synonymized *Mitra nucleola* KIENER, 1839 (non LAMARCK, 1811) with his own *M. peregra*. KIENER's description and figure do not agree with *M. peregra* REEVE, and no mention is made by KIENER of the light-coloured prominent spots on the spiral ridges.

14. *Mitra imperialis* RÖDING, 1798

(Plate 14; Figure 11)

1791. *Voluta pertusa* var. γ GMELIN, Syst. Nat., ed. 13, p. 3458

1798. *Mitra imperialis* RÖDING, Mus. Bolten., p. 135

1811. *Mitra millepora* LAMARCK, Ann. Mus. Hist. Nat., 17: 198

1817. *Voluta cribrum* DILLWYN, Desc. Cat. rec. shells, 1: 559

1817. *Voluta digitalis* DILLWYN, Desc. Cat. rec. shells, 1: 559

Shell: Shell moderate in size, elongate-ovate, solid and heavy; chestnut-brown to orange-brown in colour, ornamented with irregular large white blotches, small white spots and longitudinal dark brown streaks. Sutures moderately impressed, whorls flattened, numbering from 7-8 apart from the protoconch; spiral rows of deep punctures encircle the shell, numbering from 15-20 on the body whorl and from 5-7 on the penultimate whorl. Early whorls spirally grooved, punctures becoming obsolete, apex whitish, sutures with small, blunt white-tipped coronations which become obsolete on early whorls. Aperture equal in height or longer than the spire, aperture broadening basally, outer lip thick and sharply dentate; interior of aperture pale yellow to orange. Columella calloused, cream in colour, with 5-6 prominent oblique folds; anterior canal calloused, spirally corded, slightly recurved.

L: 40 to 60 mm W: 36 to 39% A: 53 to 59%

Type locality: None.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Rare.

Distribution: Throughout the Fiji Islands - From the Red Sea through the tropical Indo-Pacific to Polynesia.

Discussion: The species is sometimes described as being white in colour and ornamented with tan blotches. In Fiji specimens the tan or orange-brown colour is the dominant one, while the white colour appears in the form of blotches.

LINNAEUS' original diagnosis and citation of figures for *Voluta pertusa* (1758, p. 732) may equally well apply to either *Mitra cardinalis* (GMELIN) or *M. imperialis* RÖDING. As this species cannot be unequivocally identified, LINNAEUS' *Voluta pertusa* is treated as a *species dubium*, following DODGE (1955).

15. *Mitra loricata* REEVE, 1844

(Plate 14; Figure 20)

1844. *Mitra loricata* REEVE, Conch. Icon., pl. 22, fig. 174

Shell: Shell moderately small, elongate, heavy, solid; whitish in colour, ornamented with three continuous or interrupted orange transverse bands on the body whorl, and one single band on earlier whorls. Sutures moderately deep, whorls slightly convex, rounded at sutures, numbering about six apart from protoconch of two whitish nuclear whorls; irregular, rounded axial ribs cross whorls, some ribs more elevated than others, white on their summits and orange in interstices, numbering about 30 on the body whorl and 28 on the penultimate whorl. Moderately deep spiral grooves encircle shell, grooves bisecting axial ribs giving the shell an overall nodulose appearance, and numbering from 18-20 on the body whorl and 6-7 on earlier whorls; sutures are prominently nodulose. Aperture equal in height to the spire, very narrow, convexly-elongate, outer lip thick; interior of aperture whitish. Columella calloused, white in colour, with 5 prominent oblique folds; anterior canal spirally corded and slightly recurved.

L: 37.6 mm W: 36% A: 51%

Type locality: None.

Habitat: Unknown.

Very rare.

Distribution: Likuri Island, Southwest Viti Levu. - ?

Discussion: Only one single specimen has so far been collected in Fiji; the specimen illustrated has the apex and part of the anterior canal and aperture missing.

Explanation of Plate 14

- Figure 11: *Mitra imperialis* RÖDING, Fiji (x 0.7) Figure 12: *Mitra coffea* SCHUBERT & WAGNER, Fiji (x 1.0) Figure 13: *Mitra sophiae* CROSSE, Fiji (x 1.5) Figure 14: *Mitra ticaonica* REEVE, *papalis* (LINNAEUS), Fiji (x 0.5) Figure 18: *Mitra chrysostoma* Figure 16: *Mitra variabilis* REEVE, Fiji (x 1.2) Figure 17: *Mitra* Fiji (x 1.3) Figure 15: *Mitra stictica* (LINK), Fiji (x 0.8) Figure 19: *Mitra* species, Fiji (x 0.9) Figure 20: *Mitra loricata* REEVE, Fiji (x 1.3) Figure 21: *Mitra peculiaris* REEVE, Fiji (x 3.3) Figure 22: *Mitra papilio* (LINK), Fiji (x 1.0) Figure 22a: *Mitra papilio* (LINK), sculptural variant, Fiji (x 1.3) Figure 23: *Mitra granatina* LAMARCK, Fiji (x 1.0) Figure 24: *Mitra variegata* (GMELIN), Fiji (x 1.65) Figure 24a: *Mitra variegata* (GMELIN), specimen with wide-spaced spiral grooves, Fiji (x 1.4) Figure 25: *Mitra clathrus* (GMELIN), Fiji (x 1.2) Figure 26: *Mitra amoena* A. ADAMS, Fiji (x 1.8) Figure 26a: *Mitra amoena* A. ADAMS, Mauritius (x 2.0)

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Explanation of Plate 14

Figure 11: *Mitra imperialis* RÖDING. Fiji (x 0.7) Figure 12: *Mitra coffea* SCHUBERT & WAGNER. Fiji (x 1.0) Figure 13: *Mitra sophiae* CROSSE. Fiji (x 1.5) Figure 14: *Mitra ticaonica* REEVE. Fiji (x 1.3) Figure 15: *Mitra stictica* (LINK). Fiji (x 0.8) Figure 16: *Mitra variabilis* REEVE. Fiji (x 1.2) Figure 17: *Mitra papalis* (LINNAEUS). Fiji (x 0.5) Figure 18: *Mitra chrysostoma* (BRODERIP) Fiji (x 1.1) Figure 19: *Mitra* species. Fiji (x 0.9) Figure 20: *Mitra loricata* REEVE. Fiji (x 1.3) Figure 21: *Mitra peculiaris* REEVE. Fiji (x 3.3) Figure 22: *Mitra papilio* (LINK). Fiji (x 1.0) Figure 22a: *Mitra papilio* (LINK), sculptural variant Fiji (x 1.3) Figure 23: *Mitra granatina* LAMARCK. Fiji (x 1.0) Figure 24: *Mitra variegata* (GMELIN). Fiji (x 1.65) Figure 24a: *Mitra variegata* (GMELIN), specimen with wide-spaced spiral grooves. Fiji (x 1.4) Figure 25: *Mitra clathrus* (GMELIN) Fiji (x 1.2) Figure 26: *Mitra amoena* A. ADAMS. Fiji (x 1.8) Figure 26a: *Mitra amoena* A. ADAMS. Mauritius (x 2.0)



Figure 11

Figure 12

Figure 13

Figure 14

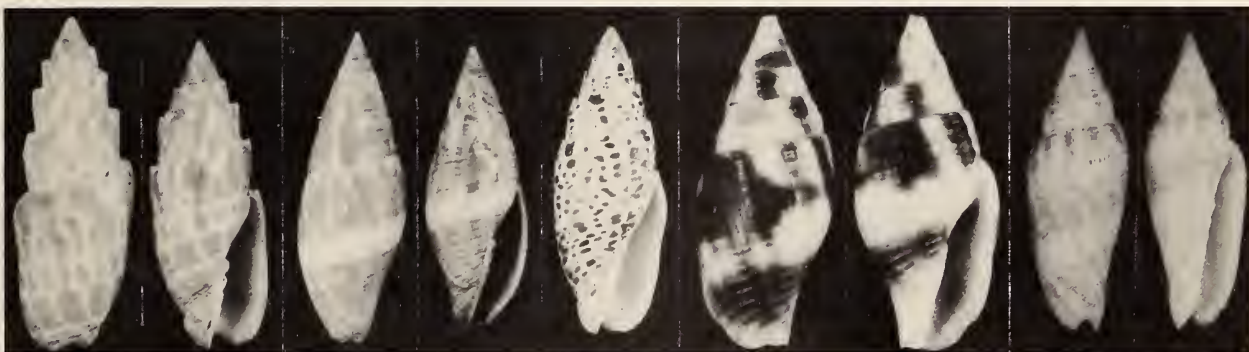


Figure 15

Figure 16

Figure 17

Figure 18

Figure 19

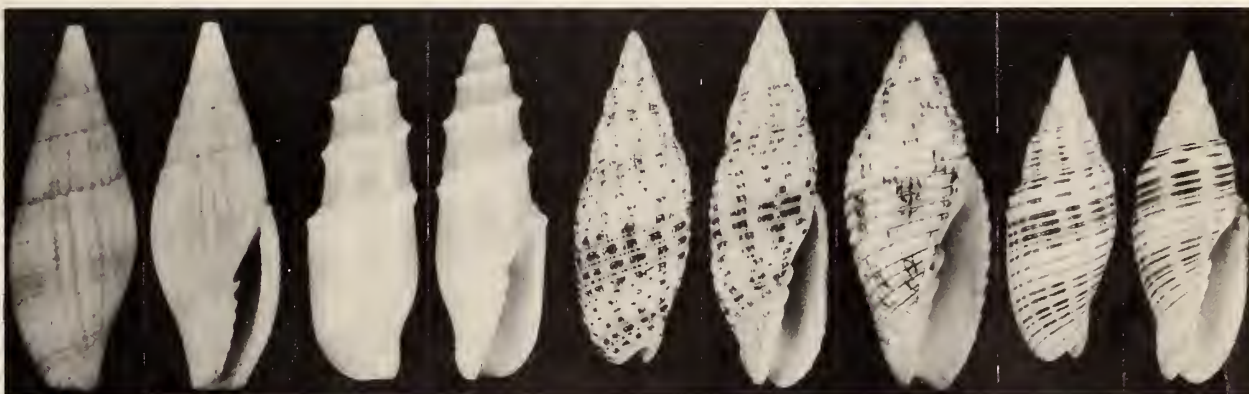


Figure 20

Figure 21

Figure 22

Figure 22 a

Figure 23



Figure 24

Figure 24 a

Figure 25

Figure 26

Figure 26 a



16. *Mitra lugubris* SWAINSON, 1822

(Plate 17; Figure 53)

1822. *Mitra lugubris* SWAINSON, Zool. Illust., ser. 1, pl. 66, top and bottom figures1841. *Mitra elegantula* KÜSTER, Conch. Cab., p. 103; pl. 17, figs. 6, 7, 81874. *Mitra albofasciata* SOWERBY, Thes. Conch., 4: 4; pl. 16, fig. 300

Shell: Shell moderately small, elongate-ovate, fairly solid; dark brown in colour, ornamented with a broad white and continuous transverse zone at the sutures, and occasionally a few small white spots on whorls; the base of the shell is white, provided that the thick periostracum is removed. Sutures deeply impressed, whorls convex, rounded at sutures, numbering from 5 - 7 apart from protoconch of 2 - 2½ white nuclear whorls; moderately elevated, narrow and rounded spiral ridges encircle the shell, numbering from 12 - 17 on the body whorl and from 3 - 7 on the penultimate whorl, ridges becoming broader and flatter towards the base. Irregular, deep axial grooves cross whorls and bisect spiral ridges, numbering from 28 - 40 on the body whorl and from 20 - 37 on the penultimate whorl; interstices of spiral ridges deeply pitted at point of intersection with the axial grooves, and finely axially striate. Sutures irregularly and obsoletely coronate, and the first 3 or 4 spiral ridges anteriorly to the sutures generally more prominent. Aperture longer than the spire, outer lip only slightly convex, occasionally almost straight, thickened and crenulate; interior of aperture porcelain-white or bluish-white, occasionally dark brown. Anterior half of columella white, calloused, with 5 - 6 prominent oblique folds; anterior canal calloused, whitish in colour, straight or slightly recurved.

L: 12 to 33 mm W: 42 to 47% A: 55 to 63%

Type locality: None.**Habitat:** Under coral rocks on sand and reef substrate, in shallow water.

Moderately common.

Distribution: Throughout the Fiji Islands. - From South Africa through the tropical Indo-Pacific to Polynesia and Hawaii.**Discussion:** The colour of the aperture is rather variable; however, the majority of specimens examined from Fiji had a porcelain-white to bluish-white aperture, while only a few specimens had a dark brown interior.

Live-collected shells are covered with a thick, brown periostracum, and only if this is removed does the white colouring of the base become visible.

COTTON (1957) alternately placed the species in the genera *Chrysame* and *Mitraria*; it has been retained here in the genus *Mitra* s. str.17. *Mitra mitra* (LINNAEUS, 1758)

(Plate 13; Figure 1)

1758. *Voluta mitra* LINNAEUS, Syst. Nat., ed. 10, p. 7321758. *Voluta episcopalis* LINNAEUS, Syst. Nat., ed. 10, p. 7321798. *Mitra carmelita* RÖDING, Mus. Bolten., p. 136

Shell: Shell large, rather heavy and solid; white in colour, ornamented with 5 - 9 transverse rows of irregular, but often squarish or rhomboidal bright orange spots on the body whorl; earlier whorls are ornamented with only 2 - 3 rows of blotches. Sutures moderately impressed, whorls convex, rounded at sutures, numbering from 9 - 10 inclusive of the protoconch. Fine punctate spiral lines encircle the shell, numbering from 5 - 8, becoming obsolete on the last two or three whorls. Aperture equal in height to spire, widening basally, outer lip almost perpendicular, thick and distinctly crenulate, crenations becoming thorn-like projections anteriorly; interior of aperture cream to yellowish in colour. Columella heavily calloused, with 4 - 5 prominent oblique folds; anterior canal with a prominent folded callus, and spiral striae.

Juvenile specimens about 20 mm in length are short and obese, with the aperture longer than the spire; body whorl distinctly spirally ridged, interstices of ridges punctate. Spiral ridges elevated on earlier whorls; interstices with short axial grooves; aperture bow-shaped, outer lip thin, and lacking dentition.

L: 34 to 170 mm W: 30 to 34 % A: 48 to 54%
Animal: Sole of foot greyish-white, mottled with dark brown; dorsum of foot creamy-white, streaked with dark brown at the edges. Siphon light grey, transversely finely lined with white; tentacles light grey, proboscis very long, bulbous, fawn at the tip becoming grey towards the base.**Type locality:** None.**Habitat:** In clean sand patches in shallow water.

Common.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia and Hawaii.**Discussion:** With the turn of the tide, the species becomes active and leaves broad tracks in the sand. The proboscis is rather long and most of the time it is protruding.18. *Mitra* cf. *Mitra nigricans* PEASE, 1865

(Plate 17; Figure 54)

1865. *Mitra nigricans* PEASE, Proc. Zool. Soc. London, p. 514

Shell: Shell small, elongate, light in weight, spire slender and pointed; dark brown in colour, ornamented with a narrow spiral band, usually brown or light orange in colour, just anteriorly to sutures. Sutures moderately to

deeply impressed, whorls flattened to slightly convex, numbering from 6 - 8 apart from protoconch which was eroded on specimens examined; small, almost obsolete elevated short ridges are positioned on top of the sutures. Shell spirally grooved, grooves shallow and punctate, numbering from 14 - 19 on the body whorl and from 6 - 7 on the penultimate whorl. Aperture equal in height or slightly longer than the spire, moderately narrow, outer lip moderately thickened and crimped, convexly elongate; interior of aperture bluish-white or brownish. Columella calloused, whitish, with 4 - 5 prominent oblique folds; base of shell spirally corded, anterior canal calloused and straight or slightly recurved.

L: 13 to 28 mm W: 34 to 39% A: 50 to 55%

Type locality: Sandwich Islands (Waikiki, Oahu, Hawaiian Islands; designated by J. CATE, 1963).

Habitat: Dredged from 15 - 20 fathoms on coral and rubble-bottom substrate. Rare in the West of Viti Levu, uncommon in the South.

Distribution: West and South Viti Levu. - Hawaii.

Discussion: Live-collected specimens are almost blackish-brown in colour and while the majority of specimens is smooth at the sutures, occasional specimens show small and short elevated striae at the sutures, only visible under magnification.

PEASE did not illustrate his new species, but a recent review with illustrations of *Mitra nigricans* PEASE can be found in CATE (1963). Fiji specimens agree in form, colour pattern, columellar folds and other salient features with PEASE's original diagnosis, with the exception of the outer lip. The outer lip in Fiji specimens is almost smooth, but in some individuals it is faintly crimped, but not crenulate in the true sense of the word.

A rather similar species to that illustrated here was figured by TINKER (1958) under the name *Mitra ostergaardi* PILSBRY, 1920 (plate facing page 154, third row, right and left).

19. *Mitra nubila* (GMELIN, 1791)

(Plate 13; Figures 8, 8a)

1784. *Mitra versicolor* MARTYN, Univ. Conch., 1: pl. 23 (non binominal)

1791. *Voluta nubila* GMELIN, Syst. Nat. ed. 13, p. 3450

1795. *Voluta nubila*, CHEMNITZ, Conch. Cab., 11: pl. 177, figs. 1705, 1706 (non binominal)

1811. *Mitra versicolor*, LAMARCK, Ann. Mus. Hist. Nat., 17: 199

1874. *Mitra propinqua* A. ADAMS, SOWERBY, Thes. Conch., 4: 3; pl. 5, fig. 59

Shell: Shell moderately large, elongate-ovate, somewhat inflated and solid; ivory-white to cream in colour, ornamented with irregular yellowish-brown or reddish-brown

straight or wavy narrow axial streaks and small spots; in some individuals the brown streaks are bordered with small whitish spots, and the body whorl bears two narrow brown transverse bands. Sutures shallow, whorls rounded and somewhat bulbous, numbering from 8 - 10 apart from protoconch of 1½ - 2 white nuclear whorls; spiral rows of moderately deep punctures encircle the shell, numbering from 22 - 33 on the body whorl and from 6 - 10 on the penultimate whorl; punctures extend sometimes as obsolete short axial striae onto the intervening broad and flat ridges. Aperture equal in height or slightly longer than the spire, broad and convexly elongate, outer lip thickened, dentate, occasionally with small brown spots on the summits of the crenations; interior of aperture porcelain-white. Columella calloused, white in colour, with 5 prominent oblique folds; anterior canal straight or slightly recurved, and prominently calloused.

L: 38 to 64 mm W: 35 to 40% A: 52 to 57%

Type locality: In Oceano australi ad insulas amicas [Tonga Islands].

Habitat: Under coral rocks on sand substrate, in patches of sand, in shallow water.

Uncommon.

Distribution: South and West Viti Levu, Lau Islands. - Pacific.

Discussion: GMELIN's *Voluta nubila* was based on a figure of *Mitra versicolor* MARTYN, 1784 (Vol. 1; pl. 23). MARTYN's work, however, has been rejected for nomenclatorial purposes under opinion 456 of the I. C. Z. N. (1958, 15th March 1957). *Voluta nubila* CHEMNITZ is undoubtedly conspecific with GMELIN's species; the two CHEMNITZ figures, however, were cited as type figures for *Mitra sanguinolenta* LAMARCK, 1811, a species described by its author as fusiformly-ovate, white in colour, with small reddish spots and axial flames, five columellar folds, and sculptured with pitted spiral grooves and very small axial striae. LAMARCK's description of *M. sanguinolenta*, and especially the type-figures, bear little resemblance to the purported holotype preserved in the Muséum Nationale in Paris and illustrated by J. CATE, (1962; pl. 11, fig. 2); this holotype, however, closely resembles KIENER's figures of *M. sanguinolenta*. REEVE (1844), when describing *M. versicolor* (= *M. nubila*), remarked that "LAMARCK's *M. sanguinolenta* appears to be a variety of this species [*M. nubila*], and not the shell figured for it by KIENER, which looks like a worn *M. texturata*." SOWERBY's comment (1874) was as follows: "*M. sanguinolenta* LAMARCK, considered doubtful as figured by KIENER, and here copied (pl. 11, fig. 160)." In view of the striking resemblance of the holotype of *M. sanguinolenta* as figured in J. CATE (*l. c.*) to KIENER's illustration of the species, and the dissimilarity to LAMARCK's type-

figures of *M. sanguinolenta*, the holotype photograph could possibly represent KIENER's type-specimen and not that of LAMARCK.

The reddish-brown axial streaks are either narrow and close-set, or broader and wide-spaced; some specimens are faintly banded with brown on the body whorl.

20. *Mitra nucleolus* LAMARCK, 1811

(Plate 16; Figure 43)

1811. *Mitra nucleola* LAMARCK, Ann. Mus. Hist. Nat., 17: 218

1923. *Mitra (Chrysame) nucleolus*, DAUTZENBERG & BOUGE, Journ. Conchyl., 67(2): 126 (valid emend.)

Shell: Shell very small, ovate, acuminate at spire and base; orange-brown to dark fawn in colour throughout, early whorls white. Sutures moderately impressed, whorls flattened or slightly convex, faintly angulate at sutures, numbering from 7 - 8 apart from protoconch of 2½ glassy-white nuclear whorls. Body whorl obsoletely axially costate, costae broad and undulate, numbering from 11 - 14 on the body whorl and from 0 - 4 on the penultimate whorl; elevated spiral ridges encircle the shell, ridges bluntly rounded or flat on the summits, numbering from 11 - 13 on the body whorl and 3 on the penultimate whorl. Interstices of spiral ridges "V"-shaped, with fine and numerous axial striae; the penultimate and antepenultimate whorls have 2 - 4 axial grooves extending from suture to suture, and the early whorls are white and finely beaded. Aperture equal in height or slightly longer than the spire, narrow, outer lip thickened and crenulate, narrowing abruptly towards the base; interior of aperture smooth and greyish-brown in colour. Columella brown in colour, calloused, with 3 whitish oblique folds, the fourth fold becoming obsolete; anterior canal calloused, produced, spirally corded and straight, slightly longer than the outer lip.

L: 10 to 14 mm W: 45 to 48% A: 50 to 56%

Type locality: None.

Habitat: Under coral rocks on sand substrate, on coral-rubble bottom from 5 - 7 fathoms.

Rare.

Distribution: Throughout the Fiji Islands. - From Indonesia to Fiji.

Discussion: Although LAMARCK's original description lacks citation of figures, it is adequate for a positive identification. The author described the species as small in size (15 to 16 mm), ovate, yellowish or fawn in colour throughout, with more or less unobtrusive longitudinal costae, spiral grooves and four columellar folds.

DAUTZENBERG & BOUGE (1923) emended *Mitra nucleola* to *M. nucleolus*. The authors pointed out that *nucleolus* is a diminutive of the noun *nucleus* (diminutive of *nux*), and thus retains the masculine gender. The author's emendation is justified under article 33(i) of the Code of

the I. C. Z. N. (1961) and is to be attributed to the original author. *Mitra nucleolus*, however, was established by LAMARCK in 1811, not in 1822 as stated by DAUTZENBERG & BOUGE.

The same species seems to be illustrated in TINKER under *Mitra* species from Hawaii (1958, plate facing page 154, bottom row, figure on extreme left).

21. *Mitra papalis* (LINNAEUS, 1758)

(Plate 14; Figure 17)

1758. *Voluta papalis* LINNAEUS, Syst. Nat., ed. 10, p. 732

1957. *Mitra papilis* COTTON, Roy. Soc. South Austral. Malac. Sect., 12: 2

Shell: Shell large, elongate-ovate, solid and heavy; whitish in colour, ornamented with close-set transverse rows of irregular dark reddish-brown blotches on the body whorl and earlier whorls. Sutures deeply impressed, whorls convex, prominently coronate at sutures, numbering from 8 to 9 apart from protoconch of 2 white nuclear whorls; punctate spiral grooves encircle the shell, grooves becoming obsolete on the penultimate and body whorl in large specimens. Aperture equal in height or longer than the spire, fairly broad, outer lip straight, thickened and crenate; interior of aperture cream to light yellow or orange. Columella calloused basally, cream in colour, with 5 - 6 prominent oblique folds; base of shell with flat spiral cords, anterior canal calloused and straight.

L: 55 to 107 mm W: 35 to 39% A: 52 to 58%

Type locality: O. Asiatico

Habitat: In coarse, clean sand and among weed, from 1 to 4 fathoms.

Rare.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia, Hawaii and Clipperton Island.

22. *Mitra papilio* (LINK, 1807)

(Plate 14; Figures 22, 22a)

1791. *Voluta exasperata* var. β GMELIN, Syst. Nat., ed. 13, p. 3453

1807. *Voluta papilio* LINK, Beschf. Nat.-Samml. Univ. Rostock, p. 127

1811. *Mitra scabriuscula* LAMARCK, Ann. Mus. Hist. Nat., 17: 203

1844. *Mitra sphaerulata* "MARTYN," REEVE, Conch. Icon., pl. 5, sp. 37

Shell: Shell moderately large, fusiformly-elongate to elongate-ovate, rather solid; whitish to pale cream in colour, ornamented with one or rarely two broad, reddish-brown central transverse bands on the body whorl, and a narrower ill-defined band adjoining sutures on earlier whorls; this band is often broken up into spots, or is absent

altogether. Sutures weakly impressed, whorls convex, rounded at sutures, numbering from 8-9 apart from protoconch of 2 glassy-brown nuclear whorls; prominent elevated spiral cords encircle the shell, numbering from 13-17 on the body whorl and from 5-6 on the penultimate whorl; some specimens have from 1-4 additional finer spiral cords and fine spiral striae. The main spiral cords are ornamented with bluish-black dots and dashes, while the interstitial smaller cords are spotted with reddish-brown; spiral cords are bisected by close-set longitudinal deep striae, giving the shell a somewhat granulose appearance. On the earlier whorls, the spiral cords are often so compressed that no interstitial spaces are visible. Aperture equal in height or longer than the spire, narrow and elongate, outer lip thickened and crimped; interior of aperture pale orange-fawn, deep interior cream. Columella calloused, orange-fawn in colour but posteriorly cream, with 4-5 prominent oblique folds; anterior canal slightly calloused, fairly straight, and with two to three isolated spiral cords.

L: 16 to 55 mm W: 31 to 39% A: 51 to 60%

Animal: Sole of foot translucent cream, densely spotted with white round spots; dorsum of foot anteriorly lined with rusty-brown, posteriorly with a longitudinal central band consisting of black, marbled blotches. Siphon translucent cream, spotted with white, transversely lined with orange-brown; tentacles short, translucent white, base of tentacles pale brown. Eyes black, ringed with white.

Type locality: None.

Habitat: In clean sand substrate, in sand pockets of coral reefs, in shallow water.

Uncommon in North Viti Levu, moderately common in the South.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: Juvenile specimens are rather broad (W: 42 to 47% of L), with an acuminate spire and $3\frac{1}{2}$ nuclear whorls; they are white in colour and ornamented with purplish-grey axial streaks and two mauve transverse bands on the body whorl; the transverse and axial ridges are more prominent than in adult specimens.

The species occurs in widely separated colonies in Fiji.

Mitra scabriuscula LAMARCK, 1811 (1798, pl. 371, figs. 5a, 5b) is undoubtedly this species, not *M. scabricula* (LINNAEUS).

23. *Mitra peculiaris* REEVE, 1845

(Plate 14; Figure 21)

1845. *Mitra peculiaris* REEVE, Conch. Icon., pl. 36, sp. 305 (in errore sp. 273 in text)

1882. *Mitra typha* TRYON (monst.), Man. Conch., 4: 128; pl. 37, fig. 116

1923. *Mitra typha* monst. *peculiaris* DAUTZENBERG & BOUGE, Journ. Conchyl., 67(2): 96

Shell: Shell small, slender and elongate, fragile and light in weight; white in colour, ornamented with a broad orange transverse band anteriorly to the suture on the body whorl, and a single band of the same colour adjoining sutures on earlier whorls. Sutures moderately impressed, whorls concave, numbering from 7-8 apart from protoconch which was eroded in the specimens examined; the last three whorls bear a prominent white keel-like carina at the sutures. Fine and shallow spiral striae encircle the shell, striae close-set but becoming wide-spaced basally, numbering from 21-27 on the body whorl and from 9 to 13 on the penultimate whorl. Aperture only slightly shorter than the spire, narrow and straight, angulate at point of commencement, outer lip moderately thin and smooth; interior of aperture white. Columella calloused basally, white in colour, with 5 prominent oblique folds; anterior canal straight or slightly curved.

L: 12 to 15 mm W: 28 to 30% A: 46 to 48%

Type locality: Puerto Galero, Island of Mindoro, Philippine Islands.

Habitat: Dredged on sand and coral-rubble bottom substrate, from 5 to 7 fathoms.

Rare.

Distribution: South Viti Levu. - From the Philippine Islands to Fiji.

Discussion: TRYON (1882) and DAUTZENBERG & BOUGE (1923) considered the species to be a monstrosity of *Mitra typha* REEVE, 1845; the latter authors recorded the monstrosity from Cebu Island (SOWERBY & FULTON) and Lifou (GOUBIN). Monstrosities of molluscan species are by no means frequent, and are generally caused by parasitic disease, influence of environment or injury to animal or shell of "typical" species. In view of the wide distribution of *M. peculiaris*, and the absence of specimens of *M. typha* in Fiji, the interpretation of *M. peculiaris* as a monstrosity of *M. typha* is not acceptable.

The specimen of *Mitra typha* reported by TRYON (*l.c.*) from Fiji may possibly represent *M. peculiaris* REEVE.

24. *Mitra pediculus* LAMARCK, 1811

(Plate 16; Figure 49)

1811. *Mitra pediculus* LAMARCK, Ann. Mus. Hist. Nat. 17: 222

Shell: Shell very small, roundly ovate, spire and base acuminate; dark reddish-brown to purplish-brown in colour, ornamented with white spiral ridges. Sutures weakly impressed, whorls flattened, slightly subangulate at sutures, numbering from 6-8 apart from protoconch of 2 white nuclear whorls; elevated, rounded white spiral ridges encircle the shell, numbering 9-11 on the body whorl and from 2-3 on the penultimate whorl. Interstices

of spiral ridges "V"-shaped and cancellate with numerous very fine axial striae; apex of spire whitish. Aperture longer than the spire, convexly rounded, outer lip moderately thickened and crenulate in a crimped manner; interior of aperture greyish-brown. Columella brownish, with 3-4 oblique folds, first of which is very prominent; anterior canal produced and pointed, spirally corded and straight.

L: 9 to 15 mm. W: 50 to 57% A: 56 to 61%

Type locality: Océan des grandes Indes.

Habitat: On broken coral substrate, from 7-10 fathoms. Rare.

Distribution: South and West Viti Levu. - From the Philippine Islands through the tropical Pacific to Polynesia.

Discussion: LAMARCK's original description is not accompanied by a citation of an illustration; his detailed diagnosis, however, allows an unequivocal identification of the species. LAMARCK listed a size of 9 to 11 mm and this appears to be the average size for the species.

The pure white spiral ridges on a purplish-brown background are rather striking and allow an easy identification of the species.

25. *Mitra* cf. *Mitra porcata* REEVE, 1844

(Plate 16; Figure 45)

1844. *Mitra porcata* REEVE, Conch. Icon., pl. 24, sp. 187

Shell: Shell very small, elongate ovate, spire and base pointed; rusty-brown in colour, ornamented with irregular small white spots and a narrow flesh-coloured transverse band just anteriorly to the sutures on the body whorl and penultimate whorl. Sutures moderately impressed, whorls slightly concave, numbering 5 apart from protoconch which is eroded; close-set and flat spiral ridges encircle the shell, ridges slightly rounded near the base, numbering 15 on the body whorl and 5 on the penultimate whorl. Interstices of spiral ridges appear only as very narrow spiral grooves; shell is obsoletely axially striate, and the body whorl has 3 deeper axial grooves extending from suture to base. Aperture longer than the spire, outer lip moderately thickened, constricted basally, interior of aperture rusty-brown; columella same colour as aperture, with 4 oblique folds. Anterior canal spirally corded, straight and pointed.

L: 9 mm W: 48% A: 62%

Type locality: None.

Habitat: Unknown.

Distribution: North Viti Levu. - ?

Discussion: Only one dead-collected specimen is known from Fiji collections, and this bears a strong resemblance to *Mitra porcata* REEVE. Further specimens are needed before it can be assigned to this species with certainty and established as a definite Fiji record.

26. *Mitra puncticulata* LAMARCK, 1811

(Plate 13; Figure 5)

1791. *Voluta papalis* var. γ GMELIN, Syst. Nat., ed. 13, p. 3459 (non LINNAEUS, 1758)

1811. *Mitra puncticulata* LAMARCK, Ann. Mus. Hist. Nat., 17: 198 (non SOUVERBIE, 1876)

1817. *Voluta digitalis* var. *puncticulata* DILLWYN, Desc. Cat. rec. shells, 1: 559

1828. *Voluta serpentina* WOOD, Ind. Test., pl. 21, fig. 138 (non *Mitra serpentina* LAMARCK, 1811)

1841. *Mitra* (*Thiarella*) *diadema* SWAINSON, in HANLEY, Exot. Conch., App., p. 36

Shell: Shell moderate in size, elongate-ovate, fairly solid; generally yellowish or light orange in colour, ornamented with a broad but indistinct central white transverse band on the body whorl and brown axial streaks and isolated white spots and patches; some specimens are dark brown in the spiral grooves. Sutures weakly to moderately impressed, whorls flattened and angulate at sutures, numbering from 8-9 on the body whorl apart from protoconch which is generally worn away; spiral grooves encircle the shell; grooves moderately shallow, cancellate with elevated small axial riblets, numbering from 10-14 on the body whorl and from 3-5 on the penultimate whorl. Sutures ornamented with nodulose white coronations which are generally short and pointing slightly outward. Aperture slightly longer than the spire, moderately broad and convexly elongate, outer lip thickened and undulate; interior of aperture creamy-white or light yellow. Columella calloused, white in colour, with 4-5 prominent oblique folds, which are often lined with yellow; anterior canal spirally corded and straight.

L: 28 to 42 mm W: 41 to 43% A: 56 to 58%
Type locality: Océan indien.

Habitat: In coarse sand substrate, in shallow water.

Rare.

Distribution: North Viti Levu. - From East Africa through the tropical Indo-Pacific to Fiji.

Discussion: SOWERBY (1874, p. 2) suggested that a shell from the Cuming collection labelled *Mitra nympha* REEVE, 1845, is only a worn *M. puncticulata* LAMARCK. REEVE's figure of *M. nympha* (1845, pl. 31, sp. 249) does not appear to be conspecific with *M. puncticulata* LAMARCK.

27. *Mitra rotundilirata* REEVE, 1844

(Plate 16; Figure 47)

1844. *Mitra rotundilirata* REEVE, Conch. Icon., pl. 23, sp. 178

1877. *Mitra rotundilirata*, LIÉNARD, Cat. Mal. Mauritius, p. 21

1882. *Mitra* (*Chrysame*) *tabanula* TRYON (pars), Man. Conch., 4: 146; pl. 42, fig. 246

Shell: Shell small, ovate, fairly solid, pointed at apex and base; orange-brown to reddish-brown in colour

throughout, spiral grooves coloured dark brown. Sutures weakly impressed, whorls convex, slightly angulate at sutures, numbering from 7-9 apart from protoconch of 2 glassy white nuclear whorls; elevated and close-set spiral ridges encircle the shell, ridges broad and rounded, numbering from 10-14 on the body whorl and from 3-4 on the penultimate whorl. Interstices of spiral ridges concave and narrow, stained dark brown and cancellate with numerous fine slightly elevated axial riblets. Aperture equal in height or longer than the spire, moderately broad, outer lip thickened and crimped, convexly rounded; interior of aperture cream or pale orange-brown. Columella orange-brown with 4-5 whitish oblique folds; base of shell calloused, straight or slightly recurved.

L: 15 to 31 mm W: 41 to 50% A: 54 to 58%

Type locality: None.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Rare.

Distribution: South and South-west Viti Levu. - From the Red Sea through the tropical Indo-Pacific to Fiji.

Discussion: The broad rope-like spiral ridges and darker interstices distinguish the shell from any other allied species.

28. *Mitra rubiginea* A. ADAMS, 1854

(Plate 16; Figure 41)

1854. *Mitra rubiginea* A. ADAMS, Proc. Zool. Soc. London, for 1854: 134

1871. *Mitra carinilirata* SOUVERBIE, Journ. Conchyl., 19: 335 (not figured)

1872. *Mitra carinilirata* SOUVERBIE, Journ. Conchyl., 20: 49-50, pl. 1, fig. 1

Shell: Shell moderately large, elongate-ovate, heavy and solid; dark red in colour throughout, rarely reddish-brown. Sutures moderately impressed, whorls slightly convex, angulate at sutures, numbering from 9-10 apart from protoconch which is usually eroded. Elevated, angulate and wide-spaced spiral ridges encircle the shell, ridges sharp and slightly rounded on the summits, numbering from 12-15 on the body whorl and from 4-5 on the penultimate whorl; some spiral ridges, but not all, have less elevated satellite spiral ridges on either side. The pen-

ultimate and body whorl have obsolete broad rounded axial mounds, which when viewed from the spire position make the whorls appear undulate. Interstices of spiral ridges are concave, and cancellate by prominent axial ridges which bisect spiral ridges which appear nodulose. Aperture equal in height or slightly longer than the spire, moderately broad, outer lip thickened and crimped, convexly elongate; interior of aperture brownish. Columella light reddish-brown, calloused, slightly convex basally, with 4-5 oblique folds; base of shell contracted, anterior canal calloused and slightly recurved.

L: 36 to 51 mm W: 39 to 43% A: 48 to 55%

Type locality: Australia

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Rare.

Distribution: North Viti Levu. - From Australia through the tropical Pacific to Hawaii.

Discussion: *Mitra tornata* REEVE, 1845 is somewhat similar, but it is smaller in size, not exceeding 25 mm in length; the spiral striae are more elevated, flat on the summits, lacking the filiform central carina of the spiral ridges in *M. rubiginea*; the interstitial axial striae are confined to the interstices in *M. tornata*, and do not bisect the spiral ridges as in *M. rubiginea*.

29. *Mitra rubritincta* REEVE, 1844

(Plate 16; Figure 44)

1844. *Mitra rubritincta* REEVE, Conch. Icon., pl. 19, sp. 147

Shell: Shell elongate-ovate to ovate, fairly broad and solid, spire acuminate; white in colour, ornamented with two rows of bright red longitudinal blotches on the body whorl, and irregular axial streaks on earlier whorls. Whorls flattened, slightly angulate at sutures, numbering from 7-8 apart from protoconch which is generally eroded; elevated angulate spiral ridges encircle the shell, numbering from 15-20 on the body whorl and from 3-4 on the penultimate whorl. Interstices of spiral ridges "V"-shaped, cancellate with elevated axial striae; longitudinal striae cross whorls, sutures very weakly impressed. apex whitish. Aperture equal in height or slightly longer than the spire, fairly wide and convexly rounded, outer lip

Explanation of Plate 15

Figure 27: *Mitra boissaci* MONTROUZIER, Fiji (x 2.5) Figure 28: *Mitra antoniae* H. ADAMS, Fiji (x 3.3) Figure 29: *Mitra flammea* OUOY & GAIMARD, Fiji (x 2.1) Figure 30: *Mitra flammigera* REEVE, Fiji (x 2.35) Figure 31: *Mitra strigillata* SOWERBY, Fiji (x 3.0) Figure 32: *Mitra philippinarum* A. ADAMS, Fiji (x 1.7) Figure 33: *Mitra filaris* (LINNAEUS), Fiji (x 1.7) Figure 33a: *Mitra filaris* (LINNAEUS), showing detail of sculpture between spiral ridges. (approx. x 5.0) Figure 34: *Mitra praestantissima* RÖDING, Fiji (x 1.5) Figure 34a: *Mitra praestantissima* RÖDING, showing detail of sculpture between spiral ridges. (approx. x 5.0) Figure 35: *Mitra peasei* DOHRN, Fiji (x 1.85) Figure 35a: *Mitra peasei* DOHRN, showing detail of sculpture between spiral ridges. (approx. x 5.0)



Figure 27

Figure 28

Figure 29

Figure 30



Figure 31

Figure 32

Figure 33

Figure 33 a

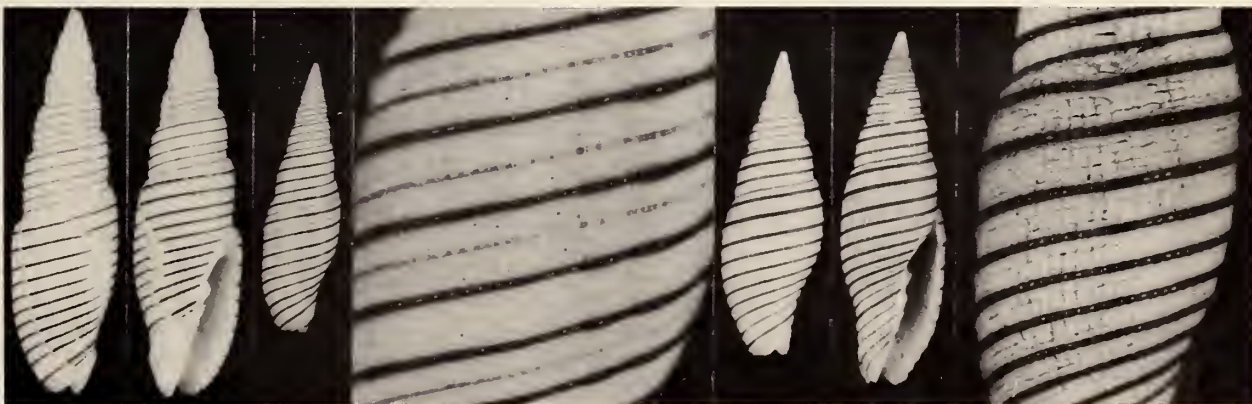


Figure 34

Figure 34 a

Figure 35

Figure 35 a



moderately thickened and crimped; interior of aperture whitish. Columella calloused, cream in colour, with 5 oblique folds; anterior canal slightly produced and straight, body whorl basally constricted.

L: 23 to 35 mm W: 46 to 51% A: 54 to 60%

Type locality: Island of Ticao, Philippines.

Habitat: Under coral rocks, on reef and sand substrate, in shallow water.

Rare.

Distribution: South and West Viti Levu. – From the Philippine Islands to Fiji.

Discussion: The fairly large red blotches on the body whorl are generally interrupted by a broad white transverse zone.

30. *Mitra scabricula* (LINNAEUS, 1758)

(Plate 13; Figure 6)

1758. *Buccinum scabriculum* LINNAEUS, Syst. Nat., ed. 10, p. 740, no. 412

1791. *Voluta dactylus* var. β GMELIN, Syst. Nat., ed. 13, p. 3443 (non LINNAEUS, 1767)

1811. *Mitra texturata* LAMARCK, Ann. Mus. Hist. Nat., 17: 213

1828. *Buccinum radiatum* WOOD, Index Testac., pl. 24, fig. 153 (non GMELIN, 1791)

Shell: Shell moderate in size, ovate and broad, ventricose and heavy; whitish in colour, ornamented with irregular dark orange-brown transverse bands at the suture and base on the body whorl, or occasionally with axial streaks and blotches. Sutures moderately impressed, whorls rounded, numbering from 5 - 6 apart from protoconch of 2 nuclear whorls; elevated and rounded spiral cords encircle the shell, cords stained with pale orange-brown and white, numbering from 10 - 15 on the body whorl and from 3 - 4 on the penultimate whorl. Close-set longitudinal grooves bisect transverse ridges, interstices punctate, becoming canaliculate on earlier whorls. Aperture much longer than spire, rather broad, outer lip almost straight, very thick and crenulate; interior of aperture whitish or light fawn in colour. Columella cream to pale fawn, calloused, with 4 - 5 oblique folds; anterior canal calloused and thickened, spirally corded, body whorl ventricose.

L: 30 to 44 mm W: 49 to 52% A: 67 to 70%

Type locality: M. Mediterraneo [error]; in India orientali (LINNAEUS, 1767).

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Rare.

Distribution: South and West Viti Levu. – From the Gulf of Oman through the tropical Indo-Pacific to Polynesia.

Discussion: The species is variable in sculpture, particularly in the density of the axial grooves, which number

from 40 - 65 on the body whorl. In some specimens the axial grooves are very deep and close-set, giving the shell an overall granulose appearance, while in others the grooves are almost obsolete.

The great width, long aperture and coarse sculpture separate this species from *Mitra sphaerulata* MARTYN (= *M. papilio* LINK) and *M. granatina* LAMARCK, with which it has been so often confused in literature. The species has been assigned to the genus *Buccinum* by LINNAEUS in his tenth edition of the "Systema Naturae" (1758), mainly because of a superficial similarity in form and sculpture with other members of that genus; it was removed from *Buccinum* in the twelfth edition of the "Systema Naturae," and placed under *Voluta* with all other Linnaean *Mitra* species.

The figures cited by LAMARCK for his *Mitra texturata* (1798; pl. 372, figs. 2 a, 2 b), are conspecific with *M. scabricula* (LINNAEUS). It has been illustrated under this specific name in most monographs on *Mitra*, e.g. REEVE (1844; pl. 20, fig. 155), SOWERBY (1874; pl. 7, fig. 84) and DAUTZENBERG (1935; pl. 3, fig. 5).

COTTON (1957) assigned *Mitra scabricula* to the genus *Imbricaria*, which comprises a group of species dissimilar in generic characters to the species under discussion.

31. *Mitra solanderi* REEVE, 1844 (emendment)

(Plate 16; Figure 46)

1844. *Mitra solandri* REEVE, Conch. Icon., pl. 22, sp. 172

Shell: Shell small, elongate-ovate, fairly solid; cream to light fawn in colour, ornamented with two moderately broad brown transverse bands on the body whorl, and a single band on earlier whorls; in some individuals the brown transverse zones are so broad that the shell would be better described as brown in colour, banded with cream or light fawn. Sutures moderately impressed, whorls slightly convex, angulate at sutures, numbering from 7 - 8 apart from protoconch of 3 glassy-fawn nuclear whorls; elevated, keel-like spiral ridges encircle the shell, ridges either close-set or wide-spaced, generally flat on the summits, but slightly rounded in some specimens and numbering from 10 - 14 on the body whorl and from 3 - 5 on the penultimate whorl. Interstices of spiral ridges shallow and concave, or deeply "V"-shaped, cancellate with numerous fine elevated axial striae; in some specimens the interstices are stained with dark brown. Aperture equal in height or slightly longer than the spire, convexly elongate and contracted basally, outer lip moderately thickened and crimped; interior of aperture brown or fawn. Columella brownish in colour, with 3 - 4 prominent cream-coloured oblique folds; anterior canal straight or slightly recurved.

L: 11 to 22 mm W: 37 to 40% A: 47 to 56%

Type locality: None.

Habitat: In sand substrate, from 10 - 15 fathoms.

Rare.

Distribution: South and West Viti Levu. - ?

Discussion: The specific name *solandri* is here emended to *solanderi*, in keeping with article 31 of the Code of the I.C.Z.N. (1961), as the species was named for Daniel Solander.

32. *Mitra sophiae* CROSSE, 1862

(Plate 14; Figure 13)

1862. *Mitra sophiae* CROSSE, Journ. Conchyl., 10: 253; pl. 10, fig. 6

Shell: Shell small, elongate-ovate, solid and heavy; whitish to cream in colour, ornamented with two broad brown transverse bands on the body whorl, and a narrow band adjoining sutures on earlier whorls. Sutures moderately impressed, whorls flattened, angulate at sutures, numbering from 7 - 8 including the protoconch; rounded spiral cords encircle the shell, cords prominent and elevated, numbering from 10 - 14 on the body whorl and from 1 - 2 on the penultimate whorl. Spiral cords are bisected by close-set axial ridges which tend to become somewhat nodulose on the summits of the spiral cords, but become obsolete on earlier whorls; interstices of spiral ridges are cancellate with elevated axial riblets. Sutures ornamented with sharp coronations which are oriented at a 45° angle from the body whorl; a second row of blunt, stunted coronations is generally situated immediately behind the first row. Aperture longer than the spire, narrow, outer lip elongate and only slightly convex, thickened and crimped; interior of aperture porcelain-white. Columella white, calloused, with 5 prominent oblique folds; anterior canal whitish, prominently calloused, slightly recurved and longer than outer lip.

L: 21 to 30 mm W: 43 to 46% A: 60 to 64%

Type locality: New Caledonia.

Habitat: Under coral rocks, in sand pools, in shallow water.

Rare.

Distribution: West Viti Levu. - New Caledonia.

33. *Mitra stictica* (LINK, 1807)

(Plate 14; Figure 15)

1791. *Voluta papalis* var. β GMELIN, Syst. Nat., ed. 13, p. 3459 (non LINNAEUS, 1758)

1798. *Mitra cardinalis* RÖDING, Mus. Bolten., p. 135 (non *Voluta cardinalis* GMELIN, 1791)

1807. *Voluta stictica* LINK, Besch. Nat.-Samml. Univ. Rostock, p. 127

1811. *Mitra abbatis* PERRY, Conchology, pl. 39, figs. 2, 3 (non DILLWYN, 1817)

1811. *Mitra pontificalis* LAMARCK, Ann. Mus. Hist. Nat., 17: 198

1817. *Voluta thiara* DILLWYN, Desc. Cat. rec. shells, 1: 561 (non HELBLING, 1779, non *Mitra coronata* LAMARCK, 1811)

1817. *Voluta coronata* SCHUMACHER, Ess. Nouv. Syst., p. 239 Moll., 1: 169

1853. *Mitra cincta* "MEUSCHEN," H. & A. ADAMS, Gen. rec.

1934. *Mitra strictica* HIRASE, Coll. of Japan, p. 70; pl. 100, fig. 12

1935. *Mitra pontificalis* var. *confluens* DAUTZENBERG, Mém. Mus. Roy. Hist. Nat., 2(17):55; pl. 2, fig. 9

1962. *Mitra stricta* KIRA, Shells West. Pacific, p. 99; pl. 35, fig. 14

Shell: Shell moderately large, elongate, fairly solid; white in colour, ornamented with 4 - 7 rows of close-set irregular but often rhomboidal bright orange or vermillion blotches on the body whorl; the blotches next to the sutures are usually the largest, and the earlier whorls are ornamented with only 2 - 3 rows of blotches which are often coalescing. Sutures moderately impressed, whorls flattened to slightly convex, angulate at sutures, numbering from 8 - 10 including the protoconch which is not discernible in fully adult shells. Spiral rows of small deep punctures encircle the shell, numbering from 2 - 3 on the penultimate whorl, but often obsolete on the body whorl; the sutures bear distinct and fairly large coronations. Aperture about equal in height to the spire, moderately broad and elongate, outer lip moderately thin and dentate anteriorly; interior of aperture whitish, cream or light orange. Columella whitish or cream, with 4 - 5 prominent oblique folds; anterior canal heavily calloused, spirally corded and straight.

L: 28 to 65 mm W: 35 to 42% A: 46 to 55%

Type locality: Batavia.

Habitat: Under coral rocks on sand and reef substrate, from 0 to 2 fathoms.

Moderately uncommon.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia and Hawaii.

34. *Mitra strigillata* SOWERBY, 1874

(Plate 15; Figure 31)

1874. *Mitra strigillata* SOWERBY, Thes. Conch., 4: 14; pl. 14, figs. 248, 249

Shell: Shell small, elongate and fusiform, light in weight; olive-green in colour, ornamented with irregular white sometimes wavy axial streaks and spots, and occasionally a few light green spots. Sutures moderately impressed, whorls convex, rounded at sutures, numbering from 8 - 9 apart from protoconch of 2 glassy-fawn nuclear whorls.

Very fine and narrow spiral grooves encircle the shell, grooves deep, obsolete or distinctly punctate, numbering from 14 - 18 on the body whorl and from 3 - 4 on the penultimate whorl; the first two spiral ridges anteriorly to the suture on the body whorl are generally slightly angulate, but the remainder of the ridges are broad and flat, or very slightly rounded. The spiral ridges on the penultimate and earlier whorls are rounded, and the interstitial punctures extend sometimes onto the walls of the spiral ridges; the body whorl is obsolete finely axially striate. Aperture longer than the spire, narrow and convexly elongate, outer lip thickened and crenulate; interior of aperture olive-brown, inner edge of outer lip white. Columella olive-green posteriorly, but white anteriorly, calloused basally, with 5 - 6 prominent white oblique folds; anterior canal slightly calloused, spirally corded and straight.

L: 14 to 18 mm W: 33 to 39% A: 55 to 63%

Type locality: None.

Habitat: In clean and slightly muddy sand, in sand patches and sand pockets of coral reefs, in shallow water.

Moderately rare.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands to Fiji.

Discussion: *Mitra fulgetrum* REEVE, 1844 is somewhat similar in appearance and was described by REEVE as being reddish-brown in colour with only 4 columellar folds. Fiji specimens of *M. strigillata* are consistently olive-green in colour, rarely light or dark green, with 5 - 6 columellar folds. REEVE's type figure of *M. fulgetrum* (1844; pl. 16, sp. 115) depicts a shell with shallow wide-spaced grooves, lacking the two angulate spiral ridges anteriorly to the suture of the body whorl.

The species appears as *Mitra strigillata* in the text of SOWERBY's monograph (1874), and as *M. strigilata* in the Index and plate explanations.

35. *Mitra tabanula* LAMARCK, 1811

(Plate 16; Figure 48; Text figures 6, 6a)

1811. *Mitra tabanula* LAMARCK, Ann. Mus. Hist. Nat., 17: 222

Shell: Shell very small, ovate, acuminate at spire and base; uniformly dark blood-red in colour throughout. Sutures weakly impressed, whorls slightly convex, subangulate at sutures, numbering from 5 - 6 apart from protoconch of 2 glassy, light brown nuclear whorls; elevated and angulate spiral ridges encircle the shell, ridges slightly rounded on the summits in some individuals, numbering from 10 - 13 on the body whorl and from 3 - 4 on the penultimate whorl. Interstices of spiral ridges broad and "V"-shaped, cancellate with numerous, close-set and very

fine axial striae. Aperture narrow, convexly rounded, outer lip thickened and crenulate; deep interior of aperture brownish-grey, edge of outer lip reddish-brown. Columella reddish-brown, calloused, with 3 - 4 prominent oblique folds; anterior canal slightly calloused, stained dark brown in adult specimens.

L: 9 to 12 W: 48 to 52% A: 56 to 61%

Type locality: Océan des grandes Indes

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Rare.

Distribution: North Viti Levu. - From East Africa through the tropical Indo-Pacific to Fiji.

Discussion: The species is similar in form and sculpture to *Mitra cucumerina* LAMARCK, but it is much smaller in size, dark reddish-brown, without the white transverse band of *M. cucumerina*. The radula pattern confirms the place-



Figure 6 and 6a

Row of Radular Teeth of Two Philippine Specimens of *Mitra tabanula* LAMARCK, 1811. x 175 (after PEILE, 1937; p. 183, figs. 13, 14)

ment of the species in the genus *Mitra*; the median has 6 to 8 main cusps and there are 13 - 16 cusps present on the laterals (PEILE, 1937).

LAMARCK did not cite any references to figures for his species; however, his description is sufficiently graphic to allow a positive identification of *Mitra tabanula*; the length quoted by LAMARCK for this species was 13 mm.

36. *Mitra ticaonica* REEVE, 1844

(Plate 14; Figure 14)

1844. *Mitra ticaonica* REEVE, Conch. Icon., pl. 23, sp. 181

1882. *Mitra crassa* TRYON (pars), Man. Conch., 4: 147; pl. 43, fig. 263 (non SWAINSON, 1822)

1921. *Mitra ticaonica vagans* PILSBRY, Proc. Acad. Nat. Sci. Phila., 72: 314; pl. 12, figs. 14, 15

Shell: Shell moderately small, elongate-ovate to broadly ovate, heavy and solid; light brown to dark tan in colour, ornamented with dark brown axial streaks and occasion-

ally a few small whitish spots; the anterior canal is usually purplish-brown. Sutures deeply impressed, whorls convex, rounded at sutures, numbering from 6 - 7 apart from protoconch of $1\frac{1}{2}$ - 2 white nuclear whorls; moderately deep spiral grooves encircle the shell, grooves at times obsolete in centre of body whorl, numbering from 14 - 21 on the body whorl and from 1 - 6 on the penultimate whorl; grooves with fine, short and close-set axial striae. Aperture longer than the spire, narrowing towards the base, outer lip thickened and crenulate, generally calloused at point of commencement; interior of aperture dark brown. Columella dark brown to purplish-brown, calloused, with 3 to 5 white oblique folds; base of shell spirally corded and truncated, anterior canal calloused and straight.

L: 21 to 34 mm W: 43 to 50% A: 56 to 64%

Animal: Sole of foot white, dorsum of foot chestnut brown. Other details not observed.

Type locality: Island of Ticao, Philippines.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Uncommon.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands through the tropical Pacific to Polynesia and Hawaii.

37. *Mitra tornata* REEVE, 1845

(Plate 16; Figure 38)

1845. *Mitra tornata* REEVE, Conch. Icon., pl. 33, sp. 269

Shell: Shell small, elongate-ovate, solid, spire pointed; yellowish-brown to orange-brown in colour throughout. Whorls slightly convex and subangulate at sutures, numbering from 7 - 8 apart from protoconch which is usually eroded; elevated spiral ridges encircle the shell, ridges flat on the summits, numbering from 10 - 13 on the body whorl and from 3 - 4 on the penultimate whorl. Interstices of spiral ridges "V"-shaped or roundly concave, cancellate with numerous fine elevated axial riblets. Aperture equal in height or slightly longer than the spire, narrow, convexly elongate and contracted at the base, outer lip moderately thickened and crimped; interior of aperture uniformly pale brown or fawn. Columella brownish, calloused, with 4 prominent oblique folds; body whorl concave basally, anterior canal slightly produced, straight or slightly recurved.

L: 15 to 26 mm W: 35 to 40% A: 52 to 56%

Type locality: Island of Guimaras, Philippines.

Habitat: Dredged from 10 - 15 fathoms, on coral fragment substrate.

Rare.

Distribution: South and West Viti Levu. - From the Philippine Islands to Fiji.

Discussion: Numerous specific names have been assigned to the species which closely resemble *Mitra tornata*, and many of these display negligible morphological differences. This particular group of species needs to be thoroughly revised before a reliable synonymy can be compiled.

38. *Mitra variabilis* REEVE, 1844

(Plate 14; Figure 16)

1844. *Mitra variabilis* REEVE, Conch. Icon., pl. 13, sp. 95

1844. *Mitra cylindracea* REEVE, Conch. Icon., pl. 13, sp. 97

Shell: Shell moderate in size, elongate ovate, fairly solid, spire pointed; brown to tan in colour, ornamented with a moderately broad, white central transverse band on the body whorl, and irregular white axial streaks and spots on all whorls. Sutures moderately impressed, whorls flattened or slightly convex, numbering 9 apart from protoconch of 2 - 3 glassy-white nuclear whorls; deep or shallow spiral grooves encircle the shell, grooves axially ridged, numbering from 23 - 31 on the body whorl and from 3 - 14 on the penultimate whorl. The periostracum is often imbedded in the spiral grooves, and thus the shell appears to be lined with brown. Resulting spiral ridges are either close-set, round and elevated, or broad and rather flat. Aperture equal in height or slightly longer than the spire, moderately broad, outer lip convexly elongate and slightly contracted basally, thickened and finely crenulate; interior of aperture brownish or dark fawn. Columella whitish or light brown, calloused, with 4 - 5 whitish prominent oblique folds; anterior canal slightly produced, calloused, spirally corded, straight and slightly recurved.

L: 29 to 38 mm W: 32 to 37% A: 49 to 55%

Type locality: Torres Strait.

Habitat: In clean sand, in sand-patches and sand-pockets of coral reefs, in shallow water.

Moderately rare.

Distribution: Southwest Viti Levu. - Australia.

39. *Mitra variegata* (GMELIN, 1791)

(Plate 14; Figures 24, 24a)

1791. *Voluta variegata* GMELIN, Syst. Nat., ed. 13, p. 3457

1798. *Vexillum rufum* RÖDING, Mus. Bolten., p. 139

1811. *Mitra serpentina* LAMARCK, Ann. Mus. Hist. Nat., 17: 204

1844. [?] *Mitra caerulea* REEVE, Conch. Icon., pl. 15, sp. 113

Shell: Shell moderately small, elongate-ovate, fairly solid; whitish or pale grey in colour, faintly tinged with blue in some specimens, irregularly ornamented with olive-green

or brown blotches, usually arranged in two transverse zones on the body whorl; earlier whorls with one transverse row of spots adjoining sutures. Maculations on the body whorl either in the form of longitudinal short bars, transverse dashes, triangular blotches or continuous white zones. Sutures impressed, whorls convex, rounded at sutures, numbering from 5 - 7 apart from protoconch of 3 glassy-white or cream nuclear whorls; first two nuclear whorls smooth, third whorl spirally striate. Fine, moderately deep spiral grooves encircle the body whorl, grooves minutely punctate or axially striate, numbering from 13 to 20 on the body whorl; the penultimate and earlier whorls are spirally ridged, ridges angulate, numbering 4 - 6 on the penultimate whorl. The body whorl is sculptured with 3 - 4 elevated and angulate spiral ridges anteriorly to the suture, and remainder of ridges become broad and flat towards the base; the summits of the spiral ridges often spotted and lined with either orange, dark brown or white. The body whorl is minutely axially striate, striae almost obsolete on body whorl, but appearing as deep axial grooves on earlier whorls, which appear granulose. Aperture longer than the spire, convexly elongate, pointedly rounded basally, outer lip moderately thickened and crenulate; interior of aperture bluish-white to steel grey, often stained with brown. Columella brownish, calloused, with 5 - 6 white and prominent oblique folds; anterior canal calloused, spirally corded, and with shallow depressions towards the basal end.

L: 19 to 34 mm W: 39 to 49% A: 58 to 66%

Type locality: None.

Habitat: In clean sand substrate, in sandy lagoons and on sand-banks, in shallow and deeper water.

Moderately rare.

Distribution: North and South Viti Levu. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: The species is extremely variable in colour and sculpture. Immature specimens have generally more prominent spiral ridges on the body whorl, which in adult specimens are close-set and flat. Specimens of *Mitra variegata* from Mauritius are predominantly light fawn in colour and occasional shells lack any further ornamentation on the body whorl; in all other respects they compare with specimens from other regions.

DAUTZENBERG & BOUGE (1923) acknowledged the identity of *Voluta variegata* GMELIN, 1791 and *Mitra serpentina* LAMARCK, 1811, but substituted *Mitra suffecta* DAUTZENBERG & BOUGE, 1923 for *M. variegata* REEVE. They believed REEVE's species to be different from GMELIN's since REEVE's *M. variegata* lacks the axial striae or pittings in the interstices of the axial ribs. Although in some individuals the axial striae may become obsolete on the body whorl, they are always distinct on the earlier

whorls, and REEVE's omission of this particular feature from his description is rather surprising.

RÖDING (1798) listed varieties a to f of *Mitra variegata* from BOLTEN's collection.

(*Cancilla* SWAINSON, 1840)

Type species by monotypy *Tiara sulcata* SWAINSON, 1832
= *Mitra (Cancilla) sulcata* (SWAINSON, 1832).

1840. *Cancilla* SWAINSON, Treat. Malac., 127: 320; fig. 84 b

Characteristics: Shell slender, fusiform, light in weight, spire pointed. Sutures plain, whorls sculptured with elevated spiral ridges, aperture narrow and often fusiform, interior of aperture smooth, outer lip moderately thin and crimped, columella obliquely plicate, anterior canal narrow and produced. Shell covered with a thin epidermis. **Discussion:** *Tiara* SWAINSON, 1831 is not a homonym of *Thiara* RÖDING, 1798, a generic name applied by RÖDING for species of the genus *Helix* LINNAEUS.

40. *Mitra (Cancilla) amoena* A. ADAMS, 1853

(Plate 14; Figures 26, 26 a)

1853. *Mitra amoena* A. ADAMS, Proc. Zool. Soc. London, pt. 19: 137

1874. *Mitra amoena* SOWERBY, Thes. Conch., 4: 10; pl. 14, fig. 244

Shell: Shell moderately small, fusiformly-elongate and slender, spire pointed; white in colour, rarely greyish white, ornamented with orange-brown, small quadrate spots upon the summits of the spiral ridges; occasional specimens have faint and irregular rose-coloured axial streaks or blotches on the body whorl. Sutures moderately deep, whorls convex, rounded or very slightly angulate at sutures, numbering from 6 - 8 apart from protoconch of 3 - 4 glassy, dark rose coloured nuclear whorls; the first 2 - 3 postnuclear whorls are similarly coloured. Moderately elevated spiral ridges encircle the shell, ridges angulate, rounded or flat on the summits, numbering from 12 - 17 on the body whorl and from 4 - 6 on the penultimate whorl. Interstices of spiral ridges either narrow and plain, or broader and sculptured with a fine intermediate spiral ridge, and 1 - 3 small transverse fillets; faint or prominent axial grooves bisect spiral ridges and interstices, numbering from 27 - 65 on the body whorl and from 20 - 41 on the penultimate whorl; the interstices between these axial grooves are occasionally very finely axially striate. Aperture equal in height or shorter than the spire, narrow and convexly elongate, or moderately straight and widening slightly anteriorly; outer lip moderately thin and crimped, interior

of aperture porcelain-white and often with a rosy tint. Columella white or rose-violet, with 4-6 prominent oblique folds; anterior canal calloused and fairly straight.

L: 15 to 25 mm W: 30 to 35% A: 40 to 47%

Animal: Sole and dorsum of foot translucent cream, spotted with small white dots. Siphon snow-white, tentacles translucent cream, base white; eyes black.

Type locality: Red Sea.

Habitat: In clean sand substrate, in sand pockets of coral reefs, from 0 to 2 fathoms.

Moderately rare.

Distribution: Throughout the Fiji Islands. - From the Red Sea through the tropical Indo-Pacific to Fiji.

Discussion: The small reddish-brown spots upon the spiral ridges are fairly regularly spaced, and assist in an easy identification of the species. A comparison of specimens from Mauritius (leg. E. Couacaud) and the Philippine Islands (leg. P. Clover) showed that the species is fairly constant in most characters throughout its range. Shells from Mauritius were generally less fusiform, and exceeded the maximum width index recorded for Fiji specimens (38% of length); the aperture was also slightly longer (50% of length).

41. *Mitra (Cancilla) antoniae* H. ADAMS, 1870

(Plate 15; Figure 28)

1870. *Mitra (Cancilla) antoniae* H. ADAMS, Proc. Zool. Soc. London, p. 788, pl. 48, fig. 1

1874. *Mitra antonii* SOWERBY, Thes. Conch., 4: 8, pl. 14, fig. 245 (non KÜSTER, 1841; non DOHRN, 1860)

1882. *Mitra (Scabricola) crenifera* TRYON (pars), Man. Conch., 4: 135; pl. 39, fig. 165 (non LAMARCK, 1811)

1896. *Mitra (Cancilla) carnicolor* MELVILL & STANDEN, Shells Lifu, p. 405 (non REEVE, 1844)

Shell: Shell small, fusiformly elongate ovate, light in weight; white in colour, ornamented with one to two faint pinkish transverse bands on the body whorl; the spiral ridges have alternate reddish-brown and white nodules, the brown nodules being predominant. Sutures moderately impressed, whorls roundly angulate at sutures, numbering from 5-6 apart from protoconch of $1\frac{1}{2}$ -2 glassy-pink

and bulbous nuclear whorls; elevated, wide-spaced and nodulose spiral cords encircle the shell, nodules on spiral ridges reddish-brown and white in colour, ridges numbering from 14-16 on the body whorl and from 3-4 on the penultimate whorl. Interstices of spiral ridges with fine axial striae and occasionally with a small intermediate lirate spiral thread. Aperture longer than the spire, narrow, outer lip convexly elongate and crimped; interior of aperture faint rosy-pink. Columella moderately calloused, whitish in colour, with 5-6 prominent oblique folds; anterior canal straight.

L: 10 to 13 mm W: 36 to 38% A: 58 to 60%

Type locality: Red Sea.

Habitat: Dredged from 10-15 fathoms, on coral fragment substrate.

Rare.

Distribution: West Viti Levu. - From the Red Sea through the tropical Indo-Pacific to Fiji.

Discussion: The species superficially resembles *Mitra (Cancilla) granatina* LAMARCK in form and sculpture, but differs in being smaller in size, with fewer and shorter whorls, more wide-spaced, prominent and less numerous spiral ridges and a narrower more fusiformly-elongate aperture; the shell has an overall slight pink or rosy tint and the interior of the aperture is similarly coloured.

42. *Mitra (Cancilla) circula* KIENER, 1839

(Plate 16; Figures 40, 40 a)

1791. *Voluta scabricula* GMELIN (pars), Syst. Nat., ed. 13, p. 3450 (non *Buccinum scabriculum* LINNAEUS, 1758)

1839. *Mitra circula* KIENER, Spéc. Gén. Icon. Coq. Viv., p. 21; pl. 5, fig. 13

1844. *Mitra circulata* REEVE, Conch. Icon., pl. 11, sp. 77

1882. *Mitra (Cancilla) filaris* var. *circulata* TRYON, Man. Conch., 4: 138; pl. 40, fig. 176

1957. *Tiara cercula* COTTON, Malac. Sect. Roy. Soc. South Austral., 12: 2

Shell: Shell small, fusiform, spire pointed; dirty-white to light grey in colour, spiral ridges irregularly lined with orange-brown in some individuals, but absent in others. Sutures moderately impressed, whorls slightly convex, sub-angulate at sutures, numbering from 8-9 apart from

Explanation of Plate 16

- Figure 36: *Mitra interlirata* REEVE, Fiji (x 1.5) Figure 36a: *Mitra interlirata* REEVE, showing detail of sculpture between spiral ridges (approx. x 5.0) Figure 37: *Mitra pia* DOHRN, Fiji (x 1.2) Figure 37a: *Mitra pia* DOHRN, showing detail of sculpture between spiral ridges (approx. x 5.0) Figure 38: *Mitra tornata* REEVE, Fiji (x 2.0) Figure 39: *Mitra incarnata* REEVE, Fiji (x 1.6) Figure 39a: *Mitra incarnata* REEVE, showing detail of sculpture between spiral ridges. (approx. x 5.0) Figure 40: *Mitra circula* KIENER, Fiji (x 2.0) Figure 40a: *Mitra circula* KIENER, showing detail of sculpture between spiral ridges. (approx. x 5.0) Figure 41: *Mitra rubiginea* A. ADAMS, Fiji (x 1.0) Figure 42: *Mitra fraga* QUOY & GAIMARD, Fiji (x 2.0) Figure 43: *Mitra nucleolus* LAMARCK, Fiji (x 3.5) Figure 44: *Mitra rubritincta* REEVE, Fiji (x 1.2) Figure 45: *Mitra* cf. *M. porcata* REEVE, Fiji (x 3.45) Figure 46: *Mitra solanderi* REEVE, Fiji (x 2.6) Figure 47: *Mitra rotundilirata* REEVE, Fiji (x 2.0) Figure 48: *Mitra tabanula* LAMARCK, Fiji (x 3.35) Figure 49: *Mitra pediculus* LAMARCK, Fiji (x 3.3)



Figure 36

Figure 36 a

Figure 37

Figure 37 a

Figure 38



Figure 39

Figure 39 a

Figure 40

Figure 40 a

Figure 41

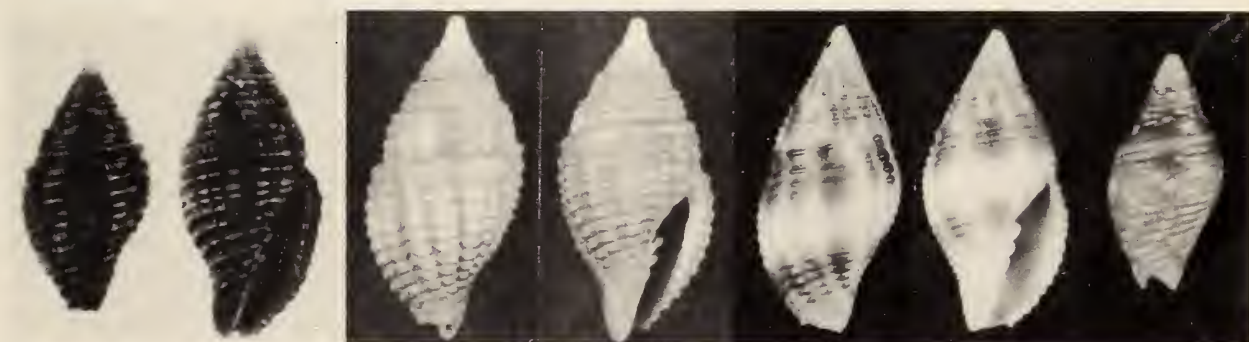


Figure 42

Figure 43

Figure 44

Figure 45



Figure 46

Figure 47

Figure 48

Figure 49

protoconch of $2\frac{1}{2}$ glassy-fawn nuclear whorls; elevated and angulate spiral ridges encircle the shell, numbering from 10 - 12 on the body whorl and 3 - 4 on penultimate whorl. Interstices of spiral ridges cancellated with numerous elevated axial ribs, numbering from 70 - 80 on the body whorl; some specimens have an additional shallow lirate intermediate ridge which overrides the axial riblets. Aperture about equal in height or longer than the spire, narrow, elongate and pointedly rounded basally; outer lip moderately thickened and faintly undulate. The interior edge of the outer lip is porcelain-white, while the deep interior is stained with coffee-brown; columella whitish, occasionally stained with brown, folds prominent and oblique, numbering about 5. Anterior canal straight, pointed, and generally shorter than the outer lip.

L: 15 to 28 mm W: 30 to 34% A: 54 to 62%

Type locality: None.

Habitat: In muddy sand and weedy sand substrate, from 0 to 17 fathoms.

Uncommon.

Distribution: North and West Viti Levu. - From Mauritius through the tropical Indo-Pacific to Fiji.

Discussion: KIENER (1839) described his new species as uniformly whitish in colour, slender, elongate, with 8 - 9 turreted slightly convex whorls which are subangulate at the sutures, and sculptured with elevated equally spaced transverse ridges. The interstitial sculpture was described as consisting of a delicate net-like pattern, and the columella with 4 folds; the size was given by KIENER as 18 lignes (=40.5 mm).

Fiji specimens agree fairly well with KIENER's description but do not attain the size quoted by him. Furthermore, live-collected specimens usually have a broad white zone at the interior of the outer lip, while the deep interior is brown.

43. *Mitra (Cancilla) clathrus* (GMELIN, 1791)

(Plate 14; Figure 25)

1791. *Voluta clathrus* GMELIN, Syst. Nat., ed. 13, p. 3457

1791. [?] *Voluta maculosa* GMELIN, Syst. Nat., ed. 13, p. 3453
(non *Mitra maculosa* REEVE, 1844)

1811. *Mitra crenifera* LAMARCK, Ann. Mus. Hist. Nat., 17: 204

1844. *Mitra pretiosa* REEVE, Conch. Icon., pl. 16, sp. 116

1921. *Mitra emersoni* PILSBRY, Proc. Acad. Nat. Sci. Phila., 72: 316; pl. 12, fig. 19

1959. *Mitra (Scabricola) crathrus* KIRA, Col. Illust. shells Jap., 1: 88; pl. 34, fig. 6

Shell: Shell moderate in size, fusiformly-elongate; very variable in colour, but generally whitish, creamy-yellow or light fawn, ornamented with one or two irregular orange, reddish-brown or dark brown transverse bands on the body whorl; in some specimens the bands are continuous,

in others they take the form of coalescing longitudinal zones. The earlier whorls are ornamented with a transverse row of blotches of the same colour and adjoin the sutures. Sutures weakly impressed, whorls convex, numbering from 6 - 9 apart from protoconch of 2 glassy-white to pale fawn nuclear whorls; spiral grooves encircle the shell, numbering from 14 - 27 on the body whorl and 3 - 11 on the penultimate whorl; spiral grooves are bisected by longitudinal grooves, which number from 28 - 61 on the body whorl and from 20 - 40 on the penultimate whorl. The resulting costate spiral ridges are angled on the body whorl and either close-set with no appreciable interstices or wide-spaced; in the latter case the interstitial sculpture is composed of faintly risen fine spiral fillets, which number from 1 - 4. Aperture equal in height or longer than the spire, narrow and elongate, pointed at the base; outer lip thickened and faintly crenulate. Interior of aperture porcelain-white; columella white, with 4 - 5 prominent oblique folds. Base of aperture longer than the siphonal canal which is calloused, straight and slightly recurved.

L: 17 to 41 mm W: 32 to 39% A: 52 to 63%

Animal: The sole and dorsum of the foot are creamy yellow in colour. Other details not observed.

Type locality: None. ("La mer de l'Inde," LAMARCK, 1811).

Habitat: In sand and among weed, from 0 - 4 fathoms.

Uncommon.

Distribution: Throughout the Fiji Islands - From the Persian Gulf through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: The species is very variable in colour pattern and sculpture of spiral ridges and interstices. Small and pale individuals, usually orange or orange-brown in colour, are prevalent in certain West Viti Levu localities; these specimens have been associated with *Mitra pretiosa* REEVE, but appear to be only an ecological variant.

Mitra emersoni PILSBRY, from Hawaii, is said to differ from *M. clathrus* in being smaller in size, with the vertical impressed lines about twice as far apart as in *M. clathrus*, and having a prominent and beaded appearance of the raised spiral bands and additional ornamentation between these spiral bands. Comparison of Hawaiian specimens of *M. emersoni* with specimens of *M. clathrus* from Fiji and the Philippines showed the differences in obesity, height of aperture and number of whorls to be insignificant; the additional ornamentation between the spiral ridges and the wide-spaced axial grooves were also present in some specimens of *M. clathrus* from Fiji. Specimens of both forms were forwarded to Mr. C. Weaver in Hawaii, for comparison with larger series of the Hawaiian form. Mr. Weaver confirmed the close affinity of all specimens and found any differences to be negligible.

DAUTZENBERG & BOUGE (1923) commented on the high variability of *Mitra clathrus* and treated *M. pretiosa* REEVE simply as a variant.

GMELIN (1791, p. 3453) described a *Voluta maculosa*, and referred to CHEMNITZ for an illustration of the species (1780; Vol. 4, pl. 149, fig. 1377). The figure cited is a dorsal view of a shell very similar to if not identical with *Mitra clathrus* GMELIN.

44. *Mitra (Cancilla) filaris* (LINNAEUS, 1771)

(Plate 15; Figures 33, 33a)

1771. *Voluta filaris* LINNAEUS, Mant. Plant., App., p. 548

1780. *Voluta filosa* BORN, Test. Mus. Caes. Vindob., p. 225; pl. 9, figs. 9, 10

1791. *Voluta leucosticta* var. β GMELIN, Syst. Nat., ed. 13, p. 3457

1811. *Mitra nexilis* LAMARCK, Ann. Mus. Hist. Nat., 17: 202

1850. *Mitra filosa bornii* PHILIPPI, Zeitschr. Malakozool., 7: 26

1850. *Mitra filosa bernardiana* PHILIPPI, Zeitschr. Malakozool., 7: 26

Shell: Shell small, elongate-ovate, moderately solid; whitish in colour, ornamented with reddish-brown to chestnut brown spiral ridges. Sutures moderately impressed, whorls convex, roundly shouldered at the sutures, numbering from 7 - 8 apart from protoconch of $2\frac{1}{2}$ nuclear whorls; slightly elevated, rounded dark brown spiral ridges encircle the shell, ridges commencing a short distance anteriorly to the sutures, leaving a moderately broad plain presutural transverse zone. Spiral ridges number from 10 - 12 on the body whorl and from 3 - 4 on the penultimate whorl; close-set axial grooves bisect the spiral ridges and interstices, numbering from 45 - 80 on the body whorl. Interstitial sculpture consists of from 4 - 7 fine spiral threads, which are divided into short fillets by the axial grooves. Aperture equal in height or slightly longer than the spire, moderately wide, outer lip straight and rounded basally, moderately thick and faintly crimped; interstices of the crimped crenations lined with dark brown. Interior of aperture porcelain-white or bluish-white; columella calloused, white in colour, with 4 - 5 oblique folds. Anterior canal slightly calloused, and straight.

L: 15 to 30 mm W: 35 to 44% A: 51 to 58%

Type locality: None.

Habitat: In clean sand, sand-pockets of coral reefs, in shallow water. Moderately common in the South of Viti Levu, uncommon elsewhere.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: *Mitra filosa* BORN was considered by most

writers to be the slender elongate form of *M. filaris* (LINNAEUS); the former species is conspecific with *M. filaris* but the narrow slender form is *M. praestantissima* RÖDING, 1798. The latter differs from *M. filaris* in being fusiformly elongate, slender, with an aperture shorter than the spire and rather narrow, and the whorls are less convex and more angulate at the sutures; the spiral ridges are wide-spaced and commence on the presutural ramp and not some distance anteriorly below the sutures as in *M. filaris*. Both species are clearly separable on sight.

45. *Mitra (Cancilla) flammea* QUOY & GAIMARD, 1833

(Plate 15; Figure 29)

1833. *Mitra flammea* QUOY & GAIMARD, Voy. Astrol., 2: 649; pl. 45, figs. 23, 24, 25 (non REEVE, 1844)

Shell: Shell small, fusiformly-ovate, moderately solid; whitish to cream in colour, ornamented with fairly regular chestnut-brown axial streaks. Sutures weakly impressed, hardly discernible in some specimens, whorls convex, rounded at the sutures, numbering from 7 - 8 apart from protoconch of 2 - 3 glassy, dirty-white nuclear whorls; moderately elevated spiral ridges encircle the shell, ridges broad at the base but angulate at the summits, numbering from 12 - 16 on the body whorl and from 3 - 4 on the penultimate whorl. Interstices moderately shallow and concave on body whorl, becoming slightly "V"-shaped on earlier whorls; interstices are cancellate with elevated, moderately broad axial riblets, numbering from 65 - 80 on the body whorl; the first two to three interstices near the sutures are ornamented with a weakly defined lirate intermediate spiral thread. Aperture slightly longer than the spire, narrow and elongate, outer lip thickened and finely crenulate; interior of aperture porcelain-white, occasionally faintly stained with brown towards the deep interior. Columella calloused, white in colour, with 4 - 5 wide-spaced oblique folds; anterior canal slightly calloused and pointed, occasionally stained with orange-brown.

L: 21 to 26 mm W: 34 to 37% A: 55 to 59%

Type locality: Philippine Islands.

Habitat: In clean sand substrate, in shallow and deeper water.

Rare.

Distribution: North and South Viti Levu. - From Mauritius through the tropical Indo-Pacific to Fiji.

Discussion: The two to three intermediate lirate spiral threads between the spiral ridges anteriorly to the sutures are a constant feature, and present in all specimens examined from Fiji and Mauritius.

46. *Mitra (Cancilla) flammigera* REEVE, 1844

(Plate 15; Figure 30)

1844. *Mitra flammigera* REEVE, Conch. Icon., pl. 22, sp. 173 a, 173 b1874. *Mitra novae-hollandiae* SOWERBY, Thes. Conch., 4: 9; pl. 19, fig. 368; pl. 20, fig. 417

Shell: Shell small, fusiformly-ovate to conically-ovate; very variable in colour, but generally white and ornamented with orange-brown, reddish-brown or dark brown irregular streaks and blotches, which are sometimes arranged as axial flames or ill-defined transverse zones on the body whorl; some specimens are orange-brown and have a minimum of white blotches and streaks. Sutures moderately impressed, whorls convex, rounded or subangulate at sutures, numbering from 8 - 9 apart from protoconch of 3 - 3½ glassy, light-brown nuclear whorls; elevated, narrow and angulate spiral ridges encircle the shell, ridges sharp or slightly rounded on the summits, numbering from 11 to 15 on the body whorl and from 3 - 4 on the penultimate whorl. A smaller, less elevated intermediate spiral ridge is present between the main spiral ridges, but this feature is not at all constant; interstices of spiral ridges concave, cancellated with numerous axial grooves which bisect the intermediate ridges and number from 45 - 70 on the body whorl; axial grooves are wide-spaced, but become close-set and obsolete on the ultimate quarter of the body whorl. Aperture equal in height or only slightly longer than the spire, very narrow, outer lip almost straight and elongate, thickened and crenulate, faintly constricted basally; interior of aperture reddish-brown or dark brown. Columella brownish, calloused basally, with 5 - 7 whitish, prominent oblique folds; anterior canal slightly or distinctly calloused and straight.

L: 10 to 23 mm W: 32 to 39% A: 50 to 56%

Type locality: None.**Habitat:** In clean and slightly muddy sand, from 0 - 15 fathoms.

Uncommon.

Distribution: North and West Viti Levu. - From the Philippines through the tropical Pacific to Fiji.**Discussion:** The species is similar in size and form to *Mitra strigillata* SOWERBY, but differs appreciably in sculpture and colour. *Mitra strigillata* is spirally grooved, not ridged, the aperture is longer, and the shell is basically green in colour with white narrow axial streaks.47. *Mitra (Cancilla) granatina* LAMARCK, 1811

(Plate 14; Figure 23)

1791. *Voluta scabricula* GMELIN (pars), Syst. Nat., ed. 13, p. 3450 (non *Buccinum scabriculum* LINNAEUS, 1758)1811. *Mitra granatina* LAMARCK, Ann. Mus. Hist. Nat., 17: 2031817. *Voluta scabricula* var. DILLWYN, Desc. Cat. rec. shells, 1: 542 (non *Buccinum scabriculum* LINNAEUS, 1758)1844. *Mitra scabriuscula* REEVE, Conch. Icon., pl. 5, sp. 35 (non *Buccinum scabriculum* LINNAEUS, 1758)1878. *Mitra scabricola* KOBELT, Illust. Conch., p. 65 (non *Buccinum scabriculum* LINNAEUS, 1758)

Shell: Shell moderately large, elongate-ovate, light in weight; ivory-white to cream in colour, ornamented with reddish-brown interrupted spiral lines and generally two broader reddish-brown spiral bands on the body whorl. Sutures moderately impressed, whorls long and convex, rounded at sutures, numbering from 7 - 8 apart from protoconch of 3½ glassy-white nuclear whorls; elevated irregularly spaced spiral ridges encircle the shell, ridges ornamented with interrupted reddish-brown spiral lines, and numbering from 19 - 28 on the body whorl and from 9 to 16 on the penultimate whorl. Whorls are axially striate, striae continuous and overriding spiral ridges; the interstitial sculpture of the spiral ridges consists of additional fine spiral striae, varying in number from 2 - 7; early whorls generally whitish and granulose. Aperture equal in height or longer than the spire, fusiformly elongate to convexly elongate, outer lip moderately thickened and crimped, and incised with short transverse lines which extend a short way into the porcelain-white or cream aperture. Columella white or cream, with 5 prominent oblique folds; anterior canal calloused, straight or slightly recurved, base of outer lip slightly pointed and longer than the anterior canal.

L: 25 to 63 mm W: 30 to 37% A: 52 to 59%

Type locality: Océan des grandes Indes.**Habitat:** In clean and muddy sand substrate, from 0 - 4 fathoms.

Moderately rare.

Distribution: Throughout the Fiji Islands - From the Red Sea through the tropical Indo-Pacific to Polynesia.**Discussion:** *Mitra granatina* LAMARCK has been used interchangeably for this species and also for *M. scabricula* (LINNAEUS). LINNAEUS (1758, p. 740) placed originally *M. scabricula* in the genus *Buccinum*, as the broad, heavy and ventricose appearance of the species bears a superficial resemblance to other members of that genus.*Mitra granatina* has been well illustrated in the Encyclopédie méthodique (1798; pl. 371, figs. 4a, 4b), which are the type figures, and also in KIRA (1959; pl. 34, fig. 4) and DAUTZENBERG (1935; pl. 2, fig. 6).An unusual fully mature dwarf variant has been dredged by A. Jennings (personal communication) in 10 fathoms off the Mamanuca group. The specimen resembles *Mitra granatina*, but is much smaller (L: 12.5 millimeters), moderately broad (W: 37%) with an aperture longer than the spire (A: 58%). The whorls are shorter, spiral ridges more prominent and wide-spaced,

numbering 15 on the body whorl and 4 on the penultimate whorl; whorls number 6 apart from the protoconch which is rather bulbous; the aperture is narrower especially towards the base and the columella has 6 columellar folds.

As only one specimen is known at the present time, and as it closely resembles *Mitra granatina*, it has been listed and illustrated as a variant only.

48. *Mitra (Cancilla) incarnata* REEVE, 1845

(Plate 16; Figures 39, 39a)

1845. *Mitra incarnata* REEVE, Conch. Icon., pl. 36, sp. 299

1882. *Mitra (Cancilla) carnicolor* REEVE, TRYON (pars), Man. Conch., 4: 139; pl. 41, fig. 186

Shell: Shell small, fusiformly-elongate, light in weight; ivory-white, cream or flesh in colour, generally ornamented with one or two broad brown transverse bands of varying intensity on the body whorl; the basal transverse band is indistinct and often absent, earlier whorls with a narrow brown spiral band adjoining sutures. Sutures weakly to moderately impressed, whorls convex, rounded at sutures, numbering from 6 - 9 apart from protoconch of two glassy-white nuclear whorls; elevated narrow spiral ridges encircle the shell, ridges angulate but slightly rounded on summits, numbering from 10 - 14 on the body whorl and from 3 - 4 on the penultimate whorl. Interspaces are axially closely grooved, separating the interstitial area into five rows of axially oriented small fillets; the central row of fillets is slightly more elevated than the two rows of fillets on either side; longitudinal grooves number from 50 - 70 on the body whorl. Aperture equal in height or slightly longer than the spire, narrow, elongate and pointedly rounded basally, outer lip moderately thickened and crimped; interior of aperture porcelain-white. Columella calloused basally, white in colour, with 4 - 5 oblique folds; anterior canal straight, sharp and pointed.

L: 15 to 30 mm W: 30 to 34% A: 48 to 55%

Type locality: Cagayan, Mindanao, Philippine Islands.

Habitat: On coral-rubble substrate, from 10 - 15 fathoms. Moderately rare.

Distribution: West Viti Levu. - From the Philippine Islands to Fiji, Hawaii?

Discussion: The type specimen of *Mitra missa* DALL (MS name), illustrated as a variant of *M. peasei* DOHRN, 1860 by J. CATE (1963; pl. 8, fig. 45) appears rather similar to the specimen illustrated here as *M. incarnata* REEVE.



49. *Mitra (Cancilla) interlirata* REEVE, 1844

(Plate 16; Figures 36, 36a)

1844. *Mitra interlirata* REEVE, Conch. Icon., pl. 10, sp. 70

1858. *Mitra foveolata* DUNKER, Novit. Conch., p. 46; pl. 15, figs. 5, 6

1882. *Mitra (Cancilla) flammea* TRYON (pars), Man. Conch., 4: 140; pl. 41, fig. 192 (non QUOY & GAIMARD, 1833)

Shell: Shell fusiformly-elongate, moderately small, light in weight; whitish in colour, ornamented with from one to three transverse rows of irregular but generally quadrate rusty-brown spots or axial streaks on the body whorl, and a single row of spots or streaks on earlier whorls; in some individuals the spots are arranged in ill-defined transverse bands. Sutures weakly impressed, whorls slightly convex, subangulate or rounded at sutures, numbering from 8 - 9 apart from protoconch of 3 white nuclear whorls; elevated, sharp and narrow spiral ridges encircle the shell, numbering from 12 - 14 on the body whorl and from 3 - 4 on the penultimate whorl; spiral ridges ornamented with interrupted reddish-brown spiral lines. Interstices of spiral ridges with a slightly elevated, lirate intermediate spiral ridge and numerous (about 60 - 80) elevated axial riblets. Aperture equal in height or slightly longer than the spire, very narrow and elongate, outer lip moderately thin and crimped; interior of aperture porcelain-white. Columella white, rarely with a brown blotch, with 5 - 6 prominent oblique folds, the last two folds rather ill-defined; anterior canal produced and pointed, straight or slightly recurved. L: 18 to 40 mm W: 28 to 31% A: 53 to 57%

Type locality: Island of Masbate, Philippines.

Habitat: In sand substrate and among weed, from 10 - 17 fathoms.

Rare.

Distribution: West Viti Levu. - From Mauritius through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: *Mitra interlirata* REEVE and six other similar species were placed in the synonymy of *M. flammea* QUOY & GAIMARD by TRYON (1882); the latter species is quite distinct, and is discussed elsewhere in this paper.

50. *Mitra (Cancilla) peasei* DOHRN, 1860

(Plate 15; Figures 35, 35a)

1860. *Mitra peasei* DOHRN, Proc. Zool. Soc. London. pt. 28: 366

1921. *Mitra langfordi* PILSBRY, Proc. Acad. Sci. Phila., 72: 315; pl. 12, fig. 20

Shell: Shell small, narrow, fusiformly-elongate; white or greyish-white in colour, ornamented with chestnut-brown spiral ridges. Sutures weakly to moderately impressed, whorls flattened to slightly convex, subangulate at sutures,

numbering from 6-9 apart from protoconch of $2\frac{1}{2}$ -3 pearly white nuclear whorls; reddish-brown to dark chestnut-brown elevated spiral ridges encircle the shell, ridges fairly thin and rounded, numbering from 10-13 on the body whorl and from 3-5 on the penultimate whorl. Interstices of spiral ridges concave, with from 3-7 intermediate fine transverse threads; moderately deep axial grooves bisect main ridges and intermediate spiral threads, numbering from 30-60 on the body whorl. Aperture about equal in height to the spire, narrow, elongate and pointedly rounded basally, outer lip moderately thin and crimped; interior of aperture porcelain-white or bluish-white. Columella white, with 4-5 oblique folds; anterior canal slightly calloused, straight or slightly recurved.

L: 11 to 26 mm W: 28 to 34% A: 45 to 55%

Animal: Sole and dorsum of foot translucent creamy-white, ornamented with small oval snow-white spots. Siphon very long, snow-white; tentacles slender and white, eyes moderately large, black.

Type locality: Australia.

Habitat: In clean and slightly muddy sand, on coral fragment and weed substrate, from 0-17 fathoms.

Moderately common.

Distribution: Throughout the Fiji Islands. - From Australia through the tropical Pacific to Hawaii.

Discussion: The size quoted by DOHRN (1860) for the species was: Length 37 mm, width 11 mm and aperture 20 mm. While Fiji specimens agree in the aperture and obesity ratios, the average length is only 20 mm; the majority of specimens examined had the chestnut-brown lining of the spiral ridges continuous, not interrupted.

The smallest juvenile specimen collected in Fiji was 8 millimeters in length and had only 5 whorls, 4 pearly-white nuclear whorls, and only 20 axial grooves.

51. *Mitra (Cancilla) philippinarum* A. ADAMS, 1853

(Plate 15; Figure 32)

1844. *Mitra flammea* REEVE, Conch. Icon., pl. 16, sp. 120 (non QUOY & GAIMARD, 1833)

1853. *Mitra philippinarum* A. ADAMS, Proc. Zool. Soc. London, pt. 19: 141

Shell: Shell moderately small, elongate-fusiform, spire pointed; very variable in colour, but generally whitish or grey, ornamented with irregular dark brown or greenish brown axial streaks and blotches; the spiral ridges are lined with interrupted orange-brown to reddish-brown spiral lines. Sutures slightly impressed, whorls convex, subangulate at sutures, numbering from 8-10 apart from protoconch of 2- $2\frac{1}{2}$ glassy-brown nuclear whorls. Elevated, keel-like spiral ridges encircle the shell, ridges lined with orange-brown and numbering from 12-17 on

the body whorl and from 3-5 on the penultimate whorl; in some specimens the spiral ridges tend to become more rounded and flat towards the base. Interstices of spiral ridges deeply "V"-shaped, cancellated with numerous axial grooves and occasionally smaller intermediate spiral ridges or striae; the axial grooves are either confined to the interstices or may override the spiral ridges. Aperture longer than the spire, very narrow and elongate, outer lip moderately thickened and crenulate; interior of aperture dark greyish-brown, interior edge of outer lip white. Columella whitish, calloused, with 5-6 oblique folds; anterior canal straight or slightly recurved.

L: 14 to 32 mm W: 31 to 37% A: 56 to 62%

Animal: Sole of foot uniformly white; dorsum of foot whitish, ornamented with small clusters of white spots at edges, anterior region of foot speckled with black. Siphon black, very finely spotted with white, distal end banded with white; tentacles thin, translucent creamy-yellow, with a fine longitudinal black line, base dark grey; eyes black.

Type locality: Philippine Islands.

Habitat: In clean and muddy sand and among weed, in shallow water.

Common.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands to Fiji.

Discussion: In large specimens (about 30 mm in length) the spiral ridges are less prominent, and interstices are concave instead of "V"-shaped.

52. *Mitra (Cancilla) pia* DOHRN, 1860

(Plate 16; Figures 37, 37a)

1860. *Mitra pia* DOHRN, Proc. Zool. Soc. London, pt. 28: 366

1934. *Mitra (Tiara) fijiensis* LADD, B. P. Bishop Mus. Bull., 119: 227; pl. 40, fig. 7

Moderately rare.

Shell: Shell small to moderate in size, fusiform, fairly solid; dirty-white to light fawn in colour, ornamented with golden-brown spiral ridges. Sutures moderately impressed, whorls flattened to slightly convex, subangulate to angulate at sutures, numbering from 8-10 apart from protoconch of 3 glassy-white nuclear whorls, first embryonic whorls generally tipped with violet; angulate and elevated spiral ridges encircle the shell, ridges narrow, slightly rounded at the summits and coloured a glossy golden-brown; spiral ridges number from 12-14 on the body whorl and from 3-4 on the penultimate whorl. Interstices of spiral ridges sculptured with a slightly risen finely beaded intermediate ridge, generally golden brown in colour; numerous, fine and elevated axial riblets cross interstices, numbering from 90-110 on the body whorl;

in one and the same specimen the axial riblets may be confined to the interstices or may override the intermediate spiral ridge. Aperture equal in height or longer than the spire, narrow and elongate, outer lip moderately thickened and crimped; interior of aperture porcelain-white. Columella slightly oblique and calloused basally, white in colour, with 4 - 6 oblique folds; anterior canal slightly produced and recurved.

L: 20 to 42 mm W: 31 to 34% A: 48 to 60%

Type locality: Australia.

Habitat: In sand and coral fragment substrate, from 10 to 17 fathoms.

Distribution: West Viti Levu. – Australia?

Discussion: The interstitial sculpture of this species is very similar to that of *Mitra interlirata* REEVE, from Fiji except that the intermediate spiral ridges on *M. pia* are slightly more elevated and golden-brown in colour, the axial riblets are narrower and more numerous, and the base of the transverse ridges is broader; the two species also differ in colour pattern, obesity and sculpture of whorls.

53. *Mitra (Cancilla) praestantissima* RÖDING, 1798

(Plate 15; Figures 34, 34a)

1791. *Voluta scabricula* GMELIN (pars), Syst. Nat., ed. 13, p. 3450

1798. *Mitra praestantissima* RÖDING, Mus. Bolten., p. 138

1850. *Mitra filosa gracilis* PHILIPPI, Zeitschr. Malakozool., 7: 26 (non REEVE, 1844)

1962. *Tiara filaris* KIRA, Shells West. Pacific, p. 98; pl. 35, fig. 1 (non *Voluta filaris* LINNAEUS, 1771)

Shell: Shell moderately small, elongate-fusiform, narrow, light in weight; white in colour, ornamented with reddish-brown or chestnut-brown spiral ridges. Sutures moderately impressed, whorls long, flattened or very slightly convex, subangulate at sutures, numbering from 8 - 10 apart from protoconch which is usually eroded; slightly elevated, chestnut-brown spiral ridges encircle the shell, ridges rounded and lirate, numbering from 10 - 12 on the body whorl and from 3 - 5 on the penultimate whorl. Interstices of spiral ridges cancellate with close-set or wide-spaced narrow axial grooves, and occasionally with a chestnut-brown intermediate spiral ridge; the interspaces are further ornamented with from 2 - 10 smaller and finer spiral threads, axial grooves bisect the main and intermediate spiral ridges, numbering from 50 - 95 on the body whorl. Aperture shorter than the spire, narrow, fusiform, pointedly rounded basally, outer lip moderately thickened and undulate; interior of aperture porcelain-white. Columella calloused basally, white in colour, with 3 - 5 prominent oblique folds; anterior canal calloused and straight.

L: 18 to 35 mm W: 26 to 29% A: 42 to 48%

Type locality: Nonc.

Habitat: In clean and weedy sand substrate, from 0 - 17 fathoms.

Uncommon.

Distribution: Throughout the Fiji Islands. – From Mauritius through the tropical Indo-Pacific to Polynesia.

Discussion: The species has occasionally been regarded by various writers as the slender form of *Mitra filaris* (LINNAEUS), but it is a clearly separable and distinct species.

RÖDING (1798) referred to MARTINI (=CHEMNITZ, 1780; Vol. 4, pl. 149, figs. 1388, 1389) for illustrations of the species; although the whorls are drawn somewhat too rounded at the sutures, they appear to represent the same species as illustrated here under *Mitra praestantissima* RÖDING.

54. *Mitra (Cancilla)* species

(Plate 14; Figure 19)

Shell: Shell moderate in size, fusiformly elongate-ovate, heavy and solid; dirty-white in colour, occasionally cream, ornamented with a broad orange-brown central transverse band on the body whorl, and two zones of fairly regular axial streaks at the sutures and base; earlier whorls with irregular orange-brown axial streaks. Sutures moderately impressed, whorls convex, rounded at sutures, numbering from 8 - 9 apart from protoconch which was eroded in specimens examined; slightly elevated and angulate spiral ridges encircle the shell, numbering from 13 - 16 on the body whorl and from 4 - 5 on the penultimate whorl. Interstices of spiral ridges shallow, sculptured with deep axial grooves and one or two fine lirate intermediate spiral threads. Body whorl very long, aperture longer than the spire, moderately broad, outer lip almost straight and crenulate; interior of aperture porcelain-white. Columella white with 5 oblique folds which decrease in size towards the base; anterior canal calloused and slightly recurved.

L: 38 to 44 mm W: 32 to 34% A: 63 to 66%

Habitat: In sand and coral fragment substrate, from 10 to 17 fathoms.

Rare.

Distribution: South and West Viti Levu. – ?

Discussion: The species is somewhat similar to *Mitra (Cancilla) philippinarum* A. ADAMS, but it is larger in size, with a longer body whorl and aperture, less elevated spiral ridges, shallow interstices, deep axial grooves and convexly rounded whorls. The aperture is broader, outer lip almost straight and the interior of the aperture is always porcelain-white, not dark greyish-brown as in *M. philippinarum*.

The intermediate spiral threads are absent in some interstices on the same shell. The species conforms with the diagnosis of *Mitra rufescens* A. ADAMS, 1853, described

from a specimen (or specimens) obtained by the "H. M. S. Samarang" in the China Seas. The species was not figured by ADAMS (1853) and was not even mentioned by SOWERBY (1874) in his monograph on *Mitra*.

Strigatella SWAINSON, 1840

Type species by original designation *Mitra zebra* LAMARCK, 1811 = *Strigatella paupercula* (LINNAEUS, 1758).

1840. *Strigatella* SWAINSON, Treat. Malac., 127: 319

1840. *Mitreola* SWAINSON, Treat. Malac., 127: 320

Characteristics: Shell ovate to elongate-ovate, heavy and solid, spire acuminate, sutures plain or rarely obsoletely coronate, whorls smooth, spirally striate or occasionally granulose, aperture narrow, outer lip thick, smooth or crenulate, interior of outer lip with a prominent callus, interior of aperture smooth, columella obliquely plicate, anterior canal short. Shell covered with a thick or thin epidermis.

55. *Strigatella acuminata* (SWAINSON, 1824)

(Plate 18; Figure 66)

1824. *Mitra acuminata* SWAINSON, Quart. Journ. Sci. Inst. Great Brit., 17(33): 36 (non *Voluta acuminata* GME-LIN, 1791)

1832. *Mitra acuminata* SWAINSON, Zool. Illust., ser. 2, p. 128, fig. 3

1833. *Mitra lutea* QUOY & GAIMARD, Voy. Astrol., 2: 650; pl. 55bis, figs. 7, 8, 9

Shell: Shell moderately small, elongate-ovate, solid, spire concave and acuminate; cream or yellowish in colour throughout. Sutures deeply impressed, whorls flattened, numbering from 8 - 9 apart from porcelain-white protoconch; numerous close-set and fine spiral striae encircle the shell, striae occasionally only faintly visible on the body whorl, but distinct on earlier whorls, numbering from 30 - 40 on the body whorl and from 12 - 17 on the penultimate whorl. Aperture longer than the spire, moderately broad and angulate, outer lip thickened and smooth, calloused near point of commencement; interior of aperture porcelain-white with a faint rosy tinge, edge of outer lip calloused and occasionally coloured yellow. Columella white or very light rose, with 4 - 5 oblique folds; anterior canal straight.

L: 22 to 29 mm W: 40 to 44% A: 56 to 61%

Type locality: Port Dorey.

Habitat: Under coral rocks on sand substrate, in shallow water.

Rare.

Distribution: South Viti Levu and the Lau Islands. - From Mauritius through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: *Strigatella acuminata* (SWAINSON) is not congeneric with *Voluta acuminata* GME-LIN, 1791 (p. 3454). GME-LIN's citation to figures was to CHEMNITZ (1780; pl. 150, figs. 1403, 1404), which depict an elongate fusiform shell, transversely and axially striate and of a costate appearance; they resemble a shell similar to *Vexillum granosum* (GME-LIN), and may possibly represent that species.

Mitra lutea RÖDING, 1798 is a *nomen nudum*.

56. *Strigatella auriculoides* (REEVE, 1845)

(Plate 18; Figure 61)

1839. *Mitra unifascialis* KIENER, Spéc. Gén. Icon. Coq. Viv., p. 53; pl. 16, fig. 51 (non LAMARCK, 1811)

1845. *Mitra auriculoides* REEVE, Conch. Icon., pl. 28, sp. 228

Shell: Shell small, elongate-ovate, rather solid; reddish-brown to chestnut-brown in colour, ornamented with either a narrow or moderately broad white transverse band anteriorly to the suture on the body whorl, and a single white band adjoining sutures on earlier whorls. The white transverse band is often blotched with white, and the band on the earlier whorls is often interrupted; the body whorl is occasionally finely spotted with white, and spots may be arranged in longitudinal rows. Sutures moderately impressed, whorls flattened or convex, rounded at the sutures, numbering from 5 - 6 apart from protoconch which is always eroded in adults; close-set, fine and punctate spiral lines encircle the shell, numbering from 18 - 25 on the body whorl and from 4 - 6 on the penultimate whorl; spiral grooves become deeper and more prominent towards the base. Aperture much longer than the spire, narrow, outer lip thickened and almost perpendicular, sinuated anteriorly and crenulated basally with 10 - 15 nodules; interior of aperture white or bluish-white. Columella concave, white or light brown, with 4 - 5 prominent oblique folds; anterior canal short and straight, spirally corded.

L: 15 to 24 mm W: 45 to 53% A: 60 to 72%

Type locality: None.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Uncommon.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands through the tropical Pacific to Polynesia and Hawaii.

57. *Strigatella columbellaformis* (KIENER, 1839)

(Plate 17; Figure 56)

1839. *Mitra colombelliformis* KIENER, Spéc. Gén. Icon. Coq. Viv., p. 47; pl. 15, fig. 461844. *Mitra columbellaformis* REEVE, Conch. Icon., pl. 18, sp. 138 (emendment)1844. [?] *Mitra decurtata* REEVE, Conch. Icon., pl. 20, sp. 1541882. *Mitra (Strigatella) limbifera* TRYON (pars), Man. Conch., 4: 154; pl. 45, figs. 323, 324 (non LAMARCK, 1811)

Shell: Shell moderate in size, broadly ovate and heavy; light or dark brown in colour, ornamented with irregular white blotches at the sutures. Sutures moderately impressed, whorls flattened or very slightly convex, numbering 6 apart from protoconch which is usually eroded in adult shells; close-set, moderately shallow punctate spiral grooves encircle the shell, numbering from 27 - 35 on the body whorl and from 7 - 8 on the penultimate whorl. The body whorl is transversely and axially striate, but the striae are so fine that they are only visible under magnification. Aperture longer than the spire, prominently calloused at point of commencement, outer lip very thick and smooth, contracted centrally, calloused within, truncated basally; interior of aperture white or bluish-white. Columella whitish, calloused, with 6 prominent oblique white folds; anterior canal straight.

L: 31 to 40mm W: 50 to 54% A: 62 to 68%

Type locality: Madagascar.**Habitat:** Under coral rocks on sand and reef substrate, in shallow water.**Rare.****Distribution:** North Viti Levu. - From Melanesia to Polynesia.**Discussion:** This species is variable in colour pattern; some specimens are almost fully brown throughout and with only a few small white spots, while some individuals are ornamented with a white transverse band at the sutures.

KIENER's type locality of Madagascar needs confirmation, as the species appears to be restricted to the Pacific region.

58. *Strigatella crassa* (SWAINSON, 1822)

(Plate 13; Figure 10; Text figure 7)

1822. *Mitra crassa* SWAINSON, Zool. Illust., ser. 1, pl. 88, fig. 4 (top and bottom)

Shell: Shell moderate in size, elongate-ovate, very heavy and solid; dark brown in colour, ornamented with a single narrow yellow or yellowish-brown transverse band just anteriorly to the sutures; occasional specimens have small fine white nodules at the sutures. Sutures deeply impressed, whorls flattened, numbering from 6 - 7 apart from protoconch of $1\frac{1}{2}$ - 2 dirty-white nuclear whorls; moderately deep spiral grooves encircle the shell, numbering from 17 - 26 on the body whorl and from 4 - 9 on the penultimate whorl; grooves are occasionally finely axially striate, and terminate as spiral ridges towards the base. Aperture longer than the spire, convexly-elongate, occasionally constricted at anterior third; outer lip thickened and crenulate. Interior of aperture whitish or pale violet; first third of columella brown, remainder whitish and calloused, with 5 - 6 prominent and oblique folds. Anterior canal only slightly calloused and straight.

L: 27 to 48mm W: 40 to 47% A: 55 to 63%

Animal: Sole of foot plain creamy-white; dorsum of foot uniformly chestnut-brown, minutely lined with dark brown, posterior region dark brown, edges of foot white. Siphon pale yellow, becoming brown towards its distal end which is banded with white; tentacles thick, short and pointed, chestnut-brown or tan in colour, points tipped with white, base of tentacles white. Eyes very small and black.

Part of the shell was removed to allow unhindered examination of the animal while living. The siphon was pure white, bulb distension a pale yellow, and measured 27mm in length. The proboscis is being distended and retracted through a circular opening between the eyes, and can be withdrawn completely into the body interior. The entire length of the proboscis is finely latitudinally wrinkled, with the exception of the bulb at the distal end which is fairly smooth. The odontophore is positioned

Explanation of Plate 17

- Figure 50: *Mitra cucumerina* LAMARCK. Fiji (x 2.0) Figure 50a: *Mitra cucumerina* LAMARCK, showing detail of sculpture on body whorl (approx. x 5.0) Figure 51: *Mitra chrysalis* REEVE. Fiji (x 2.0) Figure 51a: *Mitra chrysalis* REEVE, showing detail of sculpture on body whorl. (approx. x 5.0) Figure 52: *Mitra floridula* SOWERBY. Fiji (x 1.25) Figure 53: *Mitra lugubris* SWAINSON. Fiji (x 1.6) Figure 54: *Mitra* cf. *M. nigricans* PEASE. Fiji (x 1.9) Figure 55: Type-figures of *Mitra coronata* LAMARCK, from the "Encyclopédie méthodique." Figure 55a: *Mitra coronata* LAMARCK, dark coloured specimen dredged from 17 - 20 fathoms West off Nadi, Fiji (x 2.0) Figure 55b: *Mitra coronata* LAMARCK, axially plicate specimen from 7 fathoms, Bay of Islands, Suva, Fiji. (x 2.0) Figure 55c: *Mitra coronata* LAMARCK, specimen similar to LAMARCK's holotype, extant in the Muséum d'Histoire Naturelle, Geneva. Fiji (x 1.5) Figure 56: *Strigatella columbellaformis* (KIENER). Fiji (x 1.2) Figure 57: *Strigatella telescopium* (REEVE). Fiji (x 2.0) Figure 58: *Strigatella scutulata* (GMELIN). Fiji (x 1.3) Figure 59: *Strigatella paupercula* (LINNAEUS). Fiji (x 1.6) Figure 60: *Strigatella pelliesserpentis* (REEVE). Fiji (x 1.75)

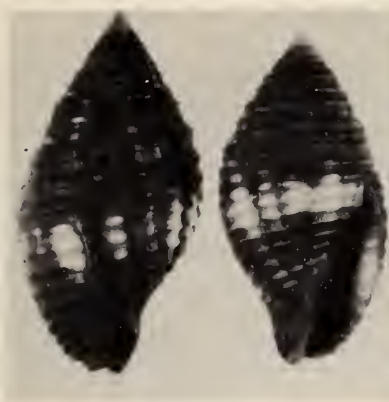


Figure 50



Figure 50 a



Figure 51

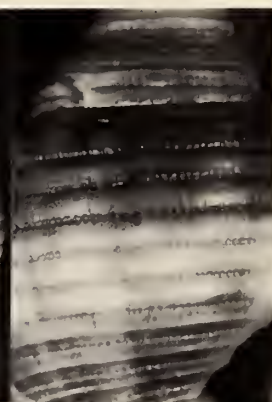


Figure 51 a

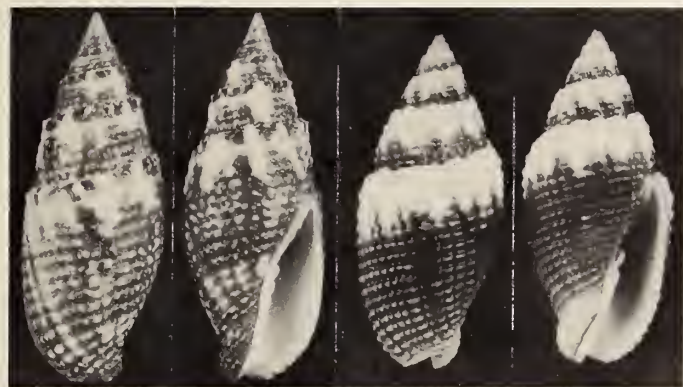


Figure 52



Figure 53



Figure 54



Figure 55



Figure 55 a



Figure 55 b



Figure 55 c

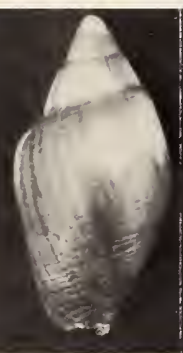


Figure 56



Figure 57



Figure 58

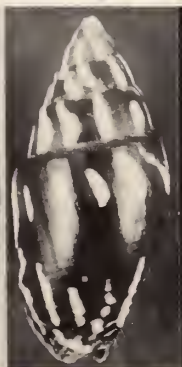
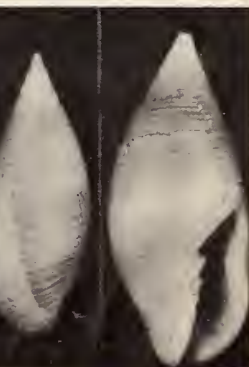


Figure 59



Figure 60



within the bulb-like distension, and attached to the interior lining by two main muscle fibers imbedded in the tissues. There is a considerable shrinkage of the proboscis in preserved specimens (17 - 18 mm); specimens preserved in spirits have all organs coloured a uniform purplish-grey, due to the discharge of purple mucus at the time of death. The tissues of the proboscis are extremely tough, and repeated cutting with a scalpel is required to penetrate the outer tissue layers.

Radula: Specimens examined ranged from 39 to 45 mm in length. The radular ribbon is of the typical *Strigatella*

centes). The centrals are roughly trapezoidal in shape, broader than they are long, with 5 moderately short main cusps; the two small side-denticles are often obsolete in some centrals of the same radula. The laterals are cleaver-shaped, three times as broad as the centrals, and have from 10 - 13 cusps; the last cusp generally becomes an obsolete denticle, and there may be an additional two denticles in some specimens.

Type locality: None.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Moderately common.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands through the tropical Pacific to Polynesia.

Discussion: The live animal pattern and radula are those of the genus *Strigatella* and closely resemble those of *S. litterata* (LAMARCK) and *S. tristis* (BRODERIP) [CERNOHORSKY, in preparation]. The species should therefore be removed from *Mitra s. str.* and transferred to the genus *Strigatella*.

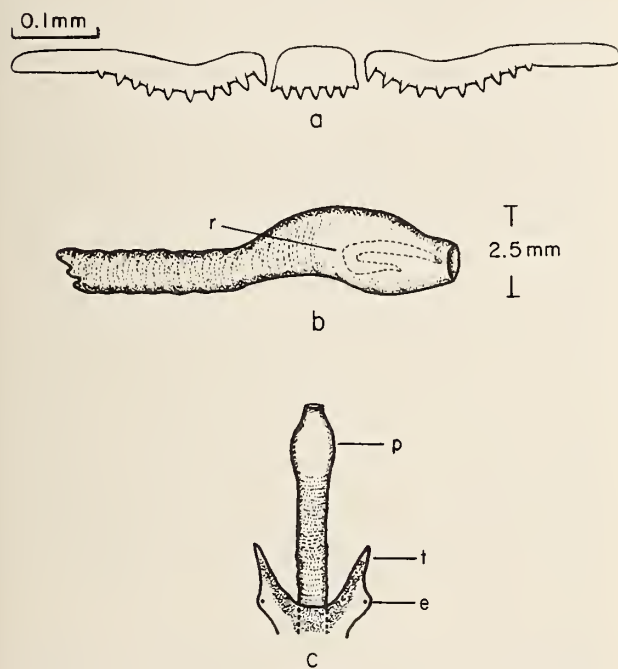


Figure 7

Strigatella crassa (SWAINSON). Fiji Islands.

a. one row of radular teeth

b. lateral view of proboscis in extended position

c. dorsal view of head of animal

r = radula *in situ* p = proboscis t = tentacle
e = eye

pattern and translucent white. The length of the ribbon varied from 0.7 to 0.9 mm in specimens examined. The first four to six rows were worn, centrals and laterals exhibiting the same amount of wear. The ribbon consists of 92 to 105 fully-formed rows of teeth (plus 4 - 6 nas-

59. *Strigatella litterata* (LAMARCK, 1811)

(Plate 18; Figure 65)

1811. *Mitra litterata* LAMARCK, Ann. Mus. Hist. Nat., 17: 220

1822. *Columbella bizonalis* LAMARCK, Anim. sans Vert. 7: 294

1923. *Mitra (Strigatella) litterata* var. *minor* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 145

1923. *Mitra (Strigatella) litterata* var. *major* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 145

Shell: Shell small, broadly ovate and heavy, spire rounded; white to cream in colour, ornamented with irregular dark brown or almost black wavy axial streaks and blotches, often arranged in two to three transverse zones on the body whorl. Sutures moderately impressed, whorls convexly rounded, numbering from 5 - 7 apart from protoconch which is always eroded in adult shells; close-set spiral rows of shallow punctures encircle the shell, numbering from 17 - 29 on the body whorl and from 4 - 13 on the penultimate whorl. Aperture much longer than the spire, narrow, rounded basally; outer lip very thick, occasionally calloused at point of commencement, straight or slightly constricted centrally, calloused within; interior of aperture bluish-white. Columella whitish, with 4 - 5 prominent white oblique folds; anterior canal straight or slightly recurved.

L: 16 to 29 mm W: 50 to 61% A: 67 to 79%

Animal: Sole of foot white; dorsum of foot uniformly chestnut-brown. Siphon light brown, tentacles short, chestnut-brown in colour and tipped with white; eyes black and ringed with white.

Type locality: Océan indien.

Habitat: Under coral rocks on sand substrate, in crevices of coral reefs, in shallow water.

Common.

Distribution: Throughout the Fiji Islands. – From the Red Sea through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: LAMARCK's original description lacks references to illustrations; his description, however, points out all the salient features of the species, which can be unequivocally identified from LAMARCK's diagnosis alone.

60. *Strigatella oleacea* (REEVE, 1844)

(Plate 18; Figure 63)

1844. *Mitra oleacea* REEVE, Conch. Icon., pl. 14, sp. 105

1882. *Mitra (Strigatella) scutulata* TRYON (pars), Man. Conch., 4:155; pl. 46, fig. 336 (non *Voluta scutulata* Gmelin, 1791)

Shell: Shell moderately small, elongate-ovate or ovate, solid, spire short; tan to dark brown in colour, colour pattern often appearing as dark brown, broad axial streaks upon a chestnut-coloured background; dark brown spiral lines encircle the shell, but are mostly obscured and only visible at the edge of the outer lip. Sutures deeply impressed and obsolete finely crenate, whorls slightly convex, numbering from 6-7 apart from protoconch which is eroded in adult shells; body whorl bulbous, apex of spire whitish. Fine and shallow spiral grooves encircle the shell, grooves usually obsolete on the central area of the body whorl, but distinct on earlier whorls; spiral grooves number from 6-14 on the body whorl and from 4-7 on the penultimate whorl. Fine and close-set axial growth-striae arc visible on the penultimate and earlier whorls. Aperture longer than the spire, moderately narrow, outer lip thick and smooth, convexly elongate, calloused interiorly near point of commencement; the edge of the outer lip is lined with short dark brown lines. Interior of aperture porcelain-white, columella white, calloused basally, with 5 prominent oblique folds; anterior canal short and straight.

L: 15 to 24 mm W: 46 to 51% A: 61 to 68%

Type locality: None.

Habitat: Under coral rocks on sand substrate, in shallow water.

Rare.

Distribution: North Viti Levu. – From Mauritius through the tropical Indo-Pacific to Fiji.

Discussion: *Strigatella pellisserpentis* (REEVE) differs from this species in colour, and it is also narrower, more elongate, with a shorter aperture, granulose whorls and a prominently crenulate and differently formed outer lip.

61. *Strigatella paupercula* (LINNAEUS, 1758)

(Plate 17; Figure 59)

1758. *Voluta paupercula* LINNAEUS, Syst. Nat., ed. 10, p. 731

1798. *Mitra venosa* RÖDING, Mus. Bolten., p. 137

1811. *Mitra zebra* LAMARCK, Ann. Mus. Hist. Nat., 17: 215

1817. *Mitra radiata* SCHUMACHER, Essai Nouv. Syst., p. 238

1833. *Mitra retusa* QUOY & GAIMARD, Voy. Astrol., 2: 645; pl. 45, figs. 19-22 (non LAMARCK, 1811)

1844. *Mitra virgata* REEVE (pars), Conch. Icon., pl. 25, fig. 197b only (non *Voluta virgata* Gmelin, 1791)

1923. *Mitra (Strigatella) paupercula* var. *obtusata* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 149

Shell: Shell small, elongate-ovate to ovate, rather solid; dark brown to almost black in colour, ornamented with straight or waved white axial streaks, which are either continuous from the suture to the base or interrupted centrally. Sutures weakly impressed, whorls flattened or very slightly convex, numbering from 5-7 apart from protoconch of 2 white nuclear whorls. Body whorl generally smooth, with the exception of the basal part which bears 6-9 thin and sharp spiral cords; in immature specimens the earlier whorls have 5-9 elevated thin spiral ridges which become ill-defined and obsolete with maturity. Aperture longer than the spire, moderately broad, outer lip thick, contracted near the point of commencement, calloused on the interior edge; edge of outer lip either smooth or with 4-9 faint crenules towards the anterior. Interior of aperture uniformly brown, edge of lip bluish-white in some specimens; columella brown, whitish and calloused basally, with 4-5 prominent white folds; anterior canal straight and spirally corded.

L: 14 to 32 mm W: 45 to 59% A: 56 to 73%

Type locality: M. mediterraneo [error].

Habitat: Under coral rocks on sand and reef substrate, more often in crevices of rocks near the high tide level.

Moderately common.

Distribution: South and West Viti Levu. – From the Red Sea through the tropical Indo-Pacific to Samoa.

Discussion: The species is extremely variable in shape, colour and pattern. It occurs in widely dispersed localities in Fiji, but when encountered is usually frequent, especially near the high-tide level in rock crevices.

Mitra pica (DILLWYN, 1817) is similar in colour-pattern, but differs in being more elongate, with a pointed and attenuated base, and fine spiral striae covering the entire body whorl; the outer lip lacks the prominent callus on the interior of the outer lip, and is moderately thin and convexly elongate instead, with a coffee-brown interior. *Mitra tigrina* A. ADAMS, 1853 is a synonym of *M. pica* (DILLWYN).

62. *Strigatella pellisserpentis* (REEVE, 1844)

(Plate 17; Figure 60)

1844. *Mitra pellis-serpentis* REEVE, Conch. Icon., pl. 10, sp. 661844. *Mitra granata* REEVE, Conch. Icon., pl. 33, sp. 2711844. *Mitra brumalis* REEVE, Conch. Icon., pl. 34, sp. 2801853. [?] *Mitra grelloisi* RÉCLUZ, Journ. Conchyl., 4: 247; pl. 7, fig. 81874. *Mitra cretacea* SOWERBY, Thes. Conch., 4: 21; pl. 26, figs. 577, 5781874. *Mitra nassoides* SOWERBY, Thes. Conch., 4: 22; pl. 27, fig. 631

Shell: Shell small, elongate-ovate, solid, spire pointed; yellow, yellowish-brown or light tan in colour throughout; rare individuals are ornamented with narrow white axial streaks. Sutures deeply impressed, whorls flattened to slightly convex, numbering from 7 - 9 apart from protoconch of 2 glassy-white nuclear whorls; spiral grooves encircle the shell, grooves sometimes obsolete on body whorl, numbering from 0 - 23 on the body whorl and from 3 - 7 on the penultimate whorl. Close-set, sometimes irregular deep or shallow axial striae bisect the spiral grooves, giving the shell a granulose appearance; axial striae number from 20 - 40 on the body whorl. Some specimens are only faintly grooved on the body whorl, and sutures have small obsolete close-set and rounded coronations; early whorls often whitish and always granulose. Aperture equal in height or slightly longer than the spire, outer lip thickened, fairly straight or slightly constricted, produced on the interior of the outer lip and prominently crenate; interior of aperture cream or yellowish in colour. Columella yellowish, calloused, with 4 prominent slightly oblique folds, ultimate fold ill-defined; anterior canal slightly produced, calloused and spirally corded.

L: 18 to 28 mm W: 38 to 44% A: 51 to 57%

Type locality: Island of Mindoro and Bohol, Philippines.**Habitat:** In clean and weedy sand substrate, occasionally under coral rocks, from 0 - 2 fathoms.

Uncommon.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia and Hawaii.**Discussion:** The species is rather variable in colour, and even more so in sculpture. Some specimens are prominently granulose, while others are almost smooth on the body whorl; occasional individuals have the spiral grooves microscopically striate.63. *Strigatella retusa* (LAMARCK, 1811)

(Plate 18; Figure 64)

1791. *Voluta paupercula* var. 8 GMELIN, Syst. Nat., ed. 13, p. 3447 (non LINNAEUS, 1758)1811. *Mitra retusa* LAMARCK, Ann. Mus. Hist. Nat., 17: 2171841. *Mitra lineata* KÜSTER, Conch. Cab., p. 121; pl. 16, figs. 19, 20 (non *Voluta lineata* GMELIN, 1791, non *Conocelix lineatus* SWAINSON, 1821)1844. *Mitra virgata* REEVE (pars), Conch. Icon., pl. 25, fig. 197a only (non *Voluta virgata* GMELIN, 1791)

Shell: Shell small, elongate-ovate to ovate, heavy and solid, spire blunt, rounded; orange-brown, reddish-brown or dark brown in colour, ornamented with close-set or wide-spaced wavy longitudinal white lines, lines often terminating as spots basally; a narrow whitish transverse band encircles the body whorl some distance anteriorly to the suture and may become obsolete in some individuals. Sutures moderately impressed, whorls convex, rounded at sutures, numbering from 5 - 6 apart from protoconch which is not discernible in adult shells; fine punctate spiral grooves encircle the shell, grooves often obsolete, especially on the body whorl, but distinct towards the base of the shell, where grooves terminate as spiral cords; spiral grooves number from 10 - 17 on the body whorl and from 3 - 5 on the penultimate whorl. Aperture longer than the spire, narrow, centrally constricted, outer lip thick, calloused from the interior, and crenate; interior of aperture brownish. Columella brown with 4 - 5 prominent white oblique folds; anterior canal truncate, generally stained purplish-brown.

L: 15 to 29 mm W: 49 to 59% A: 62 to 73%

Animal: Sole of foot creamy-white; dorsum of foot uniformly chestnut-brown. Other details not observed.**Type locality:** Océan indien.**Habitat:** Under coral rocks on sand and reef substrate, in shallow water.

Uncommon.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia.**Discussion:** REEVE's *Mitra virgata* is a composite species: figure 197a on plate 25 (1844) represents *M. retusa* LAMARCK, and figure 197b on the same plate depicts *M. paupercula* (LINNAEUS). REEVE's description mentions a narrow light transverse zone on the body whorl of the shell, and it appears that it was a variant of *M. retusa* LAMARCK which was intended for his *M. virgata*. GMELIN's *Voluta virgata* is a *Mitra* species and would preoccupy REEVE's specific name if both are placed in the same genus.LAMARCK did not omit to mention the white transverse band on the body whorl in his original description; this feature is not apparent in the two figures from CHEMNITZ cited by LAMARCK (1788, Vol. 10; pl. 150, figs. 1417, 1418). The latter figure, however, clearly shows a crenulate outer lip, a feature which excludes *Strigatella paupercula* (LINNAEUS).

64. *Strigatella scutulata* (GMELIN, 1791)

(Plate 17; Figure 58)

1791. *Voluta scutulata* GMELIN, Syst. Nat., ed. 13, p. 3452
 1798. *Mitra discolor* RÖDING, Mus. Bolten., p. 137
 1802. *Voluta scutellata* BOSCH, Hist. Nat. Coq., 5: 48
 1811. *Mitra amphorella* LAMARCK, Ann. Mus. Hist. Nat., 17: 214
 1852. *Mitra sertum* DUVAL, Journ. Conchyl., 3: 160; pl. 7, fig. 1

Shell: Shell moderate in size, elongate-ovate, heavy and solid; chestnut-brown to blackish-brown in colour, ornamented with short or long wavy axial white streaks and spots; occasional specimens have a yellowish transverse band just anteriorly to the sutures. Sutures moderately impressed, whorls convex, rounded at sutures, numbering from 6 - 7 apart from protoconch of 2 light brown and smooth whorls; slightly elevated and angulate spiral ridges encircle the shell, ridges obsolete centrally on body whorl, numbering from 2 - 7 on the body whorl and from 4 - 7 on the penultimate whorl; interstitial grooves are generally axially striate. The spiral ridges terminate towards the base of the body whorl as narrow rounded spiral cords, numbering from 5 - 10. Aperture longer than the spire, wide in some specimens but narrow in others; outer lip thick, smooth, occasionally obsoletely crenate basally, straight or constricted centrally. Interior of aperture bluish-white or greyish-brown; columella whitish, calloused, with 4 - 5 very prominent oblique folds. Anterior canal straight, calloused and spirally corded.

L: 22 to 43 mm W: 42 to 49% A: 58 to 67%
Type locality: Oceano indico.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Moderately common.

Distribution: Throughout the Fiji Islands. - From the Red Sea through the tropical Indo-Pacific to Polynesia.
Discussion: The species is very variable in colour-pattern and shape. In some specimens the yellowish transverse bands are absent, while in others they are well visible or obscured under the pattern of axial streaks and spots. The banded variant has been described by LAMARCK as *Mitra amphorella*; the more frequent axially streaked specimens are connected through a series of intermediates with the plain brown banded form. Both forms occur together in most Fijian localities and are only intrapopulation variants of a single species.

COTTON (1957) equates *Strigatella litterata* (LAMARCK) with *S. scutulata* (GMELIN); both are, however, clearly separable species.

65. *Strigatella telescopium* (REEVE, 1844)

(Plate 17; Figure 57)

1844. *Mitra telescopium* REEVE, Conch. Icon., pl. 20, sp. 80

Shell: Shell small, elongate-ovate to cylindrically-ovate, moderately solid; whitish to pale cream in colour, ornamented with a very broad chestnut-brown transverse band which covers almost two thirds of the body whorl; the brown zone is bordered by a yellow spiral band, and a single band of the same colour adjoins sutures on earlier whorls. Sutures deeply impressed, penultimate whorl almost perpendicular, earlier whorls flattened and angulate at sutures, numbering from 7 - 8 apart from protoconch which was eroded in specimens examined; fine punctate spiral grooves encircle the shell, grooves becoming more prominent towards the base and number from 13 - 17 on the body whorl and from 3 - 5 on the penultimate whorl. Aperture longer than the spire, narrow and elongate, outer lip contracted near point of commencement and crimped basally; interior of aperture light brown or grey. Anterior part of columella brownish, posterior part white and calloused, with 5 prominent bluish-white oblique folds. Anterior canal straight or slightly recurved.

L: 18 to 23 mm W: 38 to 41% A: 59 to 63%
Type locality: Island of Ticao, Philippines.

Habitat: On coral bottom and sand substrate, in deeper water.

Rare.

Distribution: South Viti Levu. - From the Philippine Islands through the tropical Pacific to Polynesia.

Discussion: The interior callus of the outer lip is extremely weak or absent in some specimens, and the assignment of the species to the genus *Strigatella* is only tentative.

66. *Strigatella turturina* (SOUEBIE, 1875)

(Plate 18; Figure 62)

1875. *Mitra turturina* SOUEBIE, Journ. Conchyl., 23: 43, 297
 1877. *Mitra turturina* SOUEBIE, Journ. Conchyl., 25: 73; pl. 1, fig. 2

Shell: Shell small, ovate, heavy and solid; orange-brown to dark brown or reddish-brown in colour, ornamented with a narrow whitish, occasionally knotted transverse band anteriorly to the suture on the body whorl, and adjoining sutures on earlier whorls; small squarish white spots are arranged in wavy or straight longitudinal rows on the lower part of the body whorl. Sutures weakly to moderately impressed, whorls convex, rounded at sutures, num-

bering from 5 - 6 apart from $1\frac{1}{2}$ - 2 cream-coloured nuclear whorls; fine punctate spiral lines encircle shell, numbering from 18 - 22 on the body whorl and from 4 - 5 on the penultimate whorl; extremely fine axial striae are visible on all whorls. Aperture much longer than the spire, heavily calloused near point of commencement, very narrow, outer lip thick, slightly contracted centrally, and with a prominent triangular callus on the inner edge of the outer lip; interior of aperture white or pink. Columella white, calloused basally, with 4 prominent oblique folds; anterior canal short and straight, spirally corded.

L: 14 to 18 mm W: 56 to 59% A: 64 to 69%

Type locality: Lifou, Loyalty Islands.

Habitat: Under coral rocks on sand substrate, in shallow and deeper water.

Rare.

Distribution: Southwest Viti Levu. - New Caledonia to Polynesia.

Discussion: *Mitra maculosa* REEVE, 1844 is similar in form, but the body whorl in this species is ornamented with a broad whitish to orange transverse zone anteriorly to the suture, while the lower half is dark brown in colour, streaked and flecked with white. *Mitra discors* (GMELIN, 1791) has priority over *M. maculosa* REEVE, as the CHEMNITZ figure referred to by REEVE (1780; Vol. 4, pl. 150, fig. 1400) has also been cited by GMELIN for *Voluta discors*.

The species differs from *Strigatella auriculoides* REEVE in being much broader and having a calloused apertural shoulder, triangular interior callus on the outer lip, and the whole length of the outer lip is simple and smooth, not crenulate towards the base as in *S. auriculoides*.

Vexillinae

Vexillum RÖDING, 1798

Type species by subsequent designation (WOODRING, 1928) *Vexillum plicatum* RÖDING, 1798 = *Vexillum plicarium* (LINNAEUS, 1758).

1798. *Vexillum* RÖDING, Mus. Bolten., p. 138

1810. *Turris* MONTFORT, Conch. Syst., 2: 538

1824. *Vulpecula* BLAINVILLE, Dict. Sci. Nat., 31: 106

1840. *Costellaria* SWAINSON, Treat. Malac., 127: 320

1840. *Callithea* SWAINSON, Treat. Malac., 127: 320 (non BOIS-DUVAL, 1835)

1849. *Turricula* HERMANNSEN, Ind. Gen. Malac., 2: 651 (non SCHUMACHER, 1817)

1929. *Pulchritima* IREDALE, Mem. Qld. Mus., 9(3): 286 (nom. nov. pro *Callithea* SWAINSON, 1840)

1929. *Arenimitra* IREDALE, Mem. Qld. Mus., 9(3): 286

1929. *Mitropifex* IREDALE, Austral. Zool., 5: 346

1963. *Atrimitra* SHIKAMA, Selec. shells world, 1: 92 - 93

Characteristics: Shell elongate-ovate to fusiform, moderately solid, spire elevated, sutures plain or tuberculate, whorls sculptured with axial ribs or striae and generally transverse grooves or ridges; aperture narrow and elongate, occasionally angulate, outer lip thick and smooth, constricted basally, interior of aperture lirate, columella obliquely plicate, anterior canal narrow and produced, generally calloused. Shell covered with a thin epidermis.

67. *Vexillum acupictum* (REEVE, 1844)

(Plate 19; Figure 81)

1844. *Mitra acupicta* REEVE, Conch. Icon., pl. 11, sp. 76

Shell: Shell moderately small, elongate-ovate, light in weight; white to cream in colour, ornamented with one or two indistinct orange to dark brown transverse bands on the body whorl, and irregular blotches, axial streaks, dots and spiral dashes on all whorls; some specimens have the whorls encircled by a narrow white spiral line. Sutures moderately impressed, whorls convex, subangulate at the sutures, numbering from 8 - 10 apart from protoconch of 2 glassy-white nuclear whorls; prominent axial ribs cross whorls, ribs angulate, numbering from 16 - 25 on the body whorl and from 14 - 26 on the penultimate whorl. Interstices of axial ribs with deep transverse grooves, grooves bisecting axial ribs which assume a costate appearance; interstitial grooves number from 14 - 25 on the body whorl and from 4 - 8 on the penultimate whorl. Aperture about equal in height to the spire, angulate and contracted basally, outer lip moderately thickened, slightly undulate and almost smooth; interior of aperture white to cream, with 0 - 20 labral lirae. Columella white or cream, with 4 - 5 prominent oblique folds; base of shell contracted, anterior canal calloused, spirally corded, straight or recurved.

L: 13 to 30 mm W: 33 to 39% A: 45 to 52%

Type locality: Zanzibar.

Habitat: In clean sand substrate, in shallow and deeper water.

Uncommon.

Distribution: Throughout the Fiji Islands. - From the Persian Gulf through the tropical Indo-Pacific to Polynesia.

Discussion: The species is extremely variable in colour pattern and albinotic specimens are collected on rare occasions.

68. *Vexillum amanda* (REEVE, 1845)

(Plate 18; Figure 73)

1845. *Mitra amanda* REEVE, Conch. Icon., pl. 38, sp. 318

Shell: Shell small, elongate-cylindrical, fairly solid; white in colour, ornamented with two to three dark brown narrow transverse bands on the body whorl, and a single band on earlier whorls. Sutures deeply impressed, whorls slightly convex, angulate at sutures, numbering from 8 - 9 apart from protoconch of $2\frac{1}{2}$ - 3 glassy-brown nuclear whorls; prominently angulate, elevated and slightly curved axial ribs cross whorls, numbering from 15 - 20 on the body whorl and from 14 - 19 on the penultimate whorl. Interstices of axial ribs almost "V"-shaped, with flat elevated spiral ridges extending either half-way towards the summits or overriding axial ribs, which become faintly granulose; interstitial spiral ridges number from 14 - 20 on the body whorl and from 5 - 8 on the penultimate whorl. Axial ribs prominent and elevated at the sutures, and a faint shallow presutural groove bisects ribs anteriorly to sutures; axial ribs granulose basally. Aperture shorter than the spire, convexly-elongate, contracted and reflexed basally, outer lip thin and faintly crenulate; interior of aperture white, banded with brown, labral lirae nodulose. Columella whitish with 4 prominent and oblique folds, which extend as strongly granulose ridges onto the body whorl; anterior canal straight and pointed, slightly longer than the aperture.

L: 12 to 15 mm W: 36 to 40% A: 41 to 45%

Type locality: Island of Burias and Negros, Philippines.**Habitat:** In coarse sand and among weed, from 0 to 3 fathoms.

Uncommon.

Distribution: Mamanuca group West off Viti Levu. - From the Philippine Islands through the tropical Pacific to Polynesia.**Discussion:** Occasional specimens are tan in colour throughout, with only one or two narrow white transverse bands on the body whorl, and a single band on earlier whorls.69. *Vexillum antonellii* (DOHRN, 1860)

(Plate 22; Figures 113, 113 a; Text figure 8)

1860. *Mitra antonellii* DOHRN, Proc. Zool. Soc. London, pt. 28: 367

Shell: Shell moderately small, elongate-fusiform and turreted; green or dark greenish-grey in colour, ornamented with a narrow or broad transverse band consisting of white or yellowish-green spiral ridges situated just below the sutures on the body whorl, and a broad or narrow whitish central band on earlier whorls; some specimens have additional white spiral threads toward the base of the body whorl and early whorls are purplish-brown. Sutures moderately impressed, last four whorls flattened, earlier whorls convex, whorls subangulate at sutures, numbering from 9 - 11 apart from protoconch of 3 - $3\frac{1}{2}$ glassy, dark purple nuclear whorls. Numerous rounded or slightly angulate axial ribs cross whorls, ribs narrow, numbering from 18 - 29 on the body whorl and from 15 - 23 on the penultimate whorl; from the sutures to the presutural ramp the axial ribs are oblique, but continue almost straight towards the base. Prominent spiral ridges encircle the shell, bisecting axial ribs which become slightly nodulose at the summits, giving the shell a latticed appearance; spiral ridges are either narrow and rounded or broad and flat, numbering from 15 - 22 on the body whorl and from 7 - 13 on the penultimate whorl. Aperture equal in height or shorter than the spire, moderately narrow and angulate, outer lip moderately thin, smooth or faintly crimped, parallel to columella or contracted centrally and basally; interior of aperture dark purple or purplish-brown with a narrow whitish transverse band and 0 - 18 labral lirae. Columella calloused, brown or purple-brown, with 4 - 5 pale violet or bluish-white oblique folds; anterior canal purplish-brown, heavily calloused, spirally corded and straight or recurved.

L: 18 to 30 mm W: 30 to 35% A: 42 to 51%

Animal: Sole of foot light grey, heavily streaked with dark grey; dorsum of foot white, variegated with dark grey. Siphon long and white, streaked with dark grey and

Explanation of Plate 18

- Figure 61: *Strigatella auriculoides* (REEVE). Fiji (x 2.5) Figure 62: *Strigatella turturina* (SOVERBIE). Fiji (x 2.6)
 Figure 63: *Strigatella oleacea* (REEVE). Fiji (x 2.5) Figure 64: *Strigatella retusa* (LAMARCK). Fiji (x 2.0) Figure 65: *Strigatella litterata* (LAMARCK). Fiji (x 2.0) Figure 66: *Strigatella acuminata* (SWAINSON). Fiji (x 2.0) Figure 67: *Vexillum semisculptum* (ADAMS & REEVE). Fiji (x 2.0) Figure 68: *Vexillum radius* (REEVE). Fiji (x 3.0) Figure 69: *Vexillum cruentatum* (GMELIN). Fiji (x 2.25) Figure 70: *Vexillum pacificum* (REEVE). Fiji (x 2.3) Figure 71: *Vexillum cadaverosum* (REEVE). Fiji (x 2.0)
 Figure 72: *Vexillum costatum* (GMELIN). Fiji (x 1.0) Figure 72a: *Vexillum costatum* (GMELIN), juvenile specimen. Fiji (x 2.0)
 Figure 73: *Vexillum amanda* (REEVE). Fiji (x 2.85) Figure 74: *Vexillum unifasciatum* (WOOD). Fiji (x 2.25)

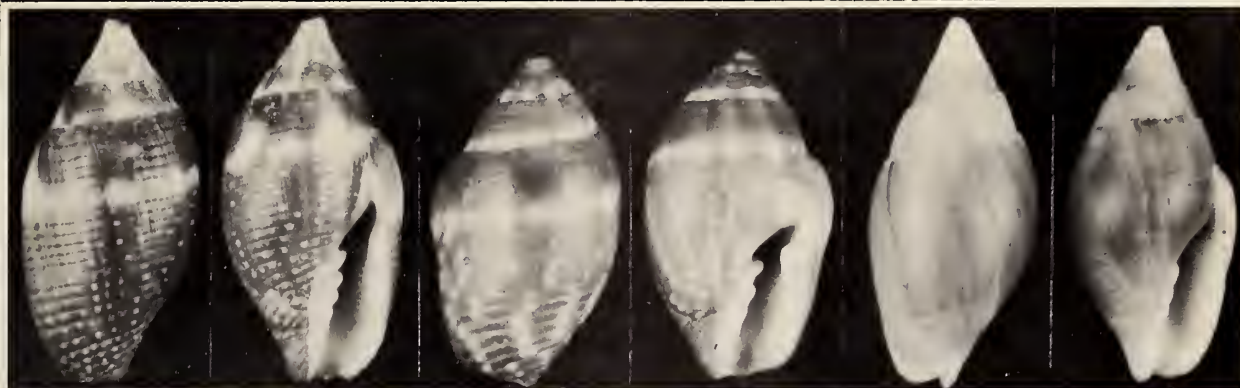


Figure 61

Figure 62

Figure 63

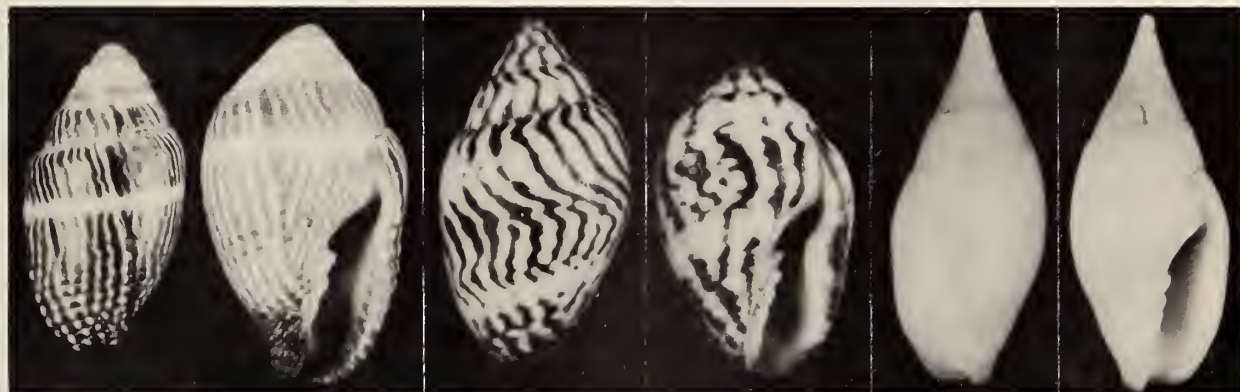


Figure 64

Figure 65

Figure 66

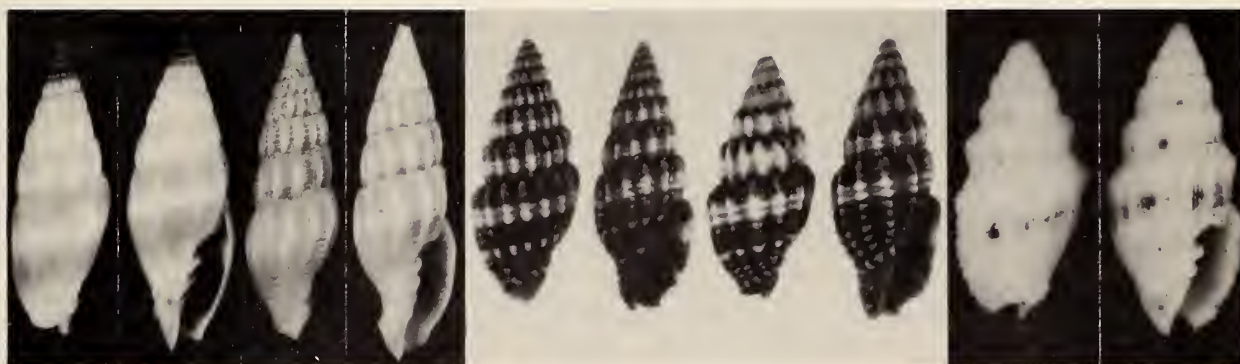


Figure 67

Figure 68

Figure 69

Figure 70



Figure 71

Figure 72 Figure 72 a

Figure 73

Figure 74



banded black at the extremity; tentacles white, flecked with grey, base of tentacles white and streaked with grey; eyes black.

Type locality: Philippine Islands.

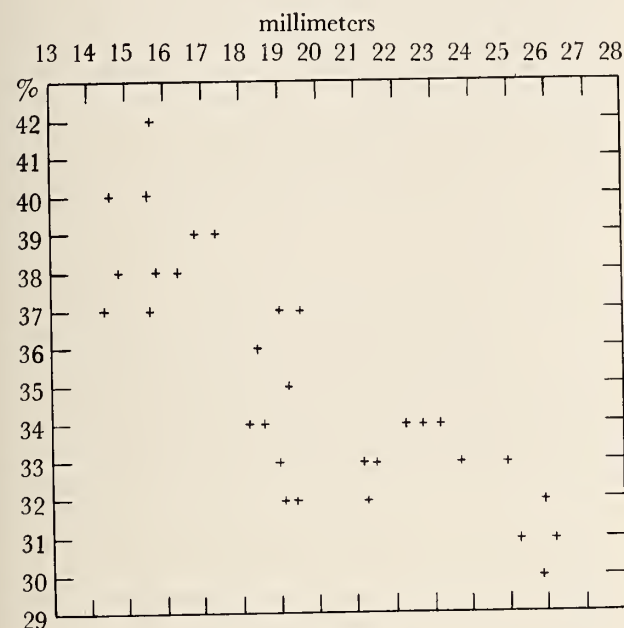


Figure 8

Diagram Showing Decrease in Shell Obesity with Maturity in *Vexillum antonellii* (DOHRN, 1860)

a.) **black form:** Similar in dimensions and sculpture to the normal form of *Vexillum antonellii* with the following exceptions: the whorls are generally subangulate at the sutures but in a few specimens they are convexly rounded.

The shell is black or dark purple, ornamented with 1 or 2 whitish or light green narrow transverse bands on the body whorl and a narrow single central band on earlier whorls. In all other characters it is similar to the normal form.

L: 19 to 32 mm W: 30 to 34% A: 43 to 49%

Animal: Sole of foot uniformly creamy-white, dorsum of foot white and variegated with longitudinal blackish zones. Siphon long and white, banded and flecked with black; tentacles plain white, base translucent white and flecked with dark grey; eyes black and ringed with white.

Habitat: In clean sand and among weed, also in slightly muddy and black sand, and in sand-pockets of coral reefs, in shallow water. Moderately frequent in North Viti Levu but rare elsewhere.

Distribution: Throughout the Fiji Islands. – From the Philippine Islands to Fiji.

Discussion: The two forms are sympatric at Viti Levu Bay and at Caboni beach, but on the outer reef at Caboni, Vatia wharf and the main Suva reef only the black form has been so far collected.

Of the typical form of *Vexillum antonellii*, 17 adults and 14 juveniles were examined, while 8 adults and 9 juveniles of the black form were available for study. Juvenile shells ranged in size from 11.5 mm to 20.0 mm, and both forms, even in the smallest specimen, had a completed colour pattern. The most surprising feature is the absence of intermediate colour variants and the constant differences in animal pattern of both forms.

DOHRN's type series (ex Mus. CUMING) from the Philippine Islands is preserved in the British Museum (Nat. Hist.), as is a specimen from the Solomon Islands (coll. BRAZIER) and several lots besides. The black form of the species is not represented in either lot (Mr. S. P. Dance, personal communication).

The statistical tables below show the arithmetic mean of the more important characters of specimens of both forms studied:

Table 1

Morphological characters (arithmetic mean)	typical form		black form	
	adults	juven.	adults	juven.
Length in millimeters	24.2	15.8	24.7	15.5
Width in % of Length	33%	38%	32%	39%
Height of aperture in % of Length	47%	49%	46½%	49%
Number of axial ribs on body whorl	22	21	21	20
Number of axial ribs on penult whorl	20	20	19.5	20
Number of spiral ridges on body whorl	19	18	16	17
Number of specimens with 4 colum. folds	8	9	2	6
Number of specimens with 5 colum. folds	9	5	6	3

Table 2

Colour of spiral ridges of transverse band on body whorl	Number of specimens
1 green and 5 white	1
2 green and 2 white	4
2 green and 3 white	15
2 green and 4 white	2
2 green and 5 white	1
3 green and 1 white	1
3 green and 2 white	1
3 green and 3 white	2
3 green and 4 white	2
2 orange and 3 white	1
2 white	1

As can be seen from the tables, the axial rib-count of adult and juvenile specimens of *Vexillum antonellii* is similar and the number of axial ribs remains stable throughout development. The obesity of juveniles decreases with maturity and the height of the aperture in relation to shell length is only slightly greater in juveniles than in adults. Approximately two-thirds of all juvenile specimens had 4 columellar folds, while the remaining one third had 5 folds. The main transverse band on the body whorl composed of 2 green and 3 white spiral ridges appears to be the most prevalent colour arrangement of the typical form in Fiji localities.

The frequent appearance of the black form of *Vexillum antonellii* in Fiji and the apparent absence in other localities where the species occurs requires further study; since ecological, seasonal and sexual factors can be excluded, it may prove to be a case of genetic polymorphism.

70. *Vexillum cadaverosum* (REEVE, 1844)

(Plate 18; Figure 71)

1844. *Mitra cadaverosa* REEVE, Conch. Icon., pl. 21, sp. 160

1923. *Mitra (Costellaria) cadaverosa* var. *mutica* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 191

1923. *Mitra (Costellaria) cadaverosa* var. *rubrozonata* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 191

Shell: Shell small, elongate-ovate to ovate, light in weight; white, creamy-white or light yellow in colour, ornamented with a narrow brownish transverse band on whorls; transverse band varies in colour intensity and is occasionally interrupted. Sutures faintly impressed, last 2 to 3 whorls distinctly concave, earlier whorls convex; whorls angulate at sutures, numbering from 7 - 9 apart from protoconch of $1\frac{1}{2}$ - 2 nuclear whorls. Elevated and angulate axial ribs cross whorls, ribs concave centrally, numbering from 8 - 14 on body whorl and from 8 - 13 on the penultimate whorl;

axial ribs prominently spinose at the presutural ramp and another row of distinct nodules appears near the periphery of the body whorl. Interstices of axial ribs broad and concave, with moderately shallow spiral grooves which override the axial ribs; grooves number from 11 - 22 on the body whorl and from 5 - 9 on the penultimate whorl, and the base of the shell has 3 - 6 nodulose spiral cords. Aperture equal in height or slightly shorter than the spire, moderately broad, outer lip contracted centrally and basally, moderately thick and smooth or obsoletely crimped; interior of aperture white with 5 - 15 nodulose labral lirae. Columella white, calloused, with 4 white oblique folds; anterior canal calloused and recurved towards the aperture.

L: 13 to 22 mm W: 44 to 51% A: 43 to 53%

Animal: Sole of foot pale yellow, heavily mottled with white; dorsum of foot uniformly pale yellow. Siphon translucent cream, flecked with white; tentacles white. Eyes black, ringed with a narrow zone of yellow and a broader zone of grey.

Type locality: Philippines and Lord Hood Islands.

Habitat: In clean and weedy sand-patches, in shallow water.

Common.

Distribution: Throughout the Fiji Islands - From the Red Sea through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: Some specimens lack the narrow transverse band, while in others it is reddish-brown in colour.

The species has fewer and more prominent axial ribs than *Vexillum pacificum* (REEVE) and the animals of the two somewhat similar species differ appreciably in pattern.

71. *Vexillum caffrum* (LINNAEUS, 1758)

(Plate 20; Figure 91)

1758. *Voluta caffra* LINNAEUS, Syst. Nat., ed. 10, p. 732, no. 363

1822. *Mitra bifasciata* SWAINSON, Zool. Illust., ser. 1, pl. 35

1832. *Mitra zonalis* QUOY & GAIMARD, Voy. Astrol., 2: 654: pl. 45bis, figs. 16, 17

Shell: Shell moderately large, fusiform and solid; very variable in colouring, but generally dark chocolate-brown or dark greenish-grey, ornamented with 2 or 3 whitish or yellow narrow transverse bands on body whorl, and a single band on earlier whorls. Sutures moderately impressed, whorls convex and rounded at the sutures, numbering from 9 - 10 apart from protoconch which is usually eroded; early whorls axially closely ribbed, ribs numbering from 20 - 24 on the antepenultimate whorl, but usually obsolete on the penultimate and body whorl. Fine transverse striae numbering from 3 - 5 override the axial ribs on the early whorls; striae usually visible near the sutures,

becoming obsolete centrally and terminating as sturdy oblique ridges near the base. Aperture longer than the spire, narrow and elongate, outer lip thick and smooth, contracted anteriorly; the inner edge and basal end of the outer lip are stained dark brown or purplish-brown, interior of aperture bluish-white with 6-10 labral lirae. Columella calloused, shell pattern visible under the enamel, and with 4 prominent oblique folds, the first of which is placed transversely to the aperture; anterior canal heavily calloused, straight or slightly recurved, and slightly longer than the outer lip.

L: 35 to 51 mm W: 32 to 37% A: 56 to 59%

Type locality: None.

Habitat: In slightly muddy sand, in shallow water.

Rare.

Distribution: North and West Viti Levu. — From Indonesia through the tropical Pacific to Polynesia.

Discussion: The species is very similar to certain smooth forms of *Vexillum vulpeculum* (LINNAEUS). The dark violet-brown stains at the base and parietal wall are often present in *V. caffrum*; the characters separating *V. caffrum* from the smooth forms of *V. vulpeculum* appear to be the absence of axial ribs on the penultimate and sometimes antepenultimate whorl, and the greater number of axial ribs where they begin to occur; the latter feature appears to be a doubtful diagnostic character, as the number of axial ribs in *V. vulpeculum* were found to vary as much as 10 ribs in individuals.

For a discussion on the variability of *Vexillum caffrum* (LINNAEUS) see DODGE, 1955; p. 112.

72. *Vexillum coronatum* (HELBLING, 1779)

(Plate 22; Figure 115)

1779. *Voluta coronata* HELBLING, Abh. Privatg. Böhmen, 4: 121; pl. 2, figs. 28, 29 (non SCHUMACHER, 1817; non *Mitra coronata* LAMARCK, 1811)

1853. *Mitra nodilirata* A. ADAMS, Proc. Zool. Soc. London, pt. 19: 136 (not figured)

1874. *Mitra nodilirata*, SOWERBY, Thes. Conch., 4: 26; pl. 19, fig. 385

1882. *Turricula (Costellaria) mucronata* TRYON (pars), Man. Conch., 4: 174; pl. 52, fig. 480 (non *Voluta mucronata* Gmelin, 1791; non *Tiara mucronata* Broderip, 1836)

1895. *Mitra (Costellaria) nodilyrata* MELVILL & STANDEN, Shells Lifu, 1: 102

Shell: Shell small, moderately slender and elongate, turreted, fairly solid, spire pointed; whitish, cream or fawn in colour, rarely yellow, ornamented with a broad yellow, orange or dark brown transverse band on the base of the body whorl; the penultimate and body whorls have occasionally a spiral row of reddish-brown spots and irregular small brown streaks and lines; some individuals have fine

brown interrupted spiral lines on all whorls. Sutures moderately impressed, whorls concave, especially the last four, angulate at sutures, numbering from 8-10 apart from protoconch of 2-3 glassy, golden-fawn nuclear whorls; prominent, elevated curved and angulate axial ribs cross whorls, ribs numbering from 10-16 on the body whorl and from 12-22 on the penultimate whorl; axial ribs slightly thickened centrally and distinctly nodulose or spinose on the presutural ramp. Interstices of axial ribs with fine and shallow spiral grooves which extend almost to the summits of the ribs, numbering from 16-26 on the body whorl and from 3-10 on the penultimate whorl; spiral grooves bisect axial ribs towards the base, becoming faintly nodulose. Aperture about equal in height to the spire, slightly angulate and constricted basally, outer lip moderately thick and smooth; interior of aperture light to dark fawn, with 0-16 labral lirae. Columella white, calloused basally, with 4-5 prominent white oblique folds, first fold thickened; anterior canal slightly produced, calloused, straight or slightly recurved.

L: 15 to 26 mm W: 33 to 42% A: 47 to 56%

Animal: Sole of foot creamy-white, spotted with small snow-white dots at the edges; dorsum of foot translucent white, flecked with snow-white, anteriorly stained with dark grey. Siphon dark grey, ornamented with cylindrically-shaped white spots and fine purplish transverse lines; extremity of siphon dark purplish-grey. Tentacles creamy-white, base whitish; eyes black, ringed with white, surrounding area grey.

Type locality: None.

Habitat: In clean sand substrate, in sand pockets of coral reefs, in shallow water.

Moderately common in North Viti Levu, uncommon elsewhere.

Distribution: Throughout the Fiji Islands. — Guam, New Caledonia, Loyalty Islands.

Discussion: DAUTZENBERG & BOUGE (1923) were the first authors to draw attention to HELBLING's obscure work (1779), in which *Voluta coronata* was established; the authors replaced *Tiara mucronata* Broderip, 1836 with *Voluta coronata* HELBLING, which they presumed to be the earliest name applicable to the species in question. In view of HELBLING's original description and type figures, and a comparison of a long series of shells of the species from Fiji, DAUTZENBERG & BOUGE's interpretation is not acceptable. HELBLING's work appears to be rather rare and is lacking in most scientific libraries; the original description is therefore cited in full:

Die gekroente Faltenspindel

(*Voluta coronata*)

“Die Schale ist spindelfoermig gewunden, einen Schuh hoch, bestehet aus sieben an einander gewach-

senen Windungen, die an ihren Fugen mit einem plattgedruckten Rande versehen, unter demselben aber mit laenglichen, erhabenen, und oben zugespitzten Ecken der Quere nach gekroent sind. Die oberen Gewinde verduennen sich in einen gethuermten Zopf, das unterste bildet einen verengerten, der Quere nach gestreiften Schnabel, der mit dem Schnirkelkopf eine gleiche Laenge hat. Die Muendung hat eine Laenge von fueuf Linien; ihre groesste Breite betraegt zwo Linien; das unterste Ende ist ausgeschlitzet. Die Spindellefze hat drey etwas schiefe Querfalten. Die Schalenlefze ist ganz und scharfrandig. Die Farbe der aeusseren Oberflaeche ist rotgelb.

Unterscheidungszeichen

Eine spindelfoermige, rothgelbe Schale mit scharfeckigen, gekroenten Windungen, und einer dreyfach gefalteten Spindellefze.

Diese Seltenheit gehoeret zu den eckigen Falten-thuermchen in der Verwandtschaft, mit der knotigen Bandnadel (Muell. Linn. Natur. VI. TH. I. B. 430 S), oder der *Voluta plicata* (Linn. S. N. Tom. I. P. II. p. 1193 Sp. 423).

Aus der Pittonischen Sammlung."

Throughout HELBLING's work the measures "Wiener Zoll," "Wiener Fuss" and "Wiener Linie" are being used, but for this particular species the term "Schuh" has been substituted. I am not familiar with the term "Wiener Schuh" as a measure, and Dr. O. Paget (*in litt.*) suggested

that it may have been a *lapsus calami* for "Zoll" or "Fuss." Should this indeed be the case, then HELBLING's specimen measured 26.34 mm, as the "Wiener Zoll" consisted of twelve "Linien," at 2.195 mm per "Linie." The width of the shell and the height of aperture in relation to total shell-length, computed from measurements taken from the type figures, show the width-index to be from 37 to 38%, and the aperture-index from 48 to 49%.

HELBLING's type figures and description depict and describe a shell which is slender and elegantly ribbed, with seven fused coils, flattened margins at the sutures, one single row of spinose nodules on the presutural ramp, a striated beak and an aperture equal in height to the spire. These features are incompatible with *Vexillum mucronatum* (BRODERIP, 1836) as originally described (1836; p. 195) and later illustrated by REEVE (1844; pl. 17, fig. 125). The latter species generally has three rows of prominent spinose nodules on the body whorl and never less than two nor more than four; the earlier whorls have two rows of spinose nodules, whereas *V. coronatum* has only one row of somewhat blunter nodules on earlier whorls. The whorls are more numerous in *V. mucronatum*, the aperture is distinctly shorter than the spire, the shell is broader and axial ribs are less elegantly curved; the base of the body whorl contains prominent nodules within the orange-brown transverse zone at the base of the body whorl. Morphological differences separating the two species have been summarized in Table 3.

Table 3

Morphological Characters (arithmetic mean)	<i>Vexillum coronatum</i>	<i>Vexillum mucronatum</i> (= <i>Vexillum echinatum</i>)
Length in millimeters:	20.0	22.6
Width in % of Length:	37%	43%
Height of Aperture in % of Length:	52%	43%
Number of Whorls:	9	10
Nuclear Whorls:	2 - 3	1½ - 2
Number of Axial Ribs on Body Whorl:	13	14
	curved	fairly straight
Number of Axial Ribs on Penult Whorl:	17	13
Rows of Nodules on Body Whorl:	1	2 - 4
	nodulose, at sutures	spinose
Rows of Nodules on Penult Whorl:	1	2
Spiral Grooves on Body Whorl:	21	9
	shallow	shallow to deep
Rows of Round Nodules at Base:	None	4 - 7
	nodulose spiral cords	
Habitat:	shallow water	deeper water
Frequency:	moderately uncommon	uncommon

Vexillum coronatum (HELBLING) is variable in colour, and one specimen found was yellow throughout, lacking the brown transverse band and spots. Comparison of 27 specimens of *V. mucronatum* and over 50 specimens of *V. coronatum* from various Fijian localities show the differences to be constant in character and confirm the valid separation of the two species.

Dr. O. Paget (*in litt.*) was unable to locate HELBLING's holotype from the Pittoni collection in the Vienna Natural History Museum.

For further discussion on *Vexillum mucronatum* (BRODERIP) see under *V. echinatum* (A. ADAMS).

73. *Vexillum costatum* (GMELIN, 1791)

(Plate 18; Figures 72, 72a)

1791. *Voluta costata* GMELIN, Syst. Nat., ed. 13, p. 3458

1811. *Mitra subulata* LAMARCK, Ann. Mus. Hist. Nat., 17: 211

1836. *Tiara terebralis* BRODERIP, Proc. Zool. Soc. London, pt. 3: 196 (non *Mitra terebralis* LAMARCK, 1811)

Shell: Shell small to moderate in size, very narrow and fusiformly-elongate, resembling a *Terebra* in form; light orange to orange-brown in colour, ornamented with two or three whitish transverse bands on the body whorl and a single band on earlier whorls; additional white blotches and streaks are irregularly distributed over the whorls, and in some specimens the white base colour is the dominant one. Sutures deeply impressed, whorls flattened or slightly convex, rounded to subangulate at the sutures, numbering from 10 - 12 apart from protoconch of 3 glassy, pearly-white nuclear whorls; close-set, broad and slightly rounded axial ribs cross whorls, ribs numbering from 20 - 38 on the body whorl and from 16 - 35 on the penultimate whorl. Moderately deep transverse grooves encircle the shell, numbering from 13 - 18 on the body whorl and from 5 - 8 on the penultimate whorl; spiral grooves bisect axial ribs, giving the shell an overall costate appearance. The interstices of the axial ribs appear only as deep longitudinal grooves and are deeply pitted at point of intersection with the spiral grooves; a deeper transverse presutural groove is situated anteriorly to the sutures. Aperture much shorter than the spire, convexly elongate, constricted basally; outer lip moderately thickened and obsoletely crenulate in a crimped manner. Interior of aperture pale orange or flesh in colour, with 6 - 13 labral lirae; columella cream in colour, calloused basally, with 4 - 5 oblique folds. Anterior canal calloused, slightly recurved towards the dorsum, base of shell spirally corded.

L: 21 to 43 mm W: 20 to 28% A: 35 to 43%

Animal: Sole of foot light creamy-yellow, sparsely flecked with bright yellow and streaked with black at the edges and with light mauve posteriorly; dorsum of foot pale

cream, sparsely flecked with black towards the edges. Siphon cream, transversely lined with greyish-brown; tentacles translucent white, base of tentacles cream, flecked with grey; eyes black.

Type locality: None. The Island of Viti Levu, Fiji Islands, is hereby designated as type locality.

Habitat: In clean sand substrate, in sand patches and sand pockets of coral reefs, from 0 - 2 fathoms.

Moderately rare.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands through the tropical Pacific to Polynesia.

Discussion: The species is better known in literature under the name *Mitra subulata* LAMARCK, 1811. LAMARCK's description of the species is far better and more detailed than that of GMELIN; however, his only reference to illustrations for *M. subulata* (SCHRÖTER, 1783; p. 302, pl. 1, fig. 17) is identical with the single reference by GMELIN for *Voluta costata*.

No type-locality has been quoted by either GMELIN or LAMARCK. The species is known to occur in the Philippine Islands (coll. P. Clover and coll. A. Deynzer) and has been reported from the Island of Anaa by BRODERIP (1836). The Fiji Islands are the approximate center of the species' distributional range and have been designated herein as the type-locality.

74. *Vexillum crebriliratum* (REEVE, 1844)

(Plate 20; Figures 97, 97a)

1839. *Mitra rosea* KIENER, Spéc. Gén. Icon. Coq. Viv., p. 83; pl. 23, fig. 73 (non *Tiara rosea* BRODERIP, 1836)

1844. *Mitra crebrilirata* REEVE, Conch. Icon., pl. 13, sp. 92

1844. *Mitra impressa* REEVE, Conch. Icon., pl. 17, fig. 130 (non ANTON, 1839)

1845. *Mitra rubricata* REEVE, Conch. Icon., Errata (nom. nov. pro *M. impressa* REEVE, 1844)

1874. *Mitra crebrilinata* SOWERBY, Thes. Conch., 4: 31

Shell: Shell moderately small, fusiformly-elongate, spire pointed; dark olive-brown in colour, rarely lead-grey, ornamented with a narrow, whitish or pale orange transverse band on all whorls; the spiral band situated a short distance anteriorly to the suture on the body whorl, but placed centrally on earlier whorls. Sutures deeply impressed, almost channeled in some specimens, whorls convex and rounded at the sutures, numbering from 9 - 10 apart from protoconch; numerous axial ribs cross whorls, ribs rounded or angulate, straight or curved, slightly or distinctly elevated and close-set, numbering from 17 - 33 on the body whorl and from 15 - 26 on the penultimate whorl. Interstices of axial ribs with broad or narrow short deep grooves, numbering from 14 - 23 on the body whorl and from 5 - 9 on the penultimate whorl. Aperture equal

in height or shorter than the spire, moderately narrow, outer lip thickened and smooth, occasionally stained with orange, slightly contracted near point of commencement and basally; interior of aperture violet, with 8 - 12 labral lirae. Columella calloused, brownish or violet but whitish basally, with 4 - 5 prominent bluish-white oblique folds, first two of which are centrally channeled; base of shell with prominent nodulose spiral cords, anterior canal distinctly calloused and straight.

L: 16 to 30 mm W: 29 to 34% A: 39 to 48%
Type locality: Ceylon.

Habitat: In clean sand substrate, in deeper water.

Rare.

Distribution: West and South Viti Levu. - From Mauritius through the tropical Indo-Pacific to Polynesia.

Discussion: The species is variable in colouring and sculpture of axial ribs. One specimen examined had pale orange and ivory-white axial ribs, and in two specimens the axial ribs were faintly calloused at the sutures. The axial ribs were found to be more prominent on smaller specimens than on larger ones.

75. *Vexillum cruentatum* (Gmelin, 1791)

(Plate 18; Figure 69)

1791. *Voluta cruentata* Gmelin, Syst. Nat., ed. 13, p. 3453

1811. *Mitra harpifera* Lamarck, Ann. Mus. Hist. Nat., 17: 217

1839. *Mitra harpaeformis* Kiener, Spéc. Gén. Icon. Coq. Viv. p. 85; pl. 25, fig. 78

1845. *Mitra discoloria* Reeve, Conch. Icon., pl. 29, sp. 230

1874. *Mitra discoloria* Sowerby, Thes. Conch., 4: 26; pl. 23, fig. 516

Shell: Shell small, elongate-ovate to ovate, fairly solid; brown to blackish-brown in colour, ornamented with one or two white or yellowish transverse bands on the body whorl and a single band on earlier whorls; axial ribs fully or partly coloured with reddish-orange, but in some individuals the orange colour of the ribs is extremely faint. Sutures moderately impressed, whorls either slightly concave, flattened or convex, rounded or subangulate at

sutures, numbering from 7 - 9 whorls apart from protoconch which is always eroded in adult shells. Elevated and angulate axial ribs cross whorls, ribs close-set or wide-spaced, straight or slightly curved, numbering from 9 to 17 on the body whorl and from 9 - 15 on the penultimate whorl; deep or moderately shallow spiral grooves encircle the shell, bisecting axial ribs, numbering from 9 to 13 on the body whorl and from 3 - 6 on the penultimate whorl; grooves terminate as nodulose spiral cords basally. These spiral grooves, if prominent and deep, give the axial ribs a nodulose appearance. Aperture equal in height or shorter than the spire, narrow, outer lip moderately thickened, smooth or obsoletely crimped, contracted basally; interior of aperture dark purple or purplish-brown, with one or two light bands and 6 - 15 labral lirae. Columella dark purple or purplish-brown, calloused basally, with 4 distinct whitish or violet folds; anterior canal calloused and straight.

L: 11 to 18 mm W: 36 to 46% A: 41 to 51%

Animal: Sole of foot pale fawn, variegated with blackish-brown; dorsum of foot pale cream, thickly spotted with blackish-brown. Siphon translucent light grey, flecked with dark brown; tentacles long and slender, translucent cream, base of the same colour. Eyes black, ringed with brown.

Type locality: Oceano indico.

Habitat: In clean and slightly muddy sand and in sand pockets of coral reefs, from 0 - 4 fathoms. Uncommon as live-collected specimens, beach specimens frequent.

Distribution: Throughout the Fiji Islands. - From the Gulf of Oman through the tropical Indo-Pacific to Samoa.

Discussion: The species is extremely variable in colour and sculpture; however the animal pattern of the various variants examined was surprisingly constant. The slender forms of *Vexillum cruentatum* can be unhesitatingly placed in the genus *Vexillum*, while the short ovate specimens resemble *Mitra discoloria* Reeve and show a greater affinity to the genus *Pusia*.

Mitra harpifera Lamarck, 1811 is an objective synonym of *Vexillum cruentatum* (Gmelin), since both descriptions were based on the same figures in Chemnitz (1788, Vol. 10; pl. 151, figs. 1438, 1439).

Explanation of Plate 19

- Figure 75: *Vexillum formosense* (Sowerby). Fiji (x 1.2) Figure 76: *Vexillum michaudi* (Crosse & Fischer). Fiji (x 2.5)
Figure 77: *Vexillum exasperatum* (Gmelin), fine-ribbed form. Fiji (x 2.0) Figure 77a: *Vexillum exasperatum* (Gmelin), coarse-ribbed form. Fiji (x 2.0) Figure 77b: *Vexillum exasperatum* (Gmelin), melanistic form. Fiji (x 2.0) Figure 78: *Vexillum filistria-tum* (Sowerby). Fiji (x 2.6) Figure 79: *Vexillum rufifiliosum* (E. A. Smith). Fiji (x 1.75) Figure 80: *Vexillum obeliscus* (Reeve). Fiji (x 2.0) Figure 81: *Vexillum acupictum* (Reeve). Fiji (x 1.6) Figure 82: *Vexillum longispinum* (Sowerby). Fiji (x 3.0)
Figure 83: *Vexillum festum* (Reeve). Fiji (x 2.85) Figure 84: *Vexillum verrucosum* (Reeve). Fiji (x 1.8) Figure 85: *Vexillum sanguisugum* (Linnaeus). Fiji (x 1.2) Figure 86: *Vexillum granosum* (Gmelin). Fiji (x 1.2) Figure 87: *Vexillum subquadratum* (Sowerby). Fiji (x 2.3) Figure 88: *Vexillum zebuense* (Reeve), fine-ribbed form. Fiji (x 1.85) Figure 88a: *Vexillum zebuense* (Reeve), coarse-ribbed form. Fiji (x 2.0)

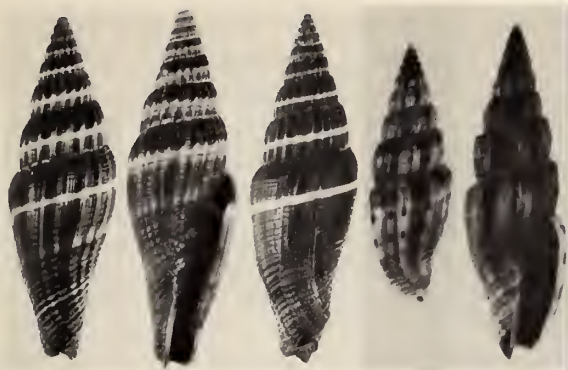


Figure 75



Figure 76



Figure 77

Figure 77 a

Figure 77 b



Figure 78

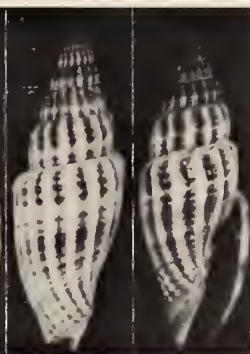


Figure 79

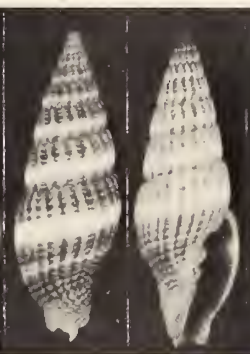


Figure 80



Figure 81

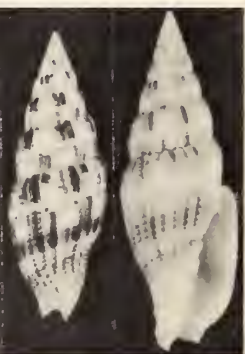


Figure 82

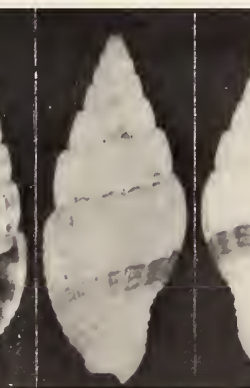


Figure 83

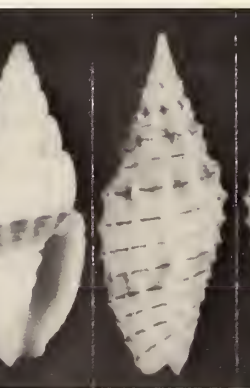


Figure 84



Figure 85

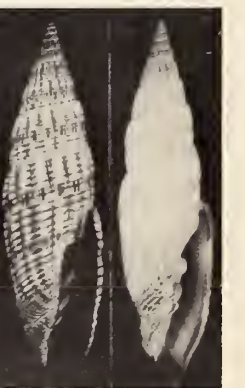


Figure 86

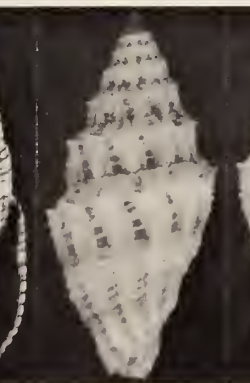


Figure 87



Figure 88



Figure 88 a



76. *Vexillum deshayesi* (REEVE, 1844)

(Plate 22; Figures 114, 114a)

1844. *Mitra deshaysii* REEVE, Conch. Icon., pl. 22, sp. 170
 1874. *Mitra deshaysii* REEVE, SOWERBY, Thes. Conch., 4: 35; pl. 10, fig. 155, and pl. 27, fig. 618 (valid emend.)
 1923. *Mitra* (*Costellaria*) *deshayesi* var. *dunkeri* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 201
 1923. *Mitra* (*Costellaria*) *deshayesi* var. *nigricans* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 201 (non PEASE, 1865)

Shell: Shell small, fusiform and turreted, fairly solid; very variable in colour, but generally whitish, bluish-white or light purple in colour, ornamented with two or three transverse rows of orange, reddish or reddish-brown longitudinal spots upon the axial ribs of the body whorl, and one single row of spots on earlier whorls; occasional specimens are light purple, the axial ribs are dark orange and interrupted by two transverse rows of white longitudinal spots. Sutures moderately impressed, whorls flattened or slightly concave, angulate or subangulate at the sutures, numbering from 8 - 10 apart from protoconch of $2\frac{1}{2}$ - 3 glassy, creamy-white nuclear whorls; elevated, prominent, broad and rounded axial ribs cross whorls, ribs slightly nodulose and pale orange on the presutural ramp, numbering from 10 - 20 on the body whorl and from 10 - 16 on the penultimate whorl. Interstices of axial ribs with moderately deep or shallow spiral grooves, grooves almost extending to the summits of the axial ribs and in some specimens faintly overriding axial ribs; spiral grooves number from 7 - 23 on the body whorl and from 0 - 9 on the penultimate whorl, and terminate as nodulose spiral cords towards the base. Aperture shorter than the spire, slightly angulate or convexly elongate and constricted basally, outer lip moderately thickened and smooth; interior of aperture dark purplish-brown with a white transverse band and a white edge on the outer lip and with 4 - 18 labral lirae. Columella bluish-white or light purplish-brown, calloused basally and with 3 - 5 prominent oblique white folds; anterior canal calloused and straight.

L: 11 to 24 mm W: 30 to 38% A: 40 to 48%

Animal: Sole of foot uniformly white or cream in colour, dorsum of foot creamy-white, sparsely flecked with dark grey. Siphon translucent creamy-white, spotted with snow-white and dark grey, banded at extremity with dark grey; tentacles translucent cream, minutely spotted with white. Eyes black.

Type locality: Nonc.

Habitat: In clean and muddy sand and among weed, in shallow water.

Common.

Distribution: Throughout the Fiji Islands. - From Mauritius through the tropical Indo-Pacific to Tonga.

Discussion: A very variable species in size, colour and sculpture. Over 120 specimens from various Fijian localities were examined and the live animals of all variants studied. Although some specimens differed in form, colour and number of axial ribs, the animal pattern showed no appreciable difference. A certain number of specimens were purely individual variants, while a greater proportion of these variants were ecophenotypes. Specimens collected in muddy-sand localities of shore reefs were generally smaller, more slender, darker in colouring and with more numerous axial ribs; specimens collected in clean sand substrate on outer reefs were appreciably larger, broader, lighter in colour and with fewer and broader axial ribs. The spiral grooves are another variable feature, pronounced in some specimens and almost obsolete in others.

DAUTZENBERG & BOUGE (1923) placed *Vexillum rectilateralis* (SOWERBY, 1874), *V. intertaeniatum* (SOWERBY, 1874) and *V. michaui* (CROSSE & FISCHER, 1864) in the synonymy of *V. deshayesi*. The last two species mentioned are specifically distinct and in the authors' later paper (1933) *V. intertaeniatum* has been treated as a separate species.

77. *Vexillum echinatum* (A. ADAMS, 1853)

(Plate 22; Figure 117)

1836. *Tiara mucronata* BRODERIP, Proc. Zool. Soc. London, pt. 3: 195 (not figured; non *Voluta mucronata* GMELIN, 1791)
 1844. *Mitra mucronata*, REEVE, Conch. Icon., pl. 17, sp. 125
 1853. *Mitra echinata* A. ADAMS, Proc. Zool. Soc. London, pt. 19: 138
 1874. *Mitra mucronata*, SOWERBY, Thes. Conch., 4: 36; pl. 19, figs. 378, 379, 380

Shell: Shell small, fusiformly-elongate, turreted, spire pointed; whitish or cream in colour, ornamented with a moderately broad, orange-brown or reddish-brown transverse band at the base of the body whorl and occasionally with one or two interrupted orange-brown spiral lines and dots; earlier whorls with irregular small spots or narrow axial streaks. Sutures moderately impressed, whorls concave, angulate at sutures, numbering from 9 - 11 apart from protoconch of $1\frac{1}{2}$ - 2 white nuclear whorls; narrow and prominent axial ribs cross whorls, ribs almost straight, numbering from 11 - 16 on the body whorl and from 10 to 16 on the penultimate whorl. Axial ribs with 2 - 4 rows of prominent spinose nodules which diminish in size towards the base; earlier whorls with only 2 rows of nodules. Interstitial spaces broad, spirally grooved, grooves shallow to deep and almost extending to the summits of axial ribs; grooves number from 6 - 12 on the body whorl and from 3 - 8 on the penultimate whorl. The reddish-brown transverse basal band contains from 4 - 7 spiral rows of promi-

nent nodules. Aperture shorter than the spire, angulate and constricted basally, outer lip moderately thickened and smooth; interior of aperture cream or pale orange in colour with 6 - 14 labral lirae. Columella calloused, cream in colour, with 4 - 5 prominent oblique folds; the first fold extends onto the body whorl as a spiral row of nodules. Anterior canal straight, spirally corded, slightly longer than the outer lip.

L: 16 to 28 mm W: 38 to 46% A: 41 to 48%

Type locality: Insulam Taheiten (Tahiti, BRODERIP, 1836).

Habitat: In clean sand and among weed, in deeper water. Moderately rare in the North of Viti Levu, uncommon in the West and South of Viti Levu.

Distribution: Throughout the Fiji Islands, - From the Red Sea through the tropical Indo-Pacific to Polynesia.

Discussion: The species is fairly constant in characters, exhibiting very little variation; it is rarer in Fiji than *Vexillum coronatum* (HELBLING), and specimens are rarely collected in shallow water. Although extreme individuals may have two or four rows of spinose nodules on the body whorl, the majority of specimens examined had only three rows; the spinose coronations are quite prominent and generally longer than in *V. coronatum*. A table (Table 3) of morphological characters separating *V. echinatum* from *V. coronatum* may be found under the description of the latter species.

The species is better known as *Vexillum mucronatum* (BRODERIP, 1836); however, BRODERIP's species name is a secondary homonym of *Voluta mucronata* GMELIN, 1791 (p. 3456). GMELIN's description is inadequate to identify the species and the figure cited (GUALTIERI, 1742; pl. 52, fig. M) depicts a *Vexillum* species of unknown identity, with prominent axial ribs, spiral striae, a narrow dark transverse line anteriorly to the suture on the body whorl and a somewhat produced anterior canal. GMELIN's species, whatever its true identity may be, is on no account conspecific with *V. mucronatum* (BRODERIP).

Mitra echinata A. ADAMS appears to be synonymous with *Vexillum mucronatum* (BRODERIP). The species has not been illustrated by ADAMS nor by SOWERBY (1874), who placed it in the synonymy of *V. mucronatum*. ADAMS' description is fairly adequate, and the phrase "*costis prominentibus, prope suturas echinato-nodulosis, et inferne subnodosis*" agree with *V. mucronatum*, but not with *V. coronatum*. *Vexillum echinatum* (A. ADAMS) is generally regarded as a junior synonym of *V. mucronatum* (BRODERIP) and it has been tentatively accepted as a replacement name for *V. mucronatum*.

Mitra concentrica REEVE, 1844 (pl. 17, sp. 128) has been placed in the synonymy of *Vexillum mucronatum* by SOWERBY, 1874. REEVE's type figure, however, does not suggest the species is conspecific with *V. mucronatum*.

ADAMS (1853) did not cite a type locality for *Vexillum*

echinatum and BRODERIP's (1836) first indication of "Tahiti" has been accepted as the type locality.

78. *Vexillum exasperatum* (GMELIN, 1791)

(Plate 19; Figures 77, 77a, 77b; Text figure 9)

1791. *Voluta exasperata* GMELIN, Syst. Nat., ed. 13, p. 3453

1811. *Mitra torulosa* LAMARCK, Ann. Mus. Hist. Nat., 17: 216

1895. *Mitra (Costellaria) exasperata* var. *hadfieldi* MELVILL & STANDEN, Shells Life, p. 102; pl. 2, fig. 14 (melanistic form)

1923. *Mitra (Costellaria) exasperata* var. *exusta* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 207

1923. *Mitra (Costellaria) exasperata* var. *candida* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 207

1923. *Mitra (Costellaria) pacifica* var. *contempta* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 207 (nom. nov. pro *M. exasperata* REEVE, 1844)

1929. *Arenimitra michaelis* IREDALE, Mem. Qld. Mus. 9(3): 286 (nom. nov. pro *Mitra exasperata* REEVE, 1844)

1957. *Arenimitra tortulosa* COTTON, Roy. Soc. South Austral. Mal. Sec. 12: 6

Shell: Shell small, elongate-ovate, turreted, fairly light in weight; white to creamy-white in colour, ornamented with one or two broad faint brown transverse bands on the body whorl and one single band on earlier whorls; these bands are generally faint in the interstices of the axial ribs, but dark reddish-brown on the summits; occasional specimens creamy-white throughout. Sutures deeply impressed, penultimate and body whorls generally concave, earlier whorls convex, whorls angulate at sutures, numbering from 8 - 9 apart from protoconch of 3 glassy, mauve coloured nuclear whorls. Elevated, angulate and concave axial ribs cross whorls, ribs distinctly produced at the sutures on the body whorl and penultimate whorl, numbering from 10 - 15 on the body whorl and penultimate whorl; numerous close-set and fine spiral threads encircle the shell, overriding axial ribs which are distinctly nodulose at the summits; spiral lirae number from 24 - 31 on the body whorl and from 8 - 14 on the penultimate whorl. Fine and numerous axial striae bisect the spiral lirae, which are generally finely nodulose; body whorl centrally distinctly concave and contracted basally. Aperture equal in height or shorter than the spire, wide and angulate, squarish, contracted basally, outer lip moderately thickened and obsoletely finely crenulate; interior of aperture porcelain-white with 10 - 17 granulose labral lirae. Columella calloused, white in colour, convex, with 4 very prominent white oblique folds; anterior canal heavily calloused, spirally corded, straight or slightly recurved towards the aperture.

L: 13 to 26 mm W: 41 to 46% A: 43 to 49%

Animal: Sole of foot translucent cream, sparsely flecked with white and bordered with purplish-grey at the edges; dorsum of foot cream, mottled with dark grey. Siphon

translucent white, flecked with snow-white and dark grey; tentacles short, white, eyes black, ringed with dark grey.

Type locality: Oceano indico.

a.) **close-ribbed form:** This variant is extremely frequent and differs from the typical form as follows: it is generally more slender, the last two whorls are flattened instead of concave and the whorls number from 8 - 10 apart from the protoconch which is the same as in the typical form; whorls are subangulate at the sutures and in some specimens even rounded. The axial ribs are less elevated,

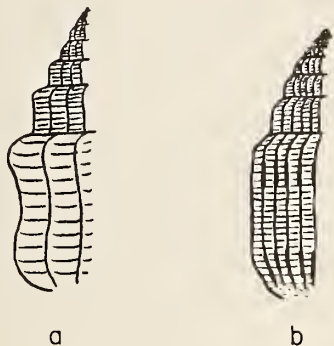


Figure 9

Vexillum exasperatum. (GMELIN, 1791)

a: Coarse-ribbed Form

b: Fine-ribbed Form

numerous and close-set, numbering from 19 - 29 on the body whorl and from 20 - 31 on the penultimate whorl. The spiral grooves number from 22 - 34 on the body whorl and from 6 - 14 on the penultimate whorl. Labral lirae number from 8 - 17 and columellar folds 4. Rare individuals are melanistic.

L: 14 to 24 mm W: 35 to 43% A: 42 to 50%

Animal: Sole of foot creamy-white, sparsely lined with grey; dorsum of foot creamy-white, variegated with grey anteriorly and at the edges. Siphon translucent white, sparsely flecked with snow-white and pale grey, extremity tipped with dark grey; tentacles short, whitish, base translucent cream. Eyes black, ringed with grey.

Habitat: In clean sand and among weed, from 0 - 5 fathoms.

Common.

Distribution: Throughout the Fiji Islands, - From the Red Sea through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: The close-ribbed variant has been regarded by many writers to be the species described by LAMARCK

as *Mitra arenosa* (1811; p. 219). LAMARCK's original diagnosis is short and no references to figures are cited. The species was described as white in colour, ovate and turreted, decussate and finely granulose, with brown transverse bands on whorls, 4 columellar folds and a slightly recurved anterior canal; the length was given as 20 mm.

LAMARCK omitted to mention the numerous axial ribs, which are more pronounced than the spiral striae and also the fact that the brown colour is more distinct upon the summits of the axial ribs than it is in the interstices. The author confused the issue by comparing his species with his own *Mitra granulosa* (1811; p. 201), a species uniformly dark brown in colour and almost twice the size of *M. arenosa*. His remark "An *Voluta costata* GMELIN, p. 3458" adds to the confusion, since *V. costata* GMELIN, 1791 is the same species as *M. subulata* LAMARCK, 1811, as both authors cited a single reference to SCHRÖTER, 1783; the latter species is dissimilar to *M. arenosa*. LAMARCK's type specimen of *M. arenosa* is not extant at the Muséum d'Histoire Naturelle in Geneva (Dr. Binder, personal communication) and thus the true identity of LAMARCK's species remains unsolved. Some of the diagnostic features mentioned by LAMARCK in his description remind one of *Vexillum pacificum* (REEVE).

Mitra torulosa LAMARCK is unquestionably a synonym of *Vexillum exasperatum*. The type specimen which is extant in the Muséum d'Histoire Naturelle in Geneva is slender in form with a short aperture and 11 axial ribs upon the body whorl, and the axial ribs are only moderately humped at the sutures (Dr. Binder, personal communication).

COTTON (1957) considered *Mitra interstriata* SOWERBY, 1870, *M. ocellata* REEVE, 1844 and *M. tortulosa* [sic] LAMARCK to be conspecific. SOWERBY's *M. interstriata* is a slender fusiform longitudinally plicate species resembling to a certain extent *Vexillum thaani* PILSBRY; REEVE's *M. ocellata* is a cylindrically fusiform, smooth and shining shell, which REEVE likened to *M. fissurata* LAMARCK, 1811, and which is actually a variant of that species. The three species are totally dissimilar and can be separated on sight.

Voluta exasperata var. β GMELIN, 1791, is the *Voluta sphaerulata* of MARTYN (= *Voluta papilio* LINK, 1807). *Voluta turricula* GMELIN, 1791 (refers to CHEMNITZ, 1780; Vol. 4, pl. 149, fig. 1376) appears to be a small variant of *Vexillum exasperatum*.

The differences in animal pattern of the two forms are negligible, but the range of variation in the number of axial ribs is greater than in any other *Vexillum* species studied. More research is necessary before the two forms can be unequivocally combined under one species.

Vexillum exasperatum also occurs in Fiji in a pure white and a melanistic form.

79. *Vexillum festum* (REEVE, 1845)

(Plate 19; Figure 83)

1845. *Mitra festa* REEVE, Conch. Icon., pl. 36, fig. 303

Shell: Shell small, pyramidally-ovate, spire pointed, fairly solid; white in colour, ornamented with a moderately broad brown peripheral band upon the body whorl, and occasional brown spots on earlier whorls. Sutures deeply impressed, whorls convex and angulate at sutures, numbering about 8-9 apart from protoconch which was eroded in specimens examined; coarse, elevated and angulate axial ribs cross whorls, numbering from 16-21 on the body whorl and from 11-14 on the penultimate whorl. Interstices of axial ribs with deep transverse grooves, grooves almost extending to the summits or overriding axial ribs. Aperture shorter than the spire, moderately broad, outer lip moderately thickened, crimped, convexly elongate and contracted basally; interior of aperture cream or yellowish, with 10-14 labral lirae. Columella white, calloused basally and with 4-5 prominent oblique folds; base of shell concave and encircled with strong nodulose spiral cords. Siphonal canal produced, calloused, and slightly longer than the aperture.

L: 15 to 18 mm W: 40 to 42% A: 44 to 47%
Type locality: Puerto Galero, Island of Mindoro, Philippines.

Habitat: In clean sand and broken coral substrate, from 10-14 fathoms.

Rare.

Distribution: West Viti Levu. - From the Philippine Islands to Fiji.

Discussion: The species closely resembles specimens of *Mitra approximata* PEASE, 1860 from Hawaii; in the latter species the interstices of the axial ribs are very deeply pitted.

80. *Vexillum filistriatum* (SOWERBY, 1874)

(Plate 19; Figure 78)

1874. *Mitra filistriata* SOWERBY, Thes. Conch., 4: 36; pl. 20, fig. 402

Shell: Shell small, pyramidally-elongate and slender, spire pointed; cream to fawn in colour, ornamented with a narrow or broad peripheral band upon the body whorl, and widely spaced brown spots at the sutures on earlier whorls; in some specimens short axial brown streaks radiate from the transverse band towards the sutures. Sutures moderately impressed, whorls convex and subangulate at the sutures, numbering from 8-9 apart from protoconch which is usually eroded; elevated and angulate curved axial ribs cross whorls, numbering from 22-26 on the body

whorl and from 13-18 on the penultimate whorl. Deep spiral grooves encircle the shell, numbering from 12-15 on the body whorl and from 5-6 on the penultimate whorl; spiral grooves override the axial ribs, giving the body whorl a granulose appearance; on the earlier whorls the spiral grooves are confined to the interstices of the axial ribs and the intervening ridges are broad, flat and slightly elevated. Aperture shorter than the spire, outer lip convex, contracted and recurved basally, lip moderately thin and crimped; interior of aperture yellowish or orange and prominently lirate. Columella cream in colour, with 5 prominent oblique folds which extend as granulose spiral ridges onto the body whorl; body whorl contracted towards the base, anterior canal slightly produced.

L: 14 to 19 mm W: 33 to 36% A: 43 to 46%
Type locality: None.

Habitat: In sand and weed substrate, from 3-15 fathoms.
 Rare.

Distribution: West Viti Levu. - Polynesia, Hawaii.

81. *Vexillum formosense* (SOWERBY, 1890)

(Plate 19; Figure 75)

1890. *Mitra formosensis* SOWERBY, Journ. Linn. Soc. London. 20: 395-396; pl. 25, figs. 4, 51907. *Turricula minahassae* SCHEPMAN, Samml. Geol. Reichs-Mus. Leiden, ser. 1, 8: 167; pl. 10, figs. 6, 6a1925. *Mitra (Vulpecula) utravis* MELVILL, Proc. Malac. Soc. London, 16: 218; pl. 10, fig. 8

Shell: Shell moderate in size, elongate-fusiform, solid, spire pointed; dark brown in colour, ornamented with one or two narrow or moderately broad, whitish to light yellow transverse bands on the body whorl and a single band on earlier whorls; occasional specimens have additional orange-brown or dark brown narrow transverse bands on the body whorl and a brown spiral thread superimposed on the white zone on earlier whorls. Sutures moderately impressed, whorls convex, rounded or subangulate at sutures, numbering from 9-11 apart from protoconch which is glassy-brown; narrow and angulate slightly curved axial ribs cross whorls, numbering from 8-20 on the body whorl and from 18-27 on the penultimate whorl; in some specimens the latter half of the body whorl is smooth. Moderately deep spiral grooves encircle the shell, grooves bisecting axial ribs, which appear nodulose on the presutural ramp; spiral grooves number from 23 to 34 on the body whorl and from 6-13 on the penultimate whorl and terminate as nodulose spiral cords basally. Aperture equal in height or slightly longer than the spire, narrow, elongate, constricted basally, outer lip thickened and smooth; interior of aperture violet, edge of outer lip dark brown with small whitish areas, and labral lirae

numbering from 3 - 13. Columella calloused, whitish or light brown, with 4 - 5 prominent folds; the first fold is moderately broad, often placed transversely to the aperture and bears a concave central channel. Anterior canal calloused, produced, and straight or slightly recurved.

L: 31 to 45 mm W: 30 to 35% A: 49 to 58%

Type locality: Island of Formosa.

Habitat: In clean and slightly muddy sand, among weed, from 0 - 10 fathoms. Rare live-collected, beach specimens not uncommon.

Distribution: Throughout the Fiji Islands. - From Indonesia to Japan and Fiji.

Discussion: The species is very variable in colour pattern and density of axial ribs; however, the variation in colour pattern in Fiji specimens is not as great as in those from the Philippine Islands. J. CATE (1962b) presented a detailed study on the three forms of *V. formosense*, and reported all three as sympatric at Naval, Leyte, Philippine Islands; the author further remarked on the frequent intergradation of shell characters in all three forms. In view of these findings it would be unwise to separate *V. minahassae* SCHEPMAN and *V. utravis* MELVILL as subspecies since the prerequisite of geographic and reproductive isolation is non-existent.

82. *Vexillum granosum* (GMELIN, 1791)

(Plate 19; Figure 86)

1791. *Voluta granosa* GMELIN, Syst. Nat., ed. 13, p. 3453

1798. *Mitra cancellata* RÖDING, Mus. Boltz., p. 138 (non SWAINSON, 1821)

1923. *Mitra (Turricula) sanguisuga* var. *albida* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 186

Shell: Shell moderate in size, fusiformly-elongate, solid and moderately heavy; steel-grey to purplish-grey in colour, ornamented with a single narrow white transverse band on the body whorl and a single band adjacent to the sutures on earlier whorls. Sutures moderately impressed, whorls convex, rounded at the sutures and numbering from 10 - 12 apart from the purplish protoconch; slightly elevated axial ribs cross whorls, ribs close-set, coarse and rounded, numbering from 18 - 23 on the body whorl and from 15 - 20 on the penultimate whorl; deep and purplish spiral grooves encircle the shell, numbering from 19 - 26 on the body whorl and from 5 - 8 on the penultimate whorl. Aperture equal in height or shorter than the spire, moderately narrow, outer lip thickened and smooth; interior of aperture violet, edge of aperture with a broad dark purple zone, deep interior pale violet or bluish-white and with 10 - 15 labral lirac. Columella calloused, purplish-brown in colour, with 4 - 5 violet folds; anterior canal calloused and straight.

L: 34 to 45 mm W: 26 to 30% A: 44 to 48%

Type locality: Oceano indico.

Habitat: In clean sand substrate, in sand pockets of coral reefs, in shallow water.

Rare.

Distribution: North Viti Levu. - From Lemuria through the tropical Indo-Pacific to Fiji.

Discussion: The species is very similar to *Vexillum sanguisugum* (LINNAEUS), but appears to differ in the following characters: the shell is more solid, the colour pattern lacks the dark red small spots of *V. sanguisugum* but has a narrow white transverse band instead; the axial ribs are generally less prominent and more close-set, with the resulting interstices narrower than in *V. sanguisugum*.

Both species have a similar distributional range and are sympatric in Malaya, Queensland, New Guinea and Fiji, and can be separated without difficulty. Nevertheless, further research is indicated before it can be accepted as a valid species.

83. *Vexillum gruneri* (REEVE, 1844)

(Plate 20; Figure 95)

1844. *Mitra gruneri* REEVE, Conch. Icon., pl. 16, sp. 119

Shell: Shell small, elongate-ovate, solid but light in weight; pinkish-grey to light brown in colour ornamented with one or two indistinct narrow white transverse bands and two to three reddish-brown interrupted spiral threads on the body whorl; earlier whorls with a narrow whitish central band on which an interrupted spiral thread is superimposed. Sutures weakly impressed, whorls flattened to slightly convex, angulate at sutures, numbering from 6 to 7 apart from protoconch which was eroded in specimens examined. Wide-spaced, elevated narrow and angulate axial ribs cross whorls, numbering from 8 - 10 on the body whorl and from 9 - 11 on the penultimate whorl; axial ribs bear prominent spinose nodules just anteriorly to the sutures. With the exception of 4 - 6 nodulose spiral cords at the base, the shell is completely smooth. Aperture longer than the spire, narrow and convexly elongate, edge of outer lip white, thick and smooth; interior of aperture brownish, deep interior bluish-grey, interior of outer lip whitish, labral lirac number from 7 - 14. Columella whitish, calloused basally, with 6 prominent oblique folds; siphonal canal calloused and straight.

L: 22 to 28 mm W: 40 to 43% A: 62 to 65%

Type locality: Island of Masbate.

Habitat: In sand pockets of coral reefs, in shallow water.

Rare.

Distribution: North Viti Levu. - From the Philippines to Samoa.

Discussion: COTTON (1957) equates *Vexillum gruneri* (REEVE) with *V. sanguisugum* (LINNAEUS). REEVE

type figure of *V. gruneri* does not even bear a superficial resemblance to *V. sanguisugum*, and a transcription error is suspected.

84. *Vexillum intertaeniatum* (SOWERBY, 1874)

(Plate 21; Figure 99)

1874. *Mitra intertaeniata* SOWERBY, Thes. Conch., 4: 35; pl. 10, fig. 154

1880. *Mitra pulchra* GARRETT, Journ. Conch., London, 3: 56

Shell: Shell small, slender and fusiform, rather solid; whitish, light grey or bluish-grey in colour, ornamented with 4-5 narrow, continuous orange or orange-brown transverse bands on the body whorl, and two such bands on earlier whorls; occasional specimens have an additional dark purple-brown central band on the body whorl. Sutures moderately impressed, whorls flattened or convex, angulate at the sutures, numbering from 8-10 apart from protoconch of 2-2½ glassy-fawn or brown nuclear whorls; prominent elevated narrow and rounded axial ribs cross whorls, ribs straight, slightly nodulose near the sutures, numbering from 10-18 on the body whorl and from 10 to 15 on the penultimate whorl. Interstices of axial ribs with weak and shallow spiral grooves, grooves extending partly onto the walls of the axial ribs, but occasionally obsolete on the penultimate and earlier whorls; spiral grooves number from 14-27 on the body whorl and from 3-7 on the penultimate whorl, and terminate as granulose spiral ridges towards the base. Aperture shorter than the spire, narrow, angulate, outer lip moderately thickened, smooth, constricted posteriorly and basally; interior of aperture dark purplish-brown with a white transverse band and 4-15 labral lirae. Columella whitish, calloused, with 3-5 oblique folds; anterior canal produced and calloused, straight or slightly recurved.

L: 12 to 27 mm W: 29 to 35% A: 41 to 47%

Animal: Sole of foot white; dorsum of foot white, flecked with dark grey. Siphon translucent white, sparsely flecked with grey; tentacles white, base brownish-grey; eyes black.

Type locality: None.

Habitat: In clean and slightly muddy sand, in sand patches and sand pockets of coral reefs, in shallow water.

Common.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands through the tropical Pacific to Polynesia.

Discussion: The species is variable in colour pattern and sculpture of whorls. Specimens collected in muddy-sand localities are usually very dark in appearance.



85. *Vexillum longispirum* (SOWERBY, 1874)

(Plate 19; Figure 82)

1874. *Mitra longispira* SOWERBY, Thes. Conch., 4: 36; pl. 20, fig. 403

Shell: Shell small, elongate-ovate to fusiform, spire pointed; light brown in colour, ornamented with a dark brown narrow transverse band near suture and base and a white central transverse band on the body whorl; earlier whorls with a white transverse band adjacent to the sutures; the dark brown colouring of the bands confined mainly to the interstices of the axial ribs, while the ribs are whitish or fawn in colour. Sutures moderately impressed, whorls slightly to distinctly convex, rounded at sutures, numbering from 8-9 apart from protoconch of 2-3 glassy-fawn nuclear whorls; coarse, elevated angulate and obtuse axial ribs cross whorls, numbering from 13-16 on the body whorl and from 12-15 on the penultimate whorl; ribs terminate as distinct nodules towards the base. Interstices of axial ribs deeply grooved, grooves short or extending almost to the summits of the axial ribs, numbering from 8-13 on the body whorl and from 4-6 on the penultimate whorl. Aperture equal in height or shorter than the spire, narrow, convexly elongate, contracted basally, outer lip thin and slightly crimped; interior of aperture pale to dark brown with one or two pale bands and elevated interrupted labral lirae. Anterior part of columella brown, posteriorly cream in colour, with 3-4 prominent oblique folds; base of shell contracted and encircled with granulose spiral cords, anterior canal straight or slightly recurved.

L: 11 to 16 mm W: 34 to 41% A: 42 to 53%

Type locality: None.

Habitat: In sand and weed substrate, from 0-1 fathom.

Uncommon.

Distribution: North and West Viti Levu. - ?

Discussion: The species superficially resembles *Vexillum obeliscus* (REEVE), but it is consistently smaller in size, with fewer and more wide-spaced axial ribs, and lacking the cancellate appearance of *V. obeliscus*; the aperture is narrower, more elongate, and the labral lirae are interrupted and appearing as short ridges which extend as far as the edge of the outer lip.

86. *Vexillum lubens* (REEVE, 1845)

(Plate 23; Figure 124)

1845. *Mitra lubens* REEVE, Conch. Icon., pl. 39, sp. 331

1853. *Mitra compta* A. ADAMS, Proc. Zool. Soc. London, pt. 19: 134

1870. *Mitra corbicula* SOWERBY, Proc. Zool. Soc. London, p. 258

Shell: Shell small, elongate-ovate, moderately solid; white in colour, ornamented with a broad or narrow pale or

bright rose-pink peripheral transverse band on the body whorl and a narrow transverse zone adjoining sutures on earlier whorls; occasional specimens lack the spiral bands, while others are spotted. Sutures deeply impressed, whorls flattened or very slightly concave, numbering from 7 - 9 apart from protoconch which was eroded in specimens examined; coarse and angulate axial ribs cross whorls, numbering from 19 - 24 on the body whorl and from 16 to 21 on the penultimate whorl. Interstices of axial ribs with coarse elevated transverse ridges which override the axial ribs, forming blunt round nodules on the summits, and slightly larger nodules on the presutural ramp; ridges number from 9 - 13 on the body whorl and from 4 - 5 on the penultimate whorl. Aperture shorter than the spire, narrow, often angulate at point of commencement and sharply contracted basally, outer lip moderately thickened, crimped; interior of aperture rose-pink, often with small white and brown zones and 8 - 14 labral lirae. Columella rose-coloured, calloused basally, with 4 - 5 very prominent white or pink oblique folds which extend as distinct granulose spiral cords onto the body whorl; anterior canal calloused, slightly produced and fairly straight.

L: 14 to 22 mm W: 36 to 40% A: 43 to 46%

Animal: Sole of foot pinkish-fawn to rose-pink, edges of foot flecked with dark brown; dorsum of foot fawn, sparsely flecked near the edges with dark brown. Siphon translucent cream, streaked with white and purple; tentacles rather short, about 3 mm in length, translucent brown, flecked with cream. Eyes bluish-black, ringed with brown.

Type locality: Island of Ticao, Philippines.

Habitat: In clean sand substrate, in sand pockets of coral reefs, in shallow water.

Moderately rare.

Distribution: Throughout the Fiji Islands. - From Mauritius through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: Occasional specimens have a row of small brown spots on the body whorl and scattered small spots on earlier whorls; these individuals resemble the species *Mitra corbicula* SOWERBY. The species is so closely latticed that intervening interstices often appear as deep pits; some specimens bear a row of nodules on the presutural ramp of the whorls.

REEVE's description and type figure of *Mitra lubens* are applicable to the species from Fiji; it is in our opinion the earliest available name for this species, and prior to *M. compta* A. ADAMS, 1853.

87. *Vexillum melongena* (LAMARCK, 1811)

(Plate 21; Figures 101, 101a, 101b)

1811. *Mitra melongena* LAMARCK, Ann. Mus. Hist. Nat. 17: 207

Shell: Shell moderate in size, fusiformly-elongate, produced at spire and base; white in colour, ornamented with alternate transverse bands of greenish-brown or very dark brown and white. Banding of body whorl consists generally of 4 white and 4 olive-green or blackish-brown transverse zones; the sutural band is broad, dark olive-green or blackish-brown and the broad white zone bears an orange or light brown spiral thread centrally. Earlier whorls with a white, broad transverse band, which is ornamented with a similar orange thread-like spiral line, and the white zone is often bordered by a narrow dark transverse zone; the white band is usually followed by an olive-green band. Sutures moderately impressed, whorls convex, rounded at sutures, numbering from 9 - 10 apart from the protoconch which was eroded in specimens examined; numerous slightly elevated axial ribs cross whorls, ribs angulate or rounded, moderately straight or slightly curved, numbering from 22 - 33 on the body whorl and from 22 - 31 on the penultimate whorl. Interstices of axial ribs transversely grooved, grooves either short or extending almost to the summits of the ribs, but overriding ribs on the presutural ramp, which appear slightly nodulose; interstitial grooves number from 12 - 15 on the body whorl and from 8 - 10 on the penultimate whorl. The axial ribs continue towards the base as round nodules; these nodules are usually very prominent and arranged in 10 - 14 spiral rows terminating at the columella. Occasional specimens are smooth on the latter half of the body whorl. Aperture equal in height or slightly longer than the spire, narrow and elongate, contracted basally, outer lip thickened, smooth, with 3 - 5 dark brown spots on the edge of the lip; interior of aperture pale violet, with occasional white areas and a dark purple stain at the base of the canal, and with 8 - 13 labral lirae. Columella brown, calloused, with 4 - 5 prominent oblique folds; anterior canal straight and spirally corded.

L: 35 to 44 mm W: 31 to 33% A: 53 to 56%

Type locality: Océan indien.

Habitat: In clean sand substrate, among weed, in shallow water.

Rare.

Distribution: North and West Viti Levu. - From the Philippines through the tropical Pacific to Fiji.

Discussion: *Vexillum melongena* has been interpreted as

a coarse heavy species with correspondingly coarser sculpture throughout, angulate whorls and straight sides and similar in colouring to *V. utravis* (MELVILL).

LAMARCK's original diagnosis is clear and detailed and mentions salient features not visible in his type figure (1798; pl. 373, fig. 9), which was the only reference cited by the author. The type figure, although badly executed, shows a shell with convex rounded whorls, and LAMARCK's description leaves no doubt that *Vexillum melongena* is a species with fine sculpture and numerous axial ribs.

LAMARCK's description is as follows: "*M. fusiformis, albida, fusco rufescente fasciata; costellis longitudinalibus creberrimis, striis transversis, infra suturas profundioribus; spira peracuta.*"

LAMARCK's French discussion adds even more detail, as can be seen from the following passage: "Elle est fusiforme, ventrue au milieu, pointue aux extrémités, et remarquable par une multitude de petites côtes longitudinales qui la font paroître cannelée dans sa longueur. Sur un fond blanchâtre, elle est ornée de plusieurs zones transverses, les une d'un roux très-brun, les autres d'un fauve livide. Elle offre en outre une ligne jaune transversale, dans la partie claire ou blanche de chaque tour."

The size of the shell was given as 38 - 40 mm, and no locality was cited.

All important diagnostic characters have been mentioned by LAMARCK: the whitish base-colour, dark brown and livid-white transverse zones, yellow spiral thread in the light zones, pointed spire and base, and the numerous crowded axial ribs; the type figure shows convexly rounded whorls.

LAMARCK's colour comparison of *Mitra melongena* with his "Mitre en lyre" (= *Mitra subdivisa* (GMELIN, 1791)) is somewhat misleading, as live-collected specimens of the latter species are certainly not whitish. LAMARCK's specimen of *M. subdivisa*, however, may have been beach-worn and such specimens exhibit a dirty-white base colour. In his description of *M. subdivisa*, LAMARCK uses the words "*albida*" and "*sur un fond blanchâtre*" to describe the colouring, colours applicable to beach-worn specimens, not to live-collected ones.

LAMARCK's cited type figure, a ventral view of the species only, is not ideal for a positive identification; however, in conjunction with his detailed description it assists in an unequivocal interpretation of the species.

88. *Vexillum michau* (CROSSE & FISCHER, 1864)

(Platc 19; Figure 76)

1844. *Mitra rigida* REEVE, Conch. Icon., pl. 22, sp. 169 (non SWAINSON, 1822)

1864. *Mitra michau* CROSSE & FISCHER, Journ. Conchyl., 12: 337 (nom. nov. pro *M. rigida* REEVE, 1844)

1874. *Mitra alauda* "QUOY," SOWERBY, Thes. Conch., 4: 35; pl. 10, figs. 134, 135

1874. *Mitra michaudi*, SOWERBY, Thes. Conch., 4: 35; pl. 10, fig. 157

Shell: Shell small, fusiformly-clongate, light in weight; purple to purplish-grey in colour, ornamented with one or two narrow light transverse bands on the body whorl and one central band on earlier whorls; body whorl with 3 - 5 rows of dark orange-brown spots situated on the axial ribs, penultimate whorl with two rows. Sutures moderately impressed, whorls convex and angulate at the sutures, numbering from 9 - 10 apart from protoconch of 2 - 2½ glassy-fawn nuclear whorls; prominent wide-spaced and curved axial ribs cross whorls, ribs angulate but slightly rounded on the summits and occasionally bluntly nodulose on the presutural ramp; axial ribs number from 9 - 13 on the body whorl and from 8 - 12 on the penultimate whorl. Interstices of axial ribs with very fine spiral striae, striae terminating as nodulose spiral cords basally. Aperture shorter than the spire, narrow, outer lip moderately thickened, smooth, elongate, pointed basally; interior of aperture dark purple-brown with a white transverse band, interior edge of outer lip whitish. Labral lirae number from 6 - 10 and are often indistinct; columella purplish, calloused basally, with 4 - 5 bluish-white oblique folds. Anterior canal produced and pointed, calloused, straight and spirally corded.

L: 16 to 23 mm W: 28 to 32% A: 41 to 46%
Type locality: None.

Explanation of Plate 20

- Figure 89: *Vexillum vulpecula* (LINNAEUS). Fiji (x 1.0) Figure 90: *Vexillum rugosum* (GMELIN) Fiji (x 1.25) Figure 91: *Vexillum caffrum* (LINNAEUS). Fiji (x 0.9) Figure 92: *Vexillum subdivisum* (GMELIN). Fiji (x 1.2) Figure 93: *Vexillum costellaris* (LAMARCK). Siasi, Sulu Isld., Philippines (x 1.1) Figure 94: *Vexillum plicarium* (LINNAEUS). Fiji (x 1.1) Figure 95: *Vexillum gruneri* (REEVE). Fiji (x 2.0) Figure 96: *Vexillum radix* (SOWERBY). Fiji (x 1.75) Figure 97: *Vexillum crebriliratum* (REEVE). Fiji (x 2.0) Figure 97a: *Vexillum crebriliratum* (REEVE), colour variant. Fiji (x 2.0) Figure 98: *Vexillum taeniatum* (LAMARCK), Type-figures from the "Encyclopédie méthodique." Figure 98a: *Vexillum taeniatum* (LAMARCK), juvenile specimen. Fiji (x 1.0) Figure 98b: *Vexillum taeniatum* (LAMARCK), fine-ribbed specimen with rounded whorls. Fiji (x 1.0) Figure 98c: *Vexillum taeniatum* (LAMARCK), specimen similar to LAMARCK's holotype extant in the Muséum d'Histoire Naturelle, Geneva. Fiji (x 1.4) Figure 98d: *Vexillum taeniatum* (LAMARCK), coarse-ribbed form with subangulate whorls. Fiji (x 1.2)



Figure 89

Figure 90

Figure 91

Figure 92

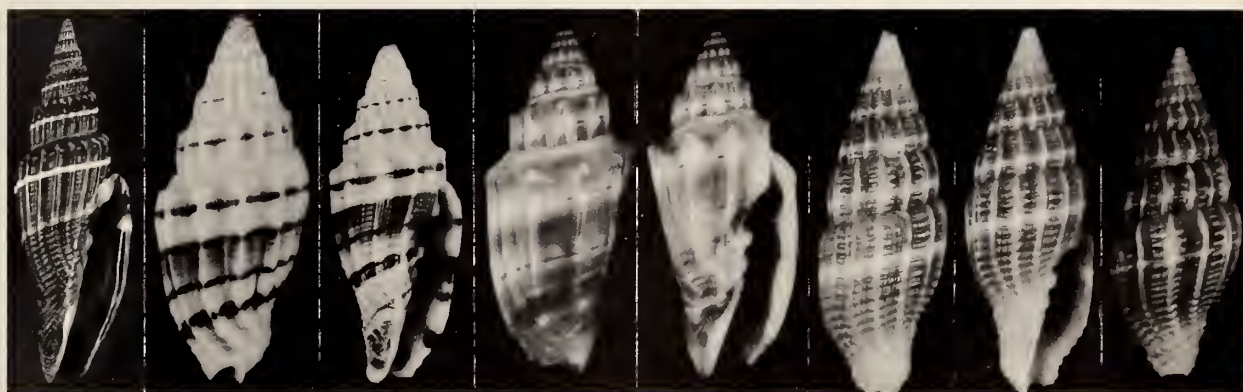


Figure 93

Figure 94

Figure 95

Figure 96



Figure 97

Figure 97 a

Figure 98

Figure 98 a

Figure 98 b

Figure 98 c

Figure 98 d



Habitat: In clean and weedy sand substrate, in sand pockets of coral reefs in shallow water.

Rare.

Distribution: North Viti Levu. – From Mauritius through the tropical Indo-Pacific to Fiji.

Discussion: *Mitra alauda* "QUOY" has not been mentioned or described prior to SOWERBY's listing in the "Thesaurus Conchyliorum" (1874).

89. *Vexillum militaris* (REEVE, 1845)

(Plate 21; Figure 103)

1845. *Mitra militaris* REEVE, Conch. Icon., pl. 29, sp. 236a, 236b

Shell: Shell small, elongate-fusiform, turreted and solid; white to cream in colour, ornamented with a narrow or broad, pink or reddish central transverse band on the body whorl; on earlier whorls the transverse bands adjoin the sutures, but may be obsolete or confined to the interstices of the axial ribs. Sutures deeply impressed, whorls flattened or slightly convex, early whorls convex, either angulate or subangulate at the sutures, numbering from 6 to 7 apart from protoconch of $1\frac{1}{2}$ creamy-white nuclear whorls. Elevated and angulate axial ribs cross whorls, ribs flattening basally, numbering from 15 - 20 on the body whorl and from 14 - 17 on the penultimate whorl; occasional specimens are bluntly coronate, faintly stained with light yellow on the presutural ramp. Interstices of axial ribs spirally grooved, grooves deep and either confined to the interstices or overriding axial ribs; grooves number from 12 - 15 on the body whorl and from 4 - 6 on the penultimate whorl. Aperture equal in height to the spire, narrow, outer lip moderately thickened, smooth, narrowly elongate, pointed basally; interior of aperture cream, light fawn or yellow, deep interior occasionally brown, with 9 - 14 labral lirae. Columella flesh-coloured, calloused basally, with 4 - 5 prominent oblique folds; anterior canal slightly produced, heavily calloused, straight or recurved.

L: 12 to 17 mm W: 34 to 37% A: 47 to 50%

Type locality: Island of Ticao, Philippines.

Habitat: In clean sand substrate, in sand pockets of coral reefs, in shallow water.

Rare.

Distribution: North Viti Levu. – From the Philippine Islands to Fiji.

90. *Vexillum obeliscus* (REEVE, 1844)

(Plate 19; Figure 80)

1844. *Mitra obeliscus* REEVE, Conch. Icon., pl. 15, fig. 107

1874. *Mitra subtruncata* SOWERBY, Thes. Conch., 4: 34; pl.

20, fig. 405

Shell: Shell moderately small, elongate-fusiform, spire long and pointed; orange-brown to dark brown in colour, ornamented with a white transverse band anteriorly to the suture on the body whorl and adjoining sutures on earlier whorls; the white bands generally extend in width over 2 - 4 spiral ridges, and occasional specimens have two such bands on the body whorl. Whorls flattened or convexly rounded, sutures deeply impressed, whorls rounded or weakly subangulate at sutures, numbering from 8 - 10 apart from protoconch of 2 glassy-purple nuclear whorls; apex of spire stained purplish-brown. Elevated, angulate or rounded axially curved ribs cross whorls, numbering from 21 - 29 on the body whorl and from 18 - 26 on the penultimate whorl; elevated spiral ridges bisect the axial ribs, often forming small nodules at point of intersection on the ribs; in some specimens the spiral ridges are confined to the interstices, where they appear as short flat ridges. Spiral ridges number from 13 - 18 on the body whorl, and from 4 - 8 on the penultimate whorl. Aperture shorter than the spire, moderately narrow, outer lip thin and convexly rounded, contracted basally; interior of aperture pale fawn to dark brown with a transverse light band and 5 - 12 labral lirae, lirae occasionally nodulose. Columella brownish, with 4 - 5 oblique folds; body whorl rounded, contracted towards the base, with nodulose spiral cords basally. Anterior canal moderately or greatly produced, calloused, straight or distinctly recurved.

L: 16 to 26 mm W: 31 to 36% A: 39 to 47%

Type locality: Bais, Island of Negros, Philippine Islands.

Habitat: In clean sand substrate, among weed, in shallow water.

Uncommon.

Distribution: West and South Viti Levu. – From Mauritius through the tropical Indo-Pacific to Fiji.

Discussion: The species is extremely variable in colour pattern, sculpture, height of aperture and length of anterior canal. The majority of specimens examined had only a single white transverse band on the body whorl, while rare individuals show two distinct white bands on the body whorl.

GATE & BURCH (1964) reported individual variants of *Vexillum obeliscus* under the name *V. subtruncatum* (SOWERBY, 1874) from Fiji. No two specimens of *V. obeliscus* collected in Fiji waters are alike and variants of the species are so frequent in all localities that it is impossible to determine which form represents the most frequent "typical" species. SOWERBY (1874) compared his *Mitra subtruncata* to *M. obeliscus* REEVE from which it is said to differ in being straight and compressed at the sides, and slightly truncated above the contracted termination.

Mitropifex kurodai SAKURAI & HASE, 1964 is similar to *Vexillum obeliscus*, except that it is larger in size (26 - 32

millimeters), broader 37-42% of Length), and with more numerous spiral cords (25) on the body whorl; there are three white transverse zones on the body whorl, but only one or two in *V. obeliscus*.

91. *Vexillum obtusispinosum* (SOWERBY, 1874)

(Plate 22; Figure 116)

1874. *Mitra obtusispinosa* SOWERBY, Thes. Conch., 4: 37; pl. 19, fig. 373

Shell: Shell moderately small, fusiformly-elongate, spire pointed; whitish to cream in colour, ornamented with irregular orange-brown or dark brown spots, blotches and longitudinal streaks. Sutures weakly to moderately impressed, early whorls convexly rounded, last three whorls concave and angulate at sutures, numbering from 8-10 apart from the protoconch of 2 nuclear whorls; prominent concave and angulate axial ribs cross whorls, ribs forming 2-3 rows of spiny nodules on the summits, spines near suture the most prominent. Interstices of axial ribs with deep transverse grooves, grooves barely extending to the summits of the ribs, or overriding these in certain individuals; transverse grooves number from 14-19 on the body whorl and from 5-7 on the penultimate whorl. Aperture about equal in height to the spire, angulate and contracted basally, outer lip slightly thickened and faintly crimped along the edge; interior of aperture white, occasionally blotched with brown, with 6-13 labral lirae. Columella white with 5 white oblique folds; anterior canal straight, with nodulose spiral cords, base of aperture slightly shorter than the anterior canal.

L: 16 to 23 mm W: 35 to 39% A: 46 to 51%

Type locality: None.

Habitat: In clean sand substrate, from 0-5 fathoms.

Uncommon.

Distribution: North and West Viti Levu. - From the Philippines through the tropical Pacific to Fiji.

92. *Vexillum pacificum* (REEVE, 1845)

(Plate 18; Figure 70)

1845. *Mitra pacifica* REEVE, Conch. Icon., pl. 33, sp. 272

1860. *Mitra wisemani* DOHRN, Proc. Zool. Soc. London, pt. 28: 367

Shell: Shell small, elongate-ovate to ovate, turreted; cream or creamy-white in colour, ornamented with round dark brown spots generally arranged in a central transverse row on the body whorl, adjoining the sutures on earlier whorls; some specimens thickly sprinkled with very small orange-brown dots. Sutures moderately to deeply impressed, whorls flattened or slightly concave,

angulate at sutures, numbering from 7-9 apart from protoconch of 1½ nuclear whorls; slightly elevated narrow and rounded axial ribs cross whorls, main ribs numbering from 11-21 on the body whorl and from 13-17 on the penultimate whorl. Smaller axial ribs are positioned between the main ribs, which become elevated nodules on the presutural ramp; deep spiral grooves encircle the shell, bisecting axial ribs, numbering from 10-15 on the body whorl and from 4-8 on the penultimate whorl; the spiral grooves and axial ribs form squarish nodules at point of intersection, which have a step-like appearance in profile. Aperture equal in height or shorter than the spire, squarish, outer lip moderately thickened and obsoletely crenulate, slightly constricted near point of commencement; interior of aperture yellowish, with 5-12 nodulose labral lirae. Columella calloused, white in colour, with 4 prominent oblique and curved folds; anterior canal calloused and recurved towards aperture. L: 10 to 20 mm W: 41 to 50% A: 40 to 50% **Animal:** Sole and dorsum of foot cream, profusely spotted with very small orange dots. Siphon creamy-white, thickly spotted with orange; tentacles translucent-white, base cream, finely spotted with orange. Eyes black, ringed with grey.

Type locality: Lord Hood Island, Pacific Ocean.

Habitat: In weedy sand substrate, in shallow water.

Moderately common.

Distribution: Throughout the Fiji Islands. - From Mauritius through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: The species is similar to *Vexillum cadaverosum* (REEVE), which has more elevated and sharply angulate axial ribs, with a row of spines on the presutural ramp and another row of nodules on the periphery of the body whorl; the last three whorls are distinctly concave in *V. cadaverosum*, the spiral grooves are shallower and the base is prominently spirally corded. The whorls are encircled by a narrow transverse band, and the species lacks the decussate appearance of *V. pacificum*. The animal-pattern of the two similar species is consistently different.

93. *Vexillum plicarium* (LINNAEUS, 1758)

(Plate 20; Figure 94)

1758. *Voluta plicaria* LINNAEUS, Syst. Nat., ed. 10, p. 732, no. 366

1798. *Vexillum plicatum* RÖDING, Mus. Bolten., p. 138

1798. *Vexillum lividum* RÖDING, Mus. Bolten., p. 138

1807. *Voluta elegans* LINK, Besch. Nat.-Samml. Univ. Rostock, p. 127 (non GMELIN, 1791)

1811. *Mitra corrugata* LAMARCK (pars), Ann. Mus. Hist. Nat., 17: 205

1845. *Mitra denticulata* "MARTYN," CHENU, Univ. Conch., p.26; pl. 35, fig. 2a

Shell: Shell moderate in size, elongate-ovate, fusiform, turreted, solid and heavy; white to cream in colour, ornamented with a broad olive-green or dark brown transverse band and one or two distinct interrupted spiral bands on the body whorl; earlier whorls encircled with a single interrupted spiral line. The narrow spiral bands are usually confined to the interstices of the axial ribs, but in some specimens they are almost continuous. Sutures moderately impressed, whorls flattened to slightly concave, angled at sutures, numbering from 8 - 9 apart from protoconch of 2 - 3 dark purple-brown nuclear whorls; wide spaced and angulate axial ribs cross whorls, ribs often spinose on the presutural ramp, numbering from 8 - 13 on the penultimate and on the body whorl. Shallow spiral grooves encircle the shell, grooves ill-defined and over-riding axial ribs on body whorl, confined to interstices on earlier whorls; grooves number from 16 - 24 on the body whorl and from 4 - 8 on the penultimate whorl, but are almost obsolete in large adult specimens. Aperture slightly longer than spire, narrow and elongate, slightly constricted centrally, outer lip thick, smooth, flecked with 3 - 4 dark brown blotches; interior of aperture whitish or light blue, with 7 - 12 labral lirae. Columella whitish, calloused basally, with 4 - 5 prominent oblique folds; the first columellar fold is generally placed transversely to the aperture. Anterior canal straight, heavily calloused, base of shell with prominent nodulose spiral cords.

L: 34 to 50mm W: 37 to 40% A: 55 to 60%

Type locality: O. Asiatico.

Habitat: In clean sand substrate, in sand patches of lagoons, in shallow water.

Rare.

Distribution: North Viti Levu. - From the Andaman Islands through the tropical Indo-Pacific to Micronesia and Fiji.

94. *Vexillum radius* (REEVE, 1845)

(Plate 18; Figure 68)

1845. *Mitra radius* REEVE, Conch. Icon., pl. 37, fig. 309

Shell: Shell small, narrow, elongate-fusiform, spire high and slender; fawn to light brown in colour, ornamented with a single broad white transverse band on the body whorl and earlier whorls. Sutures moderately impressed, whorls convex, slightly angulate at the suture in large adult specimens, numbering from 7 - 8 apart from protoconch of 2 - 3 glassy-fawn nuclear whorls; elevated, curved and angulate axial ribs cross whorls, ribs wide-spaced, occasionally rounded on the summits, numbering from 10 to

16 on the body whorl and from 10 - 14 on the penultimate whorl. Interstices of axial ribs sculptured with narrow and deep transverse grooves, grooves barely extending to the summits of the axial ribs, numbering from 13 - 18 on the body whorl and from 4 - 7 on the penultimate whorl; transverse grooves terminate as spiral cords towards the base of the body whorl. Aperture much shorter than the spire, convexly-elongate, contracted basally, outer lip thin, smooth; interior of aperture fawn to orange, with 2 - 11 labral lirae. Columella orange to fawn in colour, calloused, with 4 - 5 white oblique folds; anterior canal calloused, recurved and slightly longer than the aperture.

L: 11 to 17mm W: 29 to 35% A: 35 to 43%

Type locality: Island of Corregidor, Philippine Islands.

Habitat: In fine weedy sand substrate, from 0 to 15 fathoms.

Uncommon.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands to Fiji.

95. *Vexillum radix* (SOWERBY, 1874)

(Plate 20; Figure 96)

1874. *Mitra radix* SOWERBY, Thes. Conch., 4: 36; pl. 25, fig. 552

Shell: Shell moderately small, elongate, fairly solid; chestnut-brown in colour, ornamented with a narrow white peripheral band on the body whorl and earlier whorls. Sutures prominent, whorls convex, subangulate at sutures, numbering from 9 - 11 apart from protoconch which was eroded in all specimens examined; elevated and angulate axial ribs cross whorls, ribs arcuate, becoming nodulose towards the base, numbering from 12 to 20 on the body whorl and from 12 - 17 on the penultimate whorl. Interstices of axial ribs transversely grooved, grooves deep and broad, almost extending to the summits of the axial ribs, numbering from 12 - 17 on the body whorl and from 5 - 7 on the penultimate whorl. Aperture shorter than the spire, narrow and convexly elongate, contracted and reflected basally; outer lip moderately thin and smooth. Interior of aperture whitish or pale brown, with 7 - 11 labral lirae; columella calloused, brownish in colour, with 4 - 5 oblique white folds. Anterior canal calloused, slightly produced and spirally corded.

L: 18 to 30mm W: 32 to 37% A: 41 to 46%

Type locality: None.

Habitat: On sand and coral rubble substrate, in deep water.

Uncommon.

Distribution: South Viti Levu. - ?

Discussion: SOWERBY (1874) remarked on the similarity of his new species with *Vexillum obeliscus* (REEVE), but

pointed out that it differs in the more wide-spaced arcuate axial ribs. In *V. obeliscus* the white transverse bands are wider, axial ribs close-set and more numerous, whorls less convex, and the interstices are cancellate with spiral ridges. In *V. radix* the axial ribs are distinctly arcuate and in profile are slightly nodulose; this nodulosity is not caused, however, by the overriding spiral ridges as in *V. obeliscus*.

96. *Vexillum rufofilosum* (E. A. SMITH, 1876)

(Plate 19; Figure 79)

1876. *Mitra (Turricula) rufofilosa* E. A. SMITH, Journ. Linn. Soc., 12: 548; pl. 30, fig. 10

Shell: Shell small, turreted, moderately solid, elongate; reddish-brown to dark brown in colour, ornamented with a white transverse band a short distance anteriorly to the suture on the body whorl, and one or two ill-defined white bands towards the base; the peripheral white zone bears a central narrow continuous or interrupted orange spiral line; on earlier whorls the white transverse band is narrow and situated centrally on whorls. Sutures prominent, whorls flattened and straight or slightly convex, angulate at sutures, numbering from 9 - 11 apart from 1½ to 2 purplish-brown nuclear whorls; white elevated and angulate axial ribs cross whorls, those on the body whorl terminating in nodules towards the base; axial ribs number from 13 - 17 on the body whorl and from 11 - 15 on the penultimate whorl. Interstices of axial ribs with deep and broad spiral grooves, grooves numbering from 12 - 23 on the body whorl and from 6 - 8 on the penultimate whorl; interstitial grooves are often stained with dark brown and are either short or extend to the summits of the axial ribs; the early whorls are tinged with purplish brown. Aperture equal in height to the spire, narrow, angulate, contracted basally, outer lip thickened, smooth; interior of aperture violet, tinged with brown and with a narrow white transverse band, and 4 - 10 labral lirae. Columella brown, calloused, white basally, with 4 - 6 prominent oblique folds; anterior canal calloused, spirally corded and produced, often longer than the base of the outer lip.

L: 18 to 28 mm W: 32 to 35% A: 48 to 54%

Type locality: Solomon Islands.

Habitat: In clean sand substrate, in deeper water.

Moderately rare.

Distribution: South and West Viti Levu. - Philippines, Solomon Islands.

Discussion: The orange spiral band superimposed on the white transverse zone is generally more prominent in the

interstices of the axial ribs, becoming paler towards the summits; the orange thread was present in all specimens examined.

97. *Vexillum rugosum* (GMELIN, 1791)

(Plate 20; Figure 90)

1791. *Voluta rugosa* GMELIN, Syst. Nat., ed. 13, p. 3456

1811. *Mitra corrugata* LAMARCK (pars), Ann. Mus. Hist. Nat., 17: 205

1853. *Mitra jukesi* A. ADAMS, Proc. Zool. Soc. London, pt. 19: 139

Shell: Shell moderate in size, elongate, turreted, heavy and solid; brown, green or greenish-grey in colour, ornamented with one to three whitish transverse bands on the body whorl and a single whitish band on earlier whorls. Sutures weakly impressed, whorls flattened to convex, angulate at sutures, numbering from 9 - 10 apart from protoconch of 2 dark purple nuclear whorls; elevated and angulate axial ribs cross whorls, ribs nodulose and produced on the presutural ramp, numbering from 6 - 11 on the body whorl and from 9 - 13 on the penultimate whorl; axial ribs are generally quite distinct on the body whorl but may become obsolete on the latter half in some individuals. Moderately deep spiral grooves encircle the shell, grooves bisecting axial ribs and continuing basally as spiral cords; grooves number from 18 - 23 on the body whorl and from 5 - 8 on the penultimate whorl. Aperture equal in height or longer than the spire, narrow, angulate, somewhat constricted centrally, outer lip thick, smooth; interior of aperture bluish-white or light violet, interior edge of outer lip and anterior canal stained dark brown; labral lirae prominent, numbering from 8 - 14. Columella glazed, calloused, whitish, violet or light brown in colour, with 4 - 5 prominent oblique folds; the first columellar fold is oriented transversely to the aperture. Anterior canal calloused and straight.

L: 33 to 44 mm W: 39 to 42% A: 55 to 62%

Type locality: None.

Habitat: In clean sand substrate, in sand pockets of coral reefs, in shallow water.

Rare.

Distribution: North Viti Levu. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: The species differs from *Vexillum vulpculula* (LINNAEUS) in colour pattern, the more distinct and deeper spiral grooves, the prominent knobs of the axial ribs, angulate whorls and slightly greater width in relation to shell-length.

98. *Vexillum sanguisugum* (LINNAEUS, 1758)

(Plate 19; Figure 85)

1758. *Voluta sanguisuga* LINNAEUS, Syst. Nat., ed 10, p. 732, no. 3541811. *Mitra stigmataria* LAMARCK, Ann. Mus. Hist. Nat., 17: 2081923. *Mitra* (*Turricula*) *sanguisuga* var. *caerulescens* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 1841923. *Mitra* (*Turricula*) *sanguisuga* var. *transposita* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 1841923. *Mitra* (*Turricula*) *sanguisuga* var. *castaneocincta* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 186

Shell: Shell moderate in size, narrow, fusiformly-elongate; whitish, cream or bluish-grey in colour, ornamented with two rows of small orange to reddish-brown spots on the body whorl and a single row of spots on earlier whorls; spots either squarish or axially elongate, situated on the summits of the axial ribs. Sutures moderately impressed, whorls convex, rounded at sutures, numbering from 10 to 12 apart from protoconch of 2 dark purple nuclear whorls; axial ribs cross whorls, ribs almost straight, angulate, slightly rounded on the summits, numbering from 16 - 28 on the body whorl and from 13 - 19 on the penultimate whorl. Moderately deep spiral grooves encircle the shell, grooves often coloured purple and bisecting axial ribs, numbering from 18 - 36 on the body whorl and from 6 to 12 on the penultimate whorl; interstices of axial ribs are purple. Aperture equal in height or shorter than the spire, narrow, elongate, outer lip moderately thickened, smooth; interior edge of outer lip purplish-brown, deep interior of aperture pale violet or bluish-white, with 0 - 17 labral lirae. Columella calloused, brownish or dark purple in colour, with 3 - 5 whitish, oblique folds; anterior canal straight, calloused, spirally corded.

L: 27 to 46 mm W: 24 to 30% A: 42 to 49%

Animal: Sole of foot light grey, densely variegated with darker grey; dorsum of foot whitish, sparsely streaked with grey. Tentacles white, base white, thinly flecked with grey; siphon alternately flecked with white and dark grey, distal end tipped with blackish-grey.

Type locality: M. Mediterraneo [error].**Habitat:** In clean sand substrate, in sand pockets of coral reefs, from 0 to 4 fathoms.

Moderately common.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: DAUTZENBERG & BOUGE (1923) established a number of varietal names for colour variants which occur in almost every population of the species in Fiji localities; these varietal names are hardly justified for individual colour variants and are of no taxonomic value as subspecific terms.

Mitra stigmataria LAMARCK was actually intended as a replacement name for *Voluta granosa* GMELIN, 1791 (*vide* LAMARCK, 1811, p. 209). LAMARCK, however, specifically mentioned the transverse rows of blood-red dots on the shell and was thus describing *Vexillum sanguisugum* (LINNAEUS) and not *V. granosum* (GMELIN); the latter species always lacks the red dots on the summits of the axial ribs.

99. *Vexillum semifasciatum* (LAMARCK, 1811)

(Plate 22; Figure 112)

1811. *Mitra semifasciata* LAMARCK, Ann. Mus. Hist. Nat., 17: 2171822. *Mitra rigida* SWAINSON, Zool. Illust., ser. 1, pl. 29, fig. 2 (centre)

Shell: Shell small, elongate-ovate, solid; white, cream or grey in colour, ornamented with a broad reddish-brown to dark greenish-brown transverse band on the body whorl and a single band of the same colour adjoining sutures on earlier whorls; the transverse zones are generally bordered by a darker narrow and interrupted spiral line, and numerous specimens have orange-coloured axial ribs. Sutures deeply impressed, whorls slightly convex, angulate at sutures, numbering from 7 - 10 apart from protoconch of 2½ - 3 glassy-brown nuclear whorls; elevated, angulate and slightly curved axial ribs cross whorls, ribs coarse, slightly humped at sutures, numbering from 11 - 18 on the body whorl and from 11 - 16 on the penultimate whorl. Base of body whorl with faint spiral grooves, about 4 - 10 in number, and prominent nodulose spiral cords. Aperture equal in height or shorter than the spire, moderately narrow, outer lip convexly rounded, thickened, smooth; interior of aperture violet with a narrow white transverse band and 4 - 18 labral lirae. Columella dark brown or purplish-brown with 4 very prominent white or light violet columellar folds; anterior canal straight, heavily calloused.

L: 14 to 27 mm W: 39 to 45% A: 43 to 51%

Animal: Sole of foot white or cream, variegated with light grey; dorsum of foot white, anteriorly stained with blackish-grey. Siphon very dark grey, irregularly speckled with white; tentacles translucent cream, base stained with grey; eyes black.

Type locality: Océan indien.**Habitat:** In clean and muddy sand substrate, in sand pockets of coral reefs, in shallow water.

Common.

Distribution: Throughout the Fiji Islands. - From the Red Sea through the tropical Indo-Pacific to Samoa.

Discussion: LAMARCK (1811) did not cite any references to illustrations and the holotype is not in the Muséum

d'Histoire Naturelle in Geneva (Dr. Binder, *in litt.*). The original description, however, is clear and detailed and enables an unequivocal identification of the species.

100. *Vexillum semisculptum* (ADAMS & REEVE, 1850)

(Plate 18; Figure 67)

1850. *Mitra semisculpta* ADAMS & REEVE, Voy. Samarang, pt. 2: 27; pl. 10, fig. 28

Shell: Shell small, fusiformly-elongate, spire slender and pointed; light fawn to greenish-fawn in colour, rarely olive-green, ornamented with a narrow white central band on the body whorl and a single white band adjacent to the sutures on earlier whorls; apex dark brown to purplish brown. Sutures deeply impressed, whorls convex, rounded at sutures, numbering from 9 - 10 apart from protoconch of 2 glassy-brown nuclear whorls; coarse, wide-spaced angulate axial ribs cross whorls, numbering from 3 - 13 on the body whorl and from 8 - 13 on the penultimate whorl. Interstices of axial ribs with wide-spaced, shallow, punctate spiral grooves, grooves occasionally overriding axial ribs on penultimate and earlier whorls; grooves number from 7 - 12 on the body whorl and from 3 - 5 on the penultimate whorl, terminating towards the base of the shell in distinct spiral cords, numbering from 4 - 8. Aperture shorter than the spire, narrow, outer lip moderately thin, smooth, convexly elongate and contracted basally; interior of aperture purplish-brown with a light transverse band and 2 - 10 labral lirae. Columella greenish, with 3 - 4 oblique folds; anterior canal slightly calloused, produced, occasionally slightly longer than the outer lip.

L: 13 to 24 mm W: 30 to 36% A: 40 to 47%

Animal: The sole and dorsum of the foot are creamy-fawn.

Other details not observed.

Type locality: Sooloo Island, Philippine Islands.

Habitat: In clean sand and weedy sand substrate, in lagoons and sand pockets of coral reefs, from 0 - 3 fathoms.

Uncommon.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands through the tropical Pacific to Fiji.

Discussion: The species shows surprisingly little variation, with the exception of the number of axial ribs on the body whorl; the majority of specimens examined lacked axial ribs on the latter half of the body whorl.

101. *Vexillum subdivisum* (GMELIN, 1791)

(Plate 20; Figure 92)

1791. *Voluta subdivisa* GMELIN (pars), Syst. Nat., ed. 13, p. 3453

1811. *Mitra subdivisa*, LAMARCK, Ann. Mus. Hist. Nat., 17: 206

1822. *Mitra lyrata* LAMARCK, Anim. sans Vert., 7: 308

Shell: Shell moderate in size, elongate-fusiform, turreted, fairly light in weight; grey, olive-green or greyish-brown in colour, ornamented with two or three narrow dark brown transverse bands on the body whorl and a broad zone of the same colour at the base of the shell; earlier whorls with a central band of the same colour, occasionally situated at the sutures in some individuals; the transverse band anterior to the suture on the body whorl and the spiral bands on earlier whorls are generally bordered by a narrow white spiral band. Sutures moderately impressed, whorls convex, rounded or subangulate at sutures, numbering from 9 - 11 apart from protoconch of $1\frac{1}{2}$ - 2 glassy-brown or purple nuclear whorls; slender and angulate axial ribs cross whorls, ribs finely rounded on the summits and occasionally coloured light orange, numbering from 14 - 19 on the body whorl and from 13 - 16 on the penultimate whorl. Interstices of axial ribs with wide-spaced deep spiral grooves, grooves almost extending to the summits of the axial ribs, numbering from 15 - 22 on the body whorl and from 5 - 10 on the penultimate whorl. Aperture equal in height or slightly longer than the spire, narrow and elongate, slightly undulate, contracted basally, outer lip thick, smooth; interior of aperture bluish-white or light violet, interior edge of outer lip with 3 - 4 dark

Explanation of Plate 21

- Figure 99: *Vexillum intertaeniatum* (SOWERBY). Fiji (x 2.0) Figure 100: *Vexillum* species. Fiji (x 1.25) Figure 101: *Vexillum melongena* (LAMARCK). Fiji (x 1.25) Figure 101a: *Vexillum melongena* (LAMARCK). Pearl reef, Great Barrier Reef, Queensland, Australia (1.25) Figure 101b: Type-figures of *Vexillum melongena* (LAMARCK), from the Encyclopédie méthodique." Figure 102: *Vexillum thaanumi* PILSBRY. Keehi Lagoon, Oahu, Hawaii (x 2.0) Figure 102a: *Vexillum thaanumi* PILSBRY, juvenile specimen. Fiji (x2.8) Figure 103: *Vexillum militaris* (REEVE). Fiji (x 3.25) Figure 104: *Vexillum todilla* (MIGHELS). Fiji (x 3.4, small specimen x 2.5) Figure 105: *Pusia infausta* (REEVE). Fiji (x 3.0) Figure 106: *Pusia bernhardina* (RÖDING). Fiji (x 2.6) Figure 107: *Pusia amabilis* (REEVE). Fiji (x 3.3) Figure 108: *Pusia corallina* (REEVE). Fiji (x 2.5) Figure 109: *Pusia semicostata* (ANTON). Fiji (x 2.5) Figure 110: *Pusia microzonias* (LAMARCK). Fiji (x 2.0) Figure 110a: *Pusia microzonias* (LAMARCK), slender form. Fiji (x 2.0) Figure 111: *Pusia consanguinea* (REEVE) Fiji (x 2.0)



Figure 99

Figure 100

Figure 101

Figure 101 a

Figure 101 b



Figure 102

Figure 102 a

Figure 103

Figure 104

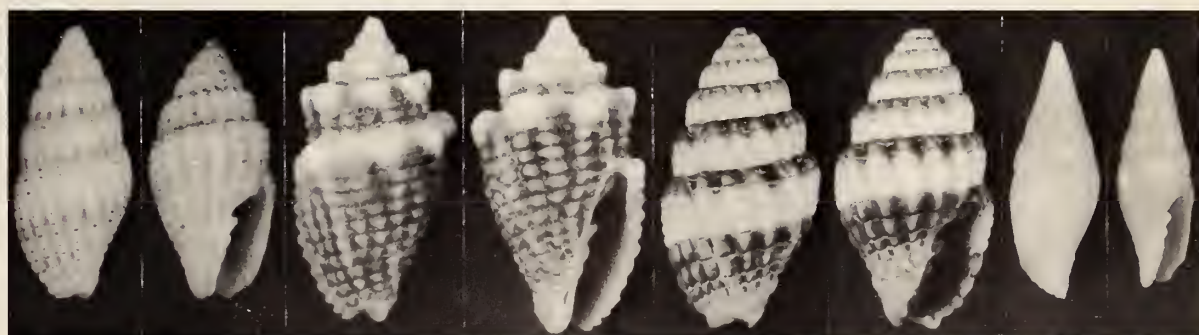


Figure 105

Figure 106

Figure 107

Figure 108

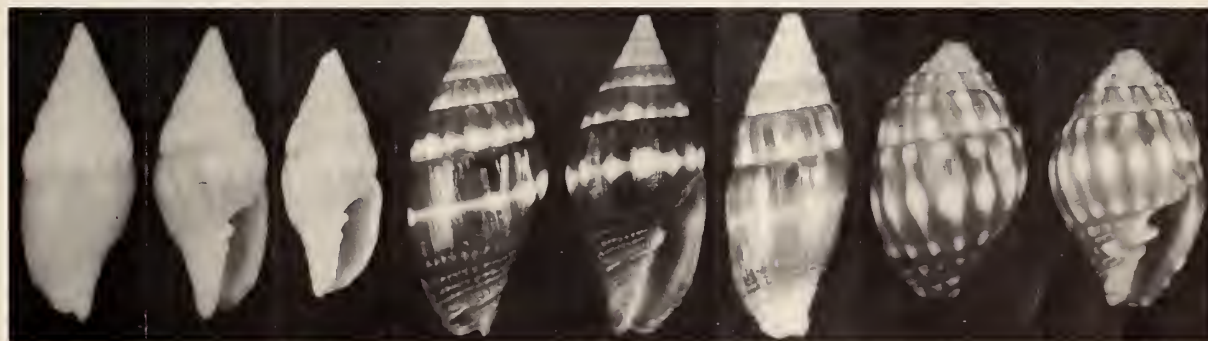
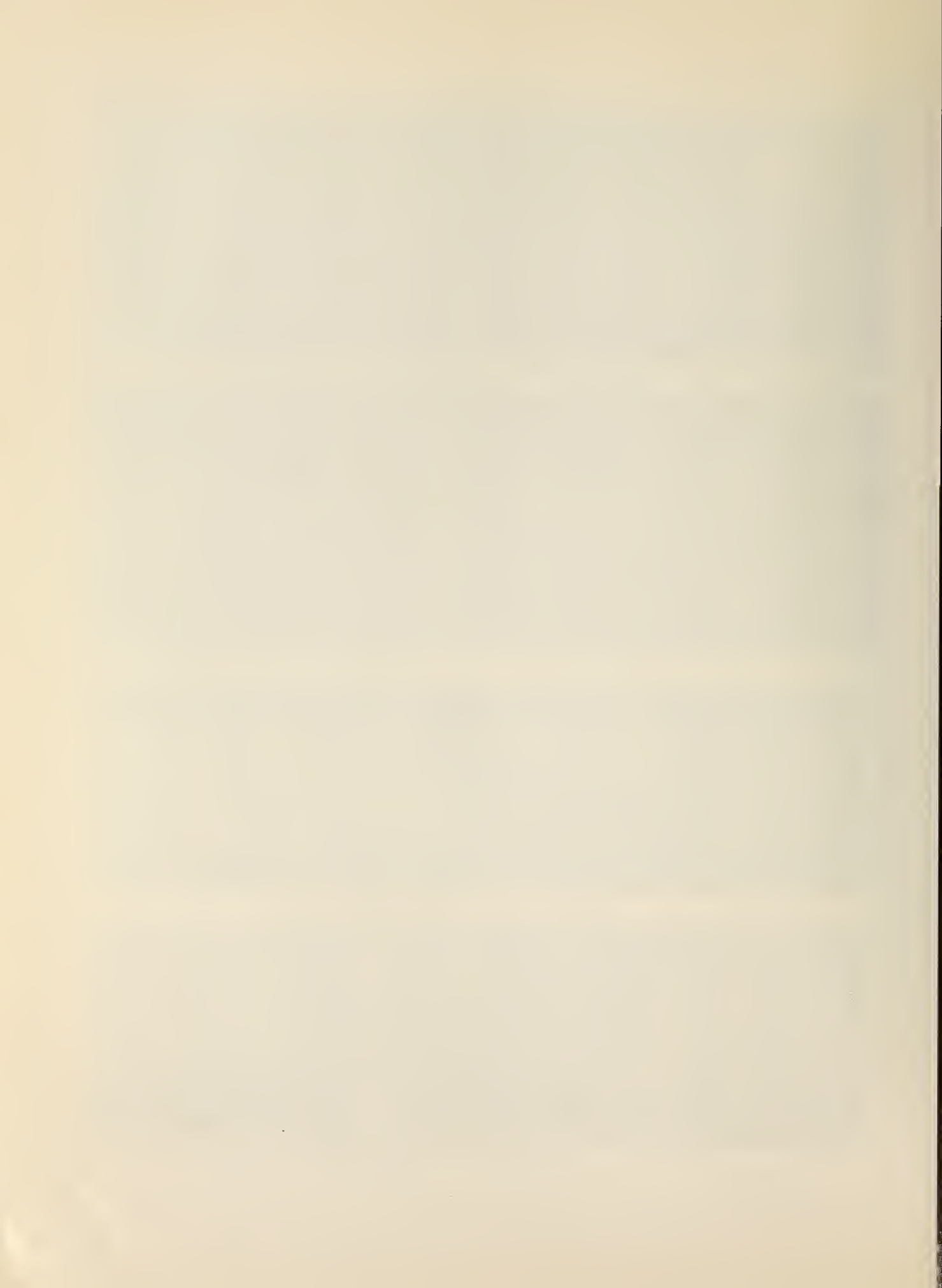


Figure 109

Figure 110

Figure 110 a

Figure 111



brown blotches; labral lirac number from 9 - 17, and the base of the anterior canal is stained dark brown. Columella glazed, calloused, brown in colour, with 4 - 5 bluish-white or violet columellar folds; base of shell with 5 - 9 prominent spiral cords which override the axial ribs and are often granulose. Anterior canal produced, calloused, slightly recurved towards the dorsum.

L: 34 to 47 mm W: 28 to 34% A: 52 to 58%

Animal: Sole of foot cream, veined with dark grey; dorsum of foot cream, densely speckled with yellowish-orange. Siphon translucent grey, thickly flecked with dark grey or black; tentacles translucent grey.

Type locality: Oceano indico.

Habitat: In coarse sand substrate and among weed, in shallow water. Moderately rare live-collected, beach specimens more frequent.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: *Voluta subdivisa* GMELIN, 1791 was a composite species and GMELIN cited illustrations from CHEMNITZ for reference (1788; Vol. 10, pl. 151, figs. 1434-1437). LAMARCK (1811) realized that the four CHEMNITZ figures represented two distinct species and restricted figures 1434 and 1435 to *Mitra subdivisa* and appended an additional reference for this species from the "Encyclopédie méthodique" (1798; pl. 373, figs. 1a, 1b). For the two remaining CHEMNITZ figures LAMARCK provided a description and named the species *Mitra costellaris* (1788; pl. 151, figs. 1436, 1437); he added two more references from the "Encyclopédie méthodique" (1798) and GUALTIERI (1742).

The species *Vexillum subdivisum* (GMELIN) has often been cited under the specific name *V. lyratum* (LAMARCK, 1822) and the year of authorship has been shown as 1811. LAMARCK's citation of the vernacular "Mitre en lyre" (1811, p. 206) has no standing in nomenclature and thus *V. lyratum* cannot date from 1811 where the species was clearly listed as *Mitra subdivisa*, a name validly established by GMELIN and having a priority of 31 years over *Mitra lyrata* LAMARCK.

102. *Vexillum subquadratum* (SOWERBY, 1874)

(Plate 19; Figure 87)

1874. *Mitra subquadrata* SOWERBY, Thes. Conch., 4: 26; pl. 22, fig. 485

1882. *Turricula (Costellaria) cadaverosa* var. *subquadrata* TRYON, Man. Conch., 4: 181; pl. 54, fig. 554

Shell: Shell moderately small, pyramidally-ovate, turreted and fenestrate; white to cream in colour, ornamented with a faint rosy-pink peripheral band on the body whorl; occasional specimens have an additional transverse band

towards the base, and the interstices of the axial ribs are rosy-pink. Sutures moderately impressed, whorls flattened or slightly concave, angulate at sutures, numbering from 8 to 9 apart from protoconch of $2\frac{1}{2}$ light-fawn nuclear whorls; broad, angulate curved axial ribs cross whorls, numbering from 11 - 14 on the body whorl and from 10 - 13 on the penultimate whorl; axial ribs become spinose near the sutures. Very prominent, wavy spiral ridges encircle the shell, ridges overriding axial ribs, giving the shell an overall fenestrate appearance; the interstices of the axial ribs near the sutures are deeply pitted, pits becoming generally less pronounced with maturity. Aperture equal in height or shorter than the spire, outer lip obsoletely crimped, contracted basally, interior of aperture white. Columella rose or light violet in colour, with 4 - 5 prominent white oblique folds; anterior canal calloused, straight or slightly recurved.

L: 17 to 22 mm W: 40 to 44% A: 47 to 51%

Type locality: Red Sea and Mauritius.

Habitat: In clean sand substrate, in sand pockets of coral reefs, in shallow water.

Rare.

Distribution: North Viti Levu. - From the Red Sea through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: The species can be easily recognized by the rasp-like sculpture of the axial ribs, the rosy or pinkish-violet tint of the shell, the wavy spiral ridges and deep pits in interstices.

The specimen figured here is slightly immature; for recent illustrations see HABE, 1961 (pl. 34, fig. 15). The shell illustrated by TINKER, 1958 (plate facing p. 156, top row, figure on extreme right) as *Mitra* species from Hawaii appears to be *Vexillum subquadratum* (SOWERBY).

103. *Vexillum taeniatum* (LAMARCK, 1811)

(Plate 20; Figures 98, 98a, 98b, 98c, 98d)

1811. *Mitra taeniata* LAMARCK (pars), Ann. Mus. Hist. Nat., 17: 204, 205

1821. *Mitra vittata* SWAINSON, Zool. Illust., ser. 1, pl. 23

1845. *Mitra fasciata* "MARTYN," CHENU, Univ. Conch., p. 26; pl. 35, fig. 3a

Shell: Shell moderately large, fusiformly-elongate, turreted, fairly solid; body whorl transversely banded with yellow or orange at the sutures, followed by a narrow black zone, a broad white zone and another blackish-brown zone; towards the base the ornamentation consists of two yellow, orange or white bands and two narrow, blackish-brown transverse zones. The penultimate and earlier whorls are ornamented with a yellow or orange transverse band posteriorly to the sutures and a white transverse zone anteriorly to the sutures; the white zone has usually an orange-brown spiral thread placed cen-

trally. Whorls convex, slightly rounded or subangulate at sutures, numbering from 10 - 12 apart from protoconch of $1\frac{1}{2}$ nuclear whorls; distinct, rounded or angulate ribs cross whorls, numbering from 6 - 14 on the body whorl and from 9 - 20 on the penultimate whorl; axial ribs may become obsolete on the latter half of the body whorl in some individuals. Interstices of axial ribs transversely grooved, grooves numbering from 24 - 33 on the body whorl if not obsolete, and from 8 - 12 on earlier whorls; the spiral grooves may extend only halfway towards the summits of the axial ribs, but in some specimens they may be continuous and overriding ribs in places. Aperture equal in height or longer than the spire, fusiform, narrow, contracted basally, outer lip thickened, smooth, with 3 - 4 small brown spots on the edge of the lip; interior of aperture whitish, cream or pale orange, with 5 - 21 labral lirae. Columella cream to yellowish in colour, calloused basally with 4 - 6 prominent, strong oblique folds; anterior canal narrow, elongate, recurved towards the dorsum, base of shell spirally corded.

L: 43 to 69 mm W: 28 to 35% A: 52 to 59%

Type locality: Océan indien.

Habitat: In clean and muddy sand, among weed, in shallow water.

Uncommon.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: The species is variable in respect to sculpture of whorls, interstices and density of axial ribs. In some individuals the whorls are subangulate at the sutures, while in others they are convexly rounded. The axial ribs are either obsolete on the latter half of the body whorl, or may be quite distinct almost to the outer lip. The interstitial grooves are often placed at irregular intervals and the intervening ridges are consequently either broad or narrow; the spiral grooves bisect the axial ribs on the body whorl and sometimes on the penultimate whorl, but are short and confined to the interstices on earlier whorls. In some individuals, however, the spiral grooves are short throughout, and present only in the interstices of the axial ribs. These sculptural variants are not confined to certain populations in Fiji, but have been observed in 42 specimens examined from various Viti Levu localities and Vanua Levu; the variation is thus individual and not ecological. Specimens from Vanua Levu localities are predominantly dark orange in colouring.

LAMARCK's original description of *Mitra taeniata* is simple and uncomplicated; however, his reference to two sets of figures is controversial, as it comprises two different species. The two CHEMNITZ figures referred to by LAMARCK (1788; Vol. 10, pl. 151, figs. 1444, 1445) depict a moderately large, slender and fusiform shell, with whorls which are angulate at the sutures, and spiral grooves

distinctly overriding axial ribs on the last three whorls; these figures are the species later named *Mitra regina* SOWERBY, 1825. The two figures from the "Encyclopédie méthodique" (1798; pl. 373, figs. 7a, 7b) represent the true *Mitra taeniata*, agreeing with LAMARCK's original diagnosis and type specimen extant in the Muséum d'Histoire Naturelle in Geneva. As pointed out under *Mitra coronata*, photographs of the holotype were unobtainable, but Dr. Binder compared photographs of variants of *Vexillum vittatum* (SWAINSON) with LAMARCK's type specimen and made the following comments: "We have Lamarck's only specimen, which measures 50 x 14 mm. The shape is almost exactly as that of your specimen of *Mitra vittata* SWAINSON [see Plate 20, Figure 98c]; the shoulder of the last whorl is just a little bit less angular on Lamarck's type. The sculpture is the same, with spiral striae appearing between the ribs; the colour is dull yellow, with one white band just above the suture, limited by two purplish-brown lines, and another brown line lower on the last whorl."

Various authors commented on the difficulty of separating *Vexillum taeniatum* from *V. vittatum*, which in itself is not surprising in view of both being variants of one and the same species. From the 42 Fiji specimens examined, individuals could be selected which would agree almost in every detail with the type figures of *V. taeniatum* or *V. vittatum*; intermediate specimens, however, are untypical of either form and represent the connecting link between *V. taeniatum* and *V. vittatum*.

DAUTZENBERG (1935) illustrated the coarse-ribbed form with subangulate whorls at the sutures and the fine-ribbed form with more numerous axial ribs and convexly rounded whorls at sutures under the specific name *Turricula vittata* (SWAINSON).

104. *Vexillum thaanumi* PILSBRY, 1921

(Plate 21; Figures 102, 102a)

1921. *Vexillum thaanumi* PILSBRY, Proc. Acad. Nat. Sci. Phila., 72: 316; pl. 12, fig. 31

Shell: Shell moderately small, ovately fusiform, light in weight; white in colour, ornamented with a broad irregular orange-brown transverse band on the body whorl, band varying in intensity of colour; a narrow part of the band is discontinuous, the orange-brown stains confined to the interstices of the axial ribs, and bordered with a fine orange-brown line; earlier whorls with a single orange-brown transverse band adjoining sutures, band mostly confined to the interstices of the axial ribs and bordered by a fine orange-brown spiral line. Sutures moderately impressed, whorls slightly convex, subangulate at sutures, numbering from 8 - 9 apart from protoconch which was eroded in specimens examined; broad, coarse,

angulate axial ribs cross whorls, ribs occasionally weak on the latter half of the body whorl, numbering from 11-13 on the body whorl and from 10-14 on the penultimate whorl; axial ribs roundly nodulose at the sutures. Interstices of axial ribs transversely grooved, grooves mostly confined to interstices on early whorls, but extending to the summits of the axial ribs on the body whorl. Aperture equal in height or longer than the spire, convexly elongate, blunt basally, outer lip moderately thickened and smooth with 2-3 orange-brown spots; interior of aperture whitish, with about half a dozen labral lirae. Columella slightly calloused, white in colour, with 5 prominent oblique folds; body whorl concave towards the base, spirally corded, anterior canal produced and calloused.

L: 16 to 25 mm W: 34 to 36% A: 50 to 56% (these morphometric data are from Hawaiian specimens available for examination).

Type locality: Off Waikiki, Oahu, Hawaiian Islands, in 200-300 feet.

Habitat: Unknown.

Distribution: West Viti Levu. - Hawaii.

Very rare.

Discussion: The species has been believed to be endemic to Hawaii; one dead specimen in fine state of preservation, with a full labial lip and colour pattern has been dredged in from 10-13 fathoms at Momi Bay by A. Jennings (personal communication). The specimen is immature, 16mm in length, 46% in width in relation to shell-length, and with an aperture slightly longer than the spire. The specimen agrees in all morphological characters with specimens of *Vexillum thaenumi* seen from the Hawaiian Islands.

Since no other specimens of *Vexillum thaenumi* have been collected in Fiji, the above description is based on shells from Hawaii (leg. C. Weaver); the illustrated adult specimen also came from Hawaii.

Mitra interstriata SOWERBY, 1870, is rather similar to *Vexillum thaenumi*, and a comparison of SOWERBY's type specimen with *V. thaenumi* should be undertaken.

105. *Vexillum todilla* (MIGHELS, 1848)

(Plate 21; Figure 104)

1848. *Pleurotoma todilla* MIGHELS, Proc. Boston Soc. Nat. Hist., 2: 24

Shell: Shell small, slender, fusiformly elongate; cream in colour, ornamented with 2-3 transverse rows of dark brown small blotches on the body whorl, and a single row of blotches on earlier whorls; some specimens show a faint brown transverse zone on the body whorl, and on earlier whorls the band adjoins the sutures. Whorls flattened to slightly convex, rounded at the sutures, numbering from

8-9 apart from protoconch of 2 pale violet nuclear whorls; elevated rounded axial ribs cross whorls, numbering from 25-34 on the body whorl and from 20-25 on the penultimate whorl. Interstices of axial ribs with broad, flat spiral cords which either extend to the summits or override axial ribs; spiral cords number from 12-16 on the body whorl and from 5-8 on earlier whorls. Aperture shorter than the spire, narrow, elongate, contracted basally, outer lip moderately thin, smooth; interior of aperture porcelain-white, lirate. Columella white with 4 to 6 close-set, prominent oblique folds; anterior canal elongate and produced, with 5-6 strong spiral cords.

L: 10 to 16 mm W: 26 to 30% A: 32 to 35%

Type locality: Sandwich Islands (Hawaii).

Habitat: In clean sand substrate and on coral-rubble bottom, from 10-15 fathoms.

Rare.

Distribution: West and South Viti Levu. - Hawaii.

Discussion: Occasional specimens show a faint narrow white spiral band on the whorls.

106. *Vexillum unifasciatum* (WOOD, 1828)

(Plate 18; Figure 74)

1828. *Voluta unifasciata* WOOD, Index Testac., Suppl. pl. 3, fig. 28

1844. *Mitra clathrata* REEVE, Conch. Icon., pl. 10, sp. 71 (non *Voluta clathrata* GMELIN, 1791)

1874. *Mitra fasciata* WOOD, SOWERBY, Thes. Conch., 4: pl. 24, fig. 532 (as synonym)

Shell: Shell very small, pyramidally-elongate, spire pointed; ivory-white in colour, ornamented with a broad deep chestnut-brown or reddish-brown central transverse zone on the body whorl and a single narrow transverse band on earlier whorls, which generally adjoins the sutures. Sutures moderately to deeply impressed, whorls convex, rounded or subangulate at sutures, numbering from 7-8 apart from protoconch which is usually eroded in adult specimens; widely spaced, elevated, broad axial ribs cross whorls, numbering from 10-14 on the body whorl and penultimate whorl; ribs slightly curved and angulate, more elevated in the white zone of the whorls, convexly nodulose at the sutures and faintly stained with yellow. Interstices of axial ribs with deep spiral grooves, grooves either barely extending to the summits of the axial ribs or overriding these in some specimens; grooves number from 6-8 on the body whorl and from 4-5 on the penultimate whorl. Aperture shorter than the spire, narrow, straight, constricted basally, outer lip moderately thin, crimped, slightly reflected; interior of aperture white with a brown median band and labral lirae. Columella brown, becoming white anteriorly, with 4 white oblique folds; body whorl basally constricted, anterior canal snow

white, narrow, elongate. The columellar folds extend as coarse granulose spiral cords onto the body whorl.

L: 14 to 17 mm W: 39 to 41% A: 45 to 47%

Type locality: China.

Habitat: Dredged from coral-rubble and sand bottom in deep water.

Rare.

Distribution: West Viti Levu. – From Mauritius through the tropical Indo-Pacific to Fiji.

Discussion: REEVE (1844) presumed *Voluta unifasciata* WOOD to be a homonym of *Mitra unifascialis* LAMARCK, 1811; according to the present rules of homonymy the endings *-ta* and *-lis* are sufficiently different to prevent homonymy.

REEVE's *Mitra clathrata* is a secondary homonym of GMELIN's *Voluta clathrata*, which is a *Mitra* species from the American Ocean (*vide* GMELIN, 1791).

The specimen illustrated here is very similar to SOWERBY's figure of that species (1874; pl. 27, fig. 616).

107. *Vexillum verrucosum* (REEVE, 1845)

(Plate 19; Figure 84)

1845. *Mitra verrucosa* REEVE, Conch. Icon, pl. 29, sp. 232

Shell: Shell moderately small, fusiformly-elongate; ivory white in colour, ornamented with a pale brown central band which is often interrupted in the form of blotches, and flecked with light brown. Spire turreted, sutures weakly impressed, whorls convex, slightly angulate at sutures, numbering from 8 - 9 apart from protoconch of 2 glassy-white nuclear whorls; elevated spiral ridges encircle the shell, numbering from 9 - 14 on the body whorl and 2 on the penultimate whorl; spiral ridges are bisected by axial ribs, numbering from 8 - 15 on the body whorl; the axial ribs form sharp spinose nodules at the point of intersection with the spiral ridges, which are generally lined with dark brown. Interstices of spiral ridges are prominently or obsoletely axially striate and usually have additional 1 - 3 intermediate fine spiral threads; the very early whorls are not nodulose but have 3 - 4 distinct spiral ridges and axial ribs in interspaces. Aperture equal in height or longer than the spire, narrow, elongate, outer lip thickened, undulate; interior of aperture porcelain-white. Columella white, slightly calloused, with 5 - 7 close-set, oblique folds; aperture pointedly rounded at the base, anterior canal slightly calloused and straight.

L: 14 to 27 mm W: 34 to 39% A: 53 to 61%

Type locality: Island of Ticao, Philippines.

Habitat: In clean sand substrate, from 0 - 4 fathoms.

Uncommon.

Distribution: Throughout the Fiji Islands. – Philippine Islands.

Discussion: The species has prominent spiral ridges, axial riblets in interstices, an elongate, narrow, fusiform aperture and lacks axial plications and labral lirae. These characteristics are more representative of the subgenus *Cancilla* than of the genus *Vexillum*, and the species would probably be more appropriately placed in the subgenus *Cancilla* under *Mitra*.

108. *Vexillum vulpecula* (LINNAEUS, 1758)

(Plate 20; Figure 89; Text figure 10)

1758. *Voluta vulpecula* LINNAEUS, Syst. Nat., ed. 10, p. 732, no. 365

1798. *Vexillum superbum* RÖDING, Mus. Bolten., p. 139

1845. *Mitra rugata* "MARTYN," CHENU, Univ. Conch., p. 26; pl. 35, fig. 2

1874. *Mitra umbrosa* SOWERBY, Thes. Conch., 4: 30; pl. 9, fig. 123

1935. *Turricula vulpecula* var. *pervariabilis* DAUTZENBERG, Mém. Mus. Roy. Hist. Nat., 2(17): 140; pl. 3, figs. 9 to 12

1935. *Turricula vulpecula* var. *simulans* DAUTZENBERG, Mém. Mus. Roy. Hist. Nat. 2(17): 141; pl. 3, fig. 8

Shell: Shell moderate in size, elongate, turreted, spire pointed; extremely variable in colour, but generally orange in colour, banded with white and black, or black in colour and banded with orange or white; some individuals are brown in colour and with or without transverse bands. Sutures moderately impressed, whorls convex, rounded or rarely subangulate at sutures, numbering from 8 - 10 apart from protoconch which is purplish but usually eroded; elevated broad, coarse axial ribs cross whorls, ribs angulate or rounded, more prominent but blunt near the sutures, occasionally very weak or obsolete on the latter half of the body whorl; axial ribs number from 6 - 12 on the body whorl and from 9 - 15 on the penultimate whorl. Moderately deep spiral grooves encircle the shell, grooves override axial ribs and terminate as spiral cords towards the base; grooves number from 21 - 26 on the body whorl and from 2 - 7 on the penultimate whorl. Aperture equal in height or longer than the spire, narrow, straight and slightly angulate, waisted centrally and constricted basally; outer lip thick, smooth, edge of lip with 2 - 3 blackish-brown or purplish-brown spots. Interior of aperture white, violet or greyish, generally with a purplish-brown blotch near the commencement of the aperture and outlet of the siphonal canal; labral lirae prominent, numbering from 4 - 14. Columella calloused, glazed, with 3 - 5 prominent oblique folds, first fold thick, oriented transversely to the aperture; anterior canal produced and calloused, fairly straight.

L: 34 to 55 mm W: 34 to 39% A: 54 to 63%

Animal: Sole of foot cream, variegated with grey, minutely spotted with yellow; dorsum of foot creamy-yellow, spotted with bright yellow and irregular clusters of white spots; the foot is streaked with grey at the edges. Siphon cream, transversely irregularly marbled with grey, minutely spotted with yellow; tentacles short, whitish, axially faintly lined with light grey, base of tentacles whitish; eyes black.

The male verge is cream or fawnish-grey, broad at the base, with a knee-like bend, gradually tapering towards the distal end which is narrowly blunt. The verge is finely transversely striated and reposes in a shallow depression of the body, located behind the right tentacle. The verge is about 7 mm long from base to distal end.

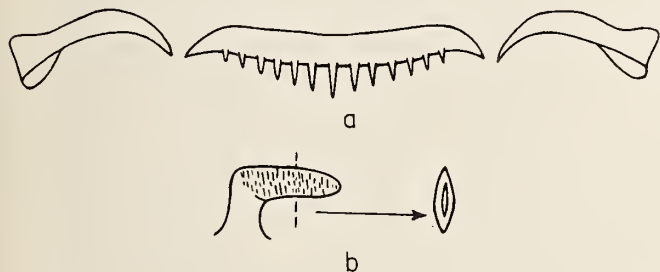


Figure 10

Vexillum vulpecula (LINNAEUS, 1758). Fiji.

- a. row of radular teeth; approximately x 250
b. dorsal view of penis and cross section

Radula: The radular ribbon of specimens examined was 3.5 to 4.0 mm in length for a shell size of 40 to 45 mm; the width of the ribbon averaged 0.4 mm. The number of rows varied from 50 to 60, nascentes excluded. The central tooth is narrow, long and comb-like, with 13 narrow pointed cusps, gradually tapering away in size towards the ends of the comb. The laterals are only about half the size of the central tooth and are curved and hook-like; they partially overlap the centrals and persist without variation almost throughout the whole length of the radular ribbon.

Type locality: O. Asiatico.

Habitat: In clean and muddy sand substrate, in sand-pockets of coral reefs, from 0 - 4 fathoms.

Common.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: Specimens found in muddy sand are generally dark blackish-brown with two or three whitish, yellowish

or orange transverse bands on the body whorl, and occasional specimens are smooth on the latter half of the body whorl. The species is extremely variable in colour and sculpture of axial ribs, and consequently received its fair share of varietal names.

COTTON (1957) equates *Vexillum vulpecula* (LINNAEUS) with *V. taeniatum* (LAMARCK, 1811). The latter is quite distinct and bears only a superficial resemblance to *V. vulpecula*.

Vexillum is a noun of neuter gender and the species has been cited in literature as *Vexillum vulpeculum* on the assumption that *vulpeculum* is an adjective. *Vulpecula* (= little fox) is the diminutive of the noun *vulpes* and should remain in this combination as *Vexillum vulpecula*.

109. *Vexillum zebuense* (REEVE, 1844)

(Plate 19; Figures 88, 88a)

1844. *Mitra zebuensis* REEVE, Conch. Icon., pl. 10, sp. 73
1850. *Mitra rorata* GOULD, Proc. Boston Nat. Hist. Soc., 3: 171
1852. *Mitra rorata* GOULD, U. S. Expl. Exp., p. 272; pl. 20, figs. 354, 354a
1860. *Mitra rufomaculata* SOUVERBIE, Journ. Conchyl., 8: 321; pl. 11, fig. 9 (in error fig. 8 on plate)
1874. *Mitra praetexta* SOWERBY, Thes. Conch., 4: 33; pl. 12, fig. 198

Shell: Shell moderately small, elongate-ovate or fusiform and turreted; white or light bluish-grey in colour, ornamented with irregular dark brown axial streaks and blotches. Sutures moderately impressed, whorls flattened to convex, last 3-4 whorls occasionally angulate at sutures, but earlier whorls convexly rounded, numbering from 8-9 apart from protoconch of 2 glassy-brown nuclear whorls; elevated and angulate axial ribs cross whorls, ribs angulate or rounded on summits, numbering from 12-32 on the body whorl and from 12-31 on the penultimate whorl. Interstices of axial ribs with moderately deep spiral grooves which become pits in close-ribbed specimens; grooves either short and confined to interstices or continuous and bisecting axial ribs, forming small fine nodules on the axial ribs at point of intersection; spiral grooves number from 15-20 on the body whorl and from 4-8 on the penultimate whorl. Aperture about equal in height to the spire, narrow, angulate, outer lip moderately thin, smooth, slightly constricted centrally and narrowing towards the base; interior of aperture either porcelain-white or stained dark brown towards the interior, with 7 to 19 labral lirae. Columella white, slightly calloused, with 5-6 white oblique folds; anterior canal spirally corded, pointed and straight.

L: 14 to 28 mm W: 33 to 38% A: 46 to 53%

Animal: Sole of foot cream, edges of foot irregularly streaked with light yellow; dorsum of foot white. Siphon

white, irregularly variegated with large zones of black and small streaks of yellow; tentacles translucent white, finely mottled with yellow towards the distal end, base translucent white and mottled with yellow; eyes black.

Type locality: Island of Zebu, Philippine Islands.

Habitat: In clean sand substrate, in sand pockets of coral reefs and lagoons, in shallow water.

Uncommon in North Viti Levu, moderately rare elsewhere.

Distribution: Throughout the Fiji Islands. – From the Philippine Islands through the tropical Pacific to Polynesia.

Discussion: The species is very variable in sculpture of whorls and axial ribs. The body whorl is rounded at the suture in some specimens and distinctly angulate in others; the axial ribs can be narrow and close-set or wide-spaced and broadly angulate. In some individuals the axial ribs are finely noded and bear a row of blunt nodules on the presutural ramp.

Mitra rufomaculata is the form of *Vexillum zebuense* with the body whorl angulate at the suture, with the axial ribs less numerous and the interstitial striae well defined. The most frequent specimens of *V. zebuense* are about 30mm in length, with convexly rounded whorls, numerous axial ribs and with the intercostal spaces reduced to deep pits. The various forms listed in the synonymy occur frequently within a restricted locality in Fiji.

The species appears to have been reported under the name *Vexillum salmoneum* (SOWERBY, 1874) from Fiji by CATE & BURCH, 1964.

whorls. Interstices of axial ribs broad, concave, with very fine moderately deep and close-set spiral grooves, grooves numerous, bisecting axial ribs and forming small fine nodules on the summits, grooves numbering from 27 to 36 on the body whorl and from 7 - 13 on the penultimate whorl. Aperture about equal in height to the spire, narrow and elongate, constricted basally, outer lip moderately thin, smooth; interior of aperture white, stained with violet-brown basally and with 5-8 labral lirae. Columella calloused, violet-brown basally, with 4 prominent oblique folds; anterior canal violet-brown, spirally corded, produced and straight.

L: 32 to 42mm W: 26 to 30% A: 50 to 54%

Habitat: Dredged on sand and coral bottom substrate, from 5 - 7 fathoms.

Rare.

Distribution: South Viti Levu. – ?

Discussion: The species is delicate in texture, with slender, red-coloured axial ribs which are finely granulose on the body whorl. There is a certain similarity to *Mitra stainforthi* REEVE, 1844, in form and sculpture, but this species has broad and coarse axial ribs, which are ornamented with four or five rows of red spots upon the summits. In *Vexillum* species the red colour of the axial ribs is interrupted by only two ill-defined white spiral lines on the body whorl and one such line on the earlier whorls. The species is known from 10 specimens collected at Bay of Islands, Suva Harbour (leg. M. Freitag) and the main Suva reef (leg. R. F. Browne).

110. *Vexillum* species

(Plate 21; Figure 100)

Shell: Shell moderate in size, slender, fusiform, light in weight; white in colour, ornamented with bright red axial ribs and two narrow spiral bands on the body whorl and a single band on earlier whorls. Sutures moderately impressed, whorls convex, rounded at the sutures, numbering from 10 - 11 apart from a brown protoconch; elevated and curved axial ribs cross whorls, ribs narrow, angulate, numbering from 11 - 14 on the penultimate and body

Pusia SWAINSON, 1840

Type species by monotypy *Mitra microzonias* LAMARCK, 1811.

1840. *Tiara* (*Pusia*) SWAINSON, Treat. Malac., 127: 320

1853. *Thala* H. & A. ADAMS, Genera Rec. Moll., 1: 178

Characteristics: Shell small, depressed, elongate-ovate or ovate, generally solid, whorls axially plicate or nodulose, rarely smooth, sutures plain, tuberculate or coronate, spi-

Explanation of Plate 22

- Figure 112: *Vexillum semifasciatum* (LAMARCK). Fiji (x 2.0) Figure 113: *Vexillum antonellii* (DOHRN). Fiji (x 2.0)
 Figure 113a: *Vexillum antonellii* (DOHRN), black form. Fiji (x 2.0) Figure 114: *Vexillum deshaysi* (REEVE), specimen from clean sand-substrate from offshore reefs. Fiji (x 2.25) Figure 114a: *Vexillum deshaysi* (REEVE), fine-ribbed specimen with prominent spiral grooves, from muddy-sand substrate, on shore reefs. Fiji (x 3.0) Figure 115: *Vexillum coronatum* (HELBLING). Fiji (x 2.0)
 Figure 116: *Vexillum obtusispinosum* (SOWERBY). Fiji (x 2.5) Figure 117: *Vexillum echinatum* (A. ADAMS). Fiji (x 2.0)
 Figure 118: *Pusia crocata* (LAMARCK). Fiji (x 2.0) Figure 118a: *Pusia crocata* (LAMARCK), juvenile specimen. Fiji (x 2.5)
 Figure 119: *Pusia aureolata* (REEVE). Fiji (x 2.4) Figure 119a: *Pusia aureolata* (REEVE), specimen with prominent and continuous spiral grooves. Fiji (x 2.4) Figure 120: *Pusia cumingi* (REEVE). Fiji (x 2.3) Figure 121: *Pusia cancellarioides* (ANTON). Fiji (x 2.0)
 Figure 121a: *Pusia cancellarioides* (ANTON), juvenile specimen. Fiji (x 2.7) Figure 122: *Pusia luculenta* (REEVE). Fiji (x 3.0)
 Figure 123: *Pusia tuberosa* (REEVE). Fiji (x 2.0)

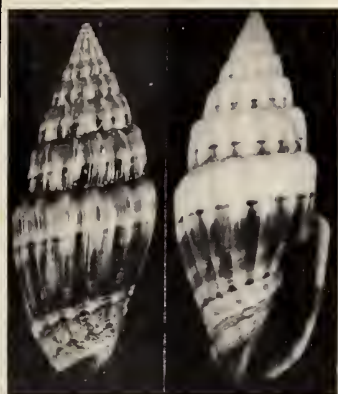


Figure 112



Figure 113



Figure 114 Figure 114 a

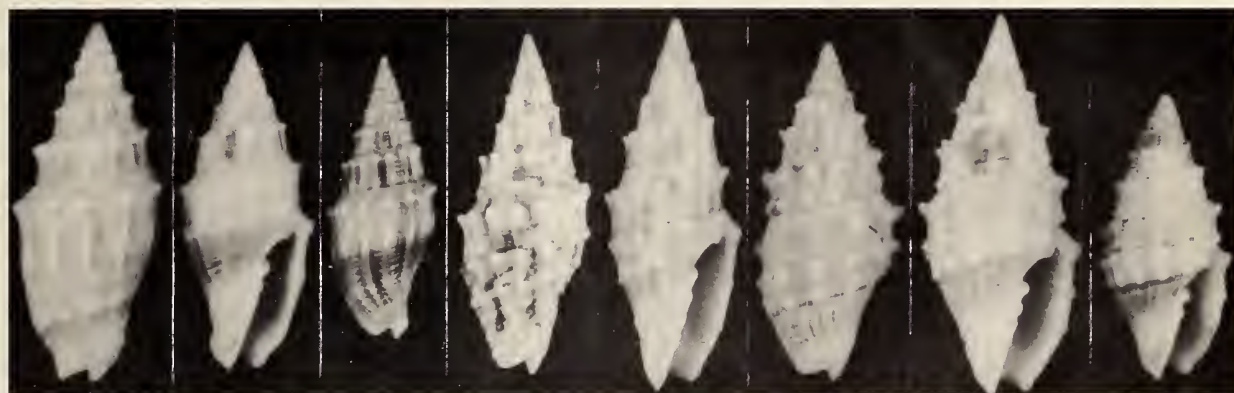


Figure 115

Figure 116

Figure 117



Figure 118

Figure 118 a

Figure 119

Figure 119 a

Figure 120



Figure 121

Figure 121 a



Figure 122

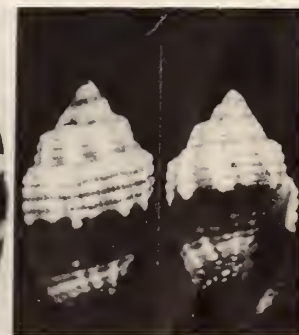


Figure 123



rally striate or ridged, spire thickened, outer lip thick or thin, aperture convexly rounded and usually constricted basally, lirae within, columella obliquely plicate, anterior canal short. Shell covered with a thin periostracum.

111. *Pusia adamsoni* (REEVE, 1844)

(Plate 23; Figure 125)

1844. *Mitra adamsoni* REEVE, Conch. Icon., pl. 19, sp. 150

Shell: Shell moderately small, roundly ovate, somewhat inflated, solid, heavy; brown to chestnut-brown or reddish-brown in colour, ornamented with one or two narrow creamy-white transverse bands on the body whorl, and a single, often interrupted spiral band on earlier whorls; some specimens are flecked with white or brown on the whorls. Sutures moderately impressed, whorls convex, slightly angulate at sutures, numbering from 7 - 8 apart from protoconch which is eroded in adult specimens; coarse, angulate, curved axial ribs cross whorls, numbering from 22 - 34 on the body whorl. Interstices of axial ribs with deep spiral grooves, grooves either extending to the summits of the axial ribs or overriding these in places; grooves number from 11 - 15 on the body whorl and from 4 - 7 on the penultimate whorl, and become continuous, bisecting axial ribs and forming distinct small nodules towards the base. Aperture equal in height or slightly longer than the spire, outer lip bow-shaped, thickened, slightly crimped; the interior edge of the outer lip stained with brown, deep interior creamy-white, and with 9 - 13 labral lirae. Columella yellowish-white, calloused, with 4 - 5 prominent oblique folds, the first fold very large, oriented transversely to aperture; area between columellar folds generally brown, and columella occasionally orange in colour. Base of shell with 3 - 4 distinct spiral cords, anterior canal calloused.

L: 25 to 31 mm W: 50 to 55% A: 52 to 56%

Type locality: Isle of Capul, Philippine Islands.

Habitat: Under coral rocks on sand substrate, in shallow and deeper water.

Rare.

Distribution: South Viti Levu. - From Mauritius through the tropical Indo-Pacific to Polynesia and Hawaii.

112. *Pusia amabilis* (REEVE, 1845)

(Plate 21; Figure 107)

1845. *Mitra amabilis* REEVE, Conch. Icon., pl. 33, sp. 274

Shell: Shell small, ovate, solid; deep green to yellowish green in colour, ornamented with a broad white or cream transverse band on all whorls. Sutures moderately impressed, whorls convex, subangulate at sutures, numbering from 6 - 7 apart from protoconch of $1\frac{1}{2}$ - 2 dark purple

nuclear whorls; prominent broad, angulate, obliquely placed axial ribs cross whorls, numbering from 13 - 23 on the body whorl and from 14 - 21 on the penultimate whorl. Narrow, deep spiral grooves encircle the shell, grooves bisecting axial ribs, coloured orange in the white zones and dark purple in the greenish-grey zones; grooves number from 9 - 12 on the body whorl and from 3 - 5 on the penultimate whorl. Aperture equal in height or longer than the spire, narrow, convexly rounded, slightly contracted basally, outer lip thickened, faintly undulate at the edge; interior of aperture dark greenish-grey, with a light transverse band and 2 - 9 labral lirae. Columella calloused, dark greenish-brown in colour, with 3 - 4 prominent oblique folds; basal half of body whorl nodulose, first columellar plait extends as a prominent granulose spiral cord onto the body whorl.

L: 8 to 13 mm W: 50 to 62% A: 50 to 56%

Animal: Sole of foot light grey, densely flecked with blackish-grey; dorsum of foot blackish-grey, finely spotted with light grey. Siphon black, flecked with light grey; tentacles translucent cream, base of tentacles blackish-grey, flecked with light grey.

Type locality: Islands of Ticao and Capul, Philippines.

Habitat: Under coral rocks on sand substrate, and in sand pockets of coral reefs, from 0 - 1 fathom.

Uncommon.

Distribution: Throughout the Fiji Islands. - From the Red Sea through the tropical Indo-Pacific to Polynesia.

113. *Pusia aureolata* (REEVE, 1844)

(Plate 22; Figures 119, 119a)

1844. *Mitra aureolata* REEVE, Conch. Icon., pl. 26, sp. 210

1844. *Mitra affinis* REEVE, Conch. Icon., pl. 27, sp. 211

1923. *Mitra (Pusia) aureolata* var. *bizonalis* DAUTZENBERG & BOUGE, Journ. Conchyl., 67: 222 (non *Columbella bizonalis* LAMARCK, 1822)

Shell: Shell small, elongate, pyramidally-ovate, fairly light in weight; yellow to orange in colour, ornamented with one to three white transverse bands on the body whorl and a single band on earlier whorls; some specimens lack the white transverse bands. Sutures deeply impressed, whorls convex, angulate at sutures, numbering from 8 - 9 apart from protoconch of 2 - 3 white nuclear whorls; elevated, roundly angulate axial ribs cross whorls, numbering from 11 - 16 on the penultimate and body whorls; ribs nodulose at sutures and on periphery of body whorl, nodules occasionally whitish. Interstices of axial ribs spirally deeply grooved, grooves almost extending to the summits of the axial ribs; base of shell spirally corded, cords prominently nodulose. Aperture equal in height or shorter than spire, outer lip moderately thin and crimped, convexly rounded and constricted basally; interior of

aperture pale orange, with 5 - 10 labral lirae. Columella cream or yellowish in colour, with 4 - 5 whitish oblique folds; body whorl contracted at base, anterior canal pointed, slightly longer than the outer lip.

L: 11 to 18 mm W: 44 to 48% A: 42 to 49%

Type locality: Island of Masbate, Philippines.

Habitat: Under coral rocks on sand substrate. from 0 - 7 fathoms.

Moderately rare.

Distribution: Throughout the Fiji Islands - From the Gulf of Oman through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: The species is variable in sculpture, and the interstitial grooves may be either short or extend to the summits of the axial ribs. In view of the variability of the species, *Tiara multicostata* BRODERIP, 1836 may prove to be a variant and would be the earliest possible name applicable to the species.

114. *Pusia bernhardina* (RÖDING, 1798)

(Plate 21; Figure 106)

1791. *Voluta patriarchalis* var. β GMELIN, Syst. Nat., ed. 13, p. 3460

1798. *Mitra bernhardina* RÖDING, Mus. Bolten., p. 136

1811. *Mitra muriculata* LAMARCK, Ann. Mus. Hist. Nat., 17: 216

Shell: Shell small, ovate, with the last three whorls produced into a pointed spire; yellowish-brown to greenish-brown colour, ornamented with white nodules at the sutures. Sutures moderately impressed, whorls straight, angulate at sutures, numbering from 5 - 7 apart from protoconch of 2 white nuclear whorls; nodulose spiral cords encircle the shell, numbering from 8 - 13 on the body whorl and from 2 - 4 on the penultimate whorl. Irregular axial grooves bisect spiral ridges, giving the shell a nodulose appearance; whorls with extremely fine axial striae, prominent blunt white coronations at the sutures, numbering from 6 - 8 on the body whorl and from 5 - 7 on the penultimate whorl. Aperture longer than the spire, convexly elongate, narrow, outer lip thickened and crimped; interior of aperture dark fawn or brown. Columella calloused, brownish in colour, with 3 - 4 oblique folds; anterior canal spirally corded, calloused.

L: 10 to 19 mm W: 51 to 65% A: 56 to 66%

Type locality: None.

Habitat: Under coral rocks on sand substrate, in shallow and deeper water.

Rare.

Distribution: South Viti Levu. - From East Africa through the tropical Indo-Pacific to Fiji.

Discussion: *Mitra muriculata* LAMARCK, 1811 is an objective synonym of *M. bernhardina* RÖDING, 1798; both authors cited the same single reference from CHEMNITZ (1788; Vol. 10, pl. 150, fig. 1427).

115. *Pusia cancellarioides* (ANTON, 1839)

(Plate 22; Figures 121, 121a)

1823. *Mitra nodosa* SWAINSON, Philos. Mag. & Journ., 62: 401 (non *Mitra nodosa* BORSON, 1820)

1839. *Mitra fraga* KIENER, Spéc. Gén. Icon. Coq. Viv., p. 91; pl. 27, fig. 87 (non QUOY & GAIMARD, 1833)

1839. *Mitra tuberculata* KIENER, Spéc. Gén. Icon. Coq. Viv., Errata, p. 119, 120 (nom. nov. pro *M. fraga* KIENER, 1839)

1839. *Mitra cancellarioides* ANTON, Verzeichn. Conch., p. 68, no. 2358

1840. *Tiara nodosa* SWAINSON, Treat. Malac., 127: 319

Shell: Shell small, roundly or rhomboidally ovate, heavy, ponderous; generally white in colour, occasionally cream or yellowish throughout. Sutures deeply impressed, whorls concave centrally, rounded at sutures, numbering from 5 - 7 apart from protoconch of 1½ nuclear whorls; body whorl with 6 - 9 transverse rows of large nodules, the penultimate whorl with 2 - 3 rows. Fine, moderately shallow punctate striae encircle the shell, numbering from 16 - 24 on the body whorl and from 8 - 15 on the penultimate whorl; whorls obsoletely axially striate. Aperture equal in height or slightly longer than the spire, small, narrow, outer lip very thick and smooth, narrowing basally; interior of aperture yellowish with 9 - 14 labral lirae. Columella calloused basally, white in colour, concave, with 4 columellar folds which diminish in size towards the base; first columellar fold large, oriented transversely to the aperture. Anterior canal short, truncated.

Juvenile shells are creamy white in colour, ornamented with yellow, orange or greenish transverse bands on the body whorl.

L: 15 to 21 mm W: 60 to 63% A: 52 to 56%

Animal: Sole of foot yellow; dorsum of foot creamy-white. Siphon creamy-white, finely spotted with snow-white; tentacles short, cream in colour and tipped with yellow, base of tentacles cream; eyes black.

Type locality: None.

Habitat: Under coral rocks on sand substrate, in sand pockets of coral reefs, in shallow water.

Rare.

Distribution: Southeast Viti Levu. - From the Red Sea through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: *Mitra cancellarioides* ANTON has to replace

the preoccupied *Mitra nodosa* SWAINSON. The species has not been illustrated by ANTON; however, his clear and precise description which is repeated here, is as good as a figure:

"*cancellarioides* mihi, spitz oval, fast rhomboedrisch, bauchig, in der Mitte am breitesten; 5-6 Windungen, die unterste halb so gross wie das Ganze; mit 7 Reihen Tuberkeln, die vorletzte mit 2 Reihen, die obere mit einer; gelb, braun gebändert; Mündung lang; Spindel mit 3 Falten, oberste sehr gross, zweite mässig gross, dritte lamellenartig, sämtlich weit in die Mündung hereinstehend (wie bei der Gattung *Cancellaria*). Ähnlich der *Mitra patriarchalis*. Br. 4" H. 7". "

All important morphological characters have been mentioned by ANTON: the almost rhomboidal obese form, the last whorl being half the length of the shell and sculptured with 7 rows of tubercles, while the penultimate whorl has 2 rows and the earlier ones one row only; the gradual reduction in size of the columellar folds towards the base has been well described, but the colour pattern mentioned by ANTON would suggest a slightly immature specimen.

The text of ANTON's description dates from August to October, 1838, whereas the title page is dated 1839.

116. *Pusia consanguinea* (REEVE, 1845)

(Plates 21 and 23; Figures 111 and 137)

1845. *Mitra consanguinea* REEVE, Conch. Icon., pl. 30, sp. 241

1882. *Turricula (Pusia) dermestina* var. *consanguinea* TRYON, Man. Conch., 4: 183; pl. 54, fig. 566

1895. *Mitra (Pusia) dermestina* MELVILL & STANDEN, Shells Lifu, 1: 103 (non LAMARCK, 1811)

1962. *Pusia pardalis consanguinea* KIRA, Shells West. Pacif., p. 94; pl. 34, fig. 1

Shell: Shell small, ovate, solid; orange-brown to dark reddish-brown in colour, ornamented with a central row of regular white spots situated upon the axial ribs on the body whorl, and a row of smaller spots at the sutures and towards the base; earlier whorls with two rows of small spots. Sutures deeply impressed, whorls very slightly convex, roundly subangulate at sutures, numbering from 7-8 apart from protoconch which is eroded in adult specimens; elevated, slightly oblique axial ribs cross whorls, ribs rounded on the summits, numbering from 13-19 on the body whorl and from 17-22 on the penultimate whorl. Axial ribs appear faintly nodulose at the sutures where they are spotted with white or cream; base of shell generally with 3-4 spiral rows of whitish to light orange nodules. Interstices of axial ribs spirally grooved, grooves very fine, microscopically punctate in some specimens, and

extending almost to the summits of the axial ribs; grooves number from 10-20 on the body whorl and from 3-7 on the penultimate whorl. Aperture longer than the spire, narrow, outer lip thickened, smooth, convexly rounded; interior of aperture whitish or very pale grey. Columella brownish with 4 prominent oblique folds; the first fold is very large and oriented transversely to the aperture. Anterior canal calloused, short and straight.

L: 11 to 18 mm W: 55 to 63% A: 57 to 64%

Type locality: None.

Habitat: Under coral rocks on sand substrate, in shallow water.

Rare.

Distribution: North and Southeast Viti Levu. - From Mauritius through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: LAMARCK's original description of *Mitra dermestina* (1811, p. 221) lacks citation of figures; his diagnosis identifies the shell as ovate, axially ribbed with intercostal transverse striae, chestnut-brown in colour, maculated with white, and with 4 columellar folds. LAMARCK comments on the close similarity to *Mitra microzonias* LAMARCK, 1811, but says that it differs from the latter in having more prominent spiral striae. This latter feature has been observed to be rather variable in specimens examined from Fiji and LAMARCK's *M. dermestina* appears to be a variant of *M. microzonias* rather than *Pusia consanguinea* (REEVE).

Pusia pardalis (KÜSTER) is somewhat similar to *P. consanguinea*, but it is a more slender species with a slightly longer aperture and less prominent axial ribs, which become generally obsolete on the latter half of the body whorl. In *P. consanguinea* the axial ribs of the body whorl are elevated, prominent, close-set, numerous and finely noduled at the sutures; in *P. pardalis* the sutures are plain.

The colour pattern of *Pusia pardalis* consists of large irregular white blotches, about 5-7 in number, which are placed centrally on the body whorl; in some specimens these blotches are connected by irregular lines. In *P. consanguinea* the white spots on the body whorl are comparatively small, numerous (10-14), and placed with geometrical precision upon the summits of the axial ribs; the sutures bear an additional row of small white or light orange spots on the axial ribs.

117. *Pusia corallina* (REEVE, 1845)

(Plate 21; Figure 108)

1845. *Mitra corallina* REEVE, Conch. Icon., pl. 39, sp. 330a, 330b

Shell: Shell very small, fusiform, light in weight; orange or red in colour throughout. Sutures moderately im-

pressed, whorls convex, rounded at sutures, numbering from 8 - 9 apart from protoconch; broad, angulate axial ribs cross whorls, numbering from 6 - 10 on the body whorl and from 12 - 16 on the penultimate whorl. The shell is smooth and shiny, and the numerous, close-set, fine spiral striae are only visible under magnification. Aperture slightly shorter than the spire, narrow, outer lip slightly thickened and smooth, straight, contracted basally; interior of aperture reddish, with 10 - 17 very fine but prominent labral lirae. Columella calloused, reddish in colour, with 4 prominent oblique folds; base of shell encircled with 3 - 6 spiral cords, anterior canal slightly recurved.

L: 12 to 16 mm W: 34 to 38% A: 45 to 48%

Type locality: Island of Masbate, Philippines.

Habitat: On coral bottom and sand substrate, in deeper water.

Rare.

Distribution: South Viti Levu. - From the Philippine Islands to Fiji.

Discussion: The species is similar to *Pusia semicostata* (ANTON), which is rather distinct in colour pattern, broader, with more convex and ventricose whorls and more prominent spiral striae.

118. *Pusia crocata* (LAMARCK, 1811)

(Plate 22; Figures 118, 118a)

1791. *Voluta nodulosa* GMELIN (pars), Syst. Nat., ed. 13, p. 3453

1811. *Mitra crocata* LAMARCK, Ann. Mus. Hist. Nat., 17: 202

1836. *Tiara aurantia* BRODERIP, Proc. Zool. Soc. London, pt. 3: 196 (non *Voluta aurantia* GMELIN, 1791)

1844. *Mitra concinna* REEVE, Conch. Icon., pl. 26, sp. 203

1844. *Mitra pyramidalis* REEVE, Conch. Icon., pl. 26, sp. 208

1844. [?] *Mitra flavescens* REEVE, Conch. Icon., pl. 26, sp. 207

Shell: Shell small, ovate to pyramidally-ovate, light in weight; orange, reddish-orange or light reddish-brown in colour, ornamented with a narrow white transverse band on the body whorl and earlier whorls; the white bands generally extend over two or three transverse cords and are placed on the third or fourth cord anteriorly to the suture on the body whorl, while on earlier whorls the band generally adjoins the sutures. Sutures moderately impressed, whorls flattened, almost perpendicular, angulate at sutures, numbering from 9 - 10 apart from protoconch which was missing in all specimens examined; strong, roundly angulate axial ribs cross whorls, numbering from 13 - 18 on the body whorl and penultimate whorl. The axial ribs are bisected by strong elevated spiral cords, numbering from 10 - 17 on the body whorl and from 3 to 5 on earlier whorls; axial ribs bear round nodules at point of intersection of spiral cords and axial ribs, and on the

second row anteriorly to the sutures nodules become triangular projections. Aperture about equal in height to the spire, occasionally slightly shorter or longer, outer lip convex, thin and crimped; interior of aperture pale orange or cream, with 3 - 8 labral lirae. Columella cream in colour, with 4 - 5 oblique folds, interspaces of folds stained orange; the columellar folds extend as nodulose spiral cords onto the body whorl. Base of shell constricted, anterior canal slightly calloused.

L: 15 to 23 mm W: 42 to 48% A: 46 to 55%

Type locality: Indies orientales.

Habitat: Under coral rocks on sand and reef substrate, on coral-rubble bottom in shallow and deeper water.

Distribution: West and South Viti Levu. - From Mauritius through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: A very variable species which received numerous specific names. Some specimens are more elongate than others, and have a reddish-brown transverse band on the penultimate and body whorls; occasional specimens have interrupted white spiral lines.

Voluta nodulosa GMELIN, 1791 was a composite species; the figure cited by GMELIN from GUALTIERI (1742; pl. 52, fig. G) for his *Voluta nodulosa* was later separated by LAMARCK as *Mitra crocata*. GMELIN's var. β of *Voluta nodulosa* is the *Mitra granulosa* LAMARCK, 1811. The GUALTIERI figure cited by LAMARCK (*l. c.*) together with his adequate diagnosis allow an unequivocal interpretation of the species.

119. *Pusia cumingi* (REEVE, 1844)

(Plate 22; Figure 120)

1844. *Mitra cumingii* REEVE, Conch. Icon., pl. 10, sp. 67

Shell: Shell small, ovate, acuminate at spire and base, light in weight; orange in colour, ornamented with irregular white zones, consisting of merging blotches and narrow white transverse bands, and close-set dark brown transverse lines. Sutures moderately impressed, last 2 - 3 whorls concave, angulate at sutures, numbering from 7 - 8 apart from protoconch which was eroded in specimens examined; elevated, broad, angulate axial ribs cross whorls, ribs spinose on the presutural ramp, and obsoletely nodulose or undulate on the summits of the axial ribs, numbering from 15 - 18 on the penultimate and body whorls. Interstices of axial ribs smooth, with shallow short spiral grooves or hardly discernible shallow depressions; the shoulder between the presutural ramp and the suture is sculptured with 2 or 3 coarse spiral ridges; the lower half of the body whorl is spirally corded, cords prominent and nodulose. Aperture equal in height or slightly longer than the spire, moderately broad, convexly rounded, constricted basally; outer lip moderately thin and obso-

letely crimped, interior of aperture cream, yellow or pale orange, with 5 - 9 labral lirae. Columella cream in colour with 4 - 5 prominent whitish and oblique folds; anterior canal spirally corded, produced, acuminate and straight.

L: 15 to 19 mm W: 45 to 48% A: 51 to 55%

Type locality: Matnog, province of Albay, Island of Luzon.

Habitat: Dredged on sand and coral-rubble bottom substrate, from 5 to 7 fathoms.

Rare.

Distribution: South Viti Levu. - From the Philippine Islands through the tropical Pacific to Polynesia and Hawaii.

Discussion: The species lacks the numerous elevated and prominent spiral cords of *Pusia crocata* (LAMARCK), and appears to have fewer, but more concave whorls, apart from displaying a different colour pattern; in all other respects the two species are similar. As both species are sympatric in Fijian localities and inhabit a similar ecological zone, the possibility of the two species being actually conspecific should not be excluded; the comparative rarity of both species in Fiji precludes more detailed comparisons in this respect.

120. *Pusia infausta* (REEVE, 1845)

(Plate 21; Figure 105)

1845. *Mitra infausta* REEVE, Conch. Icon., pl. 39, sp. 326

1888. *Mitra fulvosulcata* MELVILL, Journ. Conch. London, 5: 287; pl. 2, fig. 25

Shell: Shell very small, roundly-ovate to elongate-ovate; cream or light straw-yellow in colour, ornamented with small reddish-brown spots or short transverse lines upon the summits of the axial ribs; occasional specimens bear a white or pale orange-brown transverse band on the body whorl. Sutures deeply impressed, whorls convex, roundly angulate at sutures, numbering from 7 - 8 apart from protoconch of 2 - 2½ creamy-white nuclear whorls; close-set, elevated, angulate axial ribs cross whorls, ribs slightly curved, numbering from 16 - 22 on the body whorl and from 16 - 20 on the penultimate whorl. Fine, moderately deep spiral grooves encircle the shell, grooves bisecting axial ribs and forming small reddish-brown spots or transverse lines upon the summits of the ribs; grooves number from 10 - 15 on the body whorl and from 4 - 6 on the penultimate whorl. Aperture about equal in height to the spire, outer lip moderately thin, smooth or obsoletely crenulate, convexly rounded, contracted basally; interior of aperture creamy-white or light fawn, with 6 - 12 labral lirae. Columella same colour as the aperture, with 3 - 4 oblique folds; anterior canal short, calloused, spirally corded and straight.

L: 8 to 13 mm W: 42 to 49% A: 46 to 52%

Type locality: Island of Ticao, Philippines.

Habitat: In clean sand substrate, in sand pockets of coral reefs, in shallow water.

Rare.

Distribution: North and South Viti Levu. - From the Philippine Islands to Fiji.

121. *Pusia luculenta* (REEVE, 1845)

(Plate 22; Figure 122)

1845. *Mitra luculenta* REEVE, Conch. Icon., pl. 30, sp. 245

1867. *Mitra graeffi* CROSSE, Journ. Conchyl., 15: 297; pl. 11, fig. 6

1874. *Mitra nigrofasciata* SOWERBY, Thes. Conch., 4: 23; pl. 22, figs. 468, 469

Shell: Shell small, ovate, solid, apex rounded; very dark brown to purplish-black in colour, ornamented with two or three whitish, yellow or orange transverse bands of varying widths on the body whorl, and a single band on earlier whorls. Sutures moderately impressed, whorls convex, rounded at sutures, numbering from 5 - 7 apart from protoconch which is always eroded; elevated, broad, angulate axial ribs cross whorls, ribs straight or oblique, numbering from 10 - 16 on the body whorl and from 10 to 17 on the penultimate whorl. Base of shell with 3 - 5 rows of distinct nodules; interstices of axial ribs finely striate, striae generally obsolete on the body whorl. Aperture about equal in height or longer than the spire, outer lip thickened, smooth, constricted near commencement of aperture and towards the base; interior of aperture purple, with 2 - 3 white bands and 5 - 11 short labral lirae. Columella calloused, purplish-brown in colour, with 3 brown oblique folds; anterior canal truncated, calloused. L: 8 to 15 mm W: 50 to 60% A: 53 to 60%

Animal: Sole of foot purplish-grey, edge of foot bright yellow; dorsum of foot grey, edges bright yellow. Siphon dark grey, flecked with white, distal end banded with bright yellow; tentacles thin, translucent white, flecked with grey, base of tentacles dark grey, eyes black.

Type locality: Philippine Islands.

Habitat: Under coral rocks on sand and reef substrate, in shallow water.

Moderately uncommon.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands to Samoa.

Discussion: Fiji specimens are very similar to the form *Mitra graeffi* CROSSE, which was described by its author from Samoa; they resemble this form in being almost black and having whitish or yellowish transverse bands. The species, however, is very variable in colour and in the width of the light transverse zones on the body whorl.

DAUTZENBERG & BOUGE (1923) list the following species as variants of *Mitra luculenta* REEVE: *M. montrouzieri* TAPPARONE-CANEFRI, 1874 (fine-ribbed, red-lined variant), *M. laevizonata* SOWERBY, 1874 (smooth form), *Mitra (Pusia) accincta* SOWERBY, 1907 (pale form), *M. (Pusia) luculenta* var. *albida* DAUTZENBERG & BOUGE, 1923 (albino form) and *M. (P.) luculenta* var. *nigra* DAUTZENBERG & BOUGE, 1923 (melanistic form). None of these varieties have been collected in Fiji, with the exception of the latter variety; however, the axial ribs are distinct and the shell is not smooth as in the form *Pusia nigra*.

122. *Pusia microzonias* (LAMARCK, 1811)

(Plate 21; Figures 110, 110a)

1791. *Voluta sulcata* GMELIN, Syst. Nat. ed. 13, p. 3455 (non GMELIN, 1791, p. 3436; non *Tiara sulcata* SWAINSON, 1831)
 1811. *Mitra microzonias* LAMARCK, Ann. Mus. Hist. Nat., 17: 218
 1811. [?] *Mitra dermestina* LAMARCK, Ann. Mus. Hist. Nat., 17: 221
 1836. *Tiara semiplicata* BRODERIP, Proc. Zool. Soc. London, pt. 3: 197
 1852. *Pusia sulcata* var. *bifasciata* MÖRCH, Cat. Yoldi, p. 84 (non *Mitra bifasciata* SWAINSON, 1822)

Shell: Shell small, elongate-ovate to ovate, acuminate towards spire and base, fairly solid; chocolate-brown to dark reddish-brown in colour, ornamented with a narrow white transverse band on the body whorl, band adjoining sutures on earlier whorls; axially elongate or round white spots appear on the axial ribs of the body whorl, but are occasionally absent in some individuals. Sutures moderately impressed, whorls convex, numbering from 7-9 apart from protoconch of 2 white nuclear whorls; blunt or angulate axial ribs cross whorls, ribs often obsolete on the latter half of the body whorl, numbering from 5-15 on the body whorl and from 14-25 on the penultimate whorl; in some individuals the axial ribs are bluntly nodulose at the sutures. Interstices of axial ribs with fine spiral striae, striae occasionally overriding axial ribs, numbering from 12-18 on the body whorl and from 5-11 on the penultimate whorl; base of shell with 3-8 rows of nodulose spiral cords and smooth cords at the base. Aperture equal in height or longer than the spire, outer lip moderately thickened, convexly elongate or rounded and smooth; interior of aperture whitish and prominently lirate. Columella calloused, whitish, with 4-5 prominent oblique folds; anterior canal slightly calloused and straight.

L: 13 to 25 mm W: 36 to 50% A: 49 to 57%
 Type locality: Océan indien.

Habitat: Under coral rocks on sand and reef substrate, from 0 to 2 fathoms.

Uncommon as live-collected specimens, beach specimens more frequent.

Distribution: Throughout the Fiji Islands. - From Indonesia through the tropical Indo-Pacific to Polynesia.

Discussion: This is one of the most variable species encountered in Fiji. Specimens will range from broad to slender, with axial ribs quite prominent to the edge of the outer lip on the body whorl, or axial ribs may be obsolete on the latter two-thirds or one-half of the body whorl; the majority of specimens has a "knotted" spiral band on the body whorl, while in some specimens the band appears as a white narrow line; the nodulose spiral cords may extend almost half-way towards the suture from the base on the body whorl.

Specimens labelled *Pusia leucodesma* (REEVE) in local collections are not that species but just individual variants of the highly variable *Pusia microzonias* (LAMARCK).

123. *Pusia pardalis* (KÜSTER, 1841)

(Plate 23; Figure 126)

1841. *Mitra pardalis* KÜSTER, Conch. Cab., p. 105; pl. 17, figs. 14, 14*, 15

Shell: Shell small, elongate-ovate, moderately solid; dark reddish-brown in colour, ornamented with a central transverse row of irregular large white blotches on the body whorl and slightly triangular blotches adjoining sutures on earlier whorls; the body whorl has additional smaller spots at the sutures and small orange dots towards the base. Sutures moderately to deeply impressed, whorls convex, rounded at sutures, numbering from 7-8 apart from protoconch which was eroded in specimens examined; slightly elevated broad axial ribs cross whorls, ribs angulate, often obsolete on the latter half of the body whorl, numbering from 10-14 on the body whorl and from 18-22 on the penultimate whorl. Interstices of axial ribs spirally striate, striae often obsolete on the body whorl; base of shell with 3-4 spiral rows of small pale orange nodules. Aperture slightly longer than the spire, moderately narrow, outer lip slightly thickened, smooth, convexly elongate, contracted basally: interior of aperture pale violet or violet-grey, edge of outer lip brown, with 5-9 labral lirae. Columella light brown with 4 prominent whitish and oblique folds, first fold large and oriented transversely to the aperture; anterior canal calloused, spirally corded, straight.

L: 13 to 17 mm W: 48 to 52% A: 54 to 58%
 Type locality: Java.

Habitat: Under coral rocks on sand substrate, in shallow water.

Rare.

Distribution: Southeast Viti Levu. – From East Africa through the tropical Indo-Pacific to Fiji.

124. *Pusia patriarchalis* (Gmelin, 1791)

(Plate 23; Figure 127)

1791. *Voluta patriarchalis* Gmelin, Syst. Nat., ed. 13, p. 3460

Shell: Shell moderately small, broad, ovate, solid but light in weight for its size; white to cream in colour, ornamented with a broad reddish-brown central transverse band on the body whorl and a narrow, generally interrupted spiral band adjoining sutures on earlier whorls. Sutures moderately deep, whorls slightly concave, angulate at sutures, numbering from 7-8 apart from protoconch; broad, elevated, subangulate axial ribs cross whorls, ribs prominent, spinose at sutures, numbering from 9-13 on the body whorl and from 11-14 on the penultimate whorl; ribs become obsolete towards the base of the body whorl. Moderately deep smooth spiral grooves encircle the shell, numbering from 12-16 on the body whorl and from 4-6 on the penultimate whorl; fine, close-set axial lirae cross the body whorl and the penultimate whorl, but do not intrude into the spiral grooves. Base of shell with 6-8 spiral rows of white nodules, nodules becoming wider spaced towards the center of the body whorl, and intruding into the reddish-brown central transverse zone. Aperture moderately broad, somewhat angulate at point of commencement, convexly rounded towards the base; interior of aperture pale orange to orange-brown, with 10-15 prominent labral lirae. Columella calloused, same colour as aperture, with 4 oblique folds, first anterior fold conspicuously larger and oriented transversely to aperture; anterior canal moderately calloused, straight, somewhat pointed.

L: 22 to 27 mm W: 59 to 64% A: 54 to 60%

Type locality: Oceano indico.

Habitat: In sand substrate and on coral-rubble bottom, in deeper water.

Rare.

Distribution: South and West Viti Levu. – From East Africa through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: LAMARCK has been usually credited with the authorship of this species. Gmelin's references to figures for his *Voluta patriarchalis* are identical with those of LAMARCK (CHEMNITZ, 1788, Vol. 10; pl. 150, figs. 1425, 1426). LAMARCK (1811, p. 216) cited an additional reference for a juvenile specimen of *Mitra patriarchalis* (1798, pl. 374, figs. 1a, 1b); the latter reference is the species later called *Mitra tuberosa* REEVE, 1845.

Pusia tuberosa (REEVE), which is the more frequent species in Fiji, and *P. patriarchalis* (LAMARCK) look superficially alike, but have sufficient morphological characteristics to be separated specifically; the more obvious differentiating characters are given in Table 4.

125. *Pusia semicostata* (ANTON, 1839)

(Plate 21; Figure 109)

1839. *Mitra semicostata* ANTON, Verzeichn. Conch., p. 69

1841. *Mitra semicostata*, KÜSTER, Conch. Cab., pl. 14, figs. 20, 21

Shell: Shell small, elongate-ovate, light in weight; white in colour, body whorl and early whorls orange-brown, interstices of axial ribs with short orange-brown streaks. Sutures moderately impressed, whorls convex, ventricose, rounded at sutures, numbering from 8-9 apart from protoconch which was eroded in all specimens examined;

Table 4

Characters	<i>Pusia patriarchalis</i>	<i>Pusia tuberosa</i>
Mean length	24 mm	15 mm
Mean length of aperture	57% of Length	63% of Length
Colour of bands	reddish-brown or brown	greenish-brown or olive-brown
Axial ribs	subangulate, spinose at suture	rounded, nodulose at suture
Whorls	concave	flattened to convex
Sculpture	smooth spiral grooves	elevated spiral ridges
Aperture	moderately broad, interior with labral lirae	very narrow, interior smooth
Columellar folds	first fold rather large	folds about equal in size
Anterior canal	pointed	truncated

broad and coarse axial ribs cross whorls, ribs angulate towards the summits, obsolete on latter half of body whorl, but visible towards the base, numbering from 4 - 11 on the body whorl and from 13 - 15 on the penultimate whorl. Fine, shallow spiral striae encircle the whorls, striae overriding axial ribs, becoming obsolete on the central part of the body whorl, numbering from 13 - 18 on the body whorl and from 7 - 11 on the penultimate whorl; base of shell with narrow spiral cords. Aperture slightly shorter than the spire, narrow, elongate, constricted at anterior third and contracted basally; outer lip moderately thin, simple, interior of aperture pale orange or cream, with 10 - 15 labral lirae. Columella cream in colour, calloused, with 4 prominent white oblique folds; anterior canal somewhat produced, spirally corded, longer than the outer lip, fairly straight.

L: 13 to 17 mm W: 37 to 40% A: 47 to 50%

Type locality: None.

Habitat: Dredged on sand and coral-rubble bottom substrate, from 5 to 7 fathoms.

Moderately rare.

Distribution: South Viti Levu. - ?

Discussion: The body whorl is uniformly orange-brown, with only a small white zone intruding near the periphery a short distance past the aperture; the three subsequent whorls are white, with only short orange-brown streaks situated in the interstices of the axial ribs, and early whorls are orange-brown again.

slightly narrower band towards the base; earlier whorls generally ornamented with a narrow band which adjoins the sutures. Sutures moderately to deeply impressed, whorls flattened or slightly convex, angulate at sutures, numbering from 5 - 6 apart from protoconch which is always eroded in adult specimens; elevated narrow spiral ridges encircle the shell, numbering from 10 - 14 on the body whorls and from 3 - 4 on the penultimate whorl. Broad, wide-spaced, coarse axial ridges cross whorls, ridges confined to the white presutural zone on the body whorl, nodulose at sutures, becoming generally obsolete towards the base; axial ridges number from 10 - 13 on the body whorl and from 7 - 10 on the penultimate whorl. Interstices of spiral ridges cancellated with elevated axial striae, striae often overriding spiral ridges, giving the shell a granulose appearance; occasional specimens have longitudinal grooves on the body whorl extending from suture to base. Aperture much longer than the spire, very narrow, outer lip thick, crenulate, fairly straight, rounded basally; interior of aperture smooth, greenish, greyish or purplish-brown in colour, with a narrow white band near the juncture of aperture and columella. Columella calloused, same colour as aperture, with regular oblique folds; anterior canal distinctly calloused and truncated.

L: 12 to 18 mm W: 56 to 63% A: 60 to 65%

Type locality: Island of Zebu, Philippine Islands.

Habitat: Under coral rocks, on sand substrate, from 0 - 2 fathoms.

Moderately rare.

Distribution: West and South Viti Levu. - From Mauritius through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: The species is clearly separable from *Pusia patriarchalis* (GMELIN); for further details see discussion under that species.

DAUTZENBERG & BOUGE (1923; p. 247) treated *Pusia patriarchalis* and *P. tuberosa* as distinct species and pointed out the most important characters by which they can be distinguished.

126. *Pusia tuberosa* (REEVE, 1845)

(Plate 22; Figure 123)

1811. *Mitra patriarchalis* LAMARCK (pars), Ann. Mus. Hist. Nat., 17: 216 (spec. junius)

1845. *Mitra tuberosa* REEVE, Conch. Icon., pl. 30, sp. 237a, 237b

Shell: Shell small, elongate-ovate to ovate, heavy, solid, apex rounded; white in colour, ornamented with a broad olive-green to olive-brown transverse central band and a

Explanation of Plate 23

Figure 124: *Vexillum lubens* (REEVE). Fiji (x 2.5) Figure 125: *Pusia adamsoni* (REEVE). Fiji (x 1.65) Figure 126: *Pusia pardalis* (KÜSTER). Fiji (x 3.0) Figure 127: *Pusia patriarchalis* (GMELIN). Fiji (x 1.85) Figure 128: *Pterygia nucula* (GMELIN). Fiji (x 1.0) Figure 129: *Pterygia fenestrata* (LAMARCK). Fiji (x 2.0) Figure 130: *Swainsonia casta* (GMELIN). Fiji (x 1.25) Figure 131: *Imbricaria conularis* (LAMARCK). Fiji (x 2.0) Figure 132: *Pterygia crenulata* (GMELIN). Fiji (x 2.0) Figure 133: *Imbricaria punctata* (SWAINSON). Fiji (x 2.4) Figure 133a: *Imbricaria punctata* (SWAINSON), flat-spined variant. Fiji (x 2.4) Figure 134: *Pterygia dactylus* (LINNAEUS). Fiji (x 0.75) Figure 135: *Swainsonia olivaeformis* (SWAINSON). Fiji (x 2.0) Figure 136: *Pterygia conus* (GMELIN) - after REEVE, 1844. Figure 137: *Pusia consanguinea* (REEVE), juvenile specimen. Fiji (x 3.25)



Figure 124

Figure 125



Figure 126

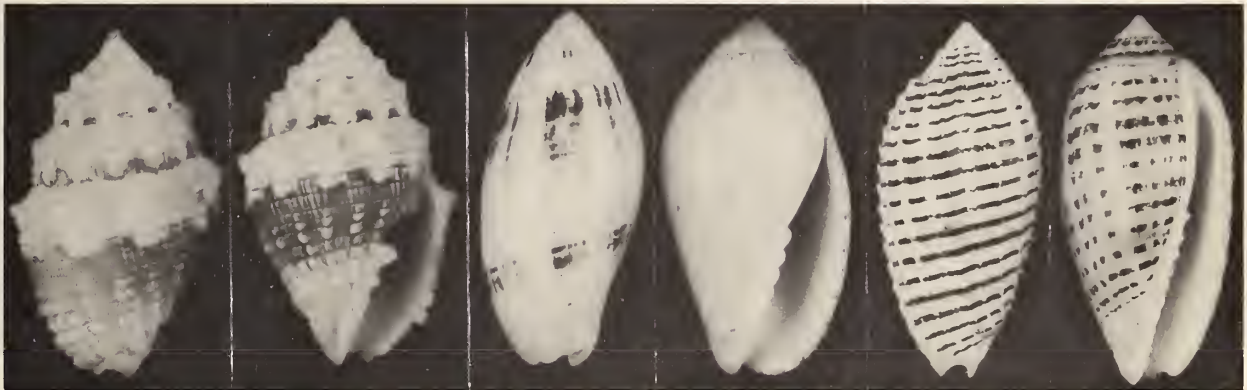


Figure 127

Figure 128

Figure 129



Figure 130

Figure 131

Figure 132

Figure 133



Figure 133 a

Figure 134

Figure 135

Figure 136

Figure 137



Cylindromitrinae

Pterygia RÖDING, 1798

Type species by subsequent designation (DALL, 1915)
Pterygia nucella RÖDING, 1798 = *Pterygia dactylus* (LINNAEUS, 1767).

1798. *Pterygia* RÖDING, Mus. Bolten., p. 51

1817. *Cylindra* SCHUMACHER, Essai Nouv. Syst., p. 236 (non *Cylindra* ILLIGER, 1802)

1884. *Cylindromitra* P. FISCHER, Man. Conch., 7: 614

1929. *Acuticylindra* IREDALE, Mem. Qld. Mus., 9(3): 287

1963. *Pterigia* SHIKAMA, Selec. shells world, 1: 93; pl. 75

Characteristics: Shell cylindrically-ovate, solid, thick, spire short, conical, whorls smooth or sculptured with spiral ridges, outer lip thick, elongate, simple or crenulate, aperture moderately wide or narrow, columella generally calloused and with numerous oblique plaits, anterior canal short. Shell covered with a thin or moderately thick periostracum.

Discussion: The subfamilial name Cylindromitrinae is presently in use for a group of Mitrid species comprising the genera *Cylindromitra* (= *Pterygia*), *Imbricaria* and *Swainsonia*. Despite the change of the nominal type-genus *Cylindromitra* P. FISCHER, 1884, to the prior *Pterygia* RÖDING, 1798, because of synonymy, the subfamilial name Cylindromitrinae must be retained. Article 40 of the Code of the I. C. Z. N. (1961) rules that a name in the family group is not to be changed and continues to be a valid name of the family group taxon, if the nominal type-genus is rejected as a junior synonym (objective or subjective) after 1960. As far as could be ascertained, the name "Pterygiinae" has not been published to-date for a subfamily of Mitridae, whereas Cylindromitrinae has been published prior to 1960 (COTTON, 1957).

The genus *Pterygia* RÖDING, 1798, is to replace *Cylindromitra* of P. FISCHER, 1884, as type-genus of the subfamily Cylindromitrinae.

127. *Pterygia conus* (GMELIN, 1791)

(Plate 23; Figure 136)

1791. *Voluta conus* GMELIN, Syst. Nat. ed. 13, p. 3449 (fig. in CHEMNITZ, 1788, 10: 163, pl. 150, figs. 1415, 1416)

1798. *Pterygia conoidea* RÖDING, Mus. Bolten., p. 53

1811. *Mitra conulus* LAMARCK, Ann. Mus. Hist. Nat., 17: 213 (fig. in Tabl. Encycl. méth., 1798, pl. 382, figs. 2a, 2b)

Shell: Shell moderate in size, conical, solid, spire short and pointed; whitish in colour, ornamented with dark brown spiral lines. Spire concave, sutures moderately impressed, whorls flattened to concave, numbering from 7 to 8 apart from protoconch; dark brown, narrow and occa-

sionally punctate spiral grooves encircle the shell, grooves becoming spiral ridges basally. Shoulder of shell angulate, spire prominently granulose, granulations occasionally extending to the shoulder of the body whorl. Aperture long, moderately broad, outer lip thick, smooth, slightly constricted, interior of aperture porcelain-white. Columella calloused, white in colour, with 5-6 prominent oblique folds; anterior canal straight.

L: 36 mm

W: 49%

A: 75%

(from Philippine specimen)

Type locality: None.

Habitat: In clean sand substrate, in shallow water.

Very rare.

Distribution: North Viti Levu. - Indonesia, Philippines.

Discussion: The species is known from only one beach-worn specimen collected at Manava Island, North Viti Levu (*leg.* J. Farkas). Another specimen was collected in the same locality by the author, but was lost a short time later. DODGE (1955) reported a specimen from Viti, Fiji Islands, and another specimen with a "Fiji" label is preserved in the United States National Museum (Dr. J. P. E. Morrison, *in litt.*).

DODGE (*l.c.*) urged the re-introduction of the earliest available name for this species, i. e. *Bulla conoidea* LINNAEUS, 1767. LINNAEUS' description is detailed, but lacks citation of figures and locality indications. One cannot help but agree with DODGE that the LINNAEAN diagnosis applies to *Pterygia conus* (GMELIN) and the placement in the genus *Bulla* by LINNAEUS is a mystery. The phrase "*suturis crenulatis*" used by LINNAEUS excludes the species *Imbricaria conularis* (LAMARCK), which has a smooth spire, whereas *Pterygia conus* is strongly granulose. CHEMNITZ (1788, Vol. 10; pl. 150, figs. 1415, 1416) described the species as "*Voluta conoidea Voluta conus*." GMELIN (1791) adopted *Voluta conus*, while RÖDING (1798) listed the species as *Pterygia conoidea*.

The modern taxonomical trend is to have all Linnaean names suppressed if they are unsupported by a citation of illustrations and subscriptions. The original diagnosis of *Bulla conoidea*, however, strongly suggests it to be the same species as *Pterygia conus* (GMELIN); furthermore, Linnaeus' description is not applicable to any other species of the subfamily Cylindromitrinae.

128. *Pterygia crenulata* (GMELIN, 1791)

(Plate 23; Figure 132)

1791. *Voluta crenulata* GMELIN, Syst. Nat., ed. 13, p. 3452

1817. *Cylindra coronata* SCHUMACHER, Essai Nouv. Syst., p. 236 (non *Voluta coronata* HELBLING, 1779; non *Mitra coronata* LAMARCK, 1811)

1929. *Cylindromitra crenulata toleranda* IREDALE, Mem. Qld. Mus., 9(3): 287; pl. 31, fig. 19

1929. *Cylindromitra fastidiosa* IREDALE, Mem. Qld. Mus., 9(3): 287; pl. 31, fig. 20

1962. *Pterygia conus* GMELIN. ABBOTT, Seashells of world, p. 96, fig. lower left (non *Voluta conus* GMELIN, 1791)

Shell: Shell moderately small, cylindrically-elongate, solid, spire short; ivory-white or cream in colour, generally ornamented with four to six narrow, orange to orange-brown, interrupted transverse zones on the body whorl, and spots and blotches of the same colour on the spire; in some specimens the transverse zones coalesce and form large longitudinal zones on the body whorl, almost obscuring the whitish base colour. Sutures deeply impressed, finely crenulate, whorls flattened or very slightly concave, numbering from 6-7 apart from protoconch of $1\frac{1}{2}$ -2 glassy-white nuclear whorls; numerous, close-set punctate spiral grooves encircle the shell, grooves shallow or moderately deep, numbering from 27-42 on the body whorl and from 2-4 on the penultimate whorl. Close-set longitudinal grooves bisect spiral grooves, giving the shell a slightly granulose appearance; the spiral ridges are either obsolete or prominent, depending on the depth of the spiral grooves. Aperture much longer than the spire, narrow, elongate, outer lip thick, faintly crenulate, interior of aperture white. Columella white, with 7-9 prominent oblique folds; anterior canal straight.

L: 15 to 32mm W: 39 to 46% A: 84 to 88%

Type locality: Oceano indico.

Habitat: In clean sand substrate, on sand banks and in lagoons, in shallow water.

Uncommon.

Distribution: Throughout the Fiji Islands. - From the Red Sea through the tropical Indo-Pacific to Polynesia and Hawaii.

Discussion: *Pterygia fastidiosa* (IREDALE) has been described as a smaller and more slender shell (39% of length), with only 8 or 9 columellar plaits in comparison with the 6 or 7 plaits in *P. crenulata*; the spiral grooves on the body whorl are said to number from 40-50 in *P. fastidiosa* instead of 30, as in *P. crenulata*, and the spirals on the penultimate whorl number 4 instead of the 2 as in *P. crenulata*. These diagnostic features on which *P. fastidiosa* was based are among the most variable in most species of Mitridae, and are well represented in individuals of populations of *P. crenulata* from Fiji.

129. *Pterygia dactylus* (LINNAEUS, 1767)

(Plate 23; Figure 134)

1767. *Voluta dactylus* LINNAEUS, Syst. Nat., ed. 12, p. 1188, no. 401

1798. *Pterygia nucella* RÖDING, Mus. Bolten., p. 53

1844. *Mitra obesa* REEVE, Conch. Icon., pl. 12, figs. 87a, 87b

1959. *Pterygia dactylus* KIRA, Col. Illust. shells Japan, 1: 86; pl. 33, fig. 16

Shell: Shell moderately large, cylindrically-ovate, heavy, solid, spire short, pointed; whitish to cream in colour, ornamented with three or four brown or fawn, sometimes interrupted transverse bands on the body whorl and brown axial streaks and blotches on the spire. Sutures moderately impressed, whorls flattened to slightly convex, numbering from 5-6 apart from protoconch of 2-3 glassy-white nuclear whorls; shallow spiral striae encircle the shell, striae dark brown in colour, numbering from 20 to 27 on the body whorl and from 2-4 on the penultimate whorl. Irregular axial ridges cross whorls, extending to the shoulder of the body whorl and becoming somewhat obsolete towards the base. Aperture much longer than the spire, widening towards the base, outer lip very thick, smooth, fairly straight; interior of aperture porcelain white. Columella heavily calloused, white in colour, with 6-7 prominent oblique folds; anterior canal calloused, truncated and straight.

In juvenile specimens the juncture of aperture and spire is higher than in adult specimens.

L: 25 to 52mm W: 55 to 60% A: 82 to 87%

Type locality: India.

Habitat: In clean sand substrate, on sand banks and in lagoons, in shallow water.

Uncommon.

Distribution: Throughout the Fiji Islands. - From the Indian region through the tropical Indo-Pacific to Polynesia.

130. *Pterygia fenestrata* (LAMARCK, 1811)

(Plate 23; Figure 129)

1811. *Mitra fenestrata* LAMARCK (pars), Ann. Mus. Hist. Nat., 17: 212

1844. [?] *Mitra glans* REEVE, Conch. Icon., pl. 24, sp. 192, fig. 191

Shell: Shell small, cylindrically-ovate, solid, spire short; white in colour, ornamented with dark reddish-brown narrow spiral bands on all whorls. Sutures deeply impressed, whorls flattened or slightly convex, numbering from 5-6 apart from protoconch of $1\frac{1}{2}$ -2 white nuclear whorls; moderately elevated, step-like spiral ridges encircle the shell, numbering from 13-17 on the body whorl and from 2-3 on the penultimate whorl, summits of ridges lined with dark reddish-brown. Irregular, broad and almost obsolete axial ridges bisect the spiral ridges, numbering from 14-29 on the body whorl and from 13 to 19 on the penultimate whorl. Aperture much longer than the spire, narrow, elongate, outer lip thick, undulately crenulate; interior of aperture porcelain-white, rarely light bluish-white. Columella calloused, white in colour, with 8-9 close-set and prominent oblique folds; anterior canal straight.

L: 19 to 27 mm W: 46 to 52% A: 84 to 90%

Type locality: Mers de l'Inde.

Habitat: In clean sand substrate, in sand pockets of coral reefs, in shallow water.

Uncommon.

Distribution: Throughout the Fiji Islands. – From the Andaman Islands through the tropical Indo-Pacific to Polynesia.

Discussion: The longitudinal ridges are either ill-defined or elevated and prominent; the transverse reddish-brown lines are continuous or interrupted.

LAMARCK's *Mitra fenestrata* was a composite species; his first reference (1798; pl. 372, figs. 3a, 3b) is a good illustration of the species he described. The second reference to GUALTIERI (1842; pl. 28, fig. P) is identical with LINNAEUS' only reference for *Pterygia dactylus*. The GUALTIERI figure is very inappropriate for either *P. dactylus* or *P. fenestrata*; the small and round, geometrically arranged dark spots on the spiral lines of the body whorl are a puzzling feature, and the figure could possibly represent a juvenile shell of *P. dactylus*. LAMARCK's description in conjunction with the figure from the "Encyclopédie Méthodique" clearly identifies the species *Pterygia fenestrata*.

131. *Pterygia nucea* (GMELIN, 1791)

(Plate 23; Figure 128)

1781. *Voluta nucea* GRONOVIVS, Zoophyl. Gron. Icon. Expl., pl. 18, fig. 11 (non binominal)

1791. *Voluta nucea* GMELIN, Syst. Nat., ed. 13, p. 3449

1811. *Mitra olivaria* LAMARCK, Ann. Mus. Hist. Nat., 17: 202

Shell: Shell moderate in size, cylindrically-ovate and ventricose, solid, heavy; white or cream in colour, ornamented with one or two dark brown narrow transverse bands on the body whorl, and spiral rows of small brown spots on all whorls; the dark brown transverse bands are often interrupted or even absent. Sutures moderately impressed, whorls slightly convex, numbering from 6-7 apart from protoconch which is nipple-like and consists of $1\frac{1}{2}$ -2 nuclear whorls; early whorls with 7-10 spiral striae, striae becoming generally obsolete on the penultimate and body whorls. The sutures are sculptured with very small nodules which are often lined with orange-brown; base of body whorl with weak spiral cords. Aperture much longer than the spire, broad, flaring basally, edge of outer lip moderately thickened, with 8-12 small brown-lined nodules; interior of aperture porcelain-white. Columella calloused, white in colour, with 5-6 prominent oblique folds; anterior canal short, straight, outer lip generally longer than the anterior canal.

L: 34 to 54 mm W: 46 to 55% A: 71 to 76%

Type locality: None.

Habitat: In clean sand substrate, in lagoons and on sand banks, in shallow water.

Uncommon.

Distribution: Throughout the Fiji Islands. – From East Africa through the tropical Indo-Pacific to Polynesia.

Swainsonia H. & A. ADAMS, 1853

Type species by monotypy

Mitrella olivaeformis (SWAINSON, 1821)

= *Swainsonia olivaeformis* (SWAINSON, 1821)

1831. *Mitrella* SWAINSON, Zool. Illust., ser. 2, pl. 54 (non *Mitrella* RISSO, 1826)

1853. *Swainsonia* H. & A. ADAMS, Gen. rec. Moll., 1: 180 (nom. nov. pro *Mitrella* SWAINSON, 1831)

Characteristics: Shell small, oliviform, smooth, shiny, occasionally puncto-striate, spire short, pointed, aperture long, narrow, outer lip thick, smooth, often longer than the anterior canal, columella obliquely plicate. Shell covered with a uniformly thin or band-like periostracum. **Discussion:** COSSMAN's (1899) designation of *Mitra* (*Swainsonia*) *fissurata* (LAMARCK, 1811) as type species of *Swainsonia* H. & A. ADAMS, 1853, appears to be invalid according to article 67(i) of the Code of I.C.Z.N., which requires that a genus proposed in replacement for a prior nominal genus must have the same type species. The generic name *Swainsonia* was proposed as a replacement name for the preoccupied *Mitrella* SWAINSON, 1831; however, no type species was originally designated by H. & A. ADAMS; SWAINSON's original nominal type species *Mitra olivaeformis* was placed by H. & A. ADAMS in the genus *Imbricaria* SCHUMACHER.

132. *Swainsonia casta* (GMELIN, 1791)

(Plate 23; Figure 130)

1786. *Voluta casta* SOLANDER in LIGHTFOOT, 1786 (nom. nud.)

1791. *Voluta casta* GMELIN, Syst. Nat., ed. 13, p. 3453 (non *Mitra casta* H. ADAMS, 1872)

1817. *Mitra matronalis* SCHUMACHER, Essai Nouv. Syst., p. 239

1853. *Mitra laevis* A. ADAMS, Proc. Zool. Soc. London, pt. 19: 132

1933. *Mitra* (*Swainsonia*) *fasciata* "MARTYN," DAUTZENBERG & BOUGE, Journ. Conchyl., 77(2): 166 (non SOWERBY, 1874)

Shell: Shell moderate in size, slender, elongate, spire pointed; white in colour, ornamented with a broad chestnut-brown band on the body whorl and a narrower band of the same colour on the penultimate whorl. Sutures moderately impressed, shallow in some specimens, whorls

flattened to slightly convex, numbering from 7 - 8 apart from protoconch of 2 glassy-white nuclear whorls; early whorls longitudinally plicate and spirally puncto-striate, the penultimate whorl in small specimens bears 2 - 4 punctate spiral lines, and most specimens are smooth on the body whorl. Aperture longer than the spire, narrow, elongate, outer lip thickened, smooth; interior of aperture porcelain-white. Columella white, with 5 - 6 very prominent oblique folds, which extend for a short distance onto the body whorl; base of shell with shallow spiral grooves, outer lip pointedly rounded basally and slightly longer than the anterior canal.

L: 25 to 42 mm W: 30 to 33% A: 61 to 67%
Type locality: Amboina.

Habitat: In clean sand substrate, on sand banks, in shallow water.

Uncommon.

Distribution: Throughout the Fiji Islands. - From East Africa through the tropical Indo-Pacific to Polynesia.

Discussion: The brown spiral bands are actually an overlying epidermis and are fugitive; portions of the bands may be partly worn off even during the animal's life, or may be removed during cleaning.

Voluta casta SOLANDER in LIGHTFOOT, 1786, is a *nomen nudum*.

133. *Swainsonia olivaeformis* (SWAINSON, 1821)

(Plate 23; Figure 135)

1821. *Mitra olivaeformis* SWAINSON, Zool. Illust., ser. 1, pl. 48

1831. *Mitrella olivaeformis* SWAINSON, Zool. Illust., ser. 2, pl. 54

1839. *Mitra dactyloidea* ANTON, Verzeichn. Conch., p. 68

Shell: Shell small, oliviform, slender; yellow in colour, with a dark purple apex and anterior canal. Sutures moderately impressed, whorls convex, numbering from 5 - 8 apart from protoconch of 2 dark purple nuclear whorls; shell either smooth or encircled with 1 - 6 punctate spiral grooves on the body whorl, and about 2 grooves on the penultimate whorl. Some specimens are longitudinally plicate on earlier whorls and occasionally for a short distance anteriorly to the suture on the body whorl. Aperture much longer than the spire, very narrow, outer lip thickened, smooth, pointedly rounded basally; interior of aperture yellowish. Columella yellowish, with 5 prominent columellar folds, folds white or light purple in colour, last 4 folds extending onto the body whorl; anterior canal straight, purplish in colour.

L: 10 to 21 mm W: 37 to 41% A: 66 to 72%
Type locality: None.

Habitat: In clean sand substrate, in sand pockets of coral reefs, in shallow water.

Moderately common.

Distribution: Throughout the Fiji Islands. - From the Philippine Islands through the tropical Pacific to Polynesia and Hawaii.

Discussion: The species occurs in widely separated colonies in Fiji, and when encountered, it is usually frequent.

The punctate spiral grooves on some specimens of *Swainsonia olivaeformis* have no connection with the developmental stage of the species. In certain localities the majority of specimens collected is smooth on the body whorl, while in other localities both forms are represented in equal numbers.

Imbricaria SCHUMACHER, 1817

Type species by original designation

Imbricaria conica SCHUMACHER, 1817

= *Imbricaria conularis* (LAMARCK, 1811)

1817. *Imbricaria* SCHUMACHER, Essai Nouv. Syst., p. 236

1821. *Conoelix* SWAINSON, Zool. Illust., ser. 1, 1: pl. 24

1825. *Conohelix* SOWERBY, Cat. coll. Tankerv., p. 79

Characteristics: Shell generally small, conical in shape, solid, spire short and often depressed, concave, whorls smooth or striate, aperture straight, narrow and rather long, outer lip thick, smooth, columella obliquely plicate, anterior canal short. The shell is covered with a very thin periostracum.

134. *Imbricaria conularis* (LAMARCK, 1811)

(Plate 23; Figure 131; Text figure 11)

1811. *Mitra conularis* LAMARCK, Ann. Mus. Hist. Nat., 17: 219

1817. *Imbricaria conica* SCHUMACHER, Essai Nouv. Syst., p. 236; pl. 21, figs. 5a, 5b

1821. *Conoelix marmoratus* SWAINSON, Zool. Illust., ser. 1, 1: pl. 24

1821. *Conoelix lineatus* SWAINSON, Zool. Illust., ser. 1, 1: pl. 24

Shell: Shell small, shiny, conically-ovate, spire extremely concave, acuminate; white, cream or light grey in colour, ornamented with one or two dark, generally brownish continuous or interrupted transverse bands, and irregular small squarish white spots on the body whorl; white spots usually longitudinally oriented; wide-spaced, slightly wavy reddish-brown spiral lines encircle the body whorl and earlier whorls, spire maculated with brown or greyish-brown, apex dark brown. Shoulder of body whorl angulate, occasionally obsoletely nodulose, sutures weakly impressed, whorls convex, numbering from 7 - 9 apart from protoconch of 2½ - 3 glassy-brown nuclear whorls. Wide spaced, shallow and occasionally punctate spiral grooves encircle the shell, numbering from 8 - 14 on the body whorl and from 1 - 2 on the penultimate whorl; some

individuals are finely axially striate on the penultimate and earlier whorls. Aperture much longer than the spire, narrow, elongate, only slightly curved; outer lip thickened and faintly crenulate; interior of aperture dark brown, interior edge of outer lip white. Columella light brown or bluish, with 6-8 sharply sculptured oblique folds; anterior canal calloused, straight.

L: 13 to 23 mm W: 39 to 50% A: 68 to 80%

Animal: Sole of foot light grey, minutely flecked with white, edge of foot whitish; dorsum of foot translucent white with two small grey zones anteriorly. Siphon black, with a longitudinal white line which is flanked by two white oval blotches; anterior end of siphon banded white. Tentacles white, base white, flecked with grey; eyes black, well developed.

Radula: Specimens examined ranged from 16.0 mm to 17.8 mm in length. The radular ribbon is translucent creamy-white in colour; length of ribbon varied from 2.0 mm to 2.2 mm, width from 0.28 mm to 0.33 mm in specimens examined. No appreciable wear was evident on

long, and equipped with two large claw-like cusps on the sides, and a smaller cusp positioned centrally on the lower plate margin; the two side-cusps on the upper plate margin are occasionally obsolete. The laterals are club-like in appearance, broad and short, approximately one and one-half times the width of the centrals; a large broad cusp points towards the central tooth, and the side-cusp close to the central is rather variable in size. Seven to nine cusps are distributed almost along the entire width of the lateral plate, the last two cusps occasionally appearing as small denticles.

The ribbon consists of 32-36 fully formed rows of teeth (plus 4-6 nascentes).

Type locality: None.

Habitat: In clean sand substrate, in sand pockets of coral reefs and among weed, in shallow water.

Moderately uncommon.

Distribution: Throughout the Fiji Islands. - From Mauritius through the tropical Indo-Pacific to Polynesia.

Discussion: The species is better known as *Imbricaria conica* SCHUMACHER. LAMARCK's description, although not accompanied by references to figures, is as clear and precise as one would wish, and identifies the species. LAMARCK's description of *Mitra conularis* is as follows:

"*M. Angusto-turbinata, albo fuscoque marmorata; striis transversis remotis; spira acuminata.*

Sa forme est celle d'un cône étroit et renversé, qui se termine par une spire acuminée. Cette coquille est marbrée de blanc et de brun, et présente des stries distantes, transverses et une surface lisse entre les stries; quatre plis à la columelle. Longueur 19 à 20 millimètres. Hab: ? Mus., n. 55"

LAMARCK's description contains all the salient features of the species: the coniform slender shape, acuminate spire, smooth and polished texture of the shell which is marbled with white and brown, and sculptured with distant spiral striae. One could take exception to the four columellar folds mentioned by LAMARCK; however, specimens examined have, at times, the ultimate two folds extremely weak.

DAUTZENBERG & BOUGE (1923) regarded *Imbricaria conularis* LAMARCK as conspecific with *I. conica* SCHUMACHER. LAMARCK's *I. conularis*, however, was erroneously dated as from 1822 and consequently placed as a variant in the synonymy of *I. conica* SCHUMACHER.

The radular pattern of the type species of the genus *Imbricaria* SCHUMACHER is dissimilar to either *Mitra*, *Vexillum* or *Strigatella*, and confirms the validity of the genus. *Imbricaria punctata* (SWAINSON) has a similar radula pattern, but the small central cusp is positioned on the upper plate of the central tooth and the laterals

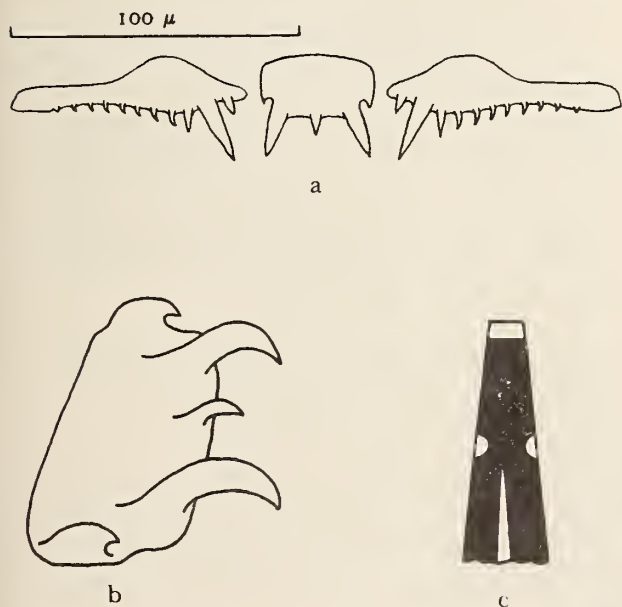


Figure 11

Imbricaria conularis (LAMARCK, 1811). Fiji Islands.

a. one row of radular teeth

b. latero-oblique view of central tooth

c. siphonal pattern consisting of black and white areas

the early rows of the radular ribbon; however, lateral teeth were missing in the first two to three rows. The centrals are rectangular in shape, broader than they are

have 3-4 denticles instead of cusps (CERNOHORSKY, in preparation).

The absence of wear on teeth, and loss of laterals, would suggest a tearing and shredding mode of feeding, similarly to that of the sand-dwelling *Vexillum* species, for which this particular radula pattern is especially suitable.

135. *Imbricaria punctata* (SWAINSON, 1821)

(Plate 23; Figures 133, 133a)

1821. *Conoelix punctatus* SWAINSON, Zool. Illust., ser. 1, pl. 24 (two lower figs.) (non *Mitra punctata* SWAINSON, 1831)

1839. *Mitra truncata* KIENER, Spéc. Gén. Icon. Coq. Viv., p. 112; pl. 30, fig. 101

1841. *Mitra conica* KÜSTER, Conch. Cab., p. 97; pl. 16, figs. 15, 16 (non *Imbricaria conica* SCHUMACHER, 1817)

1844. *Mitra ossea* REEVE, Conch. Icon., pl. 27, sp. 219

Shell: Shell small, cylindrically-ovate, conical in shape, rather solid; yellowish or fawn in colour throughout, early whorls whitish. Sutures weakly impressed, whorls flattened, slightly terraced in some specimens, numbering from 5-7 apart from protoconch of $1\frac{1}{2}$ -2 white nuclear whorls; wide-spaced, shallow, punctate spiral grooves encircle the shell, numbering from 13-20 on the body whorl and from 1-3 on earlier whorls; occasional specimens have a nipple-like apex. Aperture much longer than the spire, very narrow, straight, elongate, slightly convexly rounded in some individuals; outer lip thickened, smooth. Interior of aperture yellowish or light fawn in colour; columella calloused, same colour as aperture, with 5-7 prominent oblique folds. Anterior canal slightly calloused, straight.

L: 11 to 21 mm W: 47 to 56% A: 85 to 92%

Animal: Sole and dorsum of foot white. Siphon long and white, tentacles short, white in colour, edged with light brown, base of tentacles white; eyes black.

Type locality: Tahiti.

Habitat: In clean and slightly muddy sand, in sand pockets of coral reefs, in shallow water.

Uncommon.

Distribution: Throughout the Fiji Islands. - From Mauritius through the tropical Indo-Pacific to Polynesia.

Discussion: The height of the spire is a variable feature in this species; some specimens have an almost flat spire, while in others the spire is conical. *Mitra truncata* KIENER, 1839 appears to be the flat-spined form of the species.

Imbricaria conovula (QUOY & GAIMARD, 1833), although superficially similar, is not conspecific with *I. punctata*; the former species differs in being more globose

near the shoulder, with a prominent callus near the posterior angle of the aperture and the anterior canal, which is always dark purple. For a recent illustration of *Imbricaria conovula* see J. CATE (1963; pl. 8, figs. 55, 56).

ERRATUM

{Editor's Note: The following correction was received from the author after completion of page proofs through p. 142; it was therefore impossible to insert it in the proper place without reprinting over 30 pages; the author offers his sincere apologies for this oversight in the original manuscript.}

p. 111, col. 1, starting with fourth line from bottom, read: varied from 4.5 to 6.0mm and the width from 0.7 to 0.9mm in specimens examined. The first four to . . .

UNCONFIRMED REPORTS OF MITRIDAE FROM THE FIJI ISLANDS

Mitra avenacea REEVE, 1845. - Conch. Icon., pl. 31, sp. 246. Reported from Fiji by CATE & BURCH (1964) from the Jennings collection. REEVE's type figure depicts a shell similar to *M. tornata* REEVE, but the species is yellowish in colour, with white spots at the sutures, and with close-set spiral ridges. There is no shell answering REEVE's description in local collections.

Vexillum exquisitum (GARRETT, 1873). - Proc. Zool. Soc. London, p. 842 (not figured). Reported from Fiji by GARRETT (see J. CATE, 1963; p. 33; pl. 6, fig. 23). The species is unknown in local collections.

Pusia leucodesma (REEVE, 1845) - Conch. Icon., pl. 30, sp. 243. Reported from Fiji by CATE & BURCH (1964) from the Jennings collection. The specimens from the Jennings collection are, in our opinion, beach-worn examples of the highly variable *P. microzonias* (LAMARCK, 1811).

Vexillum mica (REEVE, 1845) - Conch. Icon., pl. 37, sp. 314. Reported from Fiji by CATE & BURCH (1964) from the Jennings collection. The species is unknown in local collections.

Mitra polita REEVE, 1844 - Conch. Icon., pl. 13, sp. 94. Reported from Fiji by CATE & BURCH (1964) from the Thaenum collection. The species is unknown in local collections.

Vexillum rectilateralis (SOWERBY, 1874). – Thes. Conch. 4: 34; pl. 20, fig. 404. Reported from Fiji by CATE & BURCH (1964) from the Thaani collection. The species which has been cited as a variant of *V. deshayesi* (REEVE, 1844) by DAUTZENBERG & BOUGE (1923), is unknown in local collections.

Mitra robusta REEVE, 1844. – Conch. Icon., pl. 18, sp. 140. Reported by DAUTZENBERG (1935) as having been collected in Fiji by DUNKER & GARRETT. The species is unknown in local collections.

Mitra rubiginosa REEVE, 1844. – Conch. Icon., pl. 10, sp. 68. Reported from Fiji by CATE & BURCH (1964) from the Jennings collection. The only specimen in that collection resembling this species is an immature example of *M. nubila* (GMELIN, 1791) and has been here illustrated under that species.

Vexillum salmonea (SOWERBY, 1874). – Thes. Conch., 4: 36; pl. 19, fig. 375. Reported from Fiji by CATE & BURCH (1964) from the Jennings collection. For description and illustration of *V. salmoneum* see under *V. zebuensis* (REEVE, 1844) in this paper.

Pusia speciosa (REEVE, 1844). – Conch. Icon., pl. 19, sp. 148 (= *Pusia variata* REEVE, 1845, Conch. Icon., Errata). Reported by DAUTZENBERG & BOUGE (1923) as having been collected in Fiji by Dr. Putzeys. The species is unknown in local collections.

Mitra typha REEVE, 1845. – Conch. Icon., pl. 33, sp. 267. Reported from Fiji by TRYON (1882). The species is unknown in local collections.

FOSSIL RECORDS OF MITRIDAE FROM THE FIJI ISLANDS

Mitra (Tiara) fijiensis LADD, 1934. – B. P. Bishop Mus. Bull. 119: 227; pl. 40, fig. 7. The species was described from Pleistocene deposits on the banks of the Wailoa river near Nasogo, at an elevation of 995 feet.

LADD compared his new species with *Mitra (Tiara) sokkohensis* MARTIN, 1916, *M. flammea* QUOY & GAIMARD, 1833 and *M. filaris gracilis* PHILIPPI, 1850 (= *Mitra praestantissima* RÖDING, 1798). The species, however, compares very favourably with the Recent species *Mitra (Cancilla) pia* DOHRN, 1860, and may possibly be identical.

Mitra (Tiara) nasongoensis LADD, 1934. – B. P. Bishop Mus. Bull. 119: 227; pl. 40, fig. 8. The species was described from the same deposits as the preceding species, and closely resembles the Recent species *Mitra flammigera* REEVE, 1844.

Vexillum (Vexillum) gembacana MARTIN, 1881. – LADD, 1934; B. P. Bishop Mus. Bull. 119: 228; pl. 40, fig. 9. Recorded by LADD from the same deposits as the previous two species. Although there is some resemblance to certain individuals of *V. deshayesi* (REEVE), the species is probably distinct.

CONCLUSION

A total of 135 species of Mitridae have been recorded from Recent collections in the Fiji Islands. Another 13 species have been reported in literature; three or four of these may possibly be synonymous with species dealt with in this study.

The number of species recorded in the appropriate genera are as follows:

<i>Mitra</i>	54
(of which subgen. <i>Cancilla</i>	14)
<i>Strigatella</i>	12
<i>Vexillum</i>	44
<i>Pusia</i>	16
<i>Pterygia</i>	5
<i>Imbricaria</i>	2
<i>Swainsonia</i>	2
Total	135

The 135 species of Mitridae recorded from Fiji represent about 27% of all Recent Mitrid species. This number is slightly higher than that of Fiji Conidae (20%), but lower than that for the Cypraeidae (33%) recorded from Fiji.

Some species of Mitridae, especially those of the subgenus *Cancilla*, clearly need further study to determine the actual range of variation within the respective species. Although the comparative rarity of certain species precludes definitive statements at the present time, the range of individual and ecological variation of members of the subgenus *Cancilla* may be found to be greater than is currently accepted.

APPENDIX

It was stated in the Introduction that egg-deposition has not been observed in Fijian species of Mitridae; however, prior to the manuscript's going to press, the oviposition of *Mitra floridula* SOWERBY has been observed. The animal, whose shell measured 55 mm in length, deposited vase-shaped egg-cases measuring 6 mm to 7 mm in height; the egg-cases were fully transparent, whereas the eggs themselves were pale yellow in colour and could be clearly seen through the envelope. Sixteen capsules were scattered over an area of one and one-half inches (A. Jennings, personal communication).

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A New *Scalina* from the Gulf of California

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(Plate 24)

While diving in eight to ten feet of water at the southwest end of Cerralvo Island, in the Gulf of California, Billee Dilworth noticed a brilliant orange coral with small, chrome yellow mollusks on it. This species of mollusk proved to be new to science and a member of the genus *Scalina*. Also of importance is the association of this *Scalina* with coral.

EPITONIIDAE

Scalina CONRAD, 1865

(*Ferminoscala* DALL, 1908)

Scalina billeeana DUSHANE & BRATCHER, spec. nov.

Description of Holotype: Shell small for genus, white under a thin, shining, yellowish buff periostracum; with

Explanation of Plate 24

Scalina billeeana DUSHANE & BRATCHER, spec. nov.

Figure 1: ventral view of holotype, CASGTC, no. 12729 (x 9). Figure 2: dorsal view of the same (x 9).

Figures 3a, 3b: Radular teeth of holotype (x 550).

Figure 4: *Tubastrea tenuilamellosa* (MILNE-EDWARDS & HAIME, 1848), host of *Scalina billeeana* (x 1.2), (Stanford University Paleontological Collection Specimen 30667, collected at Bahía Santa Cruz, Oaxaca, Mexico).