Indo-West Pacific Ranellidae, Bursidae and Personidae (Mollusca: Gastropoda)

A monograph of the New Caledonian fauna and revisions of related taxa

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Résultats des Campagnes Musorstom,
Volume 19

Alan G. BEU

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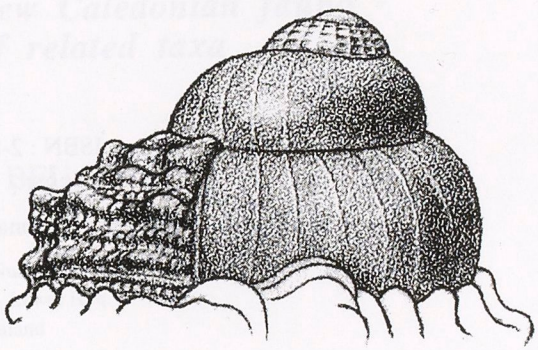
Cover photograph (from left to right, top row): *Personopsis purpurata, Cymatium tenuiliratum, Distorsio parvimpedita, Bursa fijiensis;* (lower row): *Cymatium penniketi, Distorsio parvimpedita,* and *Cymatium penniketi.*
Graphics: Atelier Pascal Colrat.

Line drawing= protoconch of *Bursa fosteri* (see Fig. 47f).

Indo-West PacificRanellidae, Bursidae and Personidae (Mollusca:Gastropoda)

A monograph of the New Caledonian fauna and revisions of related taxa



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MÉMOIRES DU MUSÉUM NATIONAL D'HISTOIRE NATURELLE

TOME 178

Résultats des Campagnes MUSORSTOM, Volume 19

Indo-West Pacific Ranellidae, Bursidae and Personidae (Mollusca: Gastropoda)

A monograph of the New Caledonian fauna and revisions of related taxa

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ABSTRACT

BEU, A. G., 1998. — Indo-West Pacific Ranellidae, Bursidae and Personidae (Mollusca: Gastropoda). A monograph of the New Caledonian fauna and revisions of related taxa. *Mém. Mus. natn. Hist. nat.*, **178**: 1-255. Paris ISBN: 2-85653-517-8.

The Ranellidae, Bursidae and Personidae from the New Caledonia region (including the Loyalty Islands, the Coral Sea and the New Hebrides Arc) are monographed based on the results of an extensive collecting effort totalling more than 1000 stations. Seventy-three species are recorded, with numerous range extensions. One of the more remarkable aspects of this fauna is the uniquely diverse deep-water tonnoidean assemblage, dominated by species such as *Bursa fijiensis*, *B. latitudo*, *B. quirihorai*, species of *Distorsio*, *Sassia remensa*, and less common small personids in the genera *Distorsionella* and *Personopsis*. The number of species of New Caledonian Personidae is the highest yet recorded. The *Personopsis* species are the first modern ones correctly referred to the genus. Revisions are provided of *Biplex, Gyrineum, Cymatium (Gelagna)*, the *Cymatium vespaceum, C. tenuiliratum* and *Bursa latitudo* species groups, of southwest Pacific species of *Sassia*, and of several *Cymatium (Ranularia)* and *Distorsio* species. New genera proposed are *Halgyrineum* (Ranellidae) and *Distorsomina* (Personidae). Seven new species are proposed: *Biplex bozzettii* (from Somalia and southern India), *Gyrineum longicaudatum* (from the tropical western Pacific), *Cymatium penniketi* (from Oman), *Distorsio parvimpedita, Distorsionella pseudaphera*, *Personopsis purpurata* and *P. trigonaperta* (all from New Caledonia). The nomenclature of numerous taxa is stabilized by the designation of neotypes and lectotypes for nominal species named by A. Adams & Reeve, Broderip, Deshayes, Dillwyn, Dunker, Fulton, Gmelin, Gould, Gray, Iredale, Jousseaume, Kuenen, Küster, Lamarck, Linné, Martin, Mighels, d'Orbigny, Perry, Reeve, Röding, Salis Marschlins, Schepman, Schumacher, G B. Sowerby II, and Wood.

RÉSUMÉ

BEU, A. G., 1998. — Indo-West Pacific Ranellidae, Bursidae and Personidae (Mollusca: Gastropoda). A monograph of the New Caledonian fauna and revisions of related taxa. *Mém. Mus. natn. Hist. nat.*, **178**: 1-255. Paris ISBN: 2-85653-517-8.

Ranellidae, Bursidae et Personidae (Mollusca: Gastropoda) de l'Indo-Ouest Pacifique : Étude monographique de la faune de Nouvelle-Calédonie et révision des taxons apparentés.

Les Ranellidae, Bursidae et Personidae de la région néo-calédonienne sont étudiés sur la base d'un échantillonnage intensif de plus de 1000 prélèvements. Soixante-treize espèces sont présentes, certaines étant signalées pour la première fois de la région. La faune bathyale, exceptionnellement diversifiée, est dominée par *Bursa fijiensis*, *B. latitudo*, *B. quirihorai*, *Sassia remensa*, diverses *Distorsio* et d'autres Personidae plus occasionnels dans les genres *Distorsionella* et *Personopsis*. La diversité des Personidae de Nouvelle-Calédonie, inégalée dans le monde, se manifeste par la présence de deux espèces de *Personopsis*, genre jusqu'ici connu exclusivement à l'état fossile. La monographie comprend des révisions de genres, groupes d'espèces ou faunules régionales : les espèces des genres ou sous-genre *Biplex, Gyrineum* et *Cymatium (Gelagna)*, les espèces des groupes de *Cymatium vespaceum, C. tenuiliratum* et *Bursa latitudo*, ainsi que les espèces de *Sassia* du Sud-Ouest du Pacifique ; la systématique de diverses espèces de *Cymatium (Ranularia)* et *Distorsio* est précisée. Deux nouveaux genres et 7 espèces nouvelles sont décrits : *Halgyrineum* et *Distorsomina* ; *Biplex bozzettii* (de Somalie et du Sud de l'Inde), *Gyrineum longicaudatum* (du Pacifique occidental tropical), *Cymatium penniketi* (d'Oman), *Distorsio parvimpedita*, *Distorsionella pseudaphera, Personopsis purpurata* et *P. trigonaperta* (tous de Nouvelle-Calédonie). La nomenclature de nombreux taxons est stabilisée par la désignation de néotypes et lectotypes d'espèces nominales nommées par A. Adams & Reeve, Broderip, Deshayes, Dillwyn, Dunker, Fulton, Gmelin, Gould, Gray, Iredale, Jousseaume, Kuenen, Küster, Lamarck, Linné, Martin, Mighels, d'Orbigny, Perry, Reeve, Röding, Salis Marschlins, Schepman, Schumacher, G B. Sowerby II et Wood.

EXTENDED ABSTRACT

BEU, A. G., 1998. — Indo-West Pacific Ranellidae, Bursidae and Personidae (Mollusca: Gastropoda). A monograph of the New Caledonian fauna and revisions of related taxa. *Mém. Mus. natn. Hist. nat.*, **178**: 1-255. Paris ISBN: 2-85653-517-8.

Seventy-three species of Ranellidae, Bursidae and Personidae are recorded from more than 1000 stations around New Caledonia and the Loyalty Islands, and in the Coral Sea and New Hebrides Arc. One of the more remarkable aspects of this fauna is the uniquely diverse deep-water tonnoidean assemblage, dominated by species such as *Bursa fijiensis* (Watson); despite not having been reported since it was collected by H.M.S. *"Challenger"* last century, this proves to be moderately common and widespread in the region in 260-580 m. The assemblage includes other common deep-water *Bursa* species (*B. latitudo* Garrard, *B. quirihorai* Beu), common deep-water *Distorsio* (mainly *D. habei* Lewis), abundant *Sassia remensa* (Iredale), and less common small personids (in genera *Distorsionella* and *Personopsis*). The number of species of New Caledonian Personidae, and particularly of the smaller-sized species in genera other than *Distorsio*, is the highest yet recorded. The *Personopsis* species are the first modern ones correctly referred to the genus. Several newly recorded species were known previously only from the Philippine Islands (*Cymatium fittkaui* Parth, *Bursa fosteri* Beu, *Bursa lucaensis* Parth, *Distorsio graceiellae* Parth, *D. kurzi* Petuch & Harasewych), whereas a few other newly recorded species (*Charonia lampas* (Linné), *Cymatium exaratum* (Reeve), *C. iredalei* (Beu), *C. parthenopeum* (Salis Marschlins)) are range extensions of taxa previously regarded (within the study area) as limited to the temperate southwest Pacific. *Cymatium armatum* (G.B. Sowerby III) is also recorded from New Caledonia.

Revisions are provided of *Biplex, Gyrineum, Cymatium (Gelagna)*, the *Cymatium vespaceum, C. tenuiliratum* and *Bursa latitudo* species groups, of southwest Pacific species of *Sassia*, and of several *C. (Ranularia)* and *Distorsio* species. New genera proposed are *Halgyrineum* (type species: *Gyrineum louisae* Lewis) and *Distorsomina* (type species: *Distorsio pusilla* Pease). Seven new species are proposed: *Biplex bozzettii* (from Somalia and southern India), *Gyrineum longicaudatum* (from the tropical western Pacific), *Cymatium (Monoplex) penniketi* (from Oman), *Distorsio parvimpedita, Distorsionella pseudaphera, Personopsis purpurata* and *P. trigonaperta* (all from New Caledonia).

Neotypes are designated for *Murex lotorium* and *M. rana rubeta* of Linné, 1758; *Murex caudatus* and *M. conditus* of Gmelin, 1791; *Murex parthenopeus* Salis Marschlins, 1793; *Cymatium rhinoceros, Distorsio muricina, D. reticulata, Neptunea doliata, Tritonium bufo, T. candisatum, T. granulare, T. jabick, T. natator, T. nicobaricum, T. opis,* and *T. tuberosum* of Röding, 1798; *Gyrineum verrucosum, Tritonium nodulus* and *T. varicosum* of Link, 1807; *Septa scarlatina* Perry, 1810; *Biplex elegans, B. perca, B. rosa, B. rubicola, B. tuberosa, B. variegata, Monoplex australasiae, Distorta acuta, D. rotunda* and *Septa rubicunda* of Perry, 1811; *Murex candisata* Dillwyn, 1817; *Distorta rugosa* and *Lampas hians* of Schumacher, 1817; *Murex labiosus* Wood, 1828; *Ranella pulchra* Gray *in* G. B. Sowerby II, 1836; *Triton lacunatum* Mighels, 1845; *Triton productum* Gould, 1852; *Ranella lamarckii* Deshayes, 1853; and *Ranella chemnitzii* and *R. sagitta* of Küster, 1871. Lectotypes are designated for *Murex anus, M. gyrinus, M. lampas, M. pyrum* and *M. tritonis* of Linné, 1758; *Murex succinctus* Linné, 1771; *Ranella bitubercularis, R. ranina, Triton distortum*, and *T. succinctum* of Lamarck, 1816; *Ranella granifera, Triton australe, T. canaliferus, T. chlorostomum, T. nodiferum, T. tuberosum* and *T. vespaceum* of Lamarck, 1822; *Ranella affinis, R. pusilla* and *R. tuberculata* of Broderip, 1833; *Ranella cruentata* G B. Sowerby II, 1835 and *R. rhodostoma* Beck *in* G. B. Sowerby II, 1836; *Triton americanum* and *T. antillarum* of d'Orbigny, 1842; *Ranella cuspidata, R. livida, R. rosea, R. siphonata, Triton decipiens, T. exaratus, T. exile, T. gracilis, T. pfeifferianus, T. sarcostoma, T. sinensis,* and *T. thersites* of Reeve, 1844; *Triton testudinarius* A. Adams & Reeve, 1850; *Bursa concinna* and *B. cumingiana* of Dunker, 1862; *Triton albocingulatus* Deshayes, 1863; *Lampas caledonensis* Jousseaume, 1881; *Ranella raninoides* Martin, 1884; *Ranella pamotanensis* Martin, 1899; *Gyrineum (Biplex) perca* var. *aculeata* Schepman, 1909; *Bursa (Biplex) microstoma* Fulton, 1930; *Ranella (Biplex) perca timorensis* Kuenen *in* Koperberg, 1931; and *Apollon deliberatus* Iredale, 1936.

RÉSUMÉ DÉVELOPPÉ

BEU, A. G., 1998. — Indo-West Pacific Ranellidae, Bursidae and Personidae (Mollusca: Gastropoda). A monograph of the New Caledonian fauna and revisions of related taxa. *Mém. Mus. natn. Hist. nat.*, **178**: 1-255. Paris ISBN: 2-85653-517-8.

Ranellidae, Bursidae et Personidae (Mollusca: Gastropoda) de l'Indo-Ouest Pacifique : Étude monographique de la faune de Nouvelle-Calédonie et révision des taxons apparentés.

L'occurrence et la distribution de soixante-treize espèces de Ranellidae, Bursidae et Personidae sont rapportées sur la base de nombreuses campagnes de prospection dans les eaux de Nouvelle-Calédonie, des iles Loyauté, de la mer du Corail et de l'arc des Nouvelles-Hébrides, où plus de 1000 prélèvements ont livré des espèces de ces familles. Un des aspects les plus remarquables de cette faune est la découverte d'un assemblage d'espèces bathyales de Tonnoidea particulièrement diversifié. Il comprend en particulier *Bursa fijiensis* (Watson) qui, bien qu'elle n'ait jamais été retrouvée depuis l'expédition du *"Challenger"* au siècle dernier, apparait largement répandue, et même relativement commune dans toute la région entre 260 et 580 m de profondeur. Cet ensemble bathyal comprend également plusieurs autres espèces, communes, de *Bursa* (*B. latitudo* Garrard, *B. quirihorai* Beu), des *Distorsio* (principalement *D. habei* Lewis), *Sassia remensa* (Iredale), particulièrement abondant, et d'autres petits Personidae plus rares dans les genres *Distorsionella* et *Personopsis*. La famille des Personidae est représentée en Nouvelle-Calédonie par un nombre d'espèces plus élevé que dans n'importe quelle autre région du monde, en particulier pour les espèces de petite taille dans les genres autres que *Distorsio*. Deux espèces de *Personopsis* sont les premières espèces de la faune actuelle correctement placées dans ce genre, jusqu'ici connu exclusivement à l'état

fossile. Dans le domaine littoral et récifal, plusieurs des espèces signalées ici pour la première fois de Nouvelle-Calédonie n'étaient connues que des Philippines (*Cymatium fittkaui* Parth, *Bursa fosteri* Beu, *Bursa lucaensis* Parth, *Distorsio graceiellae* Parth, *D. kurzi* Petuch & Harasewych), et les aires d'occurrence de quelques autres (*Charonia lampas* (Linné), *Cymatium exaratum* (Reeve), *C. iredalei* (Beu), *C. parthenopeum* (Salis Marschlins)) sont maintenant étendues au delà des eaux tempérées du Sud-Ouest Pacifique, où elles paraissaient restreintes. Enfin, la rarissime *Cymatium armatum* (G.B. Sowerby III) est également signalée de Nouvelle-Calédonie.

L'étude monographique de cette collection comprend des révisions de divers genres, groupes d'espèces ou faunules régionales : les espèces des genres ou sous-genre *Biplex, Gyrineum* et *Cymatium (Gelagna)*, les espèces appartenant aux groupes de *Cymatium vespaceum, C. tenuiliratum* et *Bursa latitudo* sont révisées critiquement, de même que les espèces de *Sassia* du Sud-Ouest du Pacifique ; la systématique de diverses espèces de *Cymatium (Ranularia)* et *Distorsio* est précisée. Deux nouveaux genres et 7 espèces nouvelles sont décrits : *Halgyrineum* gen. nov. (espèce-type : *Gyrineum louisae* Lewis) et *Distorsomina* gen. nov. (espèce-type : *Distorsio pusilla* Pease) ; *Biplex bozzettii* nov. sp. (de Somalie et du Sud de l'Inde), *Gyrineum longicaudatum* nov. sp. (du Pacifique occidental tropical), *Cymatium (Monoplex) penniketi* nov. sp. (d'Oman), *Distorsio parvimpedita* nov. sp., *Distorsionella pseudaphera* nov. sp., *Personopsis purpurata* nov. sp. et *P. trigonaperta* nov. sp. (tous de Nouvelle-Calédonie).

La partie nomenclaturale comprend de nombreuses désignations de néotypes et de lectotypes. Des néotypes sont désignés pour les espèces nominales suivantes : *Murex lotorium* et *M. rana rubeta* Linné, 1758 ; *Murex caudatus* et *M. conditus* Gmelin, 1791 ; *Murex parthenopeus* Salis Marschlins, 1793 ; *Cymatium rhinoceros, Distorsio muricina, D. reticulata, Neptunea doliata, Tritonium bufo, T. candisatum, T. granulare, T. jabick, T. natator, T. nicobaricum, T. opis* et *T. tuberosum* Röding, 1798 ; *Gyrineum verrucosum, Tritonium nodulus* et *T. varicosum* Link, 1807 ; *Septa scarlatina* Perry, 1810 ; *Biplex elegans, B. perca, B. rosa, B. rubicola, B. tuberosa, B. variegata, Monoplex australasiae, Distorta acuta, D. rotunda* et *Septa rubicunda* Perry, 1811 ; *Murex candisata* Dillwyn, 1817 ; *Distorta rugosa* et *Lampas hians* Schumacher, 1817 ; *Murex labiosus* Wood, 1828 ; *Ranella pulchra* Gray *in* G. B. Sowerby II, 1836 ; *Triton lacunatum* Mighels, 1845 ; *Triton productum* Gould, 1852 ; *Ranella lamarckii* Deshayes, 1853 ; et enfin, *Ranella chemnitzii* et *R. sagitta* Küster, 1871. Des lectotypes sont désignés pour les espèces nominales suivantes : *Murex anus, M. gyrinus, M. lampas, M. pyrum* et *M. tritonis* Linné, 1758 ; *Murex succinctus* Linné, 1771 ; *Ranella bitubercularis, R. ranina, Triton distortum* et *T. succinctum* Lamarck, 1816 ; *Ranella granifera, Triton australe, T. canaliferus, T. chlorostomum, T. nodiferum, T. tuberosum* et *T. vespaceum* Lamarck, 1822 ; *Ranella affinis, R. pusilla* et *R. tuberculata* Broderip, 1833 ; *Ranella cruentata* G B. Sowerby II, 1835 et *R. rhodostoma* Beck *in* G. B. Sowerby II, 1836 ; *Triton americanum* et *T. antillarum* d'Orbigny, 1842 ; *Ranella cuspidata, R. livida, R. rosea, R. siphonata, Triton decipiens, T. exaratus, T. exile, T. gracilis, T. pfeifferianus, T. sarcostoma, T. sinensis* et *T. thersites* Reeve, 1844 ; *Triton testudinarius* A. Adams & Reeve, 1850 ; *Bursa conciana* et *B. cumingiana* Dunker, 1862 ; *Triton albocingulatus* Deshayes, 1863 ; *Lampas caledonensis* Jousseaume, 1881 ; *Ranella raninoides* Martin, 1884 ; *Ranella pamotanensis* Martin, 1899 ; *Gyrineum (Biplex) perca* var. *aculeata* Schepman, 1909 ; *Bursa (Biplex) microstoma* Fulton, 1930 ; *Ranella (Biplex) perca timorensis* Kuenen *in* Koperberg, 1931 ; et enfin, *Apollon deliberatus* Iredale, 1936.

INTRODUCTION

This report is the sixth in which I have revised the taxonomy of some of the living and fossil species of the gastropod families Ranellidae, Bursidae and Personidae. The report is based on an enormous collection of these three families from more than 1000 localities in the New Caledonian-Coral Sea region and Vanuatu, collected by ORSTOM and the Muséum national d'Histoire naturelle, Paris (MNHN) over the years 1984-1994.

The collection reported on here is important for Indo-West Pacific molluscan biogeography, as it demonstrates that the highly diverse fauna of molluscs usually thought of in recent years as centred on the Philippine Islands actually ranges very widely throughout the western Pacific archipelagoes, at least as far south as New Caledonia. The previously apparent restriction of numerous species to the Philippine Islands is an artifact of inadequate sampling elsewhere. The more than 1200 stations sampled by B. RICHER DE FORGES of ORSTOM (447 of them containing taxa reported here) in a survey of the 23400 km^2 of the soft bottoms of the lagoons of New Caledonia in the "Programme LAGON" (RICHER DE FORGES, 1991) have demonstrated for the first time the occurrence of a small endemic New Caledonian *Distorsio* species, and of several other species in these families not previously reported south of the equator (*e.g., Cymatium fittkaui*, *C. testudinarium*, *C. tenuiliratum*, *Bursa lucaensis*, *B. fosteri*, *Bufonaria perelegans*, *Distorsio graceiellae*, *D. kurzi*). They have also demonstrated the wider southwest Pacific range of such species, previously regarded (within this general area) as Australasian, as *Charonia lampas*, *Cymatium exaratum* and *C. iredalei*. These samples are greatly amplified by the recent EXPÉDITION MONTROUZIER samples collected from shallow hard substrates in northern New Caledonia. The 55 samples containing ranellids, bursids and personids add richly to the records, including the first New Caledonian records of *Cymatium (Ranularia) exile* and *Bursa lamarckii*. *Cymatium armatum* is also reported from New Caledonia for the first time.

Even more remarkable is the deep-water fauna of the wider New Caledonian region, from the Coral Sea to southern Vanuatu, brought to light in the surveys carried out in the MUSORSTOM, SMIB, CORAIL, CHALCAL, BIOCAL, VOLSMAR, BERYX, BATHUS and more minor cruises of ORSTOM and MNHN, summarised in part (with station location maps) by RICHER DE FORGES (1990). These surveys revealed a wholly new tonnoidean fauna dominated by abundant *Sassia remensa*, and with common *Bursa fijiensis* (not reported previously since it was collected last century by the HMS *"Challenger"* expedition), abundant *B. latitudo*, common *B. quirihorai*, common *Distorsio habei*, and common *Distorsionella lewisi*. Less common members of the deep-water fauna are surprisingly diverse small-sized personids - two small *Distorsio* species, a second species referred to *Distorsionella*, and two species of *Personopsis*. The last are the first reliably assigned Recent species of a genus previously limited to Paleocene to Pliocene fossils.

For adequate identification and clarification of the taxonomy of this large fauna, it has been necessary to revise several groups on a world-wide or Pacific-wide level. Accordingly, several species are revised or newly proposed below that do not occur in New Caledonia, but are closely related to species that do. Significant groups revised below are *Biplex, Gyrineum, Cymatium (Gelagna)*, the *Cymatium vespaceum, C. tenuiliratum* and *Bursa latitudo* species groups, southwest Pacific forms of *Sassia*, several species of *Distorsio*, and all the members of the present-day genera of Personidae other than *Distorsio*. In a significant change from the classification adopted earlier (BEU & CERNOHORSKY, 1986), it is concluded that it is preferable to rank *Linatella* and *Gelagna* as subgenera of *Cymatium* rather than as full genera, and a consequent name change is introduced.

I am aware of only three significant previous catalogues or popular books on the New Caledonian fauna, in which species of Ranellidae, Bursidae and Personidae have been recorded from the islands. These are FISCHER (1860: 357-359), who recorded 11 species in these families, MELVILL & STANDEN's (1895-1897) major catalogue of the Hadfield collection from the Loyalty Islands, in which 15 species were recorded and a sixteenth (*Cymatium hepaticum*) is implied by a comment on colour variability, and the popular book by SALVAT *et al.* (1988: 100-103) who recorded 23 species. The total of 27 species recorded in these three previous works is listed in Table 1, with names updated to those used in the present report.

TABLE 1. — Previous records of Ranellidae, Bursidae and Personidae from New Caledonia.

SPECIES	FISCHER (1860)	MELVILL & STANDEN (1895)	SALVAT *et al.* (1988)
Gyrineum gyrinum	x		x
lacunatum	x	x	x
Charonia tritonis		x	x
Cymatium (Gelagna) succinctum			x
(Gutturnium) muricinum	x	x	x
(Lotoria) lotorium			x
(Monoplex) aquatile	x	x	x
mundum		x[1]	x[1]
nicobaricum	x	x	
pileare	x	x	x
(Ranularia) gutturnium			x
dunkeri			x[2]
pyrum		x	x
sinense		x[3]	
(Septa) hepaticum		?[4]	
rubeculum		x	x
(Turritriton) labiosum		x	
Bursa cruentata			x
granularis	x	x	x
rhodostoma	x	x[3]	
rosa	x	x	x
Bufonaria perelegans			x
thersites			x
Tutufa (Tutufa) bufo	x[5]		x
(Tutufella) rubeta			x
Distorsio anus			x
reticularis	x	x	x

1. As *C. gemmatum*; **assumed** implies *C. mundum*.
2. Accidentally identified by repeating the succeeding name, *C. rubeculum*.
3. In "Addenda", p. 131.
4. Assume *C. hepaticum* is implied by comment that *C. rubeculum* is "extremely varied in coloration".
5. as "*Triton lampas*" of KIENER (1842: pl. 5, fig. 1).

Two other species in these families have been recorded in other earlier papers I am aware of. EUTHYME (1889: 277, footnote) recorded a specimen of *Charonia lampas* as: "we have received it from New Caledonia absolutely conforming to the type from the Mediterranean". This description implies that Euthyme had a brightly coloured, shallow-water specimen and, as such specimens have never since been seen from New Caledonia, it seems very likely that his specimen bore a wrong locality, although a few pale, deep-water specimens are recorded below from the New Caledonian region. ARTHUR & GARCIA-TALAVERA (1990) described and illustrated in colour specimens of their new species *Cymatium (Septa) mixtum* from New Caledonia. Although I have not seen *C. mixtum* from New Caledonia in the present survey, there is no reason to doubt the locality. There is therefore, a reliable total of 28 species in the families Ranellidae, Bursidae and Personidae recorded from New Caledonia previously.

The detailed survey of even the shallow-water fauna of New Caledonia, carried out in "Programme LAGON" and EXPÉDITION MONTROUZIER, shows that earlier records were quite inadequate, as at least a further 20 shallow-water species are recorded below. But a far greater advance has been made in the knowledge of the deep-water fauna, no species of which had been recorded from New Caledonia before the ORSTOM/MNHN sampling programme commenced. This fauna turns out to be composed of surprising novelties, new records of the long-lost species *Bursa fijiensis*, and common occurrences of previously rare species.

Over the last few decades a trend, for which I am partly responsible, has grown to treat the minor geographic races or forms of widely distributed species as formal geographic subspecies. The ranellids and bursids are some of the preeminent examples of this trend. Continuing experience with tonnoidean taxonomy has shown

that this creates as many problems as it solves. The example of *Charonia lampas* (below) is typical; New Caledonian specimens are from well offshore, and do not display the minor characters used to recognise subspecies in shallow-water samples elsewhere in the world. It is clear that *C. lampas* is more usefully treated as a single, widely distibuted species. Geographic subspecies recognised for a few other taxa in this report (e.g., *Gyrineum gyrinum*) are regarded as an interim measure; some will prove to be separate species, and others will be synonymised once their true status is known.

Virtually all the New Caledonian-Coral Sea-Vanuatu material cited here is housed in MNHN, Paris. A small selection is retained in NZGS (as listed in the Appendix), and paratypes have been distributed as noted in a few cases. In the cases of species with many New Celedonian records, only the stations they occur at are listed in the text, and full station data and specimen numbers are listed in the Appendix.

TYPE SPECIMENS OF EARLY-NAMED SPECIES

A significant emphasis in this work has been permanently to stabilise the species named by earlier taxonomists, and particularly those of the eighteenth and nineteenth centuries who described species before the modern concept of type specimens had developed, as recommended in ICZN Recommendation 75E. Many of the species described by LINNÉ (1758, 1767, 1771) are represented by specimens housed by either the Linnean Society of London (DANCE, 1967) or the Zoological Museum of Uppsala University (WALLIN, 1993) and these specimens are in most cases eligible as possible lectotypes for Linné's species. Indeed, many of them bear numbers inside the aperture, written by Linné, identifying them with Linné's names. However, Linné did not mention his specimens in any of his publications. Instead, he identified which species he was describing by citing one or several earlier-published figures from pre-Linnean iconographies. As Linné did not mention his own specimens, most workers in recent times have considered that the specimens illustrated in the cited pre-Linnean iconographies and the specimens in Linné's collections have equal status as syntypes of Linné's species. In many cases, complications with identifying which species Linné intended a name to apply to have arisen because his cited figures show more than one species; differences in citations between the 10th and 12th editions of "Systema Naturae" (Linné, 1758, 1767) suggest that at least some of these were typographical errors in the 10th edition. In most cases, the actual specimens figured in the pre-Linnean iconographies cited by Linné, as well as those dating from the period shortly after Linné and cited by post-Linnean authors such as GMELIN (1791), are not available to present-day taxonomists because, in the intervening years, the collections in which the illustrated specimens belonged have been lost or sold. For example, one of the largest and therefore most frequently cited of early iconographies is that of MARTINI & CHEMNITZ (1769-1795), but very few specimens illustrated in this work are known today; RICHARDSON *et al.* (1979) republished the figures from this work cited by early taxonomists. CERNOHORSKY (1974) described the fate of the collection and the remnants of the illustrated material, and I have examined the material personally; the known illustrated material from this work is in the University Zoological Museum, Copenhagen. The material is present because it belonged to the Danish collectors Moltke and Spengler, and was apparently loaned to Martini or Chemnitz for illustration (Dr Jørgen Knudsen, Copenhagen, pers. comm.); Chemnitz's collection was dispersed by private sale, and nothing from it has been identified today. Of the specimens remaining in Copenhagen, none are the illustrated specimens for any cited figures of species of Ranellidae, Bursidae or Personidae.

Of the pre-Linnean shells cited as illustrations by Linné (1758, 1767, 1771) almost none are known today, at least of those cited for the families Ranellidae, Bursidae or Personidae. DANCE (1966: appendix 4) has provided a list of known repositories for significant collections, and the main collections containing material illustrated in pre-Linnean or early post-Linnean works of importance for the nomenclature of the Ranellidae, Bursidae and Personidae are listed briefly, from Dance:

(a) Bolten: Bolten's shells, described by RÖDING (1798), were acquired by the Art and Natural History Museum, Gotha, but as far as I am aware no type specimens have ever been reported from this museum.

(b) GUALTIERI (1742): DANCE (1966: 288) reported that Gualtieri's collection was probably in the "Pisa museum". I am pleased to report that Henk Dijkstra (Zoologisch Museum, Amsterdam; pers. comm.), with Robert Moolenbeek, recently visited the Museo di Storia Naturale e del Territorio, Università di Pisa, Certosa di Calci, Pisa, Italy, and was able to examine the collection illustrated by GUALTIERI (1742). Dr Marco Zuffi, Curator of Zoology, has since confirmed that most of the specimens illustrated by Gualtieri are present in this museum, and many have the figure number written inside the aperture; critical to the present work is the cited specimen of *Murex pileare* LINNÉ (1758: 749), designated the lectotype of *Murex pileare* by BEU & KAY (1988). This specimen is

critical because a specimen in Linné's collection, in London, identified by Linné as *Murex pileare*, is the Mediterranean species now universally known as *Cymatium corrugatum* (Lamarck); the application of this well known name would change if Linné's specimen were selected as the lectotype. DANCE (1966: 300) also reported that Gualtieri's collection contains "perhaps the only authentic extant material" from the collection of RUMPHIUS (1705).

(c) LINK (1807): DANCE (1966: 291) reported that Link's collection was supposedly in the Rostock Museum, but "specimens not isolated and none can now be identified positively". KOHN (1981: 301) gave further information on the collection now housed at Wilhelm-Pieck-Universität Rostock, but basically confirmed that "it seems unlikely that any specimens on which Link based new species descriptions can be identified at Rostock".

(d) PERRY (1810, 1811): DANCE (1966: 297) reported "some specimens figured in his *Conchology* (1811) in Brit. Mus.", but unfortunately this is not so for any of Perry's specimens of Ranellidae, Bursidae or Personidae.

(e) SCHUMACHER (1817): DANCE (1966: 301) reported that his collection is in "Copenhagen Mus.", but no type material of Ranellidae, Bursidae or Personidae named by Schumacher was present in the collection when examined by me in 1979.

Nothing seems ever to have been reported on the collections that formed the basis of the remaining three works that were cited most frequently for illustrations of Ranellidae, Bursidae and Personidae by LINNÉ (1758): BUONANNI (1681), DEZALLIER D'ARGENVILLE (1742) and KLEIN (1753) (this last seems to have been the basis of much of Linné's nomenclature of molluscs).

The position taken here has been to designate the earliest available, clearly recognisable, eligible specimen as the lectotype or neotype for a particular name, preferably from among the type material of early authors. In most cases, the same specimen has been selected as the lectotype or neotype of most or all later synonyms, so that the names are objective synonyms. Neotypes have been designated where needed for names proposed by LINNÉ (1758), GMELIN (1791), RÖDING (1798), LINK (1807), PERRY (1810, 1811), DILLWYN (1817), SCHUMACHER (1817), and a few more minor cases. The type material of almost all the members of these families described by LAMARCK (1816, 1822) is present in Lamarck's collection in Muséum de Genève, and most specimens of these families illustrated by KIENER (1841, 1842) were from among Lamarck's type material. The location of most of the material from later papers and iconographies has been well known for many years, and the locations are cited as relevant below; most material relevant to the present paper is in either BMNH or MNHN. One further important location for type specimens that came to light during this work deserves mention; Dr Rudo von Cosel (MNHN) informed me that the type specimens of Japanese molluscs described by Lischke are housed in the Löbbecke Museum und Aquazoo, Düsseldorf.

LINNÉ RANELLID SYNTYPES IN UPPSALA. — A complication in this work has been the identity of the Linné syntypes in Uppsala University Zoology Museum [UUZM] (WALLIN, 1993) of species *not* represented in the collection of the Linnean Society of London; photographs of the "syntypes" (Fig. 22) were kindly supplied by Dr Anders Warén (Swedish Natural History Museum, Stockholm). The three relevant taxa and the identities of the specimens catalogued at present as their "syntypes" are as follows: (a) *Murex lampas* Linné, 1758: UUZM Linné Colln no. 981 = *Cymatium (Lotoria) lotorium* of subsequent authors; UUZM Linné Colln no. 1618 = *Cymatium (Lotoria) grandimaculatum*; (b) *Murex lotorium* Linné, 1758: UUZM Linné Colln no. 301 = *Cymatium (Ranularia) pyrum* of subsequent authors; UUZM Linné Colln no. 899a = *Cymatium (Ranularia) pyrum* of subsequent authors; UUZM Linné Colln no. 899b = *Cymatium (Cymatium) femorale* of subsequent authors; (c) *Murex pyrum* Linné, 1758: UUZM Linné Colln no. 853 = *Cymatium (Ranularia) cynocephalum*. Not one of these "syntypes" agrees with the species it has usually been identified as, and not one agrees with the figures cited for these species by LINNÉ (1758); the specimens seem to have been muddled or added to the collection since Linné's time. WALLIN (1993) also made the point that no specimen in the collection bears an original Linné label. As the adoption of any of these specimens as lectotypes of Linnean taxa would change current usage substantially, and there is no evidence that any of them is a genuine Linnean syntype, these specimens are not considered to be syntypes, and lectotypes are chosen from other more appropriate material, in the relevant text below.

THE TROPICAL INDO-WEST PACIFIC FAUNA

As a means of demonstrating the proportion of the Indo-West Pacific fauna that is now recorded from the New Caledonian region, the full fauna known to me is listed here of the tropical Indo-West Pacific province, *i.e.*, *not* including the eastern Pacific. Names are listed critically, *i.e.*, with regard to priority and the Code of Zoological Nomenclature. Species now recorded from the New Caledonian region are in **bold type**, and any other species whose ranges suggest that they eventually might be found in the New Caledonian region are preceded by an asterisk*.

This list of 145 species and subspecies includes 73 from the New Caledonian-Coral Sea-Vanuatu region, although one of these, *Tutufa tenuigranosa*, is recorded only provisionally. Of the remaining 72 tropical Indo-West Pacific species *not* recorded from the New Caledonian region, only 14, at the most, could ever be expected to occur in New Caledonia; this is 16% of the *possible* full fauna of 87 species. Of these 14 species, only *Biplex perca, Cymatium cutaceum, C. intermedium, C. oblitum, C. pyrulum, C. flaveolum, Bursa asperrima*, and possibly *B. verrucosa* and *Bufonaria margaritula* are likely to occur in New Caledonia, and it is likely that at least 90% of the full fauna is now recorded, not including any new, restricted New Caledonian species that come to light in the future.

FAMILY RANELLIDAE

SUBFAMILY RANELLINAE

Biplex bozzettii sp. nov., Indian Ocean.
**perca* Perry, 1811, western Pacific.
pulchella (G.B. Sowerby I, 1825), northeastern Australia, New Guinea.
***pulchra* (Gray *in* G.B. Sowerby II, 1836), western Pacific.**

Gyrineum bituberculare (Lamarck, 1816), western Pacific.
concinnum (Dunker, 1862), Red Sea.
***gyrinum gyrinum* (Linné, 1758), western Pacific (and Indian Ocean ?).**
gyrinum wilmerianum Preston, 1908, Indian Ocean.
***hirasei* (Kuroda & Habe *in* Habe, 1961), Indo-West Pacific.**
***lacunatum* (Mighels, 1843), Indo-West Pacific.**
***longicaudatum* sp. nov., western Pacific.**
natator (Röding, 1798), northwestern Pacific and northern Indian oceans.
pusillum (Broderip, 1833), eastern Polynesia.
***roseum* (Reeve, 1844), western Pacific.**

***Halgyrineum* gen. nov. *louisae* (Lewis, 1974), Indo-West Pacific and Atlantic.**

SUBFAMILY CYMATIINAE

***Charonia lampas* (Linné, 1758), Mediterranean, Atlantic, South Africa, Australasia-New Caledonia, Japan-Taiwan.**
***tritonis* (Linné, 1758), Indo-West Pacific and Eastern Pacific.**

Cymatium (Cymatium) ranzanii (Bianconi, 1850), western Indian Ocean.
(Gelagna) pallidum Parth, 1996, western Indian Ocean.
***succinctum* (Linné, 1771), Indo-West Pacific and Atlantic.**
***(Gutturnium) muricinum* (Röding, 1798), Indo-West Pacific and Atlantic.**
*(Linatella) *cutaceum* (Lamarck, 1816), Indo-West Pacific and Atlantic.
(Lotoria) grandimaculatum (Reeve, 1844), northern Indian and Pacific oceans, Red Sea.
***lotorium* (Linné, 1758), Indo-West Pacific.**
perryi Emerson & Old, 1963, northern Indian Ocean.
(Monoplex) ***aquatile* (Reeve, 1844), Indo-West Pacific and Atlantic.**
***comptum* (A. Adams, 1855), Indo-West Pacific and Atlantic.**
***exaratum* (Reeve, 1844), Australasia-New Caledonia, Hawaii, Japan (Caribbean?).**

***fittkaui* Parth, 1991, western Pacific.**
***gemmatum* (Reeve, 1844), western Pacific.**
**intermedium* (Pease, 1869), Indo-West Pacific.
***mundum* (Gould, 1849), Indo-West Pacific and Atlantic.**
***nicobaricum* (Röding, 1798), Indo-West Pacific and Atlantic.**
***parthenopeum* (Salis Marschlins, 1793), Mediterranean, Atlantic, South Africa, northern Indian Ocean and Gulf of Arabia, Australia and New Zealand to Kermadec Islands, New Caledonia, central Japan, Taiwan and Hawaii.**
penniketi sp. nov., northern Indian Ocean.
***pileare* (Linné, 1758), Indo-West Pacific.**
***tenuiliratum* (Lischke, 1873), Indo-West Pacific.**
**thersites* (Reeve, 1844), Indo-West Pacific.
***vespaceum* (Lamarck, 1822), Indo-West Pacific and Atlantic.**
(Ranularia) andamanense Beu, 1987, northern Indian Ocean.
***armatum* (G.B. Sowerby III, 1879), southwestern Pacific.**
arthuri Beu, 1987, Red Sea.
boschi Abbott & Lewis, 1970, northern Indian Ocean.
***caudatum* (Gmelin, 1791), western Pacific.**
cynocephalum (Lamarck, 1816), Atlantic and western Indian oceans.
[sp. nov. aff. *cynocephalum*?, Western Australia]
***dunkeri* (Lischke, 1868), Japan-Taiwan, southwestern Pacific.**
encausticum (Reeve, 1844), northwestern Pacific.
***exile* (Reeve, 1844), western Pacific and Red Sea.**
gallinago (Reeve, 1844), Atlantic and western Indian oceans.
***gutturnium* (Röding, 1798), Indo-West Pacific.**
moniliferum (A.Adams & Reeve, 1850), Indian Ocean.
**oblitum* Lewis & Beu, 1976, western Pacific and Western Australia.
oboesum (Perry, 1811), northern Indian Ocean.
**parthi* Arthur, 1991, western Pacific.
**pyrulum* (A. Adams & Reeve, 1850) [= *fortespirale* Parth, 1993], western Pacific.
***pyrum* (Linné, 1758), Indo-West Pacific.**
***sarcostoma* (Reeve, 1844), Indo-West Pacific.**
***sinense* (Reeve, 1844), western Pacific.**
***springsteeni* Beu, 1987, Indo-West Pacific.**
***testudinarium* (A. Adams & Reeve, 1850), Indo-West Pacific.**
trilineatum (Reeve, 1844), northern Indian Ocean and Red Sea.
tripum (Lamarck, 1822), northern Indian Ocean.
(Reticutriton) ***pfeifferianum* (Reeve, 1844), Indo-West Pacific and Atlantic.**
(Septa) bibbeyi Beu, 1987, Philippine Islands.
closeli Beu, 1987, Indian Ocean.
**flaveolum* (Röding, 1798), western Pacific.
***hepaticum* (Röding, 1798), Indo-West Pacific.**
***mixtum* Arthur & Garcia-Talavera, 1990, Indo-West Pacific.**
***occidentale* (Mörch, 1877), Indo-West Pacific and Atlantic.**
peasei Beu, 1987, Polynesia.
***rubeculum rubeculum* (Linné, 1758), Indo-West Pacific.**
rubeculum marerubrum Garcia-Talavera, 1985, Red Sea.
(Turritriton) ***labiosum* (Wood, 1828), Indo-West Pacific and Atlantic.**

Sassia (Sassia) midwayensis (Habe & Okutani, 1968), Hawaiian Islands.
nassariformis (G.B. Sowerby III, 1902), western Indian Ocean - South Africa.
palmeri (Powell, 1967), northern New Zealand - Kermadec Islands.
***remensa* (Iredale, 1936), southwest Pacific - Vanuatu (further ?).**
semitorta (Kuroda & Habe *in* Habe, 1961), northwest Pacific.
sp. nov., central western Pacific.
sp. nov., Western Australia.

FAMILY BURSIDAE

Bursa **asperrima* Dunker, 1862, Indo-West Pacific.
awatii Ray, 1949, Indian Ocean and northwest Pacific.
**bufonia* (Gmelin, 1791), Indo-West Pacific.
***condita* (Gmelin, 1791), western Pacific.**
***cruentata* (G.B. Sowerby II, 1835), Indo-West Pacific.**
davidboschi Beu, 1987, northern Indian and Pacific oceans.
***fijiensis* (Watson, 1881), western Pacific.**
***fosteri* Beu, 1987, western Pacific.**
***granularis* (Röding, 1798), Indo-West Pacific and Atlantic.**
humilis Beu, 1981, western Australia.
***lamarckii* (Deshayes, 1853), western Pacific.**
***latitudo* Garrard, 1961, Indo-West Pacific.**
***lucaensis* Parth, 1991, western Pacific.**
luteostoma (Pease, 1861), Hawaiian Islands.
***quirihorai* Beu, 1987, western Pacific.**
ranelloides (Reeve, 1844), Atlantic and Indian oceans and northwest Pacific.
***rhodostoma* (Beck *in* G.B. Sowerby II, 1835), Indo-West Pacific and Atlantic.**
***rosa* (Perry, 1811), Indo-West Pacific.**
tuberosissima (Reeve, 1844), northwest Pacific.
venustula (Reeve, 1844), eastern Polynesia.
**verrucosa* (G.B. Sowerby I, 1825), southwest Pacific (Queensland, Kermadec Is., N. New Zealand).

Bufonaria albivaricosa (Reeve, 1844), northern Indian Ocean (and northern Pacific ?).
**borisbeckeri* Parth, 1996, Indo-West Pacific.
cavitensis (Beck *in* Reeve, 1844), northwest Pacific.
cristinae Parth, 1989, Philippine Islands.
crumena (Lamarck, 1816), Indian Ocean.
echinata (Link, 1807), northern Indian Ocean.
elegans (Beck *in* G.B. Sowerby II, 1836), northeastern Indian Ocean and western Indonesia.
fernandesi Beu, 1977, western Indian Ocean.
foliata (Broderip, 1826), Indian Ocean.
gnorima (Melvill, 1918), northern Indian and Pacific oceans.
***ignobilis* Beu, 1987, Indo-West Pacific.**
**margaritula* (Deshayes, 1832), Indo-West Pacific.
***nobilis* (Reeve, 1844), Indo-West Pacific.**
***perelegans* Beu, 1987, western Pacific.**
**rana* (Linné, 1758), northwest Pacific and Queensland.
subgranosa (G.B. Sowerby II, 1836), Philippine Islands and Queensland.
***thersites* (Redfield, 1846), western Pacific.**

Tutufa (Tutufa) bardeyi (Jousseaume, 1894), northern Indian Ocean.
***bubo* (Linné, 1758), Indo-West Pacific.**
***bufo* (Röding, 1798), Indo-West Pacific.**
**tenuigranosa* (Smith, 1914), Indo-West Pacific.
(Tutufella) boholica Beu, 1987, Philippine Islands.
nigrita Mühlhäusser & Blöcher, 1979, Indian Ocean.
***oyamai* Habe, 1973, Indo-West Pacific.**
***rubeta* (Linné, 1758), Indo-West Pacific.**

FAMILY PERSONIDAE

Distorsio ***anus* (Linné, 1758), Indo-West Pacific.**
burgessi Lewis, 1972, Hawaiian Islands.
***decipiens* (Reeve, 1844), western Pacific.**

***euconstricta* Beu, 1987, Indo-West Pacific.**
***graceiellae* Parth, 1989, western Pacific.**
***habei* Lewis, 1972, western Pacific.**
***kurzi* Petuch & Harasewych, 1980, Indo-West Pacific.**
muehlhaeusseri Parth, 1990, western Indian Ocean.
***parvimpedita* sp. nov., New Caledonia.**
***perdistorta* Fulton, 1938, Indo-West Pacific and Atlantic.**
***reticularis* (Linné, 1758), Indo-West Pacific.**
somalica Parth, 1990, western Indian Ocean and South Africa.
ventricosa Kronenberg, 1994, Philippine Islands.

***Distorsionella lewisi* (Beu, 1978), southwest Pacific.**
***pseudaphera* sp. nov., New Caledonia.**

***Distorsomina* gen. nov. *pusilla* (Pease, 1861), Indo-West Pacific.**

Personopsis ***purpurata* sp. nov., New Caledonia and Coral Sea.**
***trigonaperta* sp. nov., New Caledonia and southern Vanuatu.**

ABBREVIATIONS

The following abbreviations are used throughout the text:

Institutions

AMNH	American Museum of Natural History, New York
AMS	Australian Museum, Sydney
ANSP	Academy of Natural Sciences of Philadelphia
BMNH	The Natural History Museum [formerly British Museum (Natural History)], London
BPBM	Bernice P. Bishop Museum, Honolulu
CAS	California Academy of Sciences, San Francisco
DMNH	Delaware Museum of Natural History, Wilmington
IGPS	Institute of Geology & Paleontology, Tohoku University, Sendai
LACM	Los Angeles County Museum of Natural History, Los Angeles
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge
MHNG	Muséum d'Histoire Naturelle, Geneva
MNHN	Muséum national d'Histoire naturelle, Paris
RMNH	Nationaal Natuurhistorisches Museum [formerly Rijksmuseum van Natuurlijke Historie], Leiden
NMNZ	Museum of New Zealand, Wellington
NMP	Natal Museum, Pietermaritzburg
NSMT	National Science Museum, Tokyo
NZGS	Institute of Geological & Nuclear Sciences [formerly New Zealand Geological Survey], Lower Hutt; non-New Zealand Mollusca prefixed WM
NZOI	National Institute of Water and Atmospheric Sciences [formerly New Zealand Oceanographic Institute], Wellington
PRI	Paleontological Research Institution, Ithaca
USNM	National Museum of Natural History [formerly United States National Museum], Washington D.C.
UUZM	Zoological Museum of Uppsala University, Uppsala
WAM	Western Australian Museum, Perth
ZMA	Zoologisch Museum, Amsterdam.

Miscellaneous

Specimen dimensions are invariably in mm, and cited in the order H (= height), D (= maximum diameter).

Colln	collection of
coll.	collected by
juv.	juvenile
lv	collected alive
dd	empty shell.

SYSTEMATIC ACCOUNT

Subclass PROSOBRANCHIA Milne-Edwards, 1848

Superorder CAENOGASTROPODA Cox, 1959

Order NEOTAENIOGLOSSA Haller, 1882

Superfamily TONNOIDEA Suter, 1913 (1825)
(Conserved under ICZN Article 40b)

REMARKS. — BANDEL & RIEDEL (1994) and RIEDEL (1994, 1995) attempted to adopt the new superfamily name Cassoidea Latreille, 1825 in place of Tonnoidea Suter, 1913 (1825), which has been used by virtually all authors during the last 55 years. However, PONDER & WARÉN (1988: 302) conserved the family name Tonnidae Suter, 1913 (1825) under ICZN Article 40b, in place of the prior Doliidae Latreille, 1825 (based on the junior synonym *Dolium* Lamarck, 1801). As Tonnidae Suter, 1913 (1825) and Cassidae Latreille, 1825 were published simultaneously, the superfamily name Tonnoidea (also with the suffix -acea) has been adopted by the vast majority of authors since WENZ (1941: 1045), and Tonnoidea is conserved under Article 40b, I can see no justification for changing the superfamily name.

Family RANELLIDAE Gray, 1854

Subfamily RANELLINAE Gray, 1854
(= GYRINEINAE Higo & Goto, 1993 [unavailable])

REMARKS. — BEU [*in* BEESLEY *et al.*, 1997] has elevated subfamily Pisanianurinae Warén & Bouchet, 1990 to family Pisanianuridae. The species of *Pisanianura* recorded from New Caledonia by WARÉN & BOUCHET (1990) are not considered in the present report.

HIGO & GOTO (1993: 157) erected a subfamily Gyrineinae for *Gyrineum* and *Biplex*, but not only is this not available (as they did not provide a diagnosis) but also it is unnecessary, as there is no reason to remove these genera from their current position in the subfamily Ranellinae.

Genus ***BIPLEX*** Perry, 1811

Biplex Perry, 1811: explanation to plate 4. Type species (SD by GRAY, 1847: 133): *Biplex perca* Perry, 1811, Miocene to Recent, Western Pacific.

REMARKS. — *Biplex* is regarded here as a genus distinct from *Gyrineum*, containing those species with wide, thin, antero-posteriorly fused varices, forming continuous thin flanges down the left and right sides of the teleoconch, 180° apart.

Although GRAY (1847) designated a type species for *Biplex*, the first author to use the genus in a sense similar to its modern one was JOUSSEAUME (1879). In this little-known paper, JOUSSEAUME included in the genus those ranellids, buccinids and muricids with varices strongly aligned to form two ridges, *i.e.* species now included in *Biplex, Gyrineum, Nassaria, Eupleura* and *Aspella*. However, he discussed mainly the species *Biplex perca* and *B. pulchra*, and provided a table of characters distinguishing them.

As the status of the New Caledonian species of *Biplex* has been a difficult question to resolve, and as an unnamed species has come to light from the western Indian Ocean, all named fossil and living species of *Biplex* are reviewed here. The earliest known fossil record is only Early Miocene, and most species have no record before

the Late Miocene or Pliocene. ABDEL-GAWAD (1986: 115, pl. 15, fig. 1) described a supposed Late Cretaceous species, *Biplex cretaceus*, from Maastrichtian rocks of the Vistula Valley, Poland, but his illustration of a mould of a tall-spired, strongly "winged" shell appears more likely to show an aporrhaid than a ranellid. The phylogenetic origins of *Biplex* appear likely to be from a *Gyrineum* species through a relatively early, generalised *Biplex* species such as *B. bufo* (Fig. 3 a), an Early Miocene species from Kutch, Pakistan, which has moderately well expanded but non-spinose varices. The descent of this group from *Gyrineum* by expansion of the varices is a plausible but purely speculative idea at present, but the lack of any fossils referable to *Biplex* before Miocene time makes the reference of *"B". cretaceus* to the genus unacceptable.

Taxa here included in *Biplex:*

Biplex bozzettii sp. nov., Recent, northern and western Indian Ocean.
bufo (J. de C. Sowerby, 1840), Early Miocene, Pakistan.
magnifica (Martin, 1879), Miocene, Java.
pamotanensis (Martin, 1899), Pliocene, Java.
perca Perry, 1811, Miocene to Recent, Western Pacific (N. Australia to S. Japan).
perliberalis (Beets, 1984), Late Miocene, Mandul Island, East Borneo.
pulchella (G.B. Sowerby I, 1825), Recent, N. Australia and eastern Indonesia.
pulchra (Gray *in* G.B. Sowerby II, 1836), Pliocene to Recent, Western Pacific (New Caledonia and N. Australia to southern Japan).

Biplex bozzettii sp. nov.

Figs 1, 2 a-i, 6 d

Gyrineum (Biplex) perca - BOSCH *et al.*, 1995: 94, fig. 345.

TYPE DATA. — Holotype MNHN (*ex* NZGS WM15524) and 5 paratypes: 1 NZGS WM15524, 1 AMS C202741, 1 USNM 880221, 2 in collection of L. Bozzetti, Milan, trawled in 120-150 m off Ras [= Cape] Hafun, northern Somalia, presented by Luigi Bozzetti. 1 paratype NZGS WM15525, trawled in "deep water" off Mogadiscio, Somalia, presented by Abbey Specimen Shells. 4 paratypes: 3 NZGS WM15275, 1 MNHN, trawled off Somalia, East Africa, presented by Heinrich Mühlhäusser (Freiburg, Germany). 32 paratypes NZGS WM15449, "deep water" off Tuticorin, southernmost India, from local fishermen, presented by P. Muthiah, Jan. 1995

DISTRIBUTION. — I have seen this species only from the above localities: off Somalia, East Africa, and off Tuticorin, southern India. It is probably widely distributed in moderately deep water in the western and northern Indian Ocean.

DESCRIPTION. — Shell large for genus, with relatively wide, inflated whorls, very wide, thin varices fused together antero-posteriorly to form thin flanges 180° apart down whole teleoconch, and with weakly to strongly spinose variceal outline. Spire moderately tall and anterior siphonal canal moderately long, resembling those of *B. perca*, except that anterior canal is much more widely open ventrally than in *B. perca* in all available specimens (damaged?). Protoconch abraded on all available material. Teleoconch whorls strongly inflated for genus, almost evenly convex, only weakly angled by peripheral spiral cords, lacking weak subsutural channel visible on most specimens of both *B. perca* and *B. pulchra*. Spiral sculpture relatively weak, of four narrow, moderately elevated, finely nodulose cords on spire whorls and 12 on last whorl and canal; cords of most inflated, central area of each whorl remain elevated across varices to form prominent, spine-like, strongly dorsoventrally compressed nodules around variceal margins, three on spire whorls and four, plus two much weaker, lower ones on last whorl. Narrow, low, indistinct interstitial threads in some interspaces (one at periphery and 3-4 on sutural ramp in most specimens) do not cross varices. Axial sculpture of relatively low, narrow, ill-defined costae, forming low, rounded nodules where they cross spiral cords, extending full height of spire whorls and well down onto adapical part of siphonal canal on last whorl; costa-free zones between sculptured zones on last whorl (as frequently developed on *B. perca*) developed only very weakly, on only two of 11 specimens examined; 12-14 costae in one intervariceal interval on penultimate whorl, 12-17 on last whorl. Aperture oval, with raised peristome broken only by narrowly to quite widely open anterior siphonal canal. Inner lip smooth at outer margin but bearing several low, indistinct spiral ridges inside aperture, and two more prominent nodules just inside adapical end of outer lip. Outer lip lightly

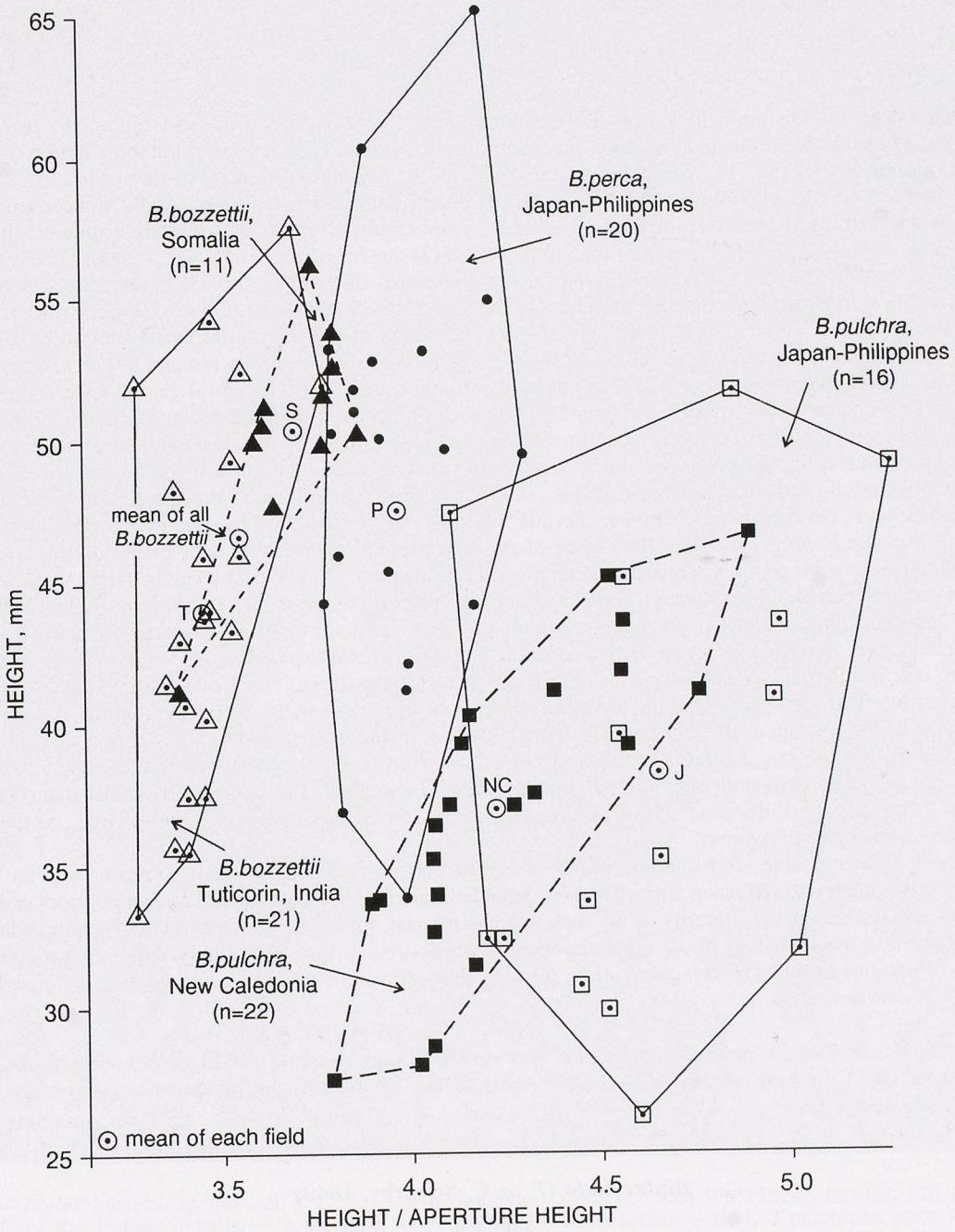

FIG. 1. — Scatter diagram comparing height to height/aperture height (relative inflation) of the three largest living *Biplex* species. Abbreviations identifying mean points: J = Japan-Philippines (*B. pulchra*), NC = New Caledonia, P = Japan-Philippines (*B. perca*), S = Somalia, T = Tuticorin, India.

thickened and slightly reflexed, its inner surface bearing many low, rounded, indistinct ridges conforming in position to external spiral inter-spaces. Colour pale fawn to cream, with darker brown spiral cords that are maculated by white nodules at the sculptural intersections. Periostracum pale yellowish fawn. Operculum oval, with abapical terminal nucleus, dark brown.

DIMENSIONS. — Holotype: H 54.0, D 22.8. Off Somalia, paratype NZGS WM15525: H 56.4, D 25.3. Tuticorin, India, largest paratype, NZGS WM15449: H 57.3, D 23.4.

REMARKS. — Distinguishing between the three larger living species *Biplex bozzettii, B. perca* and *B. pulchra* has proved to be subtle and, for some specimens, quite difficult. Dimensions of the three largest species are compared graphically in Fig. 1. The smallest living species, *B. pulchella*, is easily distinguished from the other three by its much smaller maximum size, its more deeply channelled suture, its less markedly spinose outline, and its wider and more closely spaced spiral cords. The three largest species differ in (1) the relative spire height - tallest in *B. pulchra*, slightly lower in *B. bozzettii* than in *B. perca*; (2) the relative aperture size - largest in *B. bozzettii*, smallest in *B. pulchra*; (3) the underlying reason for the above two differences, the whorl diameter - largest in *B. bozzettii*, smallest in *B. pulchra*; (4) the coarseness of the sculpture - finest in *B. bozzettii*, coarsest in *B. pulchra*, intermediate but highly variable in *B. perca*; and (5) the coarseness of the interstitial spiral sculpture, particularly over the varices. This last provides the easiest means of distinguishing between *B. perca* and *B. pulchra*: whereas *B. pulchra* has several (commonly four to six around the periphery, more on the sutural ramp, fewer on the neck) closely spaced secondary and tertiary spiral threads filling each primary spiral interspace, and extending out over the varices to form complex, closely spaced sculpture, elaborated still further by the development of weak threads on the major cords and, on many specimens, the acquisition of weak axial nodulation near the outer variceal margins, most specimens of *B. perca* lose all but a single, smooth, narrow, central secondary thread, margined by wide, smooth interspaces, between major cords on the last whorl. Even this single thread becomes weak as it extends across each varix in *B. bozzettii*. Also, the degree of sutural channelling decreases with increasing maximum size and whorl diameter: most pronounced in *B. pulchella*, still prominent in *B. pulchra*, developed only weakly towards the end of each intervariceal interval in *B. perca*, and not present in *B. bozzettii*. The sculpture also is consistently finer in *B. bozzettii* than in either of its large relatives; not only are there more axial costae because of the larger whorl diameter, but also the costae are lower, narrower and more closely spaced in *B. bozzettii* than in either *B. perca* or *B. pulchra*. Perhaps as a consequence of this last character, the development of flattened, axial-free areas in the centres of intervariceal spaces over the last whorl that is so prominent in *B. perca* populations is only weakly seen on a few of the specimens of *B. bozzettii*; this character has not been observed in *B. pulchra*.

It is surprising to recognise this species in collections from southern India, where dealers have apparently been selling it for some years under the name *B. perca*. Indian Ocean shells are consistently wider than the real *B. perca* from Japan and the Philippine Islands; either the species group has a discontinuous range, or the known samples might form part of a cline.

Three of the available Somalian specimens of *Biplex bozzettii* have only small spines around the variceal margins, or have almost no spines on almost evenly expanded flanges. However, filled variceal interiors and broken spine edges are visible on the margins of all such specimens, and spines are broken on early spire whorls but remain on the last whorl or two of all other specimens. I am satisfied that the weakly spinose specimens have merely had spine tips broken off. It is interesting, though, that specimens without prominent spines resemble the Miocene *B. pamotanensis*.

ETYMOLOGY. — I am pleased to name this species after Luigi Bozzetti of Milan, provider of most of the Somalian material of the new species as well as of most of the other novel molluscan material coming to light from Somalian fishermen.

Biplex bufo (J. de C. Sowerby, 1840)

Fig. 3 a

Ranella bufo J. de C. Sowerby, 1840: 329, pl. 26, fig. 16, and unpaginated caption.

Ranella (*Biplex*) *bufo* - VREDENBURG, 1925: 255.
Argobuccinum (*Biplex*) *perca* - EAMES, 1950: 243 (in part).
NOT *Argobuccinum* (*Biplex*) *bufo* - DEY, 1962: 75, pl. 5, figs 7, 12.

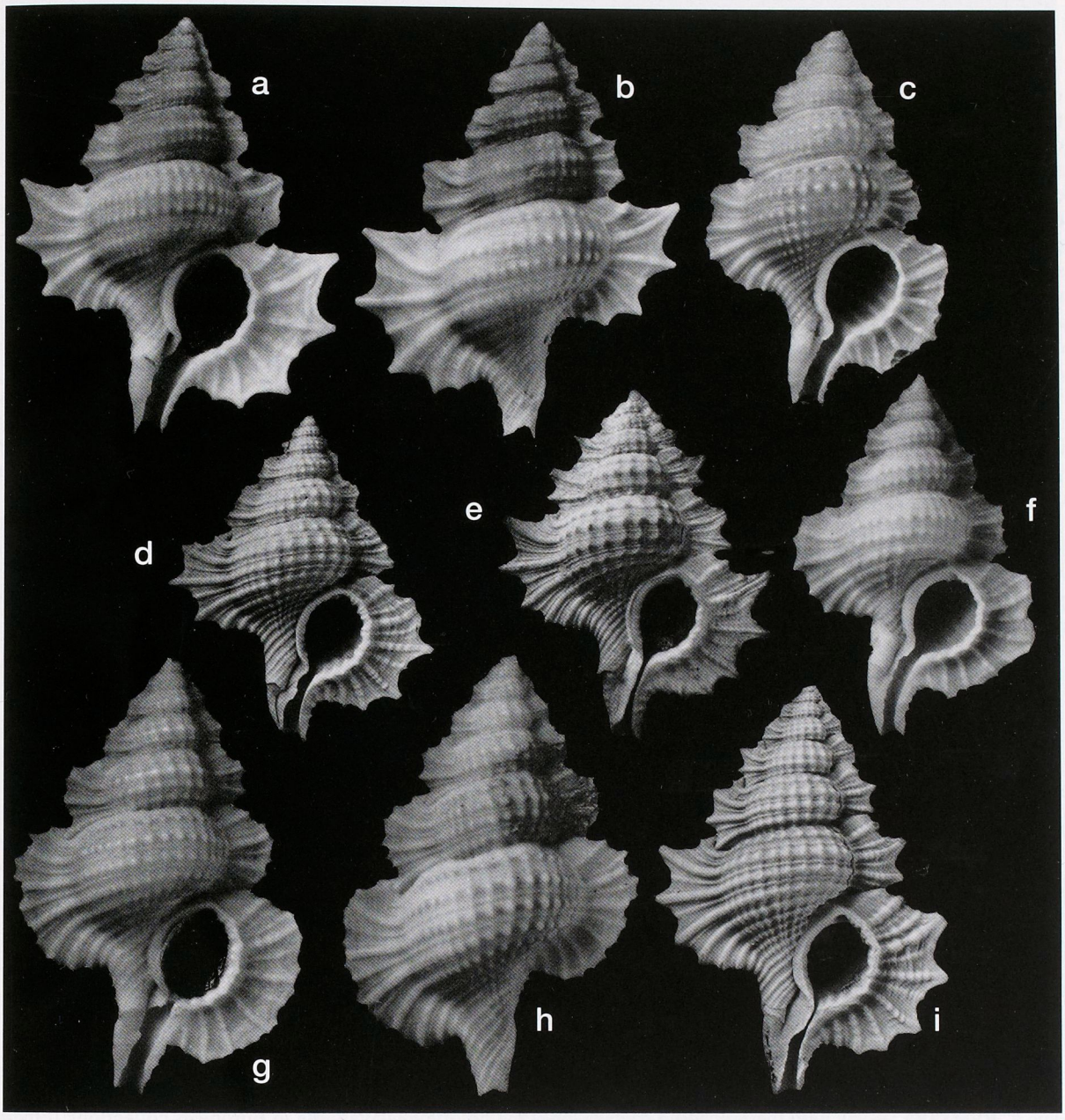

FIG. 2. — *Biplex bozzettii* sp. nov., all x 1.25. — **a-b**, holotype, MNHN (*ex* NZGS WM15524), trawled, 120-150 m, off Cape Ras Hafun, Somalia. — **c**, paratype, NZGS WM15275, off Somalia. — **d**, **i**, 2 paratypes, NZGS WM15449, off Tuticorin, Southern India. — **e**, BMNH 1995225/2, specimen accompanying neotype of *Biplex perca* (Figs 4 a, c), "Philippines" and "Japan" (India?). — **f**, widest paratype, NZGS WM15525, off Mogadiscio, Somalia. — **g-h**, paratype, NZGS WM15524, off Cape Ras Hafun, Somalia.

TYPE DATA. — Holotype, No. GG22470 in Palaeontology Dept, BMNH, from "Lower Miocene, Soomrow, Cutch, Pakistan".

DIMENSIONS. — H 33.8, D 25.9 (both slightly incomplete).

REMARKS. — The sole specimen available is the holotype. This is a slightly incomplete specimen (the outer margin of the terminal varix, the central area of the penultimate intervariceal interval, and the abapical end of the anterior siphonal canal are missing; which is not surprising, as the specimen is a brown calcite neomorph of an originally aragonitic shell). Nevertheless, what remains is quite well preserved, and shows that this is a moderate-sized (originally about 40 mm high), moderately tall-spired species of *Biplex*. The varices are thin and widely expanded, crossed by prominent major spiral cords and much weaker secondary and tertiary spiral threads, but the cords form only very low nodules at the variceal margins, rather than a prominent, digitate outline as in all Recent species. The axial sculpture consists of six or seven narrow costae on the first visible teleoconch whorl (the second?), reduced to three more prominent ones on the next whorl, and to only two or three very prominent, widely spaced costae on the succeeding three whorls. The raised margin of the inner lip passes inside the outer lip at the adapical end of the aperture, as is characteristic of *Biplex*. The anterior canal is moderately widely open. In lacking a digitate variceal margin this species resembles the Javanese Miocene *B. pamotanensis* which, however, differs from *B. bufo* in its more widely expanded varices, its lower spire, and its much finer and more numerous axial costae.

The Middle or Late Miocene specimen from the Quilon Limestone at Padappakara, near Quilon, Kerala, southern India, illustrated by DEY (1962: 75, pl. 5, figs 7, 12) as *Argobuccinum (Biplex) bufo* differs from the holotype of *Biplex bufo* in having a taller spire, markedly more subdued axial sculpture, and a still smoother variceal outline. It represents another new species of *Biplex*. The smoother variceal outline gives this specimen a closer similarity to *B. pamotanensis* than to *B. bufo*, but its spire is markedly taller than in *B. pamotanensis*.

The specific epithet *bufo* has, not surprisingly, been used at least three times for species of "frog shells". However, the other two usages (*Murex bufo* Bruguière, 1792, applying to an Atlantic species of the bursid genus *Marsupina*; *Tritonium bufo* Röding, 1798, applying to a species of the bursid genus *Tutufa*, described below) were proposed in other genera and are not primary homonyms of *Ranella bufo* J. de C. Sowerby. As all three names are now used in different genera, all are valid.

Biplex magnifica (Martin, 1879)

Figs 3 b-c

Ranella magnifica Martin, 1879: 53, pl. 10, fig. 1.

Ranella magnifica - ZWIERZYCKI, 1915: 109. — VAN DER VLERK, 1931: 241.
Biplex magnifica - MACNEIL, 1961: 59.
Apollon (Biplex) magnifica - SKWARKO & SUFIATI, 1994: m2.

TYPE DATA. — Holotype RMNH 9935, labelled " Vindplaats [Locality] K, Preangerian, Miocene"; MARTIN (1879: 53) cited the locality as Junghuhn's locality K, and provided a map showing K on a stream, Tji Badak, inland from Sindangravan (shown on modern maps as Sindangberang), on the southern coast of southwestern Java.

DIMENSIONS. — H 40.4 (probably originally about 50 mm), D 30.7.

REMARKS. — As with the preceding species, only the holotype is available in European collections (others are probably known in Indonesia). *Biplex magnifica* is a very distinctive species differing from all others in its much less dorsoventrally compressed whorls, and its relatively narrow and unusually thick varices which, despite the prominent spiral cords over the variceal faces, are raised into only very small nodules around the margins. The axial sculpture is widely spaced but is low and fine, forming only small nodules at intersections with spiral cords. In agreement with the well inflated whorls, the aperture is unusually large. The anterior siphonal canal is long and unusually straight, but the spire apex is missing.

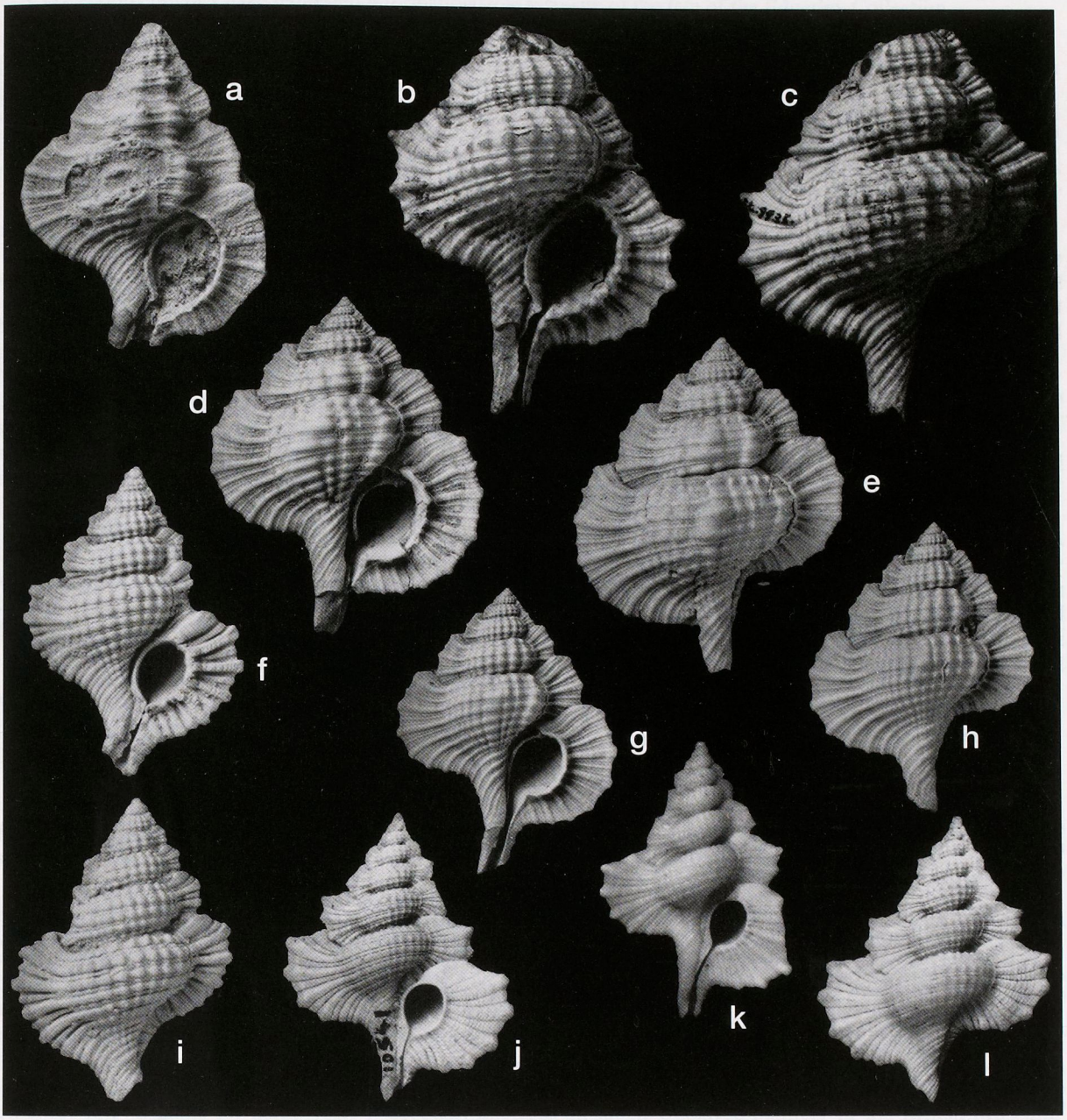

FIG. 3. — *Biplex* species. — **a**, *Biplex bufo* (J. de C. Sowerby), holotype, BMNH Palaeo. Dept, GG22470, "Lower Miocene, Soomrow, Cutch, Pakistan"; x 1.5. — **b-c**, *Biplex magnifica* (Martin), holotype, RMNH 9935, Miocene, southwestern Java; x 1.5. — **d-e**, **g-h**, *Biplex pamotanensis* (Martin), Miocene Rembang Fm., Java. **d-e**, RMNH T47068, "Rembang Ngampel, coll. K. Martin"; x1.5. **g-h**, lectotype, RMNH 9936, MARTIN's figured syntype, "G. Boetak, Rembanglagen"; x1.5. — **f**, **i**, *Biplex perliberalis* (Beets), holotype, RMNH 315217, Miocene, Mandul I., E. Borneo; x2.5. — **j-l**, *Biplex pulchella* (G.B. Sowerby I), Queensland, Australia, x2. **j**, **l**, NZGS WM10541, Bowen, Queensland. **k**, holotype, BMNH 1840.8.24.278, unlocalised, *ex* Goodall Colln.

Biplex pamotanensis (Martin, 1899)

Figs 3 d-e, g-h

Ranella pamotanensis Martin, 1899: 151, pl. 23, figs 352-352 a-c.

Ranella pamotanensis - Siemon, 1929: 52. — van der Vlerk, 1931: 241.
Ranella (Biplex) pamotanensis - Wanner & Hahn, 1935: 257.
Argobuccinum (Biplex) pamotanensis - Pannekoek, 1936: 43.
Apollon pamotanensis - Shuto, 1977: 134.
Apollon (Biplex) pamotanensis - Skwarko & Sufiati, 1994: m3.

Type data. — Lectotype RMNH 9936 (here designated), Martin's (1899: pl. 23, figs 352-352 a-c) figured syntype, from "G. Boetak, O. Mioceen, Rembanglagen", Java, *i.e.* Miocene Rembang beds; 8 paralectotypes RMNH 9937, "Ngampel, Residency of Rembang", 1 fragmentary paralectotype in matrix; 5 fragmentary paralectotypes RMNH 9938, "Panowan River, Residency of Rembang"; 1 incomplete paralectotype RMNH 9939, locality as for lectotype; 1 paralectotype RMNH 9940, "Rembanglagen".

Other material examined. — "Rembang Ngampel, coll. K. Martin", Miocene Rembang beds, Java (1 large, excellent specimen, RMNH T47068; Figs 3 d-e).

Dimensions. — Lectotype: H 29.3, D 22.8; large, subsequently collected specimen (Figs 3 d-e): H 34.1, D 27.5.

Remarks. — *Biplex pamotanensis* is the most distinctive of the larger species of *Biplex*, as it differs from *B. bozzettii, B. magnifica, B. perca* and *B. pulchra* in its shorter and wider form, its even more widely expanded, very thin varices lacking marginal spines, and its axial costae being partially fused into several wide, strongly raised axial ridges over the last two whorls. Specimens of *B. bozzettii* having only weak marginal spines (Figs 2 g-h, 6 d) resemble *B. pamotanensis* in a general way, but have much taller spires, narrower varices, and weaker sculpture than *B. pamotanensis*. The species is represented in RMNH by several specimens (nine syntypes; and one later-collected specimen, Figs 3 d-e) all of which are remarkably consistent in their distinctive characters.

Biplex perca Perry, 1811

Figs 1, 4 a-e, g-i, 6 c

Biplex perca Perry, 1811: pl. 4, fig. 5.
Gyrineum (Biplex) perca prisca Makiyama, 1927: 71, pl. 3, fig. 1 b.
Gyrineum perca edgerleyi Richards, 1933: 57, pl. 6, fig. 2.

Biplex perca - Jousseaume, 1879: 4. — MacNeil, 1961: 59, pl. 2, fig. 20; pl. 8, fig. 9; pl. 13, fig. 4. — Kira, 1962: 57, pl. 22, fig. 17. — Kuroda *et al.*, 1971: 125, pl. 33, figs 1-2. — Aoki & Baba, 1983: 50, fig. 14. — Okutani, 1986: 112-113, fig. left centre. — Noda, 1988: 40, pl. 17, figs 15-16. — Lai, 1989: 117, figs 2-4. — Wilson, 1993: 242.
Ranella perca - Deshayes, 1843: 556. — Kobelt, 1876b: 332. — Tryon, 1880: 43, pl. 23, fig. 51.
Gyrineum (Biplex) perca - Pilsbry, 1895: 48. — Altena, 1942: 100. — Cox, 1948: 41, pl. 4, figs 3 a-b. — Beu, 1985: 57. — Springsteen & Leobrera, 1986: 114, pl. 31, fig. 6. — Henning & Hemmen, 1993: 31, pl. 4, fig. 6.
Apollon (Biplex) perca - Wissema, 1947: 145. — Oyama & Takemura, 1959: *Apollon* pl. 1, figs 7-11. — Kira, 1961: 54, pl. 21, fig. 17. — Skwarko & Sufiati, 1994: m3.
Ranella pulchra - Reeve, 1844b: pl. 8, fig. 47. — Lischke, 1871: 37. — Martin, 1919: 137.
Ranella (Biplex) pulchra - Tesch, 1920: 43, pl. 129, figs 156 a-b.
Gyrineum (Biplex) aculeatum - Hinton, 1978: 30, fig. 16.

Type data. — *Biplex perca*: Perry's (1811) coloured drawing of the holotype (Fig. 4 b) of *Bipex perca* leaves no doubt of the identity of the species. The specimen illustrated by Reeve (1844b: pl. 8, fig. 47) as *Ranella pulchra* (BMNH 1995225/1) is here designated the neotype (Figs 4 a, c). Although Reeve (1844b) gave the locality as "Isle of Luzon", the original board bears the label "Japan", which is a much more likely provenance in 1844. The type locality is here designated as Sagami Bay, Honshu, Japan. The neotype is accompanied by a second small, evenly granulous specimen bearing its operculum (BMNH 1995225/2) but this is evidently a specimen of *B. bozzettii* (Fig. 2 e), possibly from India. — *Gyrineum (Biplex) perca prisca*: holotype (GK No. 301) in Department of Geology, Kyoto University (Hatai & Nisiyama, 1952: 206); not seen. —

Gyrineum perca edgerleyi: holotype stated to be in the private collection of Mrs Edgerley (RICHARDS, 1933); no U.S. collection curator I have requested information from is aware of the fate of the Edgerley Collection.

OTHER MATERIAL EXAMINED. — As *Biplex perca* has not previously been reported from Australia, Australian lots I have examined are listed: North of Port Hedland, Western Australia, BMR Sta. E68/569, 18°10' S, 118°22' E, 296 m, 10-10-1968 (1 AMS C82843). — Keppell Bay, south of Yeppoon, Queensland, April 1974 (1 AMS C98263). — 60-90 km Northwest of Port Hedland, Western Australia, trawled in 370-480 m, 1988 (2 AMS C156263). — Capricorn Channel, Queensland, trawled, in Whitehead Colln (1). — NW of Cape Leveque, Western Australia, 14°52.2-53.7' S, 121°39.9-41.7' E, 224-220 m, R.V. *"Soela"* sta. 01/84/085, coll. S. Slack-Smith, 16 Feb. 1984 (1 WAM 1715-84). — NW of Cape Leveque, Western Australia, 15°11-12.9' S, 121°26.9-25.7' E, 258-260 m, R.V. *"Soela"* sta. 01/84/087, coll. S. Slack-Smith, 17 Nov. 1984 (1 WAM 1726-84; 1 WAM 1727-84). — W of Lacepede Archipelago, Western Australia, 16°55.1-56.0' E, 119°54.6-51.5' E, 432-434 m, R.V. *"Soela"* sta. 01/84/089, coll. S. Slack-Smith, 18 Feb. 1984 (1 WAM 1732-84).

DISTRIBUTION. — Throughout the Western Pacific archipelagoes, from central Honshu, Japan to northern Australia.

Although *Biplex perca* for many years was known only from southern Japan, and has been known by such common names as the "Japanese finned frog", this apparent restriction proves to result from the great intensity of sampling of Japanese coastal waters. The species is common in the Philippine Islands (SPRINGSTEEN & LEOBRERA, 1986). MNHN material taken by N.O. *"Coriolis"* during the cruise MUSORSTOM 3, 1985, includes 24 large lots (of up to 40 specimens) of *B. perca* trawled in 183-383 m around the Philippines; specimens containing dried animals are from 183-205 m only. Only one specimen of *B. pulchra* is present in MUSORSTOM 3 samples, and it is clear that *B. perca* is very much more abundant around the Philippines than is *B. pulchra*. The species appears to extend as far westward as Hong Kong. Although all previous more southerly records of large *Biplex* appear to have been of *B. pulchra*, the New Guinea specimen identified as *G. aculeatum* by HINTON (1978: 30, fig. 16) is *B. perca*, and several specimens in AMS and WAM are from Queensland, Australia and northern Western Australia (data listed above). The species occurs commonly in about 200 m or more throughout the western Pacific. No specimens in MNHN from New Caledonia are referred here with certainty, but see below, under *B. pulchra*; a single specimen from LAGON sta. 1148 is possibly *B. perca*.

DIMENSIONS. — *Biplex perca* (neotype) BMNH 1995225/1: H 56.3, D 42.0. - Japan, NZGS WM9310: H 53.4, D 21.2, H 53.6, D 20.7. - Taiwan, NZGS WM10698: H 65.6, D 24.1. - Philippines, MUSORSTOM 3: sta. CP96, 14°00' N, 120°18' E, 190-194 m: H 49.9, D 18.0; sta. CP99, 14°01' N, 120°19' E, 196-204 m: H 50.6, D 20.1, MNHN.

REMARKS. — The synonymy list presented above is not intended to be exhaustive; this best-known of *Biplex* species has appeared in many other works under a variety of genera. The list contains names confirmed as synonyms, some important early references, and some recent references with good illustrations.

Biplex perca is the largest of *Biplex* species; an unlocalised specimen in NSMT is almost 100 mm high. It commonly reaches a height of 50-60 mm (*i.e.* significantly larger than *B. pulchra*) and the largest illustrated here (Philippine Islands, in F.J. Springsteen Colln, Fig. 4 d) is 76.2 mm high and 54.5 mm wide. Another in NSMT, from Ensu-nada, Aichi Prefecture, Honshu, is 75.8 mm high and 64.5 mm wide. It differs further from *B. pulchra* in its wider shape, wider varices with shorter, wider spines, its much less pronounced sutural channelling, its simpler and more widely spaced spiral threads over the varices, and its tendency to form smooth areas, lacking axial costae, over the central parts of the last two or three intervariceal intervals.

It appears that J.E. GRAY proposed the manuscript name *Ranella pulchra* for a species of *Biplex* at a very early stage in his career (although he never published it himself, as far as I am aware) and as it was a generally known name for many years it probably appeared on labels displayed publicly in the British Museum, but neither Gray nor any other malacologist prior to JOUSSEAUME (1879) seems to have realised that two very similar species occur throughout the Western Pacific. Thus, G.B. SOWERBY's (1825, appendix: 18) species names *Ranella pulchella* (again, by most authors assumed merely to be a synonym of *B. perca*) appears to have been intended to imply that the species is a diminutive form related to *B. pulchra* (*i.e.*, *B. perca* of this report). However, when it was first published, by G.B. SOWERBY II (1836), GRAY's name *B. pulchra* was applied to a clear illustration of the smaller, narrower species later named *B. microstoma* by FULTON (1930) (Fig. 4 f). JOUSSEAUME's (1879) realisation of the identity of the two species has understandably gone unnoticed, and confusion over the names *B. perca, B. pulchra, B. pulchella, B. aculeata* and *B. microstoma* has continued to the present day.

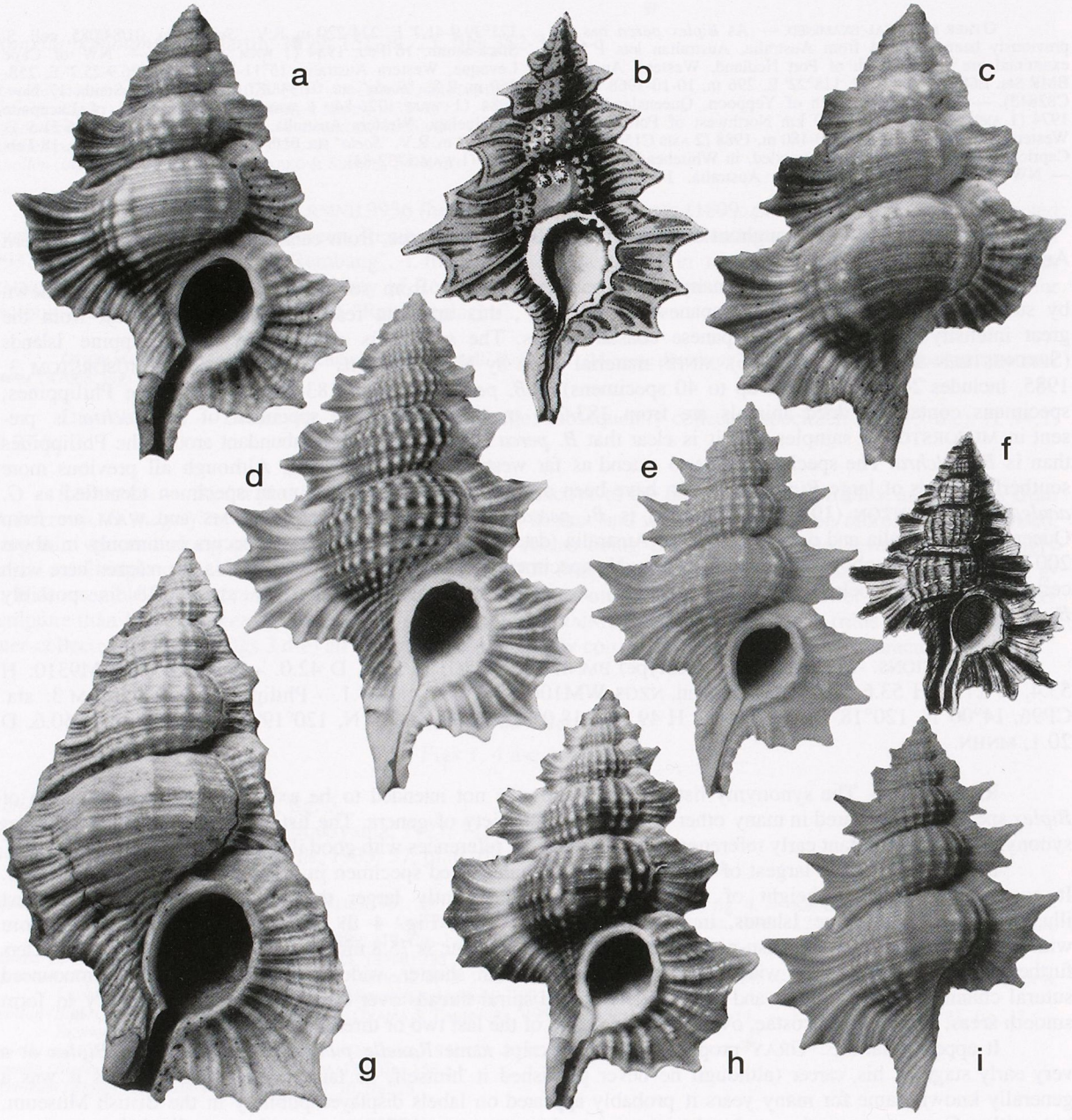

FIG. 4. — *Biplex perca* and *B. pulchra*. — **a-e**, **g-i**, *Biplex perca* Perry. — **a**, **c**, neotype, BMNH 1995225/1, REEVE's (1844b) figured specimen of "*Ranella pulchra*" (not of Gray), labelled "Philippines" and "Japan", x1.25. — **b**, copy (at published size) of PERRY's (1811: pl. 4, fig. 5) original figure of *Biplex perca*. — **d**, Mactan I., Cebu, Philippines, F.J. Springsteen Colln, x1. — **e**, **i**, MUSORSTOM 3: sta. CP96, 190-194 m, Philippine Islands, x1. — **g**, BMNH Palaeo. Dept, G51582, Noil Tobe, Timor, Pliocene; x1.5. — **h**, NZGS WM10698, Taiwan, x1. — **f**, *Biplex pulchra* (Gray *in* G.B. Sowerby II), copy (at published size) of Sowerby's original figure (G.B. SOWERBY II, 1836: pl. 93, fig. 19).

Many records of fossils from New Guinea, Indonesia, and southern Japan were not accompanied by illustrations and, as the names *B. pulchra* and *B. perca* have been regarded as synonyms by most early writers, and both species occur as fossils, it is impossible to verify the species recorded in many cases. However, ALTENA's (1942) Kendeng Pliocene specimens are mostly *B. pulchra*; both species occur in the Timor Pliocene (see below) and TESCH's (1920) record probably refers to both. The earlier record by MARTIN (1919: 137) from the Miocene of Ngembak, Java, almost certainly refers to *B. perca*.

Specimens illustrated from the Japanese Pliocene by MAKIYAMA (1927: pl. 3, fig. 16) and from the Pliocene of Okinawa by MACNEIL (1961: pl. 2, fig. 20; pl. 8, fig. 9; pl. 13, fig. 4) and NODA (1988: pl. 7, figs 15-16) all differ from most modern specimens in having numerous fine, low, closely spaced interstitial spiral threads on the varices, and MAKIYAMA's (1927: 71) name *G. perca prisca* is available for this form should it prove to be consistent. However, this sculptural form is probably a variant of *B. perca*, of no taxonomic significance.

A Pliocene fossil specimen (Fig. 4 g) is present in with specimens of *B. pulchra* from Timor: G51582, Pliocene, Noil Tobe, Timor, *ex* Mrs M.E. Walsh Colln, purchased 1930 (with 8 specimens *B. pulchra*, G51572-8, BMNH Palaeo. Dept).

So many Japanese and Philippine Islands lots of this common species are present in world museums that it is superfluous to list them all.

Biplex perliberalis (Beets, 1984)

Figs 3 f, i

Apollon (Biplex) perliberalis Beets, 1984: 58, pl. 3, figs 8-9.

Apollon (Biplex) perliberalis - SKWARKO & SUFIATI, 1994: m3.

TYPE DATA. — Holotype RMNH 315217, from Late Miocene (Preangerian), Mandul Island, NE Kalimantan Timur (*i.e.* East Borneo).

DIMENSIONS. — H 18.8, D 13.5.

REMARKS. — This small-sized species belongs in the species group of *Biplex pulchella*, being similar in size and having a similarly channelled suture and similar wide, low spiral cords to those of *B. pulchella*. *B. perliberalis* differs from *B. pulchella* in its much wider and more prominent axial cords, forming more obvious, low rounded nodules at the sculptural intersections, in its less widely expanded varices, and in having the spiral cords more prominent where they cross the varices, separated by deeper and more clearly defined interspaces, and therefore forming more prominent and more clearly separated nodules around the margins than in *B. pulchella*. The holotype is apparently the only known specimen.

Biplex pulchella (G.B. Sowerby I, 1825)

Figs 3 j-l

Ranella pulchella G.B. Sowerby I, 1825: appendix, xviii.
Ranella pulchella Forbes, 1852: 382, pl. 3, figs 5 a-b.
Ranella jucunda A. Adams, 1854: 70.

Ranella pulchella - SMITH, 1884: 56. — BRAZIER, 1889: 66.
Bursa (Eupleura) pulchella - BRAZIER, 1877: 176.
Gyrineum pulchellum - HEDLEY, 1909a: 361; 1918a: 277.
Gyrineum (Biplex) pulchellum - SCHEPMAN, 1909: 116. — WILSON & GILLETT, 1971: 78, pl. 53, figs 15-15 a. — BEU, 1985: 57. — HENNING & HEMMEN, 1993: 32, pl. 4, fig. 5.
Biplex pulchella - RIPPINGALE & MCMICHAEL, 1961: 68, pl. 7, fig. 17. — COTTON, 1964: 25, pl. 2, fig. 14. — HABE & KOSUGE, 1966a: 42, pl. 15, fig. 6.
Biplex pulchellum - WILSON, 1993: 242, pl. 40, figs 4 a-b.
Ranella jucunda - TRYON, 1880: 45.
Gyrineum (Eupleura) jucundum - MELVILL & STANDEN, 1899: 164.
Gyrineum (Biplex) jacundum (*sic*) - BEU, 1971: 104, pl. 8, figs 16-17. — HINTON, 1978: 30, figs 17-17a.
Gyrineum (Biplex) jucundum - CERNOHORSKY, 1972a: 117, pl. 34, fig. 1.

Gyrineum jacundum (sic) - SHORT & POTTER, 1987: 48, pl. 23, fig. 6.
Ranella perca - SCHMELTZ, 1877: 82.
Ranella (Eupleura) perca - WATSON, 1886: 402.
Apollon (Biplex) sp. - OYAMA & TAKEMURA, 1959: *Apollon* pl. 1, figs 3-4.

TYPE DATA. — *Ranella pulchella* G.B. Sowerby I: holotype BMNH 1840.8.24.278, without locality. The specimen is identified as "*ex* Goodall Collection"; according to MS notes in the front of a BMNH copy of G.B. SOWERBY I (1825), Dr Joseph Goodall (1760-1840) purchased part of the Tankerville Collection, for the sale of which Sowerby's catalogue was prepared, and BMNH purchased Goodall's collection. The type locality is here designated as between Cumberland Island and Point Slade, Torres Strait. — *Ranella pulchella* Forbes: 3 syntypes(?) BMNH 1851.11.24.14, from "8-11 fathoms, sand and shell bottom, between Cumberland I and Point Slade, lat. 21°S, long. 149°20' E, coll. J. McGillivray", collected in Torres Strait during the voyage of HMS "*Rattlesnake*". It is unclear, however, whether Forbes (1852) was intending to propose a new species, both synonymous and homonymous with Sowerby's, or was merely using Sowerby's name; the confusion results from the lack of any mention of Sowerby's usage of the name by FORBES (1852). — *Ranella jucunda*: neotype (of BEU, 1971: 105, pl. 8, figs 16-17) AMS C76466, dredged off Bowen, Queensland, *ex* NZGS WM10541).

OTHER MATERIAL EXAMINED. — Bowen, Queensland (11 NZGS WM10541). — Gladstone, Queensland (4 NZGS WM13810). — Port Douglas, N. Queensland (1 NZGS WM8442). — Gladstone Harbour, Queensland, *ex* J.R. Penniket Colln (1 NZGS WM15526). — Cook Reef area, W. Torres Strait, dredged 35-55 feet (2 Whitehead Colln). — Gloucester Passage, off Dingo Beach, Queensland (2 Whitehead Colln). — Gladstone, Queensland (2 Whitehead Colln). — Gladstone Harbour, Queensland, dredged (6 Whitehead Colln). — Shoal Point, McKay, Queensland (1 Whitehead Colln). — 90 lots in AMS: 9 are from southern Queensland (southernmost: C 69053, Fairfax I., Bunker Group, southernmost Great Barrier Reef, 1968), 48 from central Queensland to Torres Strait, 5 from the Gulf of Carpentaria, 13 from the Northern Territory, and 15 from Western Australia (northernmost: 160 km north of Croker I., Arafura Sea, Northern Territory, 9°30' S, 132°34' E, 124 m, 9 Nov. 1969, P. Colman on M.V. *"San Pedro Sound"*, 2).

DISTRIBUTION. — *Biplex pulchella* is a well known species of shallow inshore waters in Queensland, Australia, and ranges around northern Australia to Onslow, Western Australia (WILSON & GILLETT, 1971: 78). It also ranges along the southern coast of New Guinea, and possibly further westward in eastern Indonesia; specimens have been taken commonly from the far northwestern shelf of Western Australia, and SCHEPMAN (1909: 116) recorded a specimen from *"Siboga"* sta. 162, 18 m, "between Loslos and Broken-islands, west coast of Salawatti" (off the western tip of New Guinea).

DIMENSIONS. — *Ranella pulchella* G.B. Sowerby I (holotype): H 21.0, D 14.1 (including incomplete varices). - *Ranella pulchella* Forbes (figured syntype): H 25.6, D 17.2. - *Ranella jucunda* (neotype): H 21.9, D 16.7 (BEU, 1971: 105). - Gladstone Harbour, largest specimens seen, NZGS WM10541: H 26.2, D 18.5. - Karumba, Gulf of Carpentaria, AMS C74856: H 27.5, D 18.4.

REMARKS. — This beautiful little species, reaching only about 27 mm in maximum height, is very distinct from all other living *Biplex* species. Distinguishing characters are its fine sculpture, its deeply channelled suture, its wide varices, and its wide spiral cords, with a single low, wide secondary cord filling each spiral interspace over the surfaces of the varices. The Borneo fossil *Biplex perliberalis* is the only similar species; it has coarser sculpture, narrower varices, and more prominent major spiral cords over the varices than *B. pulchella*.

It was assumed by many early authors that G.B. Sowerby's name *Ranella pulchella* was a synonym of *Biplex perca*, and Forbes's homonym (or merely a second usage of Sowerby's name? - Forbes's intention is unclear) was therefore replaced by BEU (1971: 104) with *B. jucunda* (A. Adams) (misspelled "*jacundum*" by BEU). However, G.B. Sowerby's holotype is a small, slightly incomplete specimen of the small northern Australian species, conspecific with A. Adams's holotype of *Ranella jucunda*.

Biplex pulchra (Gray *in* G.B. Sowerby II, 1836)

Figs 1, 4 f, 5 a-m, 6 a-b

Ranella pulchra Gray *in* G.B. Sowerby II, 1836: pl. 93, fig. 19.
Gyrineum (Biplex) perca var. *aculeata* Schepman, 1909: 115, pl. 10, figs 1 a-c.
Bursa (Biplex) microstoma Fulton, 1930: 16, pl. 2, figs 2-3.
Ranella (Biplex) perca timorensis Kuenen *in* Koperberg, 1931: 119.

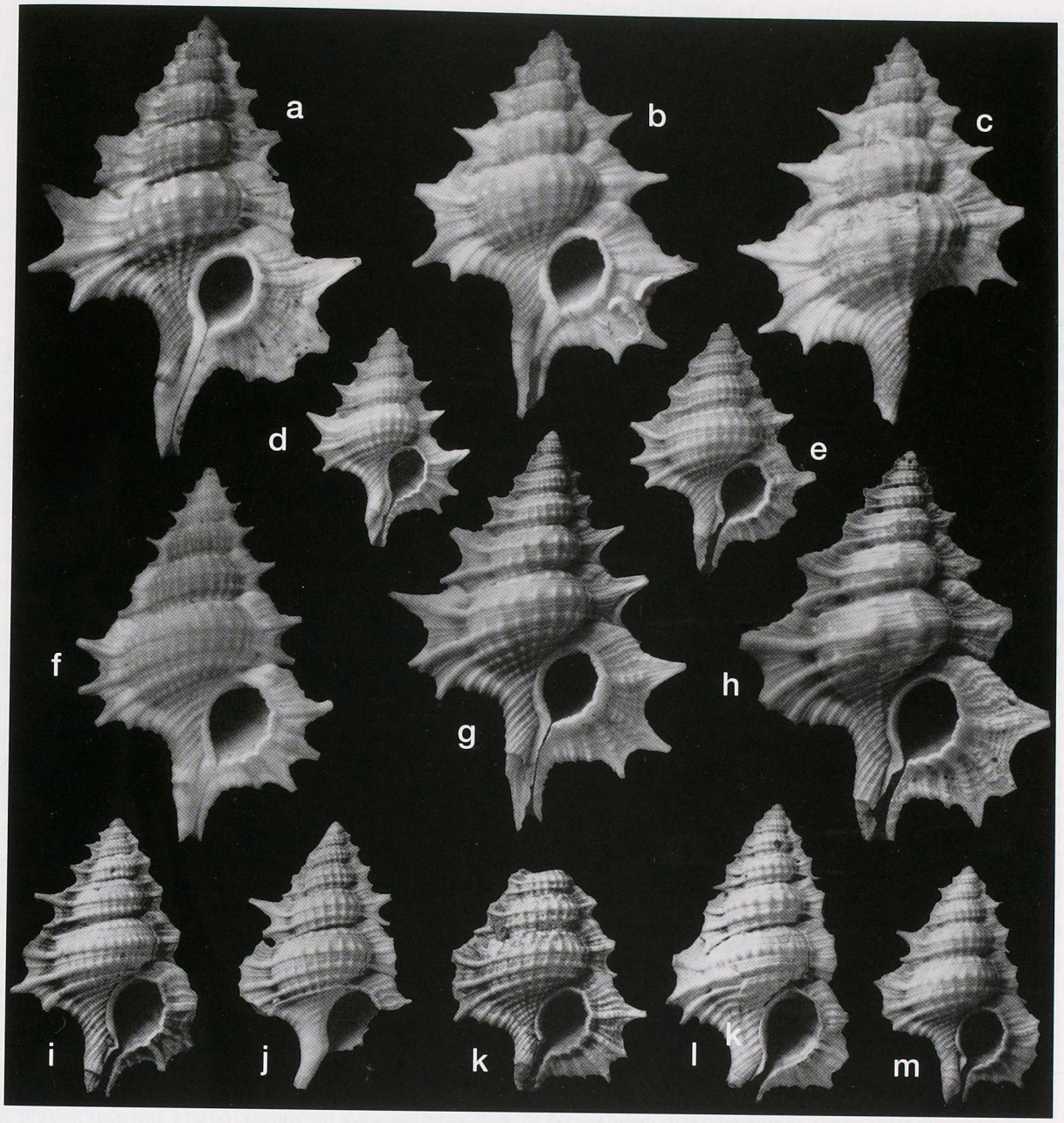

FIG. 5. — *Biplex pulchra* (Gray *in* G.B. Sowerby II), all x1.5. — **a**, neotype, BMNH 1930.4.2.2, lectotype of *Bursa (Biplex) microstoma* Fulton, "Hong Kong". — **b-c**, *"Vauban"*: sta. 9, New Caledonia, 175-200 m. — **d**, lectotype, ZMA 309001 (SCHEPMAN's figured syntype) of *G. perca* var. *aculeata* Schepman, *"Siboga"* sta. 289, Timor Sea, Indonesia, 112 m. — **e**, paralectotype of *G. perca* var. *aculeata* Schepman, ZMA 309002, all data as above. — **f**, specimen resembling New Caledonian ones; Thailand, Thora Whitehead Colln. — **g**, LAGON: sta. 1147, Belep Islands, New Caledonia. — **h**, LAGON: sta. 1148, Belep Islands, New Caledonia (specimen resembling *B. perca*). — **i**, **k**, BMNH Palaeo. Dept. G51572-8, Noel Tobe, Timor, Pliocene. — **j**, paralectotype of *Ranella (Biplex) pulchra timorensis* Kuenen *in* Koperberg, 1931, Artis Geologisch Museum, Amsterdam, no. A.9820, Pliocene, Timor. — **l**, paralectotype of *R. pulchra timorensis* Kuenen *in* Koperberg, Mineralogisch-Geologisch Museum, Delft, no. 13844, Pliocene, Timor. — **m**, lectotype of *R. pulchra timorensis* Kuenen *in* Koperberg, Mineralogisch-Geologisch Museum, Delft, no. 5, Pliocene, Timor.

Biplex pulchra - JOUSSEAUME, 1879: 4. — LAI, 1989: 117, figs 5-7.
Ranella pulchra - JAY, 1839: pl. 2, fig. 6. — KIENER, 1841: 8, pl. 6, fig. 1.
Ranella (Eupleura) pulchra var. - MARTIN, 1884: 135, pl. 7, fig. 136.
Gyrineum (Biplex) pulchrum - BEU, 1985: 57, fig. 8. — HENNING & HEMMEN, 1993: 32, pl. 4, fig. 7.
Biplex pulchrum - WILSON, 1993: 242, pl. 40, figs 5 a-b.
Apollon (Biplex) perca - SHUTO, 1969: 88, pl. 7, figs 6, 13-14.
Biplex perca - LADD, 1977: 33, pl. 11, figs 3-4.
Biplex aculeatus - HABE, 1964: 71, pl. 22, fig. 8.
Gyrineum (Biplex) aculeatum - WILSON & GILLETT, 1971: 78, pl. 53, fig. 14. — SPRINGSTEEN & LEOBRERA, 1986: 114, pl. 31, fig. 8.
Gyrineum microstomum - YEN, 1942: 214, pl. 17, fig. 106.
Apollon (Biplex) microstoma - WISSEMA, 1947: 146.
Apollon aculeatus microstoma - KURODA & HABE, 1952: 39.
Biplex microstoma - HABE, 1961: 45, pl. 22, fig. 8. — OKUTANI, 1986: 112-113, centre right fig.
Apollon (Biplex) aculeatus microstoma - OYAMA & TAKEMURA, 1959: *Apollon* pl. 1, figs 5-6.

TYPE DATA. — *Ranella pulchra*: no type material appears to have been selected by Gray. The specimen figured by G.B. SOWERBY II (1836: pl. 93, fig. 19) would be suitable to choose as the lectotype, but its whereabouts are unknown to me; it is not in the collection of the BMNH (Ms K. Way, letter 3 Jan. 1996). However, there is no doubt of the identity of the figure (Fig. 4 f). The figured syntype of *Bursa (Biplex) microstoma* (BMNH 1930.4.2.2, from "Hong Kong") is here designated the neotype of *Ranella pulchra* (Fig. 5 a). — *Gyrineum (Biplex) perca* var. *aculeata*: figured syntype (ZMA 309001, Fig. 5 d), here designated lectotype, along with 2 paralectotypes ZMA 309002 (Fig. 5 e), all from *"Siboga"* sta. 289, 112 m, "Indonesia, Timor Sea"; 1 paralectotype (ZMA 309003), from *"Siboga"* sta. 95, 522 m, "Indonesia, Sulu Sea", an abraded specimen of *B. perca*. — *Ranella (Biplex) perca timorensis*: 3 of more numerous syntypes (Figs 5 j, l-m) have been examined. Two are in the Mineralogisch-Geologisch Museum, Delft, Netherlands (Reg. nos. 5 and 13844), from "Toi Oesapi Soka (mixed with Nono Fatoe Fekoe), Timor, Mioceen" (Fig. 5 l). The third is in the Artis Geologisch Museum, Amsterdam (No. A.9820), and is presumably from the same locality as the first two (FIg. 5 j). The most complete of these (Delft, Min. Geol. Mus., no. 5) is here designated the lectotype (Fig. 5 m). These Timor Pliocene specimens are very incomplete, but their elongate shape, well defined, narrow costae and cords, and long, narrow variceal spines show they are *B. pulchra*. — *Bursa (Biplex) microstoma*: figured syntype, here designated lectotype (and neotype of *Ranella pulchra*), BMNH 1930.4.2.2, from "Hong Kong"; paralectotype (labelled "co-type", "Hong Kong") in National Museum of Wales (examined; see also TREW & OLIVER, 1980: 10).

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 496, 539, 858, 1147 (Fig. 5 g), 1148 (Fig. 5 h). — BATHUS 1: sta. DW653, DW659, CP667, CP668 (Fig. 6 a), CP669, CP712.
North of New Caledonia. MUSORSTOM 4: sta. CP172, CC173, CC175, DW185, DW186, CP189. — SMIB 6: sta. DW110, DW113, DW127, DW129, DW132, DW133, DW134, DW135, DW136. — BATHUS 4 : Sta. DW902, CP905, DW933, DW934, CP953.
Norfolk Ridge. *"Vauban"* 1978-79: sta. 9 (Figs 5 b-c).
Loyalty Ridge. MUSORSTOM 6: sta. DW398, DW417, DW442, DW456, DW462.
Local depth range 190-370 m, alive in 200-230 m.

OTHER MATERIAL EXAMINED. — **Northern Australia, New Guinea.** N. of Port Hedland, Western Australia, dredged 150 m, 18°40' S, 117°55' E, 28 March 1982, J. Paxton on R.V. *"Soela"* (1 AMS). — BMR *"Espirito Santo"* sta. E68/638, 240 miles WNW of Port Hedland, Western Australia, 19°12' S, 115°57' E, 274 m, 24 Nov. 1968 (1 AMS). — BMR *"Espirito Santo"* sta. E68/557, 130 miles north of Port Hedland, Western Australia, 229 m, 18°3' S, 118°37' E, 7 Nov. 1968 (1 AMS). — BMR *"Espirito Santo"* sta. E68/708, 120 miles north of Port Hedland, Western Australia, 161 m, 18°42' S, 118°02' E, 25 Nov. 1968 (1 AMS). — Talili Bay, New Britain, coll. A. Willey (1 AMS C3159). — BMR, M.V. *"Kos 2"* sta. K67/181, 140 miles north of Cape Leveque, Western Australia, 14°29' S, 123°03' E, 124 m, 12 Nov. 1967 (1 AMS). — R.V. *"Soela"* sta. 29-36, 85 naut. miles NNW of Port Hedland, Western Australia, 19°0.4' S, 118°01.0-01.1' E, 120-116 m, 29 Oct. 1983, coll. B.W. Jenkins (1 AMS). — Dredged off Mooloolaba, extreme southern Queensland (1, Whitehead Colln). — R.V. *"Soela"* sta. S02/82/13A, 114 miles off Port Hedland,Western Australia, 18°25' S, 118°22' E, 201 m, coll. L. Marsh, 2 April 1982 (100+ specimens). — R.V. *"Soela"* sta. S02/82/48, 109 miles NW of Port Hedland, Western Australia, 18°56-57' S, 117°21-19' E, 201 m, coll. L. Marsh (12 WAM 3090-83). — R.V. *"Soela"* sta. S02/82/10A, 100 miles NW of Port Hedland, Western Australia, 18°47.5" S, 117°58' E, 154 m, coll. L. Marsh (10 WAM 3064-83; 40+ WAM 3348-83; 10 WAM 3064-83; 15 WAM 3348-83). — R.V. *"Soela"* sta. 01/84/084, NW of Cape Leveque, Western Australia, 14°57.6-56.4 'S, 121°40.5-42.5' E, 200-236 m, coll. S.Slack-Smith, 16 Feb. 1984 (1 WAM 1713-84). — R.V. *"Soela"* sta. S02/82/08, 115 miles north of Port Hedland, Western Australia, 18°24.5' S, 118°31-24.5' E, 154-156 m, coll. L. Marsh, 28 March 1982 (1 WAM). — 9 miles north of Long I., Onslow, Western Australia, 77 m, coll. B.R. Wilson, 17 June 1960 (1 WAM). — CSIRO sta. 173, DW6/63, north of Norwest Cape, Western Australia, 21°50' S, 113°46' E, 140 m, 6 Oct. 1963 (1 WAM).
Localities other than the NW Pacific. Off Malabar Coast, India, 66 m, *ex* Indian Museum (1 AMS C3230). — SE of Hong Kong, 116-128 m, 21°00.7-05' N, 115°4.7-18.2' E, 8 April 1983, W.F. Ponder on FRV *"Tai Shun"* (11 AMS C143026). — CORINDON: sta. DR208, Straits of Makassar, 0°14' N, 117°52' E, 150 m (1 MNHN). — Sta. DR216, Straits of Makassar, 0°40' N, 117°51' E, 96 m (1 MNHN). — Thailand (1, unusual narrow shell, Fig. 5 f). — Russell I., Solomon Islands, from South Pacific Shells, dredged, 180-200 m (1) (both Whitehead Colln).
Vanuatu. MUSORSTOM 8: sta. CP1071, 15°37' S, 167°16' E, 180-191 m (2 MNHN). — Sta. DW1097, 15°05' S, 167°11' E, 281-288 m (2 MNHN). As most museum specimens are from southern Japan, Taiwan or the Philippine Islands, specimens seen from this area are not listed.
Indonesian fossils. Ngembak, Res. Semarang, Java, K. Martin's specimens (1 RMNH 9933). — Martin's figured specimen, NHML 9934, loc. as above (MARTIN, 1884: 135, pl.7, fig. 136). — ALTENA's (1942) Kendeng Pliocene material, identified as *G. perca*, 5 lots present, nearly all specimens are *B. pulchra*. — Timor Island, Pliocene: G.51572-8, BMNH Palaeo. Dept, from Noel Tobe, Timor, ex Mrs M.E. Walsh Colln, purchased Feb. 1930 (with one *B. perca*).

DISTRIBUTION. — *Biplex pulchra* occurs throughout the western Pacific archipelagoes, from southern Queensland, Australia, New Caledonia, and the northern shelf of Western Australia as far south as Shark Bay (WILSON, 1993: 242), to central Honshu in Japan. HABE (1964: 72) cited the northernmost occurrence in Japan as Enshu Nada (Wakayama Prefecture, southern Honshu) whereas *B. perca* occurs further north, to Boso Peninsula, central Honshu (KURODA *et al.*, 1971: 125).

DIMENSIONS. — *Gyrineum (Biplex) perca* var. *aculeata* (lectotype): H 22.0, D (including varices) 16.4; paralectotypes: H 26.1, D 20.0; H 20.5 (incomplete), D 17.0. - *Ranella pulchra* (neotype) and *Bursa (Biplex) microstoma* (lectotype): H 46.3, D 34.3; paralectotype: H 44.6, D 33.7. - *Ranella (Biplex) perca timorensis* (lectotype): H 24.66, D 17.3; paralectotypes, Delft, Min.-Geol. Mus., no. 13844: H 30.8, D 19.4 ; Artis Mus. no. A9820: H 27.9, D 18.0. - Large specimens from New Caledonia. MUSORSTOM 4: sta. DW186: H 45.3, D 32.7. BATHUS 1: sta. CP668: H 46.9, D 33.2. BATHUS 4: sta. DW934: H 47.4, D 31.0.

REMARKS. — This is the intermediate-sized of the western Pacific Recent species, smaller and narrower and with longer variceal spines, more complex interstitial variceal spiral sculpture, a more deeply channelled suture and, in most specimens, a smaller aperture and longer anterior siphonal canal than those of *Biplex perca*. It appears likely that almost all malacologists before JOUSSEAUME (1879) did not realise that the two relatively large species *B. perca* and *B. pulchra* co-occur from southern Japan to northern Australia, and Gray's name *Ranella pulchra* was almost certainly originally intended to apply to the species now universally called *B. perca*. However, the first publication of the name *Ranella pulchra*, attributed to Gray, was by G.B. SOWERBY II (1836: pl. 93, fig. 19) where the figure (Fig. 4 f) clearly shows the species usually known since as either *B. microstoma* (Fulton) or *B. aculeata* (Schepman). Early figures by JAY (1839: pl. 2, fig. 6) and KIENER (1841: pl. 6, fig. 1) also show what is here called *B. pulchra*, although that by REEVE (1844b: pl. 8, fig. 47) under this name is clearly the species now known as *B. perca*.

As differences between *Biplex pulchra* and *B. perca* are subtle, particularly with immature specimens, the identity of the type specimens of several of the listed synonyms has been difficult to evaluate. Characters used to distinguish juvenile and incomplete specimens are: (1) most small *B. perca*, in the range of 15-20 mm high, are very much shorter and wider than comparable *B. pulchra* (when identities were decided by occurrence in samples with a large size range); (2) the difference in variceal spine shape (longer and markedly narrower in *B. pulchra* than the wide, triangular ones of *B. perca*; still shorter in *B. bozzettii*) holds at small sizes; (3) many (but by no means all) *B. pulchra* have only **one** free variceal spine on spire whorls, rather than the two or, less commonly, three on *B. perca*. Although some specimens of *B. pulchra* have the lower (abapical) variceal spine free of the succeeding varix, specimens with only **one** spine free have not been observed in *B. perca*. On these grounds, SCHEPMAN'S (1909: pl. 10, figs 1 a-c) figured syntype of *G. (Biplex) perca* var. *aculeata* is identified as *B. pulchra* and, as the unfigured syntypes include a large, corroded specimen of *B. perca*, the figured syntype is here designated the lectotype. On the same grounds, KUENEN and KOPERBERG's (1931) Timor Pliocene specimens (Figs 6 j, l-m) are identified as *B. pulchra*, also. Of course, there is no doubt that Fulton's figured syntype of *Bursa (Biplex) microstoma* is a large, typical specimen of *B. pulchra*; it is designated above as the neotype of *Ranella pulchra*.

Almost all specimens from New Caledonia (listed above) are of a rather distinctive form of *B. pulchra* that is smaller and proportionally wider than most northern Pacific shells, with relatively prominently shouldered whorls, in many specimens quite prominent axial costae, almost all specimens are cream to white (including those dredged alive), and most have the lower (abapical) variceal spines short and directed strongly anteriorly on the last whorl, so there is only one free spine on spire whorls. This form looks so different, at first sight, from the common Philippines-Japan taller and narrower, pale tan, weakly sculptured, unshouldered form with more laterally directed spines that I have considered the possibility that the New Caledonian specimens represent a further species of *Biplex*. However, Philippine Islands specimens are highly variable and, for example, of two specimens in MNHN, one is the "typical" tan form (between Bohol & Cebu, local fishermen, 50-150 m) whereas the other closely resembles New Caledonian specimens (N.O. *"Coriolis"* MUSORSTOM 3: sta. CP107, 111-115 m, 14°02' N, 120°28' E, 2 June 1985). A large lot presented to NZGS by F.J. Springsteen (NZGS WM14039, "Punta Engaño, Mactan I, Cebu", *i.e.* from fishermen's sales, exact locality unknown; 31 specimens) contains 22 tan shells, three white ones resembling New Caledonian specimens, and six intermediate shells. Also, a few New Caledonian specimens resemble northern Pacific specimens in size, shape, sculpture and coloration (BATHUS 1: sta. CP668, 3 pale brown, including one of the largest [H 46.9] from New Caledonia; LAGON: sta. 1147, one typical, pale brown and tall; MUSORSTOM 4: sta. DW186, 3 large and narrow, cream). It is concluded the species is highly variable, and New Caledonian specimens are part of the variation of *B. pulchra*.

FIG. 6. — *Biplex, Gyrineum* and *Halgyrineum*. — **a-b**, *Biplex pulchra* (Gray *in* G.B. Sowerby II). **a**, BATHUS 1: sta. CP668, New Caledonia, x1. **b**, NZGS WM10820, Taiwan, x1. — **c**, *Biplex perca* (Perry), NZGS WM10698, Taiwan, x1. — **d**, *Biplex bozzettii* sp. nov., paratype, NZGS WM15524, off Cape Ras Hafun, Somalia, x1. — **e-g**, *Gyrineum longicaudatum* sp. nov., all x 1.9. **e**, holotype, MNHN (*ex* NZGS WM15041), off Tudela, Pacijan I., Philippines. **f**, NZGS WM14962, off Panglao, Bohol I., Philippines. **g**, MNHN, LAGON: sta. 378, New Caledonia. — **h**, *Gyrineum natator* (Röding), NZGS WM15532, off Madras, India, x1.3. — **i**, *Gyrineum concinnum* (Dunker), NZGS WM13337, Madat I., Ethiopia, Red Sea, x2. — **j-k**, *Gyrineum lacunatum* (Mighels), sculptured and smooth forms, New Caledonia. **j**, LAGON: sta. 152, x2. **k**, LAGON: sta. 127, x2. — **l-m**, *Gyrineum bituberculare* (Lamarck) x1.25. **l**, NZGS WM13192, Philippine Islands, Samar. **m**, WM13103, Bohol (specimen resembling lectotype of *Ranella bitubercularis* Lamarck). — **n-o**, *Gyrineum roseum* (Reeve), x2. **n**, CHALCAL 1: sta. D26, Chesterfield-Bellona Plateau, Coral Sea. **o**, NZGS WM14271, Mactan I., Cebu, Philippines. — **p**, *Halgyrineum* (gen. nov.) *louisae* (Lewis), SMIB 8: sta. DW163, Norfolk Ridge, New Caledonia, x1.5.

A single New Caledonian specimen (Fig. 5 h), LAGON: sta. 1148, Secteur des Belep, northernmost New Caledonia, 220 m, is shaped more like *B. perca* than *B. pulchra*, but on the evidence of variceal spiral sculpture is more likely to be *B. pulchra*. More material might well show that *B. perca* occurs in New Caledonia. Recent Vanuatu specimens taken during cruise MUSORSTOM 8 and Pleistocene fossils from the Kere River, southern Espiritu Santo I., Vanuatu (USNM, localities USGS 25718, USGS 25715, USGS 25717; some hundreds of specimens) are also consistently the angled, prominently costate form that occurs in New Caledonia, and further investigation is needed to evaluate the possibility that *B. pulchra* displays a cline in sculpture and colour, the pale, shouldered, narrow-spined form becoming dominant in the SE of its range.

Genus *GYRINEUM* Link, 1807

Gyrineum Link, 1807: 123. Type species (SD by DALL, 1904: 131): *Gyrineum verrucosum* Link, 1807 [= *Murex gyrinus* Linné, 1758], Pliocene to Recent, West Pacific.
Apollon Montfort, 1810: 571. Type species (by monotypy): *Murex gyrinus* Linné, 1758.
Gyrinella Dall, 1924: 89. Type species (OD): *Ranella pusilla* Broderip, 1833, Recent, French Polynesia [misidentified type species? - probably intended for *G. lacunatum* (Mighels), Indo-West Pacific].

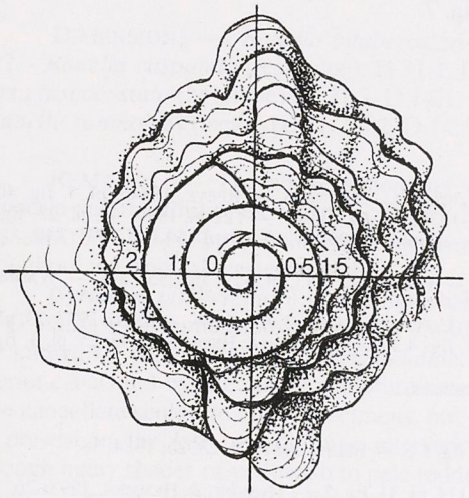

FIG. 7. — Sketch of apical view of a *Gyrineum* protoconch, showing method of counting protoconch whorls. Horizontal line through initiation point crosses suture line first at 0 (after an initial hemispherical cap), then after a half-whorl at 0.5, after one full whorl at 1, and so on. This specimen has *ca* 2.2 whorls (based on SEM micrograph of *G. lacunatum* (Mighels), AMS C60682, lectotype of *Apollon deliberatus* Iredale, Fig. 14 h).

REMARKS. — The genus *Gyrineum* is a compact group of species, all of which have solid, strongly sculptured shells with varices fused into two ridges roughly 180° apart up the whole teleoconch, and a conservative sculptural plan with three or, on some parts of some individuals, four spiral cords on the penultimate whorl, and seven or eight forming low variceal nodules on the last whorl. *Gyrineum louisae*, with its very different sculptural plan, is separated below in the new genus *Halgyrineum*. Species of *Gyrineum* also all have very similar apertures, with a nearly continuous peristome (interrupted by the narrowly open anterior canal) and a ridged, weakly flared inner lip, seven nodules inside the outer lip, and a very similar, lightly curved anterior canal (although the length of the canal varies between species). They also all have similar smooth, globose, turbiniform protoconchs, with protoconchs I and II not differentiated, but in some cases the number of protoconch whorls is a very useful species character.

Examination of *Gyrineum* protoconchs by SEM has demonstrated that those of several species differ enough in number of whorls for this to be a practical way of distinguishing the species. Protoconch whorls have been counted in diverse ways by previous authors, so it is important to commence with a definition of the counting method: I have adopted MARWICK's (1957: 14, fig. 2) convention that a protoconch commences with a hemispherical "cap", so that counting commences only from the **end** of the initial hemisphere, and only a **half** whorl (180°) has been turned by the time a radial line through the suture apex is met again (Fig. 7). Counting on apical views of enlarged scanning electron micrographs then produces a reasonably objective figure for each species, although some ambiguity is introduced when the initial hemisphere of the protoconch is very small (*e.g. G. lacunatum*, Fig. 14 c; *G. bituberculare*, Fig. 9 j; *G. concinnum*, Fig. 10 a). Counts arrived at by this means are: *G. pusillum* (*sensu stricto*), 0.8-0.9 whorls; *G. roseum*, 1.25-1.3 whorls; *G. longicaudatum*, 1.3-1.6 whorls; *G. lacunatum* (= *G. pusillum* of almost all previous authors), 1.8-2.2 whorls (most specimens), to as many as 2.6 whorls; *G. gyrinum*, 2.2 whorls; *G. hirasei*, 1.9-2.2 whorls; *G. bituberculare*, 2.3-2.4 whorls; *G. natator*, 2.6 whorls; and *G. concinnum*, *ca* 2.7 whorls. Clearly, this

criterion separates *G. pusillum, G. roseum* and *G. longicaudatum* from all the others most readily, but is of little practical use for distinguishing the other six species.

Criteria used to distinguish the remaining six species are size (*G. natator* and *G. bituberculare* reach a considerably larger maximum size than the other species), colour pattern (very consistent in most species, but highly varied in *G. longicaudatum*, *G. lacunatum*, and *G. bituberculare*), length of the anterior canal, and coarseness of the sculpture. Some species have their own unique characters, *e.g.*, the left margin of the inner lip is raised into a narrow free rim, or collar, in *G. longicaudatum* only.

Because of the possibility that Indo-Pacific Recent species that have been named relatively recently were named earlier as fossils, in Indonesia or Japan, some consideration has been given here to fossil species where possible, but this is essentially a monograph of the living Indo-West Pacific species. Other species that appear to be correctly referred to *Gyrineum* occur in the European Tertiary and in Miocene rocks of southern Australia (*G. maccoyi* (Pritchard)) but are not reviewed here.

Gyrineum bituberculare (Lamarck, 1816)

Figs 6 l-m, 8 a-k, 9 a-j

Ranella bituberculatis Lamarck, 1816: pl. 412, fig. 6; "Liste des objets", p. 4.
Ranella cuspidata Reeve, 1844b: pl. 8, fig. 48.
Bursa fusco-costata Dunker, 1862: 239.
Ranella? tritonoides Woodward, 1879: 539 [reprint p. 23], pl. 14, fig. 7.
Ranella anjarensis Martin, 1884: 137, pl. 7, fig. 137.
Ranella raninoides Martin, 1884: 203, pl. 9, fig. 6.
Ranella karikalensis Cossmann, 1903a: 156, pl. 5, figs 20-21.
Apollon osawanoensis Tsuda, 1959: 87, pl. 4, figs 9-10.
Apollon minoense Itoigawa, 1960: 284, pl. 5, figs 4 a-b.

Ranella bituberculatis - LAMARCK, 1822: 153. — KIENER, 1841: pl. 6, fig. 2. — DESHAYES, 1843: 548. — REEVE, 1844b: pl. 7, fig. 40. — KÜSTER & KOBELT, 1871: 153, pl. 39 a, figs 9, 12. — KOBELT, 1876b: 331; 1876c: pl. 10, fig. 10. — TRYON, 1880: 43, pl. 23, fig. 44. — MARTIN, 1884: 136. — VREDENBURG, 1925: 255. — FISCHER, 1927: 33. — SIEMON, 1929: 54. — VAN DER VLERK, 1931: 240.
Bursa (Lampas) bitubercularis - BRAZIER, 1877: 175.
Ranella (Apollo) bitubercularis - MARTIN, 1899: 149, pl. 23, figs 349-350 a, 351. — TESCH, 1920: 43, pl. 129, figs 155 a-b. — WANNER & HAHN, 1935: 233, 257.
Gyrineum bituberculare - SCHEPMAN, 1907: 182; 1909: 114. — ALTENA, 1942: 96. — COX, 1948: 40, pl. 3, figs 6 a-b. — LADD, 1977: 33, pl. 12, figs 7-9. — BEU, 1985: 56. — SPRINGSTEEN & LEOBRERA, 1986: 113, pl. 31, figs 4 a-b. — HENNING & HEMMEN, 1993: 25, pl. 3, figs 4-5. — WILSON, 1993: 241, pl. 40, fig. 7. — BOSCH *et al.*, 1995: 95, fig. 348.
Argobuccinum (Gyrineum) bituberculare - BEETS, 1941: 88 (with many other references).
Apollon (Apollon) bituberculare - WISSEMA, 1947: 143.
Gyrineum bitubercularis - HINTON, 1972: 12, pl. 6, fig. 18; 1978: 30, fig. 13.
Apollon bitubercularis - BEETS, 1950a: 245. — POPPENOE & KLEINPELL, 1978: pl. 5, fig. 6 b. — BEETS, 1981: 20, 23, 26; 1984: 58.
Ranella cuspidata - REEVE, 1844d: 139. — KOBELT, 1876b: 331.
Gyrineum cuspidatum - SCHEPMAN, 1909: 114. — SPRINGSTEEN & LEOBRERA, 1986: 114, pl. 31, fig. 5. — HENNING & HEMMEN, 1993: 26, pl. 3, fig. 6.
NOT *Gyrineum cuspidatum* - HINTON, 1978: 30, fig. 15. [= *G. longicaudatum*].
Apollon cuspidatus - HABE & KOSUGE, 1966a: 42, pl. 15, fig. 7.
Bursa fusco-costata - DUNKER, 1863-64: 57, pl. 19, figs 1-2.
Ranella fusco-costata - KOBELT, 1876b: 331.
Ranella? tritonoides - VAN DER VLERK, 1931: 240.
Bursa (Ranella) tritonoides - SKWARKO & SUFIATI, 1994: n4.
Ranella anjarensis - VAN DER VLERK, 1931: 240.
Argobuccinum anjarense - DEY, 1962: 75.
Bursa (Ranella) anjarensis - SKWARKO & SUFIATI, 1994: n4.
Apollon osawanoensis - ANONYMOUS, 1992: 23, pl. 12, figs 1 a-b.
Apollon minoense - ITOIGAWA *et al.*, 1981: pl. 35, figs 4 a-b.
Gyrineum cf. *G. reticulare robusta* - LADD, 1982: 41, pl. 7, figs 5-6.

TYPE DATA. — *Ranella bitubercularis*: 2 syntypes (MNHG 1098/89/1-2); the larger (1098/89/1) is the specimen figured by both LAMARCK (1816: pl. 412, fig. 6) and KIENER (1841: pl. 6, fig. 2) and is here designated the lectotype; unlocalised. The type locality is here designated as Bohol, Philippine Islands. — *Ranella cuspidata*: 3 syntypes (BMNH 1967663) of which the smoothest, medium-sized specimen (H 31.1, D 20.3) is here designated the lectotype (Figs 8 e, h-i, k); from the Philippine Islands, *ex* Cuming Colln ("Capul and Ticao"). — *Bursa fuscocostata*: holotype BMNH 1968531 (Figs 8 g, j), from "California" (wrong; probably Philippine Islands). — *Ranella? tritonoides*: type(s) not known to me. — *Ranella anjarensis*: holotype RMNH 9932, late Quaternary, "Banjar Anjar, Residency of Soerabaja", Java, a finely sculptured last whorl (Fig. 8 f). — *Ranella raninoides*:

Martin's figured syntype? RMNH 9922, from Late Miocene (Preangerian), "Tji Longon, Java" (it is not clear now how many specimens in the present RMNH collection were among Martin's types of *Ranella raninoides*, as they have all been catalogued as *G. bituberculare*; it is assumed that Martin's figured specimen was only one of several syntypes, as 10 lots in the collection date from Martin's time; the figured specimen accordingly is here designated the lectotype of *Ranella raninoides* (Figs 9 a, d). — *Ranella karikalensis*: 2 presumed syntypes examined, from the Pliocene of India, in Colln Cossmann, Laboratoire de Paléontologie, MNHN, labelled "Karikal *dedit* M. Bonnet"; both are small but otherwise typical specimens of *Gyrineum bituberculare*. — *Apollon osawanoensis*: holotype (JC.140044) in Department of Geology & Mineralogy, Kyoto University (MASUDA & NODA, 1976: 181); not seen; from "Kurosedani Miocene", Japan. — *Apollon minoense*: holotype (ESN.20063) in Department of Earth Sciences, Nagoya University (MASUDA & NODA, 1976: 181); not seen; from "Oidawara Miocene", Japan.

OTHER MATERIAL EXAMINED. — **New Guinea.** Port Moresby Harbour (AMS specimen figured by HINTON, 1972: pl. 6, fig. 18).
Northern Australia. Murray I., Torres Strait, N. Queensland, dredged 9-15 m, coll. C. Hedley (5 AMS C29980). — SW of Pt Cloates, Western Australia, CSIRO sta. 187, 23°39' S, 113°11' E, 140 m, June 1963 (1 WAM).
Many lots, not listed, in world museums, from Indonesia to the Philippine Islands; several lots from Sri Lanka and off southern India.

DISTRIBUTION. — Living in Taiwan (?); from the Philippine Islands throughout the western Pacific to Torres Strait and the far northwestern shelf of Western Australia; westward along the coasts of southern Asia to southern India. Fossil in Miocene to Pleistocene rocks of Japan, Taiwan, the Philippine Islands, India, and throughout Indonesia; the most commonly reported fossil *Gyrineum* species.

DIMENSIONS. — *Ranella bitubercularis* (lectotype): H 42.3, D 27.6; unfigured paralectotype: H 34.9, D 21.7. - *Ranella cuspidata* (lectotype): H 31.1, D 20.3; unfigured paralectotypes: H 34.7, D 22.0; H 30.9, D 19.7. - *Bursa fuscocostata* (holotype): H 21.7, D 14.1. - *Ranella anjarensis* (holotype): H (very incomplete) 15.3, D 14.7. - *Ranella raninoides* (lectotype): H 20.2, D 14.5 (anterior canal incomplete).

REMARKS. — The above synonymy does not include most of the long lists of works on fossils of Indonesia and the Philippine Islands cited by BEETS (1941) and ALTENA (1942). These and other authors (*e.g.* WISSEMA, 1947: 143) have discussed the numerous fossil records of the species from Miocene to Pleistocene rocks throughout the tropical western Pacific.

Gyrineum bituberculare is distinguishable from other *Gyrineum* species by reaching a larger size than all but *G. natator* (specimens are commonly 35-40 mm high, which is unusually large for *G. gyrinum* and larger than any known *G. lacunatum, G. longicaudatum*, or *G. roseum*), by its relatively tall, narrow spire and its long anterior canal, and by the coarse sculpture seen in at least some specimens in most samples - early spire whorls have cancellate sculpture on all specimens, but on many specimens only two or three very prominent axial costae are present in the last two or three intervariceal intervals. The teleoconch colour is white to medium brown (through many shades of yellowish to pale reddish brown) on all specimens, the aperture is white to off-white, and in most coarsely sculptured individuals the prominent costae are much darker than the rest of the shell. The protoconch has 2.3-2.4 whorls (Figs 9 e-j).

Because of its great variability, *Gyrineum bituberculare* has received many synonyms. *Bursa fuscocostata* (Figs 8 g, j) is based on a specimen in which the unusually prominent axial costae are very dark brown; this form is common in Philippine Islands samples. MARTIN's holotype of *Ranella anjarensis* (Fig. 8 f) has been compared carefully with living species as, although I conclude that it is a particularly finely sculptured specimen of *G. bituberculare*, the small size, the fine sculpture, the long anterior canal, and the absence of the spire and protoconch make it possible this could be an earlier name for either *G. hirasei* or *G. longicaudatum*. MARTIN's holotype differs from both similar living species in having 10 axial costae in one intervariceal interval (only 6-7 on *G. hirasei* and *G. longicaudatum*), in having narrower varices, and in having a more closely plicate, adherent inner lip, not raised into a free rim along its outer edge as in *G. longicaudatum*. WOODWARD's (1879: pl.14, fig. 7) figure of *Ranella? tritonoides* (from the Miocene(?) of Sumatra) shows a normal specimen of *G. bituberculare*, lacking most of the last whorl (I am not aware of the whereabouts of the holotype). MARTIN himself (MARTIN, 1899: 156) realised that his species *Ranella raninoides* is a synonym of *G. bituberculare*, and in recent years his figured syntype has been catalogued (and, until recently, not marked as a type) among other K. MARTIN material of *G. bituberculare* in RMNH. This species is a common fossil in Miocene to Pleistocene rocks of Japan, the Philippine Islands, India, and Indonesia, and was recorded by MARTIN (1919: 130, 141, 146) from three localities in Indonesia (including the record of *Ranella anjarensis*). Other records by ALTENA (1942),

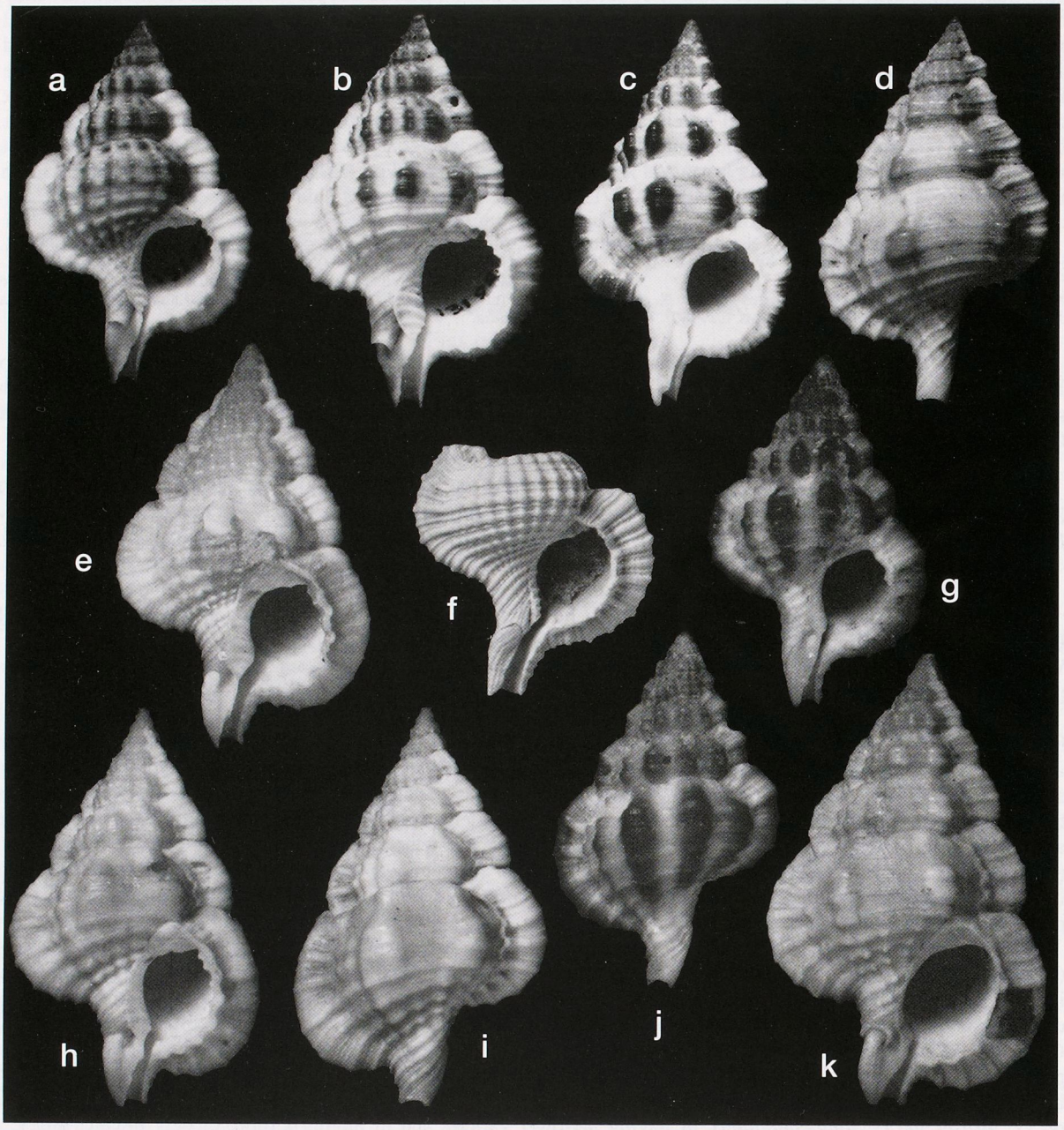

FIG. 8. — *Gyrineum bituberculare* (Lamarck). — **a-b** NZGS WM13192, Samar, Philippines, x1.5. — **c**, NZGS WM13826, off Davao, Mindanao, Philippines, x1.5. — **d**, NZGS WM5393, Sri Lanka, x1.5 (specimen closely resembling LAMARCK's (1816: pl. 412, fig. 6) original figure of the lectotype of *Ranella bitubercularis*). — **e**, **h-i**, **k**, the three syntypes of *Ranella cuspidata* Reeve, BMNH 1967663, "Capul and Ticao", Philippines, all x2. — **f**, holotype of *Ranella anjarensis* Martin, RMNH 9932, Pleistocene, Bandjar Anjar, Residency of Surabaya, Java, x2.5. — **g**, **j**, holotype of *Bursa fuscocostata* Dunker, BMNH 1968531, "California" (wrong), x2.5.

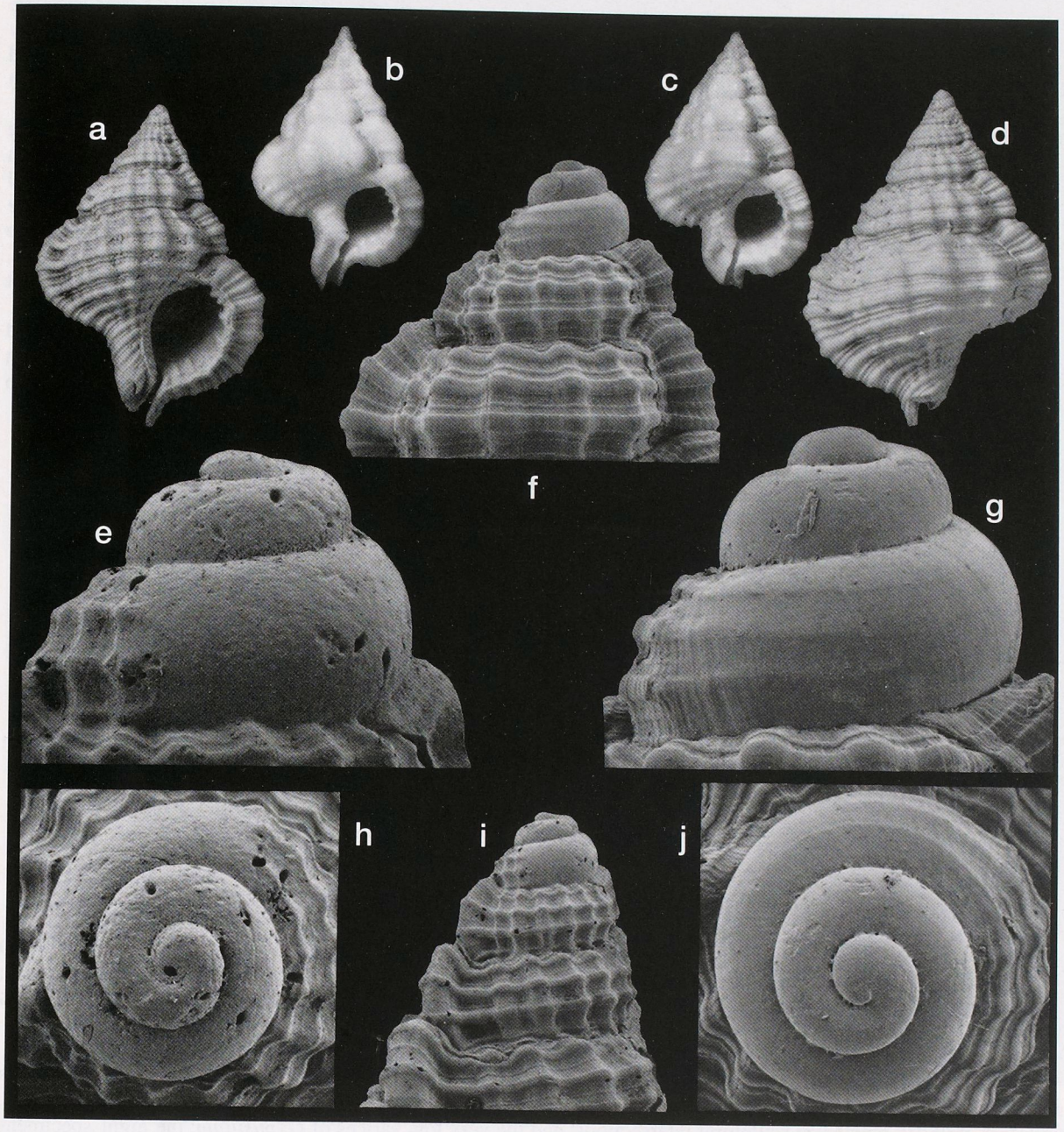

FIG. 9. — *Gyrineum bituberculare* (Lamarck). — **a**, **d**, lectotype of *Ranella raninoides* Martin, RMNH 9922, Miocene, Tji Longan, Java, x2.5. — **b-c**, NZGS WM13319, off Zamboanga, Philippines, x1.5 (the form known as "*Gyrineum cuspidatum*"). — **e**, **h-i**, NZGS WM14423, Mactan I., Cebu, SEM micrographs of protoconch of *cuspidatum* form; e. x45; h. x36 (showing 2.3 whorls); i. x12.5. — **f-g**, **j**, NZGS WM14102, Mactan I., Cebu, Philippines, SEM micrographs of protoconch of typical form of *G. bituberculare*; f. x12; g. x35; j. x30 (showing 2.4 whorls).

BEETS (1941, 1984), DEY (1962), LADD (1977, 1982), MARTIN (1884, 1899), TESCH (1920) and WISSEMA (1947) are listed in the synonymy. The Japanese fossil nominal species *Apollon osawanoensis* and *A. minoense* are very similar to each other and are certainly synonymous, and it appears likely that they and *Ranella karikalensis* are based on rather small, coarsely sculptured specimens of *G. bituberculare* very close to the living form usually known as *G. cuspidatum*, but specimens and illustrations I have seen all show shells that are a little more squat and solid than most living ones. Comparison of protoconchs could help to clarify this probable synonymy; I have seen no protoconchs of Japanese fossil specimens.

The status of the form (or species?) known as *Gyrineum cuspidatum* has troubled me for a long time. The name is applied to unusually smooth (*i.e.* with very restrained spiral cords), uniform white to yellowish brown specimens, with relatively short anterior canals, nearly all from the Philippine Islands. The protoconch is identical to that of *G. bituberculare*. REEVE's (1844a: pl. 8, fig. 48) three syntypes are, however, larger and more variable than the usual concept of this "species" (Figs 8 e, h-i, k) and are best described as rather large, uniform white to pale yellow specimens of *G. bituberculare*. The form appears to be based on carefully selected, smoothish, pale, shallow-water specimens of *G. bituberculare* with a short anterior canal, and in my opinion there is little doubt that it is merely part of the variation of *G. bituberculare*.

Gyrineum bituberculare has a more restricted central western Pacific distribution than the more widespread *G. gyrinum* and *G. lacunatum*, and (for example) only two lots have been seen from northern Australia, although HINTON (1972) has recorded it from New Guinea. It does not occur in southern Japan or in Hawaii, and there are no specimens in the present New Caledonian material.

Gyrineum concinnum (Dunker, 1862)

Figs 6 i, 10 a-c, e-h

Bursa concinna Dunker, 1862: 239.

Bursa concinna - DUNKER, 1863: 55, pl. 18, figs 3-4.
Ranella concinna - TAPPARONE-CANEFRI, 1875a: 45. — KOBELT, 1876a: 51; 1876b: 330.
Gyrineum concinnum - BEU, 1985: 56. — SINGER, 1990: 24, 26, fig. 18. — HENNING & HEMMEN, 1993: 26, pl. 3, fig. 8.
Ranella pusilla - G.B. SOWERBY II, 1835: pl. 84, fig. 1. — ?KOBELT, 1876a: 52.
Ranella pusilla, var. - SMITH, 1879: 815 (in part).
Ranella (Argobuccinum) pusilla - TRYON, 1880: 44 (in part).

TYPE DATA. — *Bursa concinna*: 3 syntypes BMNH 1968532. The syntype figured by DUNKER (1863: pl. 18, figs 3-4) is here designated the lectotype (Figs 10 b, e), from "Red Sea", *ex* Cuming Colln.

OTHER MATERIAL EXAMINED. — **Red Sea.** Madat I., Ethiopia, Red Sea, 2-4 m, on coral, coll. D. Peled, May 1973 (3 NZGS WM13337, Figs 6 i; 2 NMP G5091). — Nabek, Eilat, Red Sea, on edge of reef, coll. D. Peled, March 1978 (1 NZGS WM13338). — Shallow water around Jiddah, Saudi Arabia (1 NMP J1830).

DISTRIBUTION. — Limited to the Red Sea.

DIMENSIONS. — *Bursa concinna* (lectotype): H 20.0, D 13.4; paralectotypes: H 21.3, D 13.1; H 17.4, D 10.6. - Madat I., NMP G5091: H 23.5, D 14.3; H 19.2, D 11.9, data as G5091, NZGS WM13337: H 19.4, D 12.7; H 16.8, D 10.7; H 16.1, D 10.2 (specimen in Figs 10 f-g). - Jiddah, NMP J1830: H 19.0, D 12.2. - Nabek, NZGS WM13338: H 17.6, D 12.0.

REMARKS. — The apparently single species of *Gyrineum* inhabiting the Red Sea is *G. concinnum*. This species closely resembles both *G. pusillum* and *G. lacunatum*. It has the consistent, even, cancellate sculpture, with low, rounded nodules at sculptural intersections, and the very low varices of *G. pusillum*; the eight specimens I have seen are consistently granulose and a "*cuspidatum*" smooth form does not seem to occur. The teleoconch external colour is consistently weakly banded pale pinkish yellow-brown to moderately dark, dull, red-brown, with much paler varices banded pale yellow-brown and white, and with a peribasal white band on the last whorl, its upper edge just visible around the base of spire whorls. The aperture is consistently white. *G. concinnum* differs markedly from *G. lacunatum*, however, in having a protoconch with 2.7 whorls (Figs 10 a, c) rather than 1.8-2.2 whorls (although that of *G. lacunatum* rarely has as many as 2.6 whorls; Fig. 14 c). The uniform pinkish brown to dull red-brown coloration, apart from a white basal band and pale varices, is a colour pattern not observed in *G. lacunatum*.

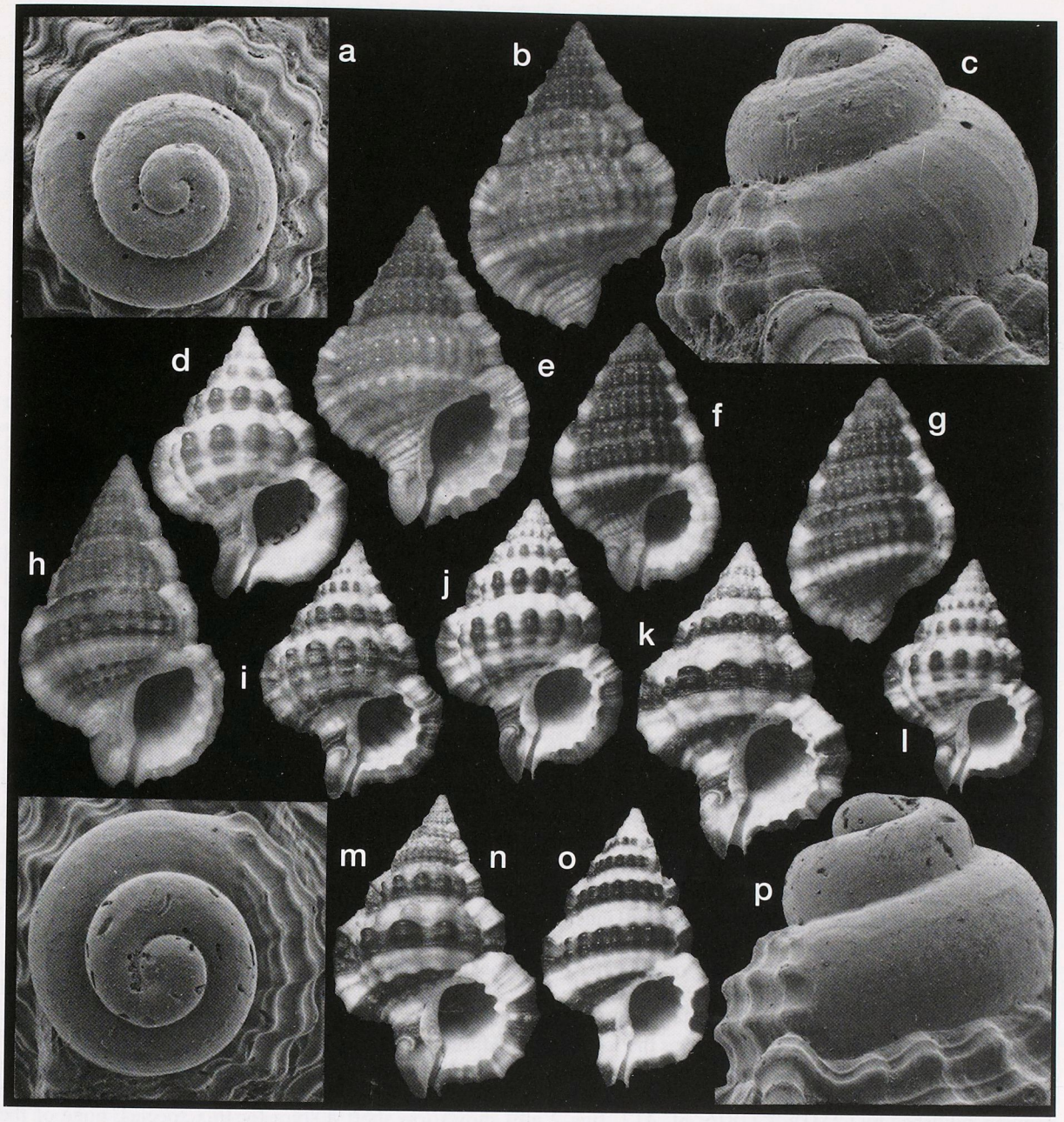

FIG. 10. — *Gyrineum concinnum* and *G. gyrinum*. — **a-c**, **e-h**, *Gyrineum concinnum* (Dunker), Red Sea. **a**, **c**, SEM micrographs of protoconch, NZGS WM13337, Madat I., Ethiopia; a. x30 (showing *ca* 2.7 whorls); c. x38. **b**, **e**, lectotype, BMNH 1968532/1, "Red Sea", *ex* Cuming Colln, x2.5. **f-g**, NZGS WM13337, Madat I., Ethiopia, x2.5. **h**, paralectotype, BMNH 1968532/2, x2.5. — **d**, **i-j**, **l**, *Gyrineum gyrinum wilmerianum* Preston, all x1.5. **d**, NZGS WM13510, Malé Atoll, Maldive Islands. **i-j**, **l**, NZGS WM13880, Mauritius, coll. J. Closel, *ex* E.S. Gourlay Colln. — **k**, **m-p**, *Gyrineum gyrinum gyrinum* (Linné). **k**, **o**, 2 specimens in one lot, NZGS WM14116, Mactan I., Cebu, Philippines, x1.5. **m**, **p**, SEM micrographs of protoconch, NZGS WM14261, Mactan I., Cebu, Philippines; m. x34 (showing 2.2 whorls); p. x38. **n**, NZGS WM13916, under coral boulders, Baie Ferme Nord, New Caledonia, x1.5.

Gyrineum gyrinum gyrinum (Linné, 1758)

Figs 10 k, m-p

Murex gyrinus Linné, 1758: 748.
Gyrineum verrucosum Link, 1807: 123.
Biplex variegata Perry, 1811: pl. 5, fig. 2.
Ranella ranina Lamarck, 1816: pl. 412, figs 2 a-b; "Liste des objets", p. 4.

Murex gyrinus - LINNÉ, 1767: 1216. — GMELIN, 1791: 3531. — DILLWYN, 1817: 693 (in part). — HANLEY, 1855: 285.
Ranella gyrinus - REEVE, 1844b: pl. 8, fig. 49. — FISCHER, 1860: 358. — KÜSTER & KOBELT, 1871: 152, pl. 40, figs 4-6. — KOBELT, 1876b: 331. — BRAZIER, 1879: 186.
Ranella gyrina - SCHMELTZ, 1877: 82. — MARTIN, 1919: 137. — VAN DER VLERK, 1931: 241.
Bursa (Apollon) gyrina - BRAZIER, 1877: 175.
Ranella (Argobuccinum) gyrina - TRYON, 1880: 43, pl. 23, fig. 78.
Ranella (Apollon) gyrinus - TAPPARONE-CANEFRI, 1881: 54.
Ranella (Apollo) gyrina - MARTIN, 1899: 149, pl. 23, figs 347-347a.
Gyrineum gyrinus - SCHEPMAN, 1907: 182. — ALTENA, 1942: 98.
Gyrineum gyrinum - SCHEPMAN, 1909: 114. — HINTON, 1978: 30, fig. 14. — SPRINGSTEEN & LEOBRERA, 1986: 114, pl. 31, fig. 7. — OKUTANI, 1986: 112; 113, top right fig. — SHORT & POTTER, 1987: 48, pl. 23, fig. 4. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 10. — LAI, 1989: 118, figs 8-9. — WILSON, 1993: 241, pl. 40, fig. 6.
Argobuccinum (Gyrineum) gyrinum - BEETS, 1941: 195.
Apollon (Apollon) gyrinus - WISSEMA, 1947: 144. — BEETS, 1983: 29. — SKWARKO & SUFIATI, 1994: m2.
Apollon (Apollon) gyrinum - OYAMA & TAKEMURA, 1959: *Apollon* pl. 2, figs 7-8.
Apollon (Apollon) gyrinum robusta - OYAMA & TAKEMURA, 1959: *Apollon* pl. 2, figs 9-10.
Apollon gyrinus - HABE, 1961: 45, pl. 22, fig. 1. — RIPPINGALE & MCMICHAEL, 1961: 68, pl. 8, fig. 15. — HABE, 1964: 71, pl. 22, fig. 1. — HABE & KOSUGE, 1966a: 42, pl. 15, fig. 4.
Gyrineum (Gyrineum) gyrinum gyrinum - BEU, 1985: 56. — HENNING & HEMMEN, 1993: 24, pl. 3, fig. 2.
Ranella ranina - LAMARCK, 1822: 154. — KIENER, 1841: 28, pl. 2, fig. 3. — G.B. SOWERBY II, 1842: pl. 17, fig. 393. — DESHAYES, 1843: 549.

TYPE DATA. — *Murex gyrinus*: Linné's collection, housed by the Linnean Society of London, contains two specimens of *Gyrineum gyrinum gyrinum* of all subsequent authors, both of which bear in their apertures the number "528" (the species number of *Murex gyrinus* in LINNÉ, 1767: 1216). The smaller specimen has had the inner lip excavated by a "hermit crab" (pagurid), so the larger specimen (H 24.4, D 17.0) is here designated the lectotype of *Murex gyrinus* Linné, 1758. The type locality is here designated as Ambon Island (Amboina), Indonesia. Three further paralectotypes are present in the Linné Collection in the Uppsala University Zoological Museum (nos. 1625 a-c; WALLIN, 1993:75). — *Gyrineum verrucosum* is identified by its references to "*M. gyrinus* L." and to MARTINI & CHEMNITZ (vol. 4: pl. 128, figs 1233-1234). The reference to Linné is merely a species name listed in synonymy, and in my opinion this reference does not make Linné's specimens syntypes of *G. verrucosum*. MARTINI & CHEMNITZ's figures are poorly drawn but show a clearly banded specimen of *Gyrineum gyrinum*; the specimen illustrated must be construed as the holotype of *Gyrineum verrucosum*. However, as this specimen is not among the few Martini or Chemnitz specimens that have been recognised today (not having originated from the Moltke or Spengler collections), another type specimen is required for *Gyrineum verrucosum*. Therefore, the specimen designated above as the lectotype of *Murex gyrinus*, H 24.4, D 17.0, housed by the Linnean Society of London, is here designated also the neotype of *Gyrineum verrucosum*. — *Biplex variegata*: the specimen designated above as the lectotype of *Murex gyrinus* is here designated also the neotype of *Biplex variegata*. — *Ranella ranina*: Lamarck's collection in Geneva contains a single lot (MHNG 1098/88) of three specimens identified as syntypes, all of which are typical specimens of *Gyrineum gyrinum gyrinum*. As the drawing published by LAMARCK (1816: pl. 412, figs 2 a-b) shows too short a spire for this species, none of the specimens match the drawing particularly well, but the largest of the three is the widest and so matches more nearly than the others and is here designated the lectotype (MHNG 1098/88/1, H 29.1, D 20.0).

NEW CALEDONIA RECORDS. — LAGON: sta. 3, 16, 20, 25, 28, 30, 32, 57, 58, 68, 69, 73, 85, 89, 92, 107, 112, 113, 119, 131, 143, 146, 147, 150, 155, 161, 201, 226, 232, 233, 247, 249, 250, 251, 270, 272, 275, 276, 279, 285, 286, 289, 301, 542, 614, 625, 636, 641, 656, 657, 662, 669, 686, 723, 726, 728, 731, 737, 759, 771, 788, 801, 808, 814, 828, 834, 837, 840, 851, 876, 905, 910, 915, 921, 923, 937, 940, 951, 957, 958, 966, 967, 975, 977, 978, 979, 980, 983, 1001, 1020, 1023, 1046, 1069, 1145. — Banc Gail, Lagon SW de Nouméa, 27 m. — EXPÉDITION MONTROUZIER: sta. 1237, 1241, 1242, 1245, 1252, 1256, 1259, 1260, 1266, 1270, 1277, 1278, 1279, 1282, 1283, 1284, 1286, 1287, 1289, 1290, 1291, 1292, 1296, 1297, 1298, 1299, 1301, sta 1302, 1308, 1310, 1312, 1314, 1315, 1318, 1322. — LAGON DE NOUMÉA: sta. 1350, 1355, 1356. — BATHUS 1: sta. DW692, DW1234, DW1235, DW1236.
The depth range in these 137 stations is intertidal to 68 m

DISTRIBUTION. — Throughout the western Pacific faunal province from southern Japan (as far north as the Amami Islands; HABE, 1964: 71) to southern Queensland in Australia (southernmost, Fairfax I., Bunker Group, southern Great Barrier Reef, 1968, 4 AMS C669053) and common in New Caledonia; not recorded from Hawaii (KAY, 1979). Replaced in the Indian Ocean by the following subspecies.

DIMENSIONS. — Dimensions of Linné's and Lamarck's types given above. - Pelican I., off Dingo Beach, Proserpine, Queensland, Whitehead Colln, largest specimen seen: H 50.0, D 31.3. - Apart from this unusual "giant", the largest seen is H 38.8, D 25.1 (Mystery Reef, Swain Reefs, Queensland, 3-6 m in large pool, 21°23' S, 152°02' E, 13 Jan. 1985, AMS).

REMARKS. — Although this subspecies is not as common a fossil in the tropical western Pacific as is *Gyrineum bituberculare*, numerous references to its fossil occurrence, listed by BEETS (1941) and ALTENA (1942), have been omitted above as I do not have access to the original references or specimens. MARTIN (1919: 137) recorded it from the Miocene of Ngembak, Java.

Gyrineum gyrinum gyrinum is a common and widespread western Pacific intertidal to shallow subtidal form, represented by huge collections of samples in all major museums. It is represented in 137 stations from New Caledonia; all except one are from around New Caledonia itself. The subspecies is easily recognised by its large size (commonly reaching 30 mm high, and rare specimens up to 50 mm), its squat shape, its short anterior canal, its coarse sculpture with additional fine sculpture of low, narrow, closely spaced, axial costellae crossing all other sculpture, and its broad dark brown, bright yellow and white colour bands. The shell bears alternating, equally wide dark brown and bright yellow-on-white bands, six on the spire and six on the last whorl. The sutural ramp is white, with two rows of yellow nodules and yellow bands on the varices; below this is a strongly contrasting dark brown band around two rows of nodules, and half of the anterior interspace below them, forming a particularly marked brown band on the varices; below this is a single row of yellow nodules on a white ground on spire whorls, and on the last whorl a wide white band and two rows of yellow nodules, again producing a bright yellow band on the varices; below this again, a peribasal brown band over two rows of nodules and a brown anterior canal tip are separated by a white band bearing two or three rows of yellow to pale brown nodules. All colours are enhanced on costae and varices of most specimens, producing an obscure axial banding that crosses the more obvious spiral pattern. In life, the pattern is hidden beneath a thin, straw-yellow periostracum that bears closely spaced rows of closely spaced bristles, one row along the crest of each narrow, closely spaced teleoconch axial costella; the bristles are *ca* 1 mm long over most of the shell, but *ca* 3 mm long over the varices and prominent axial costae. The bristles trap much mud, and effectively disguise the shell (specimens observed alive in lunular hollows of *Tridacna gigas,* at Orpheus I., Queensland). The coloration is described in detail because it provides the sole separating character of the Indian Ocean subspecies *G. gyrinum wilmerianum* (below). The protoconch has 2.2 whorls (Figs 10 m, p).

G. gyrinum has been recognised with little difficulty since Linné's time, and so has received no synonyms other than the obligatory renaming in the individual "systems" of a few early authors.

Gyrineum gyrinum wilmerianum Preston, 1908

Figs 10 d, i-j, l

Gyrineum wilmeriana Preston, 1908: 195, pl. 15, fig. 37.

Gyrineum (Gyrineum) gyrinum wilmerianum - BEU, 1985: 56. — HENNING & HEMMEN, 1993: 25, pl. 3, fig. 3.
?*Ranella pusilla* - SMITH, 1879: 815.
?*Gyrineum gyrinum* - DRIVAS & JAY, 1988: 64.

TYPE DATA. — PRESTON (1908: 194) stated that the types of all species described in his paper are in the Indian Museum, Calcutta; not seen. The type locality is "Andaman Islands", collected by Colonel L.W. Wilmer.

OTHER MATERIAL EXAMINED. — **Indian Ocean.** Malé Atoll, Maldive Islands, 6-8 m on sand (1 NZGS WM13510, Fig. 10 d). — Trincomalee, Sri Lanka, *ex* J.R. Penniket Colln (1 NZGS WM15527). — Mauritius, coll. J. Closel, *ex* E.S. Gourlay Colln (17 NZGS WM13880, Figs 10 i-j, l). — Maldive Islands (1 NMP H7533).

DISTRIBUTION. — Indian Ocean, type locality Andaman Islands; seen only from Sri Lanka, the Maldive Islands, and Mauritius, but presumably occurring also in southern India and along the East African coast. Poorly known.

DIMENSIONS. — PRESTON (1908: 195) stated the dimensions of the holotype to be H 28.5, D 20.5. - Malé Atoll, NZGS WM13510: H 27.9, D 20.4. - Trincomalee, NZGS WM15527: H 30.8, D 21.7. - Mauritius, NZGS WM13880: H 31.3, D 21.0; H 30.0, D 18.6. - Maldive Islands, NMP H7533: H 35.0, D 24.3.

REMARKS. — I have not seen the type material of *Gyrineum wilmeriana*, or any other material from the type locality (Andaman Islands), but PRESTON's figure, specimens from the Maldive Islands and many from Mauritius represent a form that is very similar to *G. gyrinum*. Specimens with yellow coloration on the nodules and varices of the pale bands are rare (the only one I am aware of is that illustrated by DRIVAS & JAY, 1988: 64) and in all other Indian Ocean specimens I have seen the dark brown is more limited to nodules and varices, fading out over some of the surface between, and is less markedly limited to spiral bands than in *G. gyrinum gyrinum*, so that some is present over much of the basal half of most specimens. The result is a much less regular, scattered brown and white maculation, rather than clear bands. However, these specimens also differ from western Pacific *G. gyrinum* is having a protoconch of only 2.0 whorls. The specimen from Réunion or Mauritius figured by DRIVAS & JAY (1988: 64) agrees in all respects with western Pacific specimens of *G. gyrinum*, so the possibility deserves investigation that *G. wilmerianum* is a distinct Indian Ocean species, and that *G. gyrinum* occurs rarely with it in the Indian Ocean. At present it seems more likely that this only subtly distinct form is (at most) a geographic subspecies of *G. gyrinum*.

Gyrineum hirasei (Kuroda & Habe *in* Habe, 1961)

Figs 11 a-j, 12 a-j

Biplex hirasei Kuroda & Habe *in* Habe, 1961: 45, pl. 22, fig. 5; appendix p. 16.

Biplex hirasei Kuroda (MS) - OYAMA & TAKEMURA, 1959: *Apollon* pl. 1, fig. 1, 2 (*nomen nudum*). — HABE, 1964: 71, pl. 22, fig. 5. — MATSUMOTO, 1979: 38, pl. 8, fig. 4.
Apollon hirasei Kuroda (MS) - AZUMA, 1960: 30, pl. 3, fig. 2 (*nomen nudum*).
Gyrinum hirasei - BEU, 1985: 56. — OKUTANI, 1986: 112, 113, 2nd to top fig., left column. — HENNING & HEMMEN, 1993: 27, pl. 33, fig. 7.
Ranella hirasei - TSUCHIDA & KUROZUMI, 1996: 38, fig. 7.2.

TYPE DATA. — Holotype NSMT 53486 (Figs 11 b, f) and 1 paratype NSMT 53487, both from off Cape Ashizuri, Tosa Bay, Shikoku, A. Teramachi Colln.

NEW CALEDONIA RECORDS. — **Loyalty Ridge.** MUSORSTOM 6: sta. 391, 397 (Figs 12 f-j). Local depth range 380-390 m.

OTHER MATERIAL EXAMINED. — **Japan.** South China Sea (4 NSMT 63866). — Izu Islands, 80 m, *ex* Kawamura Colln (1 NSMT; Figs 11 c, g). — Japan, labelled in Japanese, 2 lots *ex* Kawamura Colln (5 NSMT). — Off Wakayama Pref., Honshu, 190 m (2 NSMT 63866). — South China Sea (1 NSMT 45559). — Tosa Bay, Kochi Pref., Shikoku, trawled (1 NSMT 48933; Fig. 11 e). — *"Soyo Maru"* sta. 211, off Wakayama Pref., Honshu, 190 m (1 NSMT). — South China Sea, *ex* NSMT 46233 (2 NZGS WM14878; Figs 12 a-c).
Philippine Islands. Panglao, Bohol I. (1 NZGS WM14963). — Philippine Islands, M. Marrow Colln (3).
Indonesia. N.O. *"Baruna Jaya 1"*, cruise KARUBAR, off the Tanimbar and Kai Islands, eastern Indonesia, coll. Bouchet, Kastoro & Métivier, all in MNHN: sta. DW18, 05°18' S, 133°01' E, 205-212 m, 24 Oct. 1991 (4). — Sta. DW29, 05°36' S, 132°56' E, 181-184 m, 26 Oct. 1991 (1). — Sta. DW30, 05°39' E, 132°56' E, 118-111 m, 26 Oct. 1991 (1). — Sta. DW50, 07°59' S, 133°02' E, 184-186 m, 29 Oct. 1991 (2 lv).
South Africa. Off Sodwana Bay, Zululand, 100 m, coll. A. Connell, 14 Nov. 1979 (1 NMP B3448). — Off Richards Bay, Zululand, 29°02.3' S, 32°10.1' E, coll. A. Connell, 8 May 1985 (1 NMP D1534; Figs 11 h-i). — Natal, dredged off Park Rynie, 150 m, coll. R. Kilburn, 5 March 1981 (1 NMP B3929; Figs 11 a, d). — Natal, dredged off Park Rynie, 100-110 m, coll. R. Kilburn, 4 March 1981 (1 NMP B3933). — R.V. *"Meiring Naudé"*, off Park Rynie, Natal, 30°23.2' S 30°50.8' E, 140 m, 19 Aug. 1981 (2 NMP C1598). — R.V. *"Meiring Naudé"*, off Port Edwards, Natal, 31°06.8' S, 30°17.8' E, 120-125 m, 8 July 1985 (1 NMP D1384). — R.V. *"Meiring Naudé"*, off Port Grosvenor, Transkei, 39°57.9' S, 31°25.9' E, 120-128 m, Aug. 1981 (1 NMP C1175). — R.V. *"Meiring Naudé"*, off Mtamvuna River, Transkei, 31°05.0' S, 30°19.1' E, 100 m, 15 June 1983 (1 NMP C5455; Figs 11 j, 12 d-e). — R.V. *"Meiring Naudé"*, between Mtamvuna and Mzamba Rivers, Transkei, 31°05.6' S, 30°18.6' E, 100 m, 15 June 1983 (1 NMP C5416).

DISTRIBUTION. — Specimens of *G. hirasei* are known from a depth range of 80-390 m, from Japan (as far north as Okino-Yama Bank, off Boso Peninsula, Honshu; TSUCHIDA & KUROZUMI, 1996), the Philippine Islands, eastern Indonesia, New Caledonia and South Africa. In South Africa, it has been collected from west of the Mtamvuna River (to about 30°18' E) eastwards at least to Sodwana Bay, near the Mozambique border (implying that it occurs further north in the western Indian Ocean). These records indicate a range encompassing the Indian Ocean and the western Pacific archipelagoes.

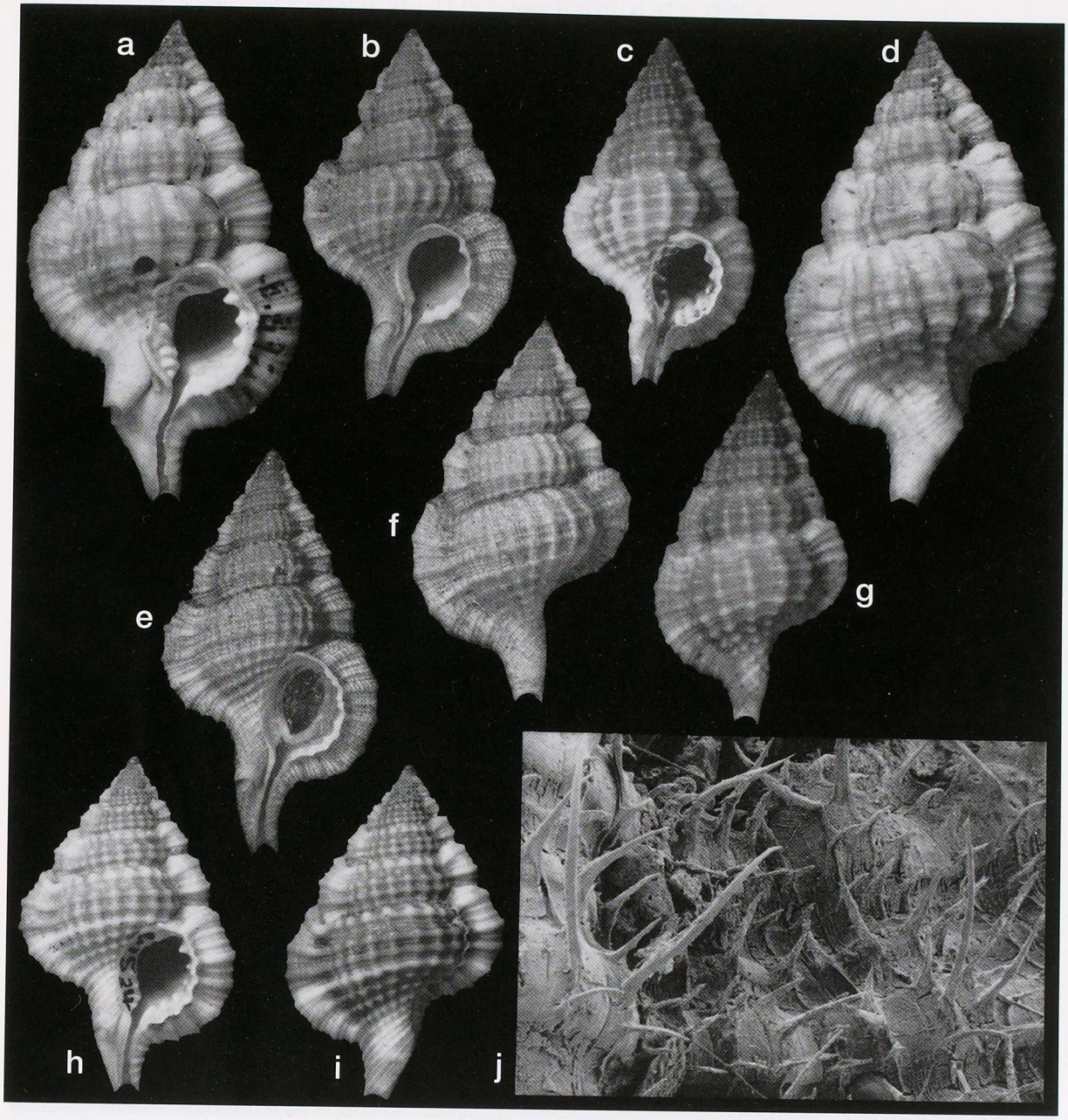

FIG. 11. — *Gyrineum hirasei* (Kuroda & Habe *in* Habe). — **a**, **d**, largest seen, NMP B3929, dredged, 150 m, off Park Rynie, Natal, South Africa, x2. — **b**, **f**, holotype, NSMT 53486, off Cape Ashizuri, Shikoku, Japan, x2. — **c**, **g**, NSMT (unreg.), 80 m, off Hachijo I., Izu Islands, Japan, x2. — **e**, NSMT 48933, trawled, Tosa Bay, Shikoku, Japan, x2. — **h**, **i**, NMP D1534, dredged off Richards Bay, Zululand, South Africa, x2. **j**, periostracum, SEM micrograph, NMP C5455, off Natal, South Africa, x20.

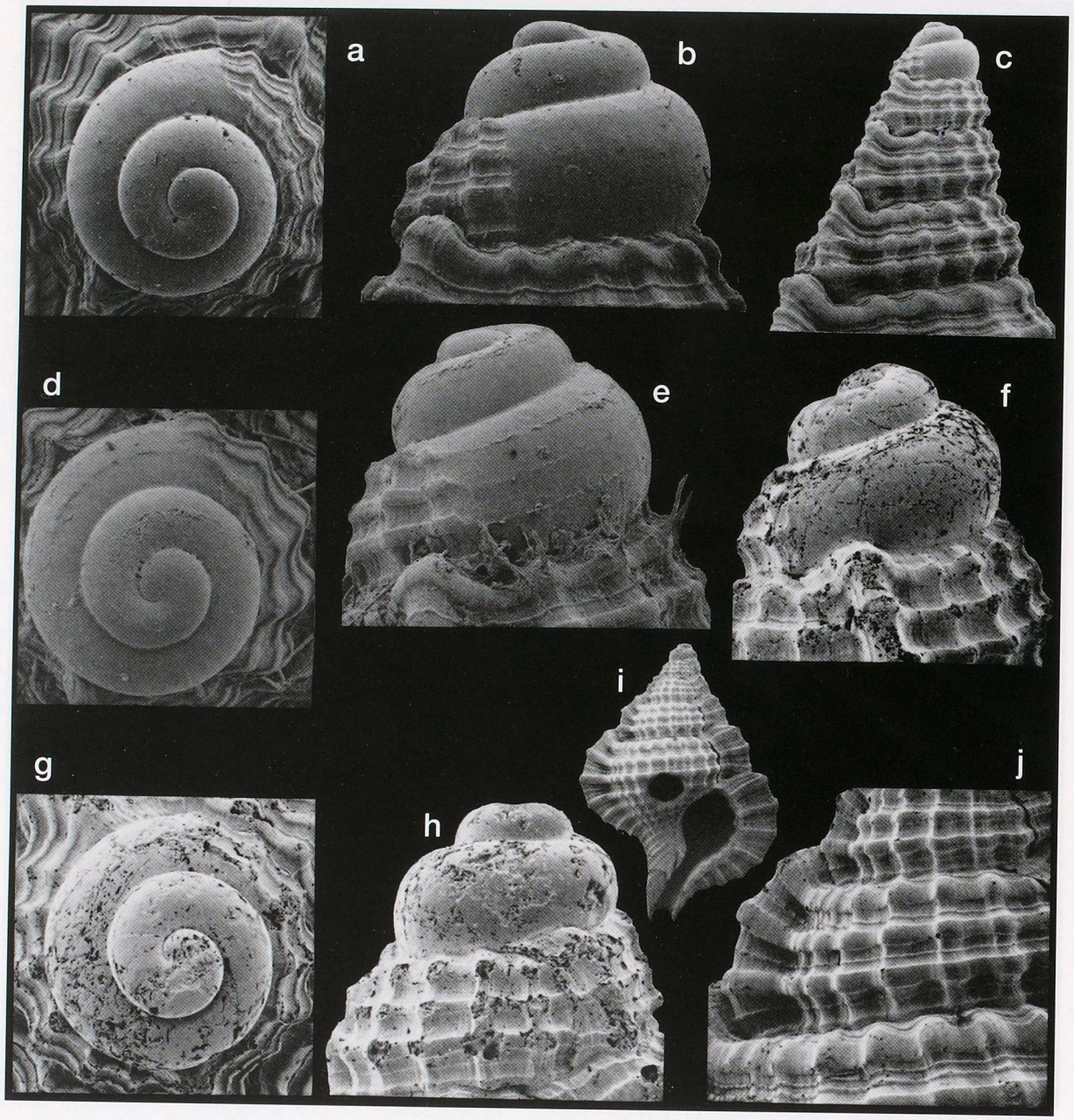

FIG. 12. — *Gyrineum hirasei* (Kuroda & Habe *in* Habe), SEM micrographs. — **a-c**, NZGS WM14878, dredged, South China Sea; a. x30 (showing *ca* 2.2 whorls); b. x36; c. x10. — **d-e**, NMP C5455, same specimen as Fig. 11 j; d. x36 (showing *ca* 2.2 whorls); e. x37. — **f-j**, MUSORSTOM 6: sta. DW397, Loyalty Ridge, New Caledonia, 380 m; f, h. x31; g. x32 (showing *ca* 1.9 whorls); i. x 3.8; j. x16.

DIMENSIONS. — Holotype: H 29.0, D 16.7; paratype: H 25.7, D 14.3. - Tosa Bay, NSMT 48933: H 31.2, D 16.7. - Kawamura Colln, largest: H 31.4, D 17.7. - Off Richards Bay, Zululand, NMP D 1534: H 26.1, D 16.7. - Off Park Rynie, Natal, NMP B3933: H 30.7, D 18.5; NMP B3929: H 37.5, D 21.4.

REMARKS. — *Gyrineum hirasei* is a highly distinctive, elongate species, resembling *G. bituberculare* in its tall spire and its very long anterior canal, but differing from *G. bituberculare* in its much smaller maximum size (although a single South African specimen I have examined is as large as an average-sized *G. bituberculare*), its straight spire outlines, its still taller spire, its very consistent fine, cancellate sculpture, and its completely consistent, distinctive, pale, pinkish orange to bright yellow-orange colour with vaguely defined white subsutural and basal bands. Specimens dredged alive have a thick, slightly felted to densely bristled, pale brown periostracum covering the entire teleoconch. The protoconch has 2.2 whorls. Although *G. hirasei* was described as a species of *Biplex*, it lacks the widely extended varices of *Biplex* and appears to be most similar to *Gyrineum bituberculare*.

This species has been recorded previously only from Japan ("uncommon at about 100 m depth from Enshu Nada, Honshu to Tosa Bay, Shikoku"; HABE, 1964: 71) but I have seen a few specimens from the Philippine Islands (most specimens so identified from the Philippine Islands have proved, however, to be *G. longicaudatum*). In view of this recorded distribution, it was of some surprise to receive nine lots from South Africa on loan from the Natal Museum, and to realise that *G. hirasei* is the most common species of *Gyrineum* in dredgings off South Africa. Four lots are also present in MNHN collections from off the Tanimbar and Kai Islands in eastern Indonesia, and two juvenile specimens are present in collections from the Loyalty Ridge, New Caledonia, so this species probably occurs widely in the Indo-West Pacific in about 100-400 m of water. Protoconchs of South China Sea and South African specimens have 2.2 whorls (Figs 12 a, d) whereas a Loyalty Ridge specimen has 1.9 whorls (Fig. 12 g).

Gyrineum lacunatum (Mighels, 1845)

Figs 6 j-k, 13 a-o, 14 a-h

Triton lacunatum Mighels, 1845: 24.
Ranella sagitta Küster *in* Küster & Kobelt, 1871: 147, pl. 38 a, fig. 6.
Ranella chemnitzii Küster *in* Küster & Kobelt, 1871: 148, pl. 39, figs 3-4.
Ranella polychloros Tapparone-Canefri, 1875a: 1028.
Ranella junghuhni Martin, 1879: 54, pl. 10, fig. 2.
Apollon facetus Iredale, 1936: 309, pl. 24, fig. 3.
Apollon deliberatus Iredale, 1936: 310, pl. 24, fig. 4.
Apollon pusillis cuspidataeformis Kira, 1956: 122, fig. 2.

Triton lacunatum - JOHNSON, 1949: 226.
Gyrineum lacunatum - WILSON, 1993: 241, pl. 40, figs 8 a-c.
Ranella sagitta - KOBELT, 1876b: 330.
Ranella chemnitzii - KOBELT, 1876b: 331.
?*Bursa (Apollon) garretti* - SEMPER, 1874: 139 (*nomen nudum*).
?*Ranella garretti* - SCHMELTZ, 1877: 82.
Ranella junghuhni - MARTIN, 1899: 150. — VAN DER VLERK, 1931: 241.
Gyrineum (Gyrineum) junghuhni - ALTENA, 1942: 98. — SKWARKO & SUFIATI, 1994: m14.
Apollon facetus - RIPPINGALE & MCMICHAEL, 1961: 68, pl. 7, fig. 16.
Ranella pusilla - REEVE, 1844b: pl. 8, figs 44a-b. — KRAUSS, 1848: 113. — FORBES, 1852: 365. — FISCHER, 1860: 357. — PEASE, 1868: 107. — ANGAS, 1871: 88. — KOBELT, 1876b: 330. — SCHMELTZ, 1877: 82.
Tritonium pusillum - LANGKAVEL, 1871: 4. — MARTENS & LANGKAVEL, 1871: 4.
Bursa (Apollon) pusilla - BRAZIER, 1877: 175 (not *Ranella pusilla* Broderip, 1833).
Ranella (Argobuccinum) pusilla - TRYON, 1880: 44, pl. 24, figs 56-58, 66. — WATSON, 1886: 402.
Ranella (Apollon) pusilla - TAPPARONE-CANEFRI, 1881: 55. — MELVILL & STANDEN, 1895: 110.
Gyrineum (Apollon) pusillum - MELVILL & STANDEN, 1899: 164.
Gyrineum pusillum - HEDLEY, 1907: 483. — SCHEPMAN, 1909: 115. — HEDLEY, 1918b: M67. — YEN, 1942: 214. — KAY, 1979: 226, figs 79 g-h. — KILBURN & RIPPEY, 1982: 75, pl. 17, fig. 9. — BEU, 1985: 56. — SPRINGSTEEN & LEOBRERA, 1986: 114, pl. 31, fig. 10. — OKUTANI, 1986: 112; 113, third fig. in right column. — SHORT & POTTER, 1987: 48, pl. 23, fig. 7. — DRIVAS & JAY, 1988: 66, fig. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 11. — LAI, 1989: 118, figs 10-11. — HENNING & HEMMEN, 1993: 29, pl. 4, fig. 2. — BOSCH *et al.*, 1995: 95, fig. 348.
Apollon pusillus - OYAMA & TAKEMURA, 1959: *Apollon* pl. 2, figs 1-2. — HABE, 1961: 45, pl. 22, fig. 3; 1964: 71, pl. 22, fig. 3.
Apollon (Gyrinella) pusillus - HABE & KOSUGE, 1966a: 42, pl. 15, fig. 8.
Apollon pusillis cuspidataeformis - MATSUMOTO, 1979: 38, pl. 8, fig. 2. — OYAMA & TAKEMURA, 1959: *Apollon* pl. 2, figs 3-4.
Gyrineum (Gyrineum) pusillum var. *cuspidataeformis* - HENNING & HEMMEN, 1993: 29, pl. 4, fig. 3.

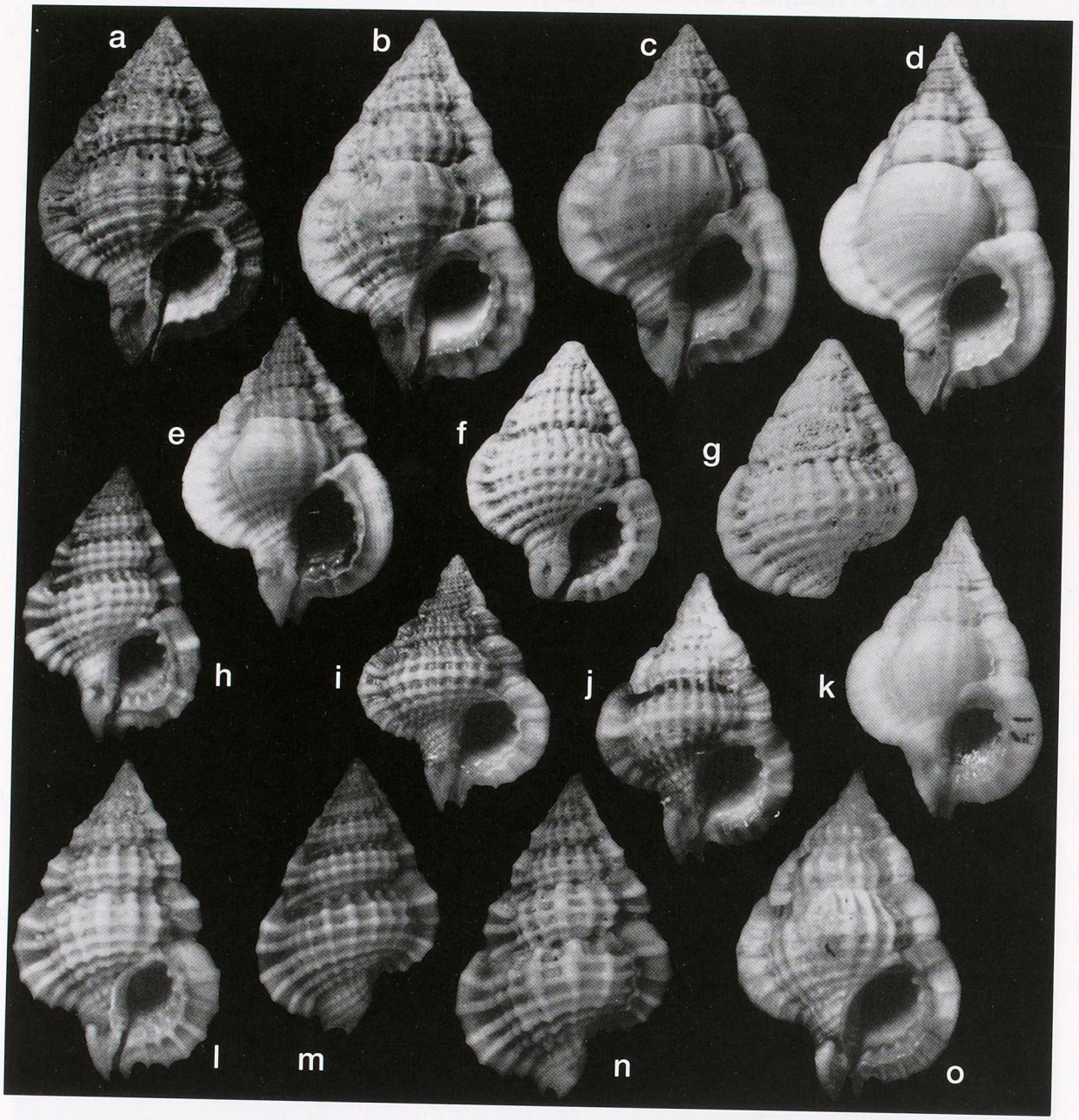

FIG. 13. — *Gyrineum lacunatum* (Mighels), all x2.5. — **a-d**, AMS C116449, paralectotypes of *Apollon deliberatus* Iredale, dredged, 15 m, Lindeman I., Queensland, Australia. — **e**, lectotype of *Apollon deliberatus* Iredale, AMS C60682, data as above. — **f-g**, holotype of *Ranella junghuhni* Martin, RMNH 9931, Miocene, Java. — **h**, **m**, neotype of *Triton lacunatum* Mighels, BMNH 1986096/1, REEVE's (1844a: pl. 8, fig. 44a) specimen figured as "*Ranella pusilla* Broderip", "Philippine Islands", *ex* Cuming Colln. **i**, holotype of *Apollon facetus* Iredale, AMS C60681, Sydney Harbour, New South Wales, Australia. **j**, AMS C147609, Otter Reef, N. Queensland, Australia. — **k**, *cuspidataeformis* form, AMS C147608, Broadhurst Reef, E. of Townsville, Queensland, Australia. — **l**, **n**, **o**, 2 "syntypes" of *Ranella pusilla* Broderip accompanying neotype of *Triton lacunatum* Mighels. **l**, **n**, BMNH 1986096/2. **o**, BMNH 1986096/3.

TYPE DATA. — As noted below, neotype (designated here) of *Triton lacunatum*, of *Ranella sagitta*, and of *Ranella chemnitzii* BMNH 1986096/1 (Figs 13 h, m), with 5 other specimens previously regarded as syntypes of *Ranella pusilla* (BMNH 1986096/2-6), from "Philippine Islands", *ex* Cuming Colln. — *Ranella polychloros*: type material not seen, presumably in Museo Civico di Storia Naturale "Giacomo Doria" in Genova, Italy; from Wokan, Aru Islands, southeastern Indonesia, coll. Beccari (TAPPARONE-CANEFRI, 1875: 1028). — *Ranella junghuhni*: holotype RMNH 9931 (Figs 13 f-g), from Junghuhn's Locality H, "Miocene, Java". — *Apollon deliberatus*: lectotype (designated here; Iredale's figured syntype) AMS C60682 (Fig. 13 e), with 65 paralectotypes: 62 AMS C116449 (Figs 13 a-d), 3 NZGS WM14606), all dredged 15 m, off Lindeman I., Whitsunday Passage, Queensland, by M. Ward & T. Iredale. — *Apollon facetus*: holotype AMS C60681 (Fig. 13 i), dredged, Sydney Harbour, New South Wales, by M.V. *"Triton"*. — *Apollon pusillus cuspidataeformis*: type not seen, stated by KIRA (1956) to be from a small islet off Nagashima, Mie Prefecture, Kii Peninsula, Japan, "littoral, with *A. pusillus*".

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. D35. — CORAIL 2: sta. DW4, DW9, DW79.

New Caledonia. LAGON: sta. 10, 17, 46, 63, 68, 69, 72, 79, 84, 92, 110 bis, 111, 112, 116, 120, 123, 127 (Fig. 6 k), 129, 133, 146, 147, 151, 152 (Fig. 6 j), 180, 181, 229, 243, 244, 247, 248, 249, 251, 259, 260, 264, 301, 312, 319, 320, 322, 324, 327, 328, 356, 357, 359, 368, 374, 375, 384, 384 bis, 398, 400, 403, 405, 409, 433, 440 bis, 443, 452, 455, 477, 478, 481, 483, 484, 489, 522, 529, 535, 542, 545, 558, 560, 569, 570, 581, 597B, 598, 599, 600, 601, 602, 603, 604, 606, 619, 623, 633, 648, 675, 676, 682, 698, 710, 712, 713, 723, 726, 747, 749, 765, 769, 771, 781, 807, 808, 814, 815, 820, 830, 836, 840, 855, 864, 867, 885, 886, 899, 900, 911, 980, 983, 994, 1011, 1026, 1027, 1030, 1040, 1069, 1105, 1123, 1126, 1134, 1139, 1140, 1154, 1156, 1158, 1168, 1174, 1193, 1196. — EXPÉDITION MONTROUZIER: sta. 1242, 1259, 1260, 1261, 1299, 1306, 1308, 1310, 1311, 1312, 1314, 1315, 1316, 1318, 1319, 1321, 1322, 1323, 1333. — LAGON DE NOUMÉA: sta. 1352, 1354, 1355, 1356. — Banc Gail, Lagon SW de Nouméa, 27 m. — BATHUS 1: sta. DW678, CP680, DW692, DW1233, DW1235.

North of New Caledonia. MUSORSTOM 4: sta. CP148, DW 149, DW187.

Norfolk Ridge. *"Vauban"* 1978-1979: sta. 10, 48. — MUSORSTOM 4: sta. DW204. — CHALCAL 2: sta. DW80. — SMIB 8: sta. DW186. — BATHUS 2: sta. DW714.

The depth range in these 186 samples is intertidal to 210 m, but most were taken in 20-50 m, and few over 80 m.

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. CP961, 20°18' S, 169°50' E, 100-110 m (1). — Sta. DW1021, 17°43' S, 168°37' E, 124-130 m (1).

DISTRIBUTION. — The distribution of *Gyrineum lacunatum* almost coincides with the limits of the tropical Indo-West Pacific faunal province, *i.e.* it occurs throughout the Indian and western Pacific Oceans (but not in the Red Sea, where it is replaced by the similar *G. concinnum*). In the Indian Ocean, it ranges from Port Alfred, South Africa (NMP D2188; 19 other lots from South Africa and Mozambique examined on loan from Natal Museum), through the oceanic islands (Mauritius and Réunion; DRIVAS & JAY, 1988: 66; also material examined in MNHN and NZGS), along the entire East African coast, to Oman (NZGS WM13167, Masirah I., pres. E. & D. Bosch), then eastward to Hawaii (KAY, 1979: 226) ("Oahu" [but probably really from Kauai], type locality of *Triton lacunatum*; JOHNSON, 1949: 217, 226). The southern limit seems to be near Sydney, New South Wales (Sydney Harbour *"Triton"* dredgings, Captain Comtesse, holotype of *Apollon facetus*, + one other specimen in AMS; Botany Heads, New South Wales, *ex* Hargreaves Colln (1 AMS C147607); Cape Banks, New South Wales, *i.e.* Kurnell headland, S. Botany Bay, 1 AMS); a single specimen has been seen from Lord Howe Island, southwest Pacific (AMS C59464) and, of course, taken abundantly around New Caledonia. The northern limit in Japan is the Izu Peninsula, Honshu (HABE, 1964: 71).

DIMENSIONS. — See Table 2.

REMARKS. — As noted below, BRODERIP's (1833a) type specimens of *Gyrineum pusillum* are a white species of *Gyrineum* with a distinctive protoconch of only 0.8 whorls. They are not conspecific with the multicoloured, variably sculptured species with a protoconch of 1.8-2.2 whorls that has borne this name since the highly influential works of G.B. SOWERBY II (1835-1836) and REEVE (1844b) incorrectly illustrated *G. lacunatum* under the name *Ranella pusilla*. As BRODERIP (1833a: 194) clearly described *Ranella pusilla* as "*alba*", the approach taken here has been to designate one of Broderip's undoubted white syntypes as the lectotype of *Ranella pusilla*, and adopt the next available name for the multicoloured species more usually known by this name, in preference to applying Broderip's name to one of his more doubtfully associated syntypes(?) and proposing a new species name for the white species.

The next available name for *Gyrineum pusillum* of most authors is *Triton lacunatum*. JOHNSON (1949) reviewed the publications and existing type specimens of J.W. MIGHELS, and was unable to record any remaining original material of *Triton lacunatum*. MIGHELS' (1845: 24) description states "varices extending on both sides from the apex to the base; "aperture ... stained with purple", and so there is no doubt that this name applies to the species usually known as *G. pusillum*. A neotype is designated here for *Triton lacunatum*: the specimen figured by REEVE (1844b: pl. 8, fig. 44 a) as *Ranella pusilla*, and until recently labelled in BMNH as a possible syntype of *Ranella pusilla*. This specimen recently has been recatalogued as BMNH 1986096/1.

TABLE 2. — Dimensions (in mm) of *Gyrineum lacunatum* (Mighels).

Locality etc.	H	D
Neotype, BMNH 1986096/1	20.9	14.2
"syntypes" of *Ranella pusilla* BMNH 1986096/2-6	17.6	11.6
" "	23.6	14.8
" "	19.9	13.0
" "	16.9	12.5
" "	13.9	8.4
Holotype of *Ranella junghuhni*	15.6	11.8
Holotype of *Apollon facetus*	18.7	13.6
Lectotype of *Apollon deliberatus*	19.3	13.3
Paralectotypes of *Apollon deliberatus* AMS C116449	23.4	15.3
" "	24.5	15.4
" "	24.0	15.6
" "	24.5	15.0
Rockhampton, Queensland, NZGS WM15531	27.6	17.6
Mauritius, NZGS WM13883	24.8	16.9
" "	22.9	14.7
Kelso Beach, Natal, S. Africa, NMP B2639	22.5	15.0
Durban, South Africa, Burnup Colln, NMP 193	21.5	15.2
" "	21.7	15.1
Mzamba Beach, Transkei, S. Africa, NMP B4491	21.6	14.3

Gyrineum lacunatum is the most widespread, most common, and most variable species of *Gyrineum*, and so has received many synonyms. It is also the most common of the shallow-water tonnoideans studied here in the New Caledonian region, occurring in 186 samples. While all specimens are united by their small size (rarely exceeding 20 mm in height), their turbiniform protoconch of 1.8 to (more usually) 2.2 whorls (Figs 14 h, f) (but ranging to as many as 2.6 whorls; Fig. 14 c), their strongly cancellate sculpture on early spire whorls, their short, rapidly contracted last whorl and short anterior canal, and their pale pinkish lilac to deep violet aperture, the sculpture of intervariceal intervals of the last two whorls and the coloration are extremely variable. All specimens have even, cancellate sculpture on the early spire whorls, but as the shell grows the sculpture can either remain coarsely cancellate, or the axial costae can fuse together into larger ridges, or become low and weak, eventually fading out altogether on the last one or two intervariceal intervals of some specimens. The spiral sculpture varies in the same way, on some specimens independently of the axial sculpture or, on others, concomitantly with it. In most specimens on which the sculpture becomes subdued over the last few intervariceal spaces, the colour pattern also fades out, so the exterior is uniform white. The end result in many samples (*e.g.* the many large collections of immature specimens, up to *ca* 10 mm long, that many museums have recently acquired from "deep-water shell debris" from the Philippine Islands) is a dimorphic population consisting either of cancellate, brightly banded pink, white and brown shells, or almost smooth (with subdued spiral cords and, on most shells, 2-3 low, smooth, widely spaced axial costae in each intervariceal interval), white shells in which the purple aperture provides the only obvious colour. The form named *Apollon pusillus cuspidataeformis* by KIRA (1956) is the latter smooth form (Fig. 13 k), but this had earlier been named *Apollon deliberatus* by IREDALE (1936: 310). Iredale's type lot of *A. deliberatus* consists of 66 specimens, and these show an enormous range of variation from coarsely cancellate to smooth, weakly colour-banded to white, apertures pale purple to white, but all clearly intergrading and conspecific.

The case of *Apollon facetus* is more complex. Iredale's holotype is a very wide, short, white shell with coarsely cancellate sculpture. Its protoconch (Figs 14 f-g) is abraded but clearly had about 2 whorls. Some specimens of this type from New Caledonia have a protoconch with a wider initiation than usual, and then have only 1.8-2.0 protoconch whorls, rather than the 2.2 or more whorls of most specimens. The huge collection from New Caledonia was, therefore, studied carefully (186 samples, *ca* 400 specimens), and it is clear that the shell width and protoconch whorl numbers vary as much as all other characters.

The status of the other listed synonyms also deserves comment. The obscurely published *Bursa (Apollon) garretti* SEMPER (1874) is accompanied only by the comment "*R. rosea* Reeve *vero simil*" and is a *nomen nudum*; in view of the pink specimens assigned below, with some hesitation, to *G. pusillum (sensu stricto)* it could conceivably have been intended for either *G. lacunatum* or *G. pusillum*. *Apollon polychloros* was described as "*albo, carneo et fusco spiraliter zonata*" and "*apertura parva violascens*", leaving no doubt that it refers to

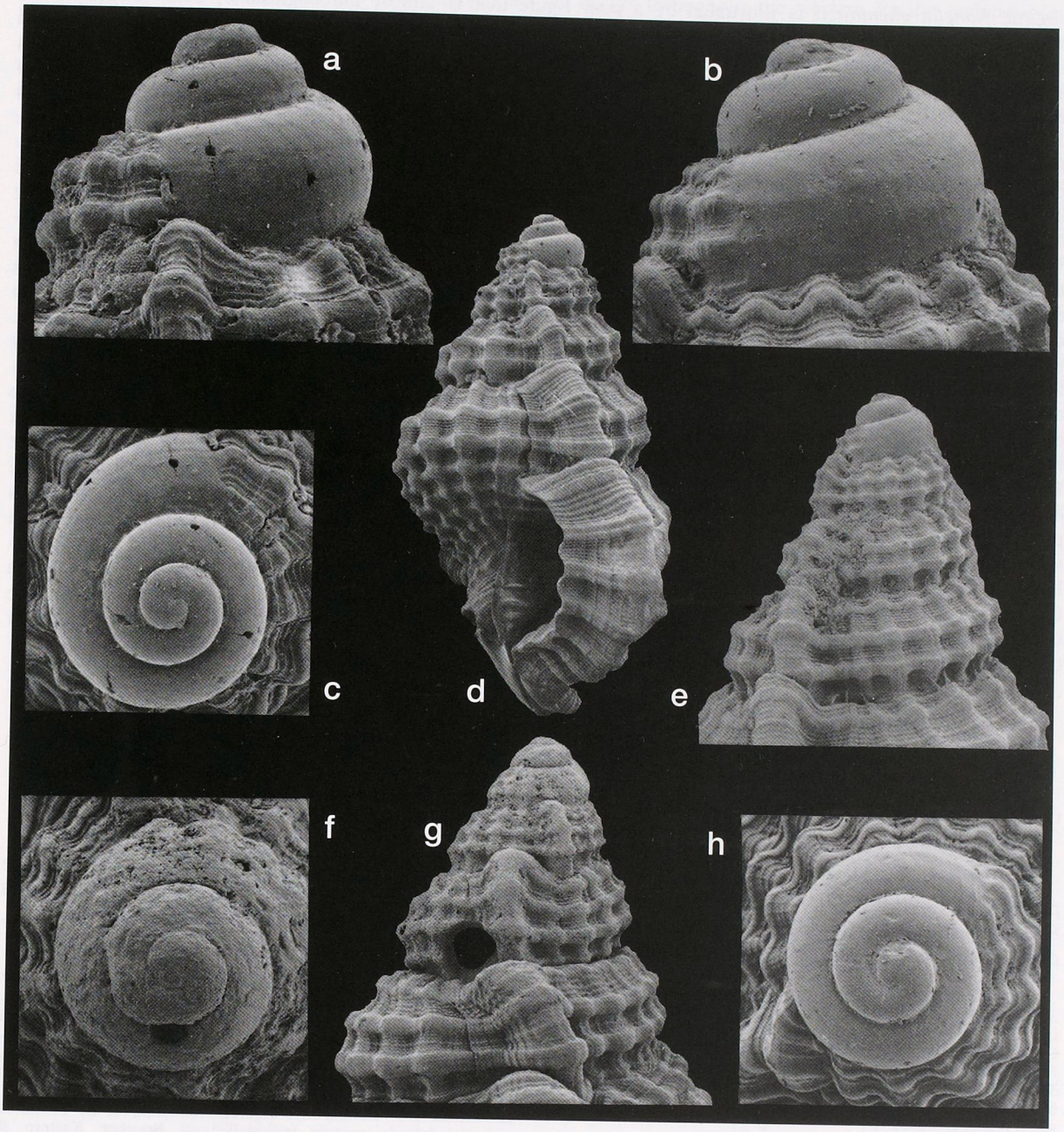

FIG. 14. — *Gyrineum lacunatum* (Mighels), SEM micrographs. — **a**, **c-d**, NZGS WM13183, Mactan I., Cebu, Philippines. a. x37; c. x34 (showing *ca* 2.6 whorls); d. x10. — **b**, **e**, **h**, lectotype of *Apollon deliberatus* Iredale (see Fig. 13 e); b. x49; e. x14; h. x37 (showing *ca* 2.2 whorls). — **f-g**, holotype of *Apollon facetus* Iredale (see Fig. 13 i); f. x38 (showing *ca* 2.0 whorls); g. x13.

G. lacunatum. Ranella sagitta is illustrated by a poorly drawn and coloured figure that could have been intended to show either *G. lacunatum* or *G. concinnum*; it makes little difference which, as both are earlier names than *R. sagitta. Ranella chemnitzii* is illustrated by a poor figure that is almost unrecognisable, even to genus; the description includes a reference to the figure by CHEMMITZ (1795, vol. 11, pl. 193, figs 1860-1861), which is an indeterminate figure that could represent either a *Gyrineum* species such as *G. bituberculare*, or a *Cymatium* species such as *C. nicobaricum*. To clarify the application of the names *Ranella sagitta* and *Ranella chemnitzii*, both of Küster *in* KÜSTER & KOBELT (1871), the specimen here designated as the neotype of *Triton lacunatum* (BMNH 1986096/1) is also here designated the neotype of both *Ranella sagitta* and *R. chemnitzii*. The holotype of *Ranella junghuhni* is an evenly cancellate but quite severely abraded specimen of *G. lacunatum* (Figs 13 f-g), evidently picked up in a stream rather than removed from an outcrop. The type material of *Apollon pusillus cuspidataeformis* has not been seen, but Kira's description and figure leave no doubt that he was describing the near-smooth variant of *G. lacunatum*.

The confusion over the application of the name *Ranella pusilla* results from the collection of specimens in BMNH treated as syntypes of *R. pusilla*. This lot, until recently all catalogued together as BMNH 1984256, consists of nine specimens, three white with a protoconch of 0.8 whorls, the other six multicoloured and with a protoconch of 2.2 whorls. BRODERIP's (1833a: 194) description merely states "*Ran. [ella] testa pyramidali, alba, granulosa.* long. 8/12, lat. 5/12 *poll. Hab.* in Oceano Pacifico (Lord Hood's Island). Found on the reefs". It is therefore, clear that the three white syntypes, from Lord Hood's Island (South Marutea I., Tuamotu Islands; DANCE, 1966: 148), are the only original syntypes, and the other six (from the Philippine Islands) must have been added *after* Broderip described the species. Therefore, the six coloured specimens are not syntypes. The coloured specimens include the two illustrated by REEVE (1844a: pl. 8, figs 44 a-b): the original of REEVE's pl. 8, fig. 44 a (now BMNH 1986096/1) is a fresh, sharply cancellate, brightly coloured specimen, 17.6 mm high and 11.6 mm wide, here designated the neotype of *Triton lacunatum*, of *Ranella sagitta*, and of *Ranella chemnitzii*; the original of REEVE's pl. 8, fig. 44 b is a larger but rather corroded specimen, retaining a purple aperture, 20.9 mm high and 14.2 mm wide. REEVE (1844a: caption to pl. 8, fig. 44) commented that the shells "found by Mr Cuming at Lord Hood's Island in the Pacific are pale and discoloured", and no-one seems previously to have noticed that the specimens in this lot belong in two species. The least corroded of Broderip's undoubted (white) syntypes of *Ranella pusilla*, the only one with a fresh protoconch (BMNH 1984256/1), is here designated the lectotype of *Ranella pusilla*; the other two paralectotypes are BMNH 1984256/2-3.

Gyrineum longicaudatum sp. nov.

Figs 6 e-g, 15 a-l

Gyrineum cuspidatum - HINTON, 1978: 30, fig. 15.
Gyrineum n.sp. - HENNING & HEMMEN, 1993: 30, pl. 4, fig. 4.

TYPE DATA. — Holotype MNHN (*ex* NZGS WM15041, Fig. 6 e), 17 paratypes NZGS WM15041, a single paratype in AMNH 226539, ANSP 399243, AMS C202740, BMNH 1996034, LACM T2789, NMNZ M272485, USNM 880222 and NMP L2063, off Tudela, Pacijan I., between Leyte & Cebu, Philippine Islands (124°35' E, 10°40' N), dredged 400 m, F.J. Springsteen on local fishing boat, 29 Oct. 1987.

NEW CALEDONIA RECORDS. — **Coral Sea.** MUSORSTOM 5: sta. 375. — CHALCAL 1: sta. D9 (Figs 15 b, d), D11, D41, D47 (Figs 15 f, i, k-l), D52. — CORAIL 2: sta. DW1, DW4, DW9, DW19, DW21, CP24, DW60.
New Caledonia. LAGON: sta. 317, 319, 326, 331, 332, 350, 352, 357, 370, 374, 378 (Fig. 6 g), 382, 384, 384 bis, 386, 387, 397, 580, 598, 603, 604. — EXPÉDITION MONTROUZIER: sta. 1321, 1322. — BATHUS 1: sta. DW639, DW653.
North of New Caledonia. BATHUS 4: sta. DW932.
Norfolk Ridge. *"Vauban"* 1978-79: sta. 40. — MUSORSTOM 4: sta. DW203. — SMIB 5: sta. DW81, DW82. — SMIB 8: sta. DW154, DW159, 170-172. — BATHUS 2: sta. DW714, DW717.
Loyalty Ridge. MUSORSTOM 6: sta. DW462.

OTHER MATERIAL EXAMINED. — **Philippines.** Punta Engano, Mactan I., Cebu, pres. F.J. Springsteen (2 NZGS WM14966). — Off Panglao Peninsula, Bohol, 150 m (2 NZGS WM14962; Fig. 6 f). — Off Balicasag I., Bohol, 200-300 m (2 NZGS WM14070 + 1 returned to Abbey Specimen Shells, Santa Barbara; Figs 15 g-h, j). — Philippine Islands, local fishermen, in A.R. Arthur Colln (2; Figs 15 a, c, e). — Off Manila, fishing boats, A.R. Arthur Colln (1). — Between Bohol and Cebu, 50-150 m, from local fishermen, 1987 (4 MNHN). — Pamilacan I., Bohol, 9°30' N, 123°55' E, tangle nets in 90-145 m (1 AMS C160398). — Off Cebu, bottom nets, 140-180 m, Whitehead Colln (2). — Off Bohol, tangle nets, Whitehead Colln (1).
Indonesia. N.O. *"Baruna Jaya 1"*, cruise KARUBAR, off the Tanimbar and Kai Islands, eastern Indonesia, coll. Bouchet, Kastoro & Métivier: sta. DW22, 05°22' S, 133°01' E, 124-85 m, 25 Oct. 1991 (2). — Sta. DW30, 05°39' S, 132°56' E, 118-111 m, 26 Oct. 1991 (1). (all in MNHN).
Vanuatu. MUSORSTOM 8: sta. DW976, 19°25' S, 169°27' E, 160-182 m (1). — Sta. DW1021, 17°43' S, 168°37' E, 124-130 m (2). — Sta. CP1071, 15°37' S, 167°16' E, 180-191 m (1). — Sta. DW1105, 15°03' S, 167°07' E, 154-179 m (2).
The depth range in these 65 samples (including the holotype lot) is 45 to 400 m; most New Caledonian and Coral Sea samples are from depths of 60 to 200 m.

DISTRIBUTION. — The above-listed samples, almost all from either the Philippine Islands or New Caledonia, the Loyalty Ridge, and the Coral Sea, reflect sampling intensity in these two areas; the Indonesian and Vanuatu records demonstrate that *Gyrineum longicaudatum* occurs throughout the western Pacific archipelagoes between these extremes. The only previous records are by HINTON (1978: 30, fig. 15) who illustrated a specimen, presumably from New Guinea (no Australian specimens are present in Australian museums), under the name *G. cuspidatum*; and HENNING & HEMMEN (1993: 30, pl. 4, fig. 4) who illustrated a specimen from the Philippine Islands.

DESCRIPTION. — Small for genus (few specimens exceed 23 mm in height), with moderately tall spire and long, narrow, narrowly open anterior canal curved weakly to right. Varices fused into ridge up each side of teleoconch, thick, wider than in all other species of *Gyrineum*. Sculpture of early spire whorls consisting of cancellate narrow axial costae and narrow spiral cords, 7-9 costae (8 on most) in each intervariceal interval and 3 cords per whorl on most specimens, forming small rounded nodules at intersections; number of axial costae per intervariceal interval decreasing and their coarseness and spacing increasing down teleoconch, 7-8 costae remaining on a few evenly cancellate specimens but reduced to 4 or 5 costae on most (including holotype).

Aperture small, subcircular, with thin, almost continuous, protruding margining rim broken only by anterior canal; 7 rather long ridges inside outer lip, upper one or two bifid in some specimens; inner lip with free up-standing left margin or collar, and with 1-2 prominent ridges at top (adapical) end, 4-5 coarse ridges on base of columella and, in most specimens, a row of low nodules (spiral cords of previous whorl protruding through callus) along outer margin between other two areas of ridges. A few specimens pale brown, with darker varices banded white on spiral cords; most (including holotype) banded bright red-brown and white on spire and adapical half of last whorl, base white except for narrow, faint brown interspaces on neck and brown interspaces on varices; many specimens with pale blue or mauve wash on white areas. Aperture white or (on most specimens, including holotype) pale pinkish mauve. Protoconch of 1.3-1.6 whorls.

DIMENSIONS. — See Table 3.

TABLE 3. — Dimensions (in mm) of *Gyrineum longicaudatum* sp. nov.

Locality etc.	H	D
Holotype	21.7	14.8
Paratype, same lot as holotype	20.8	14.8
Paratype, same lot as holotype	20.5	14.3
Paratype, same lot as holotype	18.7	13.0
Paratype, same lot as holotype	17.9	12.8
Paratype, same lot as holotype	19.8	12.7
Paratype, same lot as holotype	18.9	12.2
Paratype, same lot as holotype	17.8	11.9
Paratype, same lot as holotype	16.7	11.2
Off Cebu, largest seen, Whitehead Colln	28.9	18.4
Off Manila, fishing boats, A.R. Arthur Colln	28.6	16.6
LAGON: sta. 331, Grand Récif Sud, New Caledonia	15.7	12.3
" sta. 352 " " "	19.0	12.6
" sta. 374 " " "	18.7	12.0
" sta. 374 " " "	16.8	11.3
" sta. 378 " " "	17.5	11.7
" sta. 382 " " "	16.2	12.2
" sta. 387 " " "	16.5	11.2
" sta. 387 " " "	16.4	10.4
MUSORSTOM 5: sta. 375, Chesterfield Bank, Coral Sea	24.0	14.5

REMARKS. — The combination of a long anterior canal (similar to that of offshore specimens of *G. bituberculare*), the small size, the unusually wide, thick varices, the pale mauve aperture (similar to, but never as bright as, that of most *G. lacunatum*), the brightly banded tan and white coloration, the raised, free rim of the inner

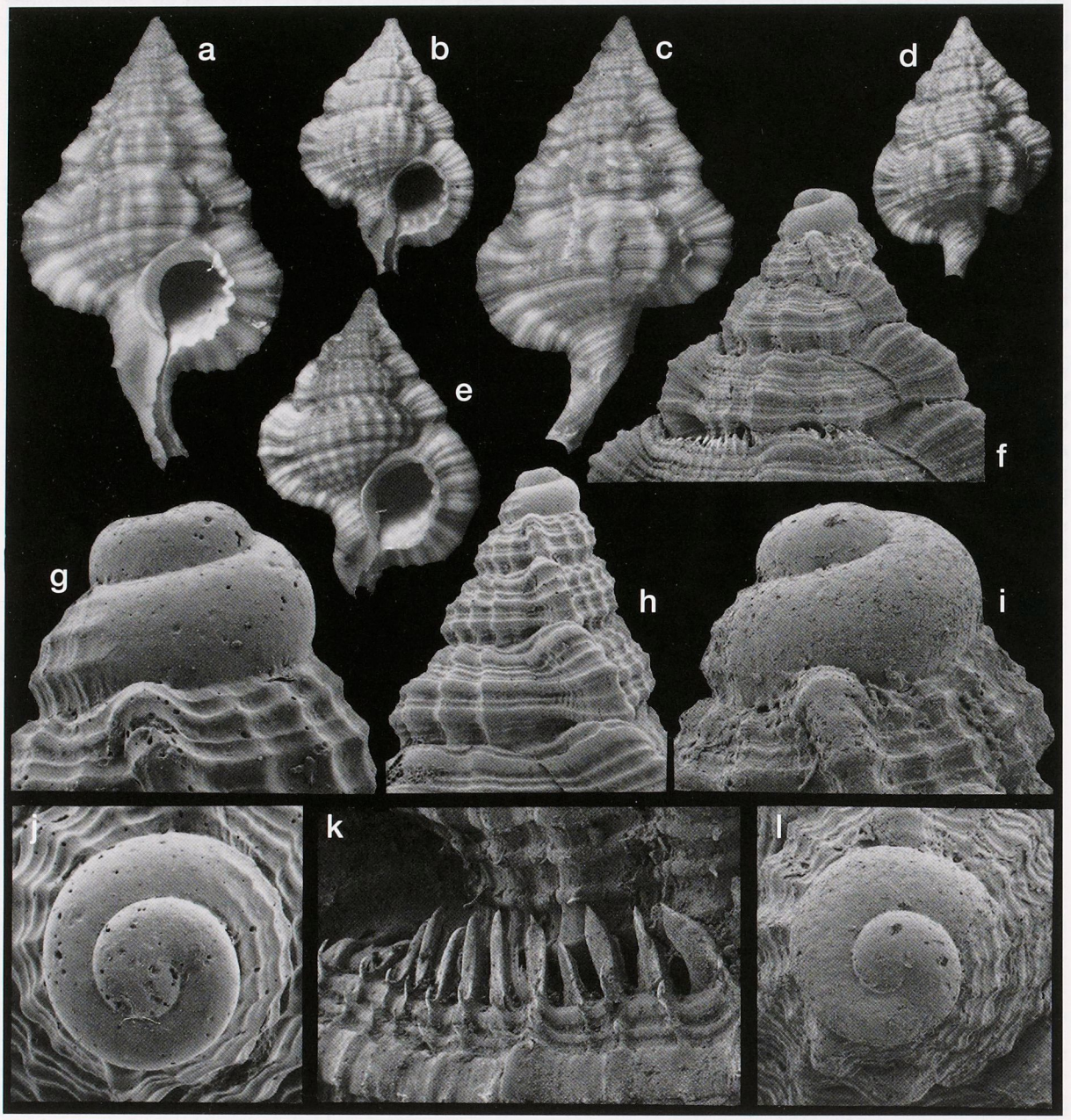

FIG. 15. — *Gyrineum longicaudatum* sp. nov. — **a**, **c**, **e**, 2 specimens, from fishing boats, Manila, Philippines, in A. Arthur Colln, x2.5. — **b-d**, CHALCAL 1: sta. D9, Lansdowne-Fairway Banks, Coral Sea, 75 m. — **f**, **i**, **k-l**, SEM micrographs, CHALCAL 1: sta. D47, Chesterfield-Bellona Plateau, Coral Sea, 70 m; f, x10; i. x34; k. periostracal bristles at suture, x30; l. x27 (showing *ca* 1.3 whorls. — **g-h**, **j**, NZGS WM14070, Balicasag I., Philippines; g. x43; h. x12; j. x38 (showing *ca* 1.6 whorls).

lip (a unique character), and a protoconch of only 1.3-1.6 whorls (Figs 15 l, j), makes *Gyrineum longicaudatum* one of the most distinctive species in the genus. In size and coloration it most closely resembles *G. lacunatum*, and most specimens I have seen have been removed from samples identified as *G. lacunatum*, but the longer anterior canal, the raised rim on the inner lip and, in particular, the number of protoconch whorls allow its immediate separation.

Gyrineum natator (Röding, 1798)

Figs 6 h, 16 a-i

Tritonium natator Röding, 1798: 127.
Biplex elegans Perry, 1811: pl. 5, fig. 3.
Ranella tuberculata Broderip, 1833a: 179.
Ranella olivator Mörch, 1852: 106.
?*Ranella prototubercularis* Noetling, 1901: 306, pl. 20, figs 9-9 a-d.
Gyrineum natator var. *robusta* Fulton, 1936: 10, pl. 2, fig. 4.

Gyrineum natator - LINK, 1807: 123. — ALTENA, 1942: 99. — HINTON, 1978: 30, fig. 12. — ABBOTT & DANCE, 1982: 125. — BEU, 1985: 56, fig. 7. — OKUTANI, 1986: 112; 113, 3rd fig. top row. — HENNING & HEMMEN, 1993: 28, pl. 3, fig. 1. — SKWARKO & SUFIATI, 1994: m15. — BOSCH *et al.*, 1995: 95, fig. 347.
Apollon (Apollon) natator var. - OYAMA & TAKEMURA, 1959: *Apollon* pl. 2, figs 11-12.
Ranella tuberculata - G.B. SOWERBY II, 1835: pl. 89, fig. 13. — KIENER, 1841: 27, pl. 12, fig. 2. — DESHAYES, 1843: 555. — REEVE, 1844b: pl. 7, fig. 36. — KÜSTER & KOBELT, 1871: 14b, pl. 39, figs 8-9. — KOBELT, 1876a: 51; 1876b: 330. — MARTIN, 1884: 137; 1919: 137, 146. — VAN DER VLERK, 1931: 241.
Bursa tuberculata var. - DUNKER, 1863-64: 54, pl. 18, figs 1-2.
Ranella (Argobuccinum) tuberculata - TRYON, 1880: 43, pl. 23, figs 45-47.
Ranella (Apollo) tuberculata - MARTIN, 1899: 149, pl. 23, figs 348-348 a.
Ranella (Apollon) olivator - TAPPARONE-CANEFRI, 1881: 54.
?*Ranella tubercularis* (*sic*) - NOETLING, 1895: 31, pl. 7, figs 1-1 a-c. — VREDENBURG, 1921: 270, 289; 1925: 251.
Apollon olivator robustus - KURODA & HABE, 1952: 39.
NOT *Apollon (Apollon) gyrinum robusta* - OYAMA & TAKEMURA, 1959: *Apollon* pl. 2, figs 9-10 [= *G. gyrinum gyrinum*].
NOT *Gyrineum* cf. *G. reticulare robusta* - LADD, 1982: 41, pl. 7, figs 5-6 [= *G. bituberculare*].

TYPE DATA. — *Ranella tuberculata*: 3 specimens labelled "possible syntypes", BMNH 1968534; the smallest of these (a very short specimen; H 42.1, D 26.0) bears a label "ig" (*i.e.* the remnants of "Fig") inside the aperture, and appears to be the original of REEVE (1844a, pl. 7, fig. 36) as the species was not illustrated by Broderip, and it matches Reeve's figure well. The specimens lack any other evidence of authenticity; their only early labels read "Bombay" and "Malacca". The specimens are from the Cuming Colln and, in the absence of any other possible type material, are accepted as syntypes of *Ranella tuberculata* Broderip. The medium-sized specimen of these three (H 48.6, D 28.2; Figs 16 d-e; BMNH 1968534/1) is here designated the lectotype of *Ranella tuberculata*, as well as the neotype of both *Tritonium natator* and *Biplex elegans*. The type locality is here designated as Bombay, India. — The name *Ranella olivator*, from MÖRCH's (1852) Yoldi catalogue, was a result of Mörch's nomenclaturally valid usage of the non-binominal names of MEUSCHEN (1778, *Museum Gronovium*), unavailable under ICZN Opinion 260. MÖRCH cited the following references for this name: "Mart. 4, 1229.30; *Gyrineum natator* (Trit.) Bolt Lnk.; *R. tuberculata* Brod.". The lectotype of *Ranella tuberculata*, designated above, is also designated here the lectotype of *Ranella olivator*. — The status of Noetling's names *Ranella tubercularis* [*sic*] and *Ranella prototubercularis* was discussed at some length by VREDENBURG (1921: 270, 298; 1925: 251) but remains unclear, and can be resolved only by examination of the specimens, presumably housed by the Geological Survey of India, Calcutta. The names were included in the synonymy of *G. natator* (with queries) by ALTENA (1942: 99). — *Gyrineum natator robustum*: holotype BMNH 19365263, from "Japan" (almost certainly incorrect) (Fig. 16 a).

OTHER MATERIAL EXAMINED. — Many lots in all major museums, not listed here. As the species has not previously been recorded from the Mozambique coast of East Africa, the following Natal Museum material deserves recording: Porto Amelia, Mozambique, intertidal on rocks, 1973 don. A. Ramalho, 1975 (3 NPM G4737; Fig. 16 c). — Chonguene, Mozambique, leg. Mrs S. Wastell (1 NMP 6025); off Beira, Mozambique, dredged, E. Roscoe, 28 January 1976 (3 NMP G8167, smallest illustrated, Figs 16 g-i).

DISTRIBUTION. — Throughout the western and central Indian Ocean, as far south as Beira, Mozambique, recorded from the Gulf of Arabia (BOSCH *et al.*, 1995: 95); common along the southern coast of Asia, frequently seen in collections from India, Hong Kong and Singapore; and south to Indonesia. The eastern and southern limits

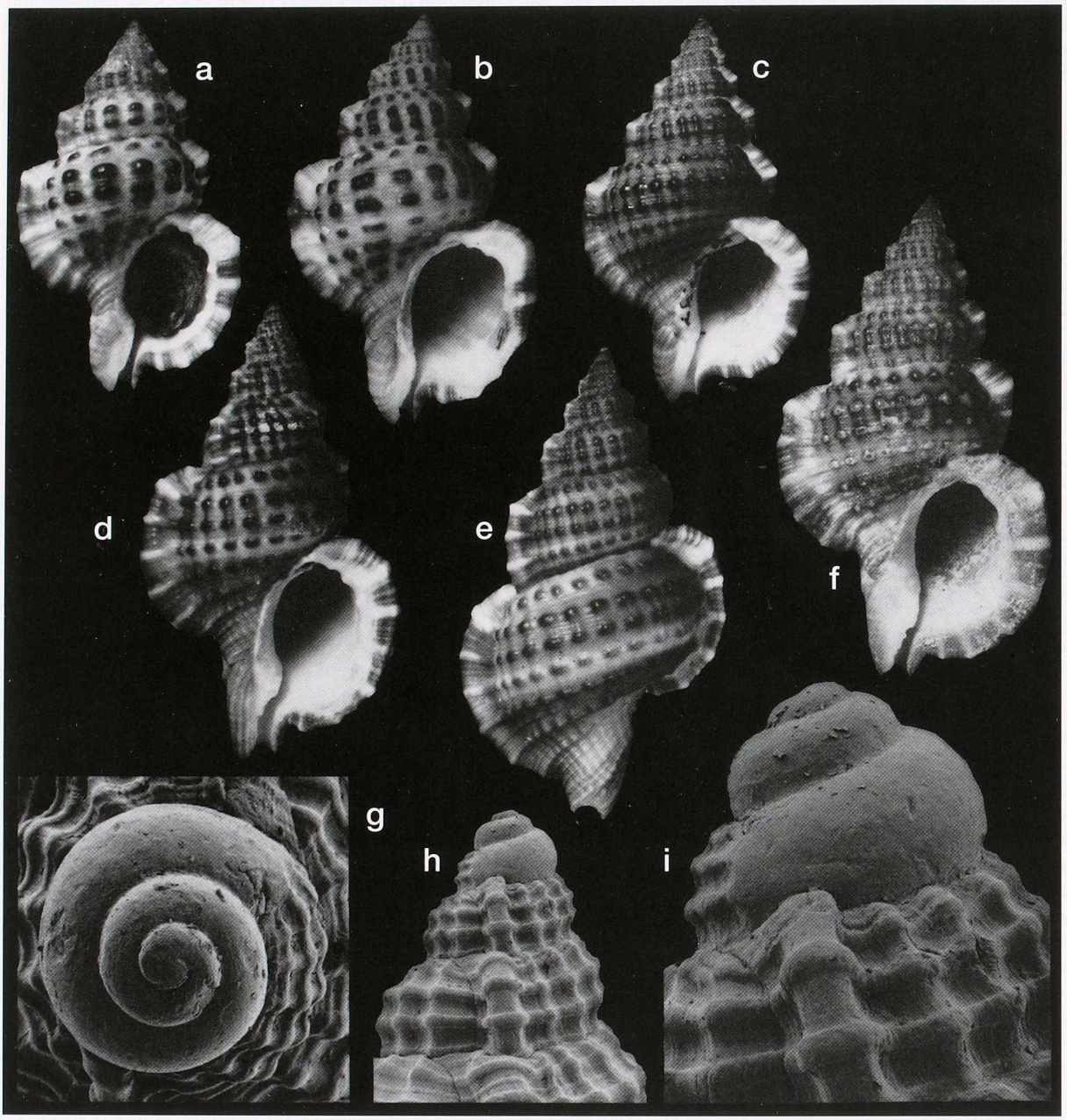

FIG. 16. — *Gyrineum natator* (Röding). — **a**, holotype of *Gyrineum natator robustum* Fulton, BMNH 19365263, "Japan" (wrong), x1.5. — **b**, **d-f**, syntypes of *Ranella tuberculata* Broderip, "Pacific Islands" ("Bombay" and "Malacca" on original labels), all x1.5. **b**, paralectotype, BMNH 1968534/2. **d-e**, lectotype, and neotype of *Tritonium natator* Röding and *Biplex elegans* Perry, BMNH 1968534/1. **f**, paralectotype, BMNH 1968534/3. — **c**, NMP G4737, intertidal rocks, Porto Amelia, Mozambique, x1.5. — **g-i**, NMP G8167, off Beira, Mozambique, SEM micrographs of protoconch, g. x33 (showing *ca* 2.7 whorls); h. x12; i. x36.

are poorly known; not recorded from Mauritius or Réunion by DRIVAS & JAY (1988), nor from the Philippine Islands by SPRINGSTEEN & LEOBRERA (1986). A lot in NZGS from "Sulu Sea" is as likely to be wrongly localised as it is to indicate an eastern limit just reaching into the southwestern Philippines. Recorded from New Guinea(?) by HINTON (1978: 30, fig. 12) but no specimens from Australia exist in Australian museums. The easternmost Indonesian specimens in AMS are from Bali (C60883) and the Moluccas Islands (C34885).

DIMENSIONS. — *Ranella tuberculata* and *R. olivator* (lectotype), and also *Tritonium natator* and *Biplex elegans* (neotype): H 48.6, D 28.2; paralectotype (REEVE's figured specimen): H 42.1, D 26.0; paralectotype: H 49.1, D 28.7. - Chonguene, Mozambique, NMP 6025: H 40.9, D 24.4. - Porto Amelia, Mozambique, NMP G4737: H 40.8, D 24.6; H 39.7, D 24.1. - Off Madras, S. India, NZGS WM15532: H 36.9, D 22.7 (Fig. 6 h). - Marua Beach, Brunei, Borneo, NZGS WM13803: H 36.7, D 22.4. - "India", AMS C36425: H 43.9, D 25.7.

REMARKS. — As with several species described above, the synonymy given by ALTENA (1942: 99) includes many other references to fossil records of *Gyrineum natator* from Pliocene to Pleistocene rocks of India, Indonesia and the Philippine Islands. MARTIN (1919: 137, 146) recorded it, as *Ranella tuberculata*, from the Miocene of Ngembak and the Pleistocene of Banjar Anjar, Java.

Gyrineum natator is a large, robustly sculptured species, easily distinguished from all its congeners by being the largest species of the genus, by its low varices, by its thin shell, by its more strongly shouldered whorls, producing a stepped outline to the varices, and by its dark brown to dark olive green-brown coloration, uniform in some specimens, and in others consisting of dark nodules on a paler ground (pale brown, yellow, or white). The aperture is white, with smoother lips than in most other species. The protoconch resembles those of other species with high whorl numbers, and has 2.6 whorls (Fig. 16 g).

Gyrineum pusillum (Broderip, 1833)

Figs 17 a-j

Ranella pusilla Broderip, 1833b: 194.

Ranella pusilla - G.B. SOWERBY II, 1835: pl. 84, fig. 1* (in part, asterisked figure only).
?*Apollon pusillus* - SALVAT & RIVES, 1975: 306, fig. 175.
NOT *Ranella pusilla* - G.B. SOWERBY II, 1835: pl. 84, fig. 1. — ?KOBELT, 1876a: 52. [= *G. concinum*].
NOT *Ranella pusilla* - REEVE, 1844b: pl. 8, figs 44a-b. — KRAUSS, 1848: 113. — FORBES, 1852: 365. — FISCHER, 1860: 357. — PEASE, 1868: 107. — ANGAS, 1871: 88. — KOBELT, 1876b: 330. — SCHMELTZ, 1877: 82. [= *G. lacunatum*].
NOT *Ranella pusilla* - SMITH, 1879: 815 [?= *G. gyrinum wilmerianum*].
NOT *Bursa (Apollon) pusilla* - BRAZIER, 1877: 175. [= *G. lacunatum*].
NOT *Ranella (Argobuccinum) pusilla* - TRYON, 1880: 44, pl. 24, figs 56-58, 66. — WATSON, 1886: 402. [= *G. lacunatum*].
NOT *Ranella (Apollon) pusilla* - TAPPARONE-CANEFRI, 1881: 55. — MELVILL & STANDEN, 1895: 110. [= *G. lacunatum*].
NOT *Gyrineum (Apollon) pusillum* - MELVILL & STANDEN, 1899: 164. [= *G. lacunatum*].
NOT *Gyrineum pusillum* - HEDLEY, 1907: 483. — SCHEPMAN, 1909: 115. — HEDLEY, 1918b: M67. — YEN, 1942: 214. — KAY, 1979: 226, figs 79 g-h. — KILBURN & RIPPEY, 1982: 75, pl. 17, fig. 9. — BEU, 1985: 56. — SPRINGSTEEN & LEOBRERA, 1986: 114, pl. 31, fig. 10. — OKUTANI, 1986: 112; 113, third fig. in right column. — SHORT & POTTER, 1987: 48, pl. 23, fig. 7. — DRIVAS & JAY, 1988: 66, fig. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 11. — LAI, 1989: 118, figs 10-11. — HENNING & HEMMEN, 1993: 29, pl. 4, fig. 2. — BOSCH *et al.*, 1995: 95, fig. 348. [= *G. lacunatum*].
NOT *Apollon pusillus* - OYAMA & TAKEMURA, 1959: *Apollon* pl. 2, figs 1-2. — HABE, 1961: 45, pl. 22, fig. 3; 1964: 71, pl. 22, fig. 3. [= *G. lacunatum*].
NOT *Apollon (Gyrinella) pusillus* - HABE & KOSUGE, 1966a: 42, pl. 15, fig. 8. [= *G. lacunatum*].
?*Bursa (Apollon) garretti* - SEMPER, 1874: 139 (*nomen nudum*).

TYPE DATA. — Lectotype BMNH 1984256/1, designated here, the most complete specimen, with good protoconch (Figs 17 a-d, g), 2 paralectotypes, BMNH 1984256/2-3; from "Lord Hood's Island", *ex* Cuming Colln (= South Marutea I., Tuamotu Islands). Semper's name *Ranella garretti* is a *nomen nudum* based on specimens from Polynesia "*R. rosea* Reeve *vero simil.*", and could refer to *G. pusillum*, to *G. roseum*, or to *G. lacunatum*.

OTHER MATERIAL EXAMINED. — **Eastern Polynesia.** Beach, Tubuai I., Austral Islands, French Polynesia, coll. J. Tröndlé, July 1977 (1 in Tröndlé Colln, Figs 17 e-f, h-j; 1 NZGS WM15533). — Beach, Rapa Island, SE of Raivavae, Austral Islands, French Polynesia, coll. J. Tröndlé, 1981 (1). — ?Raivavae, Austral Islands, specimens illustrated by SALVAT & RIVES (1975: 306, fig. 175).

DISTRIBUTION. — Apparently restricted to eastern Polynesia; poorly known.

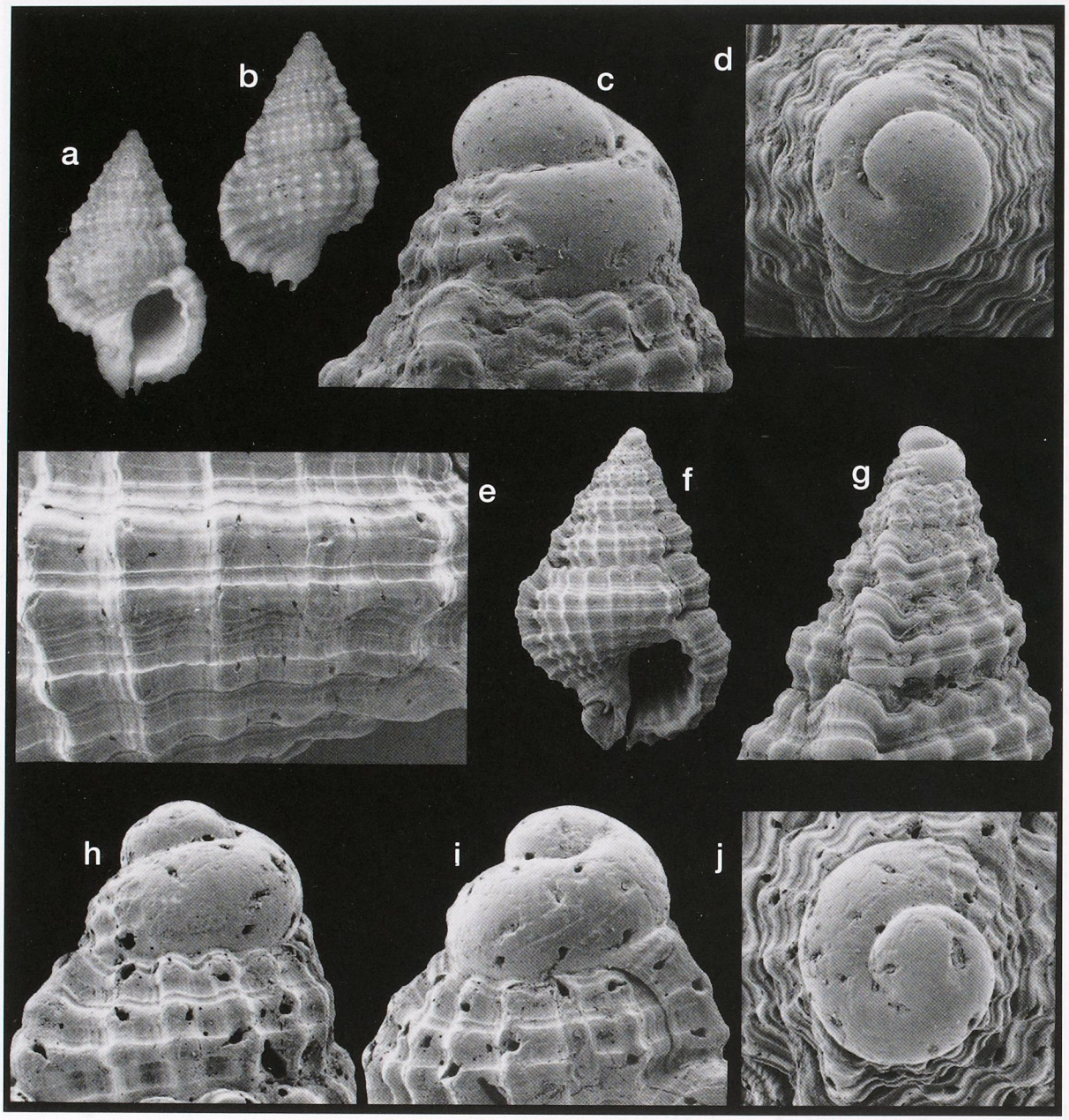

FIG. 17. — *Gyrineum pusillum* (Broderip). — **a-d**, **g**, lectotype, BMNH 1984256/1,"Lord Hood's Island" (South Marutea I., Tuamotu Islands), a-b. x2.5. c. x38. d. x30 (showing 0.8 whorls). g. x10.8. — **e-f**, **h-j**, MNHN, beach, Tubuai I., Austral Islands, French Polynesia, coll. J. Tröndlé, e. x15. f. x3.9. h, i. x32; j. x34 (showing *ca* 0.8-0.9 whorls).

DIMENSIONS. — *Ranella pusilla* (lectotype): H 16.5, D 10.1; paralectotypes: H 16.6, D 10.4; H 13.5, D 9.0.

REMARKS. — As noted under *Gyrineum lacunatum*, Broderip's only undoubted syntypes of *Ranella pusilla* are white shells with a bulbous protoconch of only 0.8 whorls, clearly distinct from the multicoloured species with a turbiniform protoconch of 1.8-2.2 whorls that has usually been known as *G. pusillum*. The syntypes of *G. pusillum* are small (13.4 to 16.5 mm high), narrow, evenly and finely nodulose, white shells with very low varices. The type locality is "Lord Hood's Island" (South Marutea Island, Tuamotu Islands; DANCE, 1966: 148; DANCE, 1980). The sole figure of the true *G. pusillum* in early iconographies is that by G.B. SOWERBY II (1835: pl. 84, fig. 1*) which appears to have been based on the specimen here designated the lectotype. The identity of the true *G. pusillum* has, however, been recognised from specimens collected in eastern Polynesia by Jean Tröndlé, who kindly made them available for examination. These two lots (two specimens from Tubuai in the Austral Islands, and two from Rapa) were identified by Tröndlé as *G. roseum* and, indeed, closely resemble western Pacific specimens of *G. roseum* in shape and sculpture. They differ most obviously from *G. roseum* in their very elevated and wide, bulbous protoconch initiation (Figs 17 c-d, h-j), producing a protoconch of only about 0.8-0.9 whorl, in their narrower shape, and in their white to pale pink or pale orange-yellow coloration, rather than the consistent dark pink, with yellow nodules, of *G. roseum.* It therefore seems likely that the uniform pale pink specimens from Raivavae, in the Austral Islands, illustrated by SALVAT & RIVES (1975: 306, fig. 175) are *G. pusillum*. All these eastern Polynesian specimens, including Broderip's type material of *G. pusillum*, have uniform sculpture of even rows of low nodules, without the large, fused nodules seen on many *G. roseum,* have lower, narrower varices than in *G. roseum,* and have very clearly and sharply margined spiral cords rather than the indistinctly margined cords, merging smoothly with their background, seen on *G. roseum.* The overall similar appearance of all these specimens to *G. roseum* suggests the possibility that there is an east-west cline in protoconch whorl numbers and that *G. roseum* and *G. pusillum* might be conspecific, but much more material from eastern and central Polynesia is needed to evaluate this.

Gyrineum roseum (Reeve, 1844)

Figs 6 n-o, 18 a-m

Ranella rosea Reeve, 1844b: pl. 8, fig. 46.

Ranella rosea - REEVE, 1844d: 139. — KOBELT, 1876b: 330.
Ranella pusilla var. *rosea* - SMITH, 1879: 815.
Ranella (Argobuccinum) pusilla - TRYON, 1880: 4 (in part not off Broderip, 1833).
Gyrineum roseum - HIRASE, 1936: 66, pl. 96, fig. 3. — OKUTANI, 1986: 112; 113, 2nd fig. right column. — LAI, 1989: 118, figs 12-13. — WILSON, 1993: 242.
Apollon roseus - KURODA & HABE, 1952: 39. — HABE, 1961: 45, pl. 22, fig. 2; 1964: 71, pl. 22, fig. 2. — HABE & KOSUGE, 1966a: 41, pl. 15, fig. 3.
Apollon (Apollon) roseus - OYAMA & TAKEMURA, 1959: *Apollon* pl. 2, figs 5-6.
Gyrineum (Gyrineum) roseum - BEU, 1985: 56. — SPRINGSTEEN & LEOBRERA, 1986: 114, pl. 31, fig. 9. — HENNING & HEMMEN, 1993: 30, pl. 4, fig. 1.

TYPE DATA. — 2 syntypes BMNH 1967662, the larger and fresher here designated the lectotype BMNH 1967662/1, (H 21.1, D 14.8, Figs 18 e-f); from "I. of Ticao, Philippines", *ex* Cuming Colln. The original label also says "3 largest MC", so one has apparently been lost from this lot. A further paralectotype is present in MCZ (MCZ 156180, "co-type, Philippine Islands, H. Cuming, *ex* C.B. Adams Colln"). As most lots of types of species named by REEVE (1844a, b) consist of three specimens, it is clear that Hugh Cuming sold other specimens to other malacologists. Syntypes of several of Reeve's species are present in MCZ (*Triton thersites*, MCZ 188154; *Triton moritinctus*, MCZ 188151; *Triton exilis*, MCZ 188153; *Triton trilineatus*, MCZ 188152; *Triton decipiens*, MCZ 188158; *Triton ridens*, MCZ 186600 [a specimen of *Distorsio decussata* (Valenciennes, 1832)] and possibly are present in other museums.

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. D2, D6, D7, D8, D15, D18, D24, D26 (Fig. 6 n), D29, D45, D47, D50, D51, D57. — Unlocalised. — CORAIL 2: sta. DW1, DW8, DW9, DW10, DW11, DW18, DW19, DW38, DW56, DW65, DW80, DW82, DW83, DW84, DW88, DW89, DW91, DW93, DW94, DW95, DW102, DW105, DW110, DW115, DW117, DW118, CP124, DW128, DW133, DW136, DW141, DW143, DW144, DW148, DW153, DW156, DW157, DW160. — W. Ilôt Reynart, 6 m.

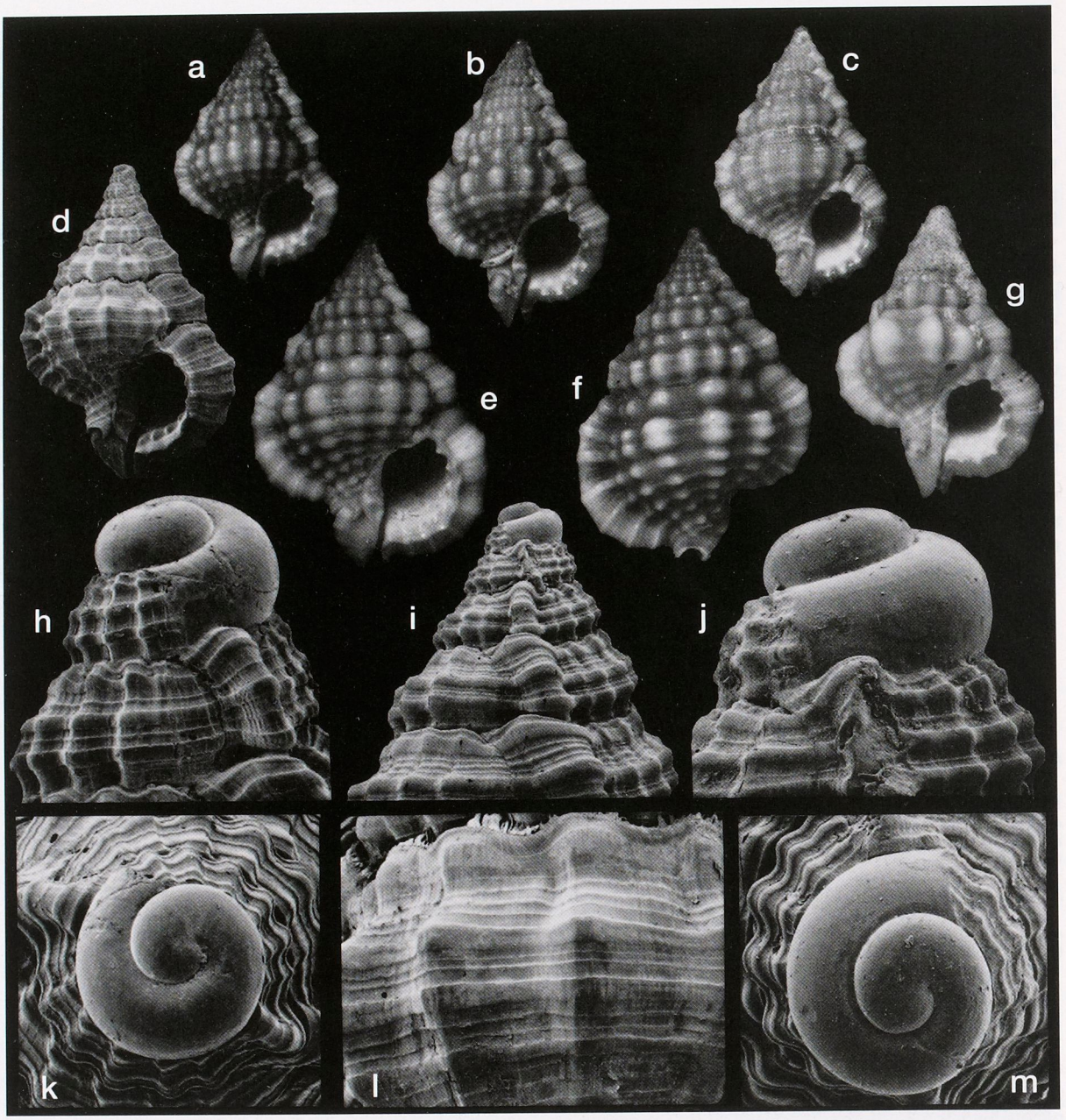

FIG. 18. — *Gyrineum roseum* (Reeve). — **a-b**, **g**, sculptural range in one lot, NZGS WM14064, Mactan I., Cebu, Philippines; x2.5. — **c**, CHALCAL 1: sta. D26, Chesterfield-Bellona Plateau, Coral Sea, 48 m; x2.5. — **d**, **h**, **k-l**, MNHN, 50 m, under coral, Afaahiti, Tahiti, Society Islands, coll. J. Tröndlé, d. x3.8; h. x30; k. x30 (showing *ca* 1.25 whorls); l. x15. — **e-f**, lectotype of *Ranella rosea* (Reeve), BMNH 1967662/1, Ticao, Philippines, *ex* Cuming Colln, x2.5. — **i-j**, **m**, NZGS WM14111, Mactan I., Cebu, Philippines, i. x11; j. x39; m. x36 (showing *ca* 1.3 whorls).

New Caledonia. LAGON: sta. 1158. — EXPÉDITION MONTROUZIER: sta. 1311, 1316, 1318, 1331.
North of New Caledonia. LAGON: sta. 473. — BATHUS 4: sta. DW887, DW896.
Local depth range 12-100 m, empty shells occasionally deeper.

OTHER MATERIAL EXAMINED. — **Australia.** Capricorn Group, Queensland, T. Iredale Colln (1 AMS). — Northwest I., Queensland, Oct. 1954, L. Woolacott (1 AMS). — Capricorn Group, Queensland, C.F. Laseron Colln (1 AMS C67048). — Tryon I. Capricorn Group, Queensland, coll. J. Kerslake, Sept. 1954 (3 AMS). — Wheeler Reef, NE of Townsville, Queensland, subtidal, coll. I. Loch, 15 June 1974 (1 AMS).
Lord Howe Island. HMAS *"Kimbla"* sta. LH5, off Lord Howe I., 30°25.5' S, 159°6' E, 49-51 m, 6 Nov. 1976 (2 AMS).
French Polynesia. Tahiti, Afaahiti, 50 m, coll. J. Tröndlé (1; Figs 18 d, h, k-l).

DISTRIBUTION. — Throughout the western Pacific archipelagoes, from southern Japan (as far north as Kii Peninsula, Honshu; HABE, 1964: 71) to the Capricorn Group, southern Great Barrier Reef, Queensland, Australia; as far east in the Pacific as Rarotonga, Cook Islands (several lots seen in AMS, MCZ) and Tahiti. I have not seen specimens from west of the Philippines and Indonesia.

DIMENSIONS. — Lectotype: H 21.1, D 14.8; paralectotype (BMNH 1967662/2): H 20.2, D 14.5. - Philippines, NZGS WM14064 (Figs 18 a-b, g): H 18.2, D 12.7; H 18.0, D 11.4; H 15.9, D 10.3. - CHALCAL: sta. D26: H 17.1, D 10.8. - Northwest I., Queensland, AMS: H 23.7, D 15.4.

REMARKS. — Despite the almost complete agreement among early writers that this pink species was merely a colour form of the species here called *Gyrineum lacunatum, G. roseum* is in fact a distinctive species. Apart from the almost uniform white to dark pink colour, with paler nodules on some specimens and, on some others, pale yellow to bright yellow nodules, distinctive characters are its short, wide form, its close spacing of the two peripheral spiral cords (almost fused, to form a single row of bifid nodules, on many specimens), and its protoconch of only 1.25 - 1.3 whorls (Figs 18 k, m). The axial sculpture is very variable in prominence and in the number of costae; as in most other species of *Gyrineum*, early spire whorls are evenly cancellate, but whereas many specimens remain cancellate to the last whorl, many others reduce the number of costae and increase their prominence down the shell, so the last one or two intervariceal intervals may have as few as three large, widely spaced peripheral nodules. The juvenile specimen from EXPÉDITION MONTROUZIER: sta. 1318, Grand Récif de Koumac, in 20-30 m, has an excellently preserved protoconch displaying four spiral rows of short periostracal bristles.

Although *Gyrineum roseum* has not been recorded previously from as far south as Australia, several authentic Australian lots are present in Australian collections. It is common in MNHN/ORSTOM samples from the Coral Sea, but it is rare species in New Caledonia, where only eight lots have been collected and all material seen is from the north of the region, and many specimens are white, although the juvenile specimens collected near the Passe de Koumac and Grand Récif de Koumac during EXPÉDITION MONTROUZIER are typical orange to pink colours. Recently, huge numbers of specimens have become available from Philippine Islands "deep water" shell debris (*e.g.*, NZGS WM13109, *ca.* 230 specimens).

Genus *HALGYRINEUM* gen. nov.

Type species: *Gyrineum louisae* Lewis, 1974, Recent, Indo-West Pacific and Atlantic; Pleistocene, Costa Rica.

DIAGNOSIS. — Shell small for the family (rarely over 25 mm high), dorsoventrally compressed (maximum diameter *ca* 1.6 times minimum diameter); spire moderately tall but anterior siphonal canal short; varices at each 180° around teleoconch, not strictly aligned into two lateral ridges but each slightly offset from the preceding varix; whorl surface evenly convex, without a shoulder angulation. Varices low, thinner than in *Gyrineum* species, weakly hollowed abapertually. Sculpture of many fine, regular, even rows of small nodules at intersections of very low, weakly defined axial costae and similarly spaced, low, weakly bifid spiral cords; 6 cords on spire whorls and 11 on last whorl (passing onto the terminal varix; many more weak ones below); 15-17 axial costae per intervariceal interval; interspaces crowded with narrow, sharp, cancellate axial and spiral threads. Aperture relatively large, weakly subquadrate; interior of outer lip with 10 low, narrow, widely spaced transverse ridges; inner lip flared over previous whorl, masking pseudumbilicus, smooth except for one low parietal ridge and 4-6 low ridges on base of columella. Protoconch of 3.3 inflated whorls (Fig. 19 f), with widely spaced, prominently cancellate, narrow axial and spiral sculpture.

REMARKS. — "*Gyrineum*" *louisae* differs so strongly from the other very uniform group of *Gyrineum* species in almost all characters that its inclusion makes *Gyrineum* a polyphyletic group, and the new genus *Halgyrineum* is proposed for *G. louisae*. The most obvious difference from *Gyrineum* is the radically distinct sculptural plan; the evenly inflated whorl surface (*i.e.*, without angles) covered with regularly spaced gemmae, produced by six spiral cords on spire whorls and 11 on the last whorl, crossing up to 17 costae in each intervariceal interval, produces a fundamentally different appearance from the pattern of **all** undoubted *Gyrineum* species, in which 3-4 cords on spire whorls and 7 on the last whorl cross only 6-10 axial costae (reduced to only 2-3 on last whorl of some specimens). Correspondingly, *Halgyrineum louisae* consistently has 10 ridges inside the outer lip instead of the 7 in all *Gyrineum* species. The fine, crisply cancellate, interstitial sculpture is also highly distinct from the few low, wide interstitial spiral cords seen on *Gyrineum* species. The almost smooth, flared inner lip is also quite different from the narrow, coarsely ridged inner lip of *Gyrineum* species. Finally, *Halgyrineum louisae* is the only known species of Ranellinae with a multiwhorled, cancellate protoconch, similar to that of *Sassia remensa*, reflecting a particularly wide teleplanic larval dispersal. This plesiomorphic tonnoidean protoconch (see Warén & Bouchet, 1990) seems to indicate that *Halgyrineum* evolved from an early tonnoidean separately from *Gyrineum*. *Halgyrineum louisae* is the only ranelline found widely in both the central Atlantic and central Indo-West Pacific provinces. A formerly continuous range throughout the tropical ocean has apparently been interrupted by uplift of the Isthmus of Panama late in Pliocene time (supported by the occurrence of Pleistocene fossils at Limón, Costa Rica; see below) but has not been followed by the evolution of morphological differences between the Indo-Pacific and Atlantic populations. The protoconch and developmental type in itself is not a generic character, even though it contrasts strongly with the protoconchs of *Gyrineum* species, which are all very similar to each other; time will tell whether other *Halgyrineum* species are found with a similar protoconch.

Halgyrineum resembles early western American species ancestral to the *Argobuccinum* and *Fusitriton* groups of Ranellinae (*e.g.* the specimen of *"Ranella" californica* (Gabb) illustrated by SMITH, 1970: pl. 49, figs 1-2) and it appears possible that it is a descendant from the early western American ranelline group, rather than being closely related phylogenetically to *Gyrineum*.

ETYMOLOGY. — I have great pleasure naming this genus in honour of my friend Hal Lewis, a great student of the ranellids and describer of the type species of the genus; the name is composed from Hal + *Gyrineum*.

Halgyrineum louisae (Lewis, 1974)

Figs 6 p, 19 a-i

Gyrineum louisae Lewis, 1974: 11, figs 1-3.
Gyrineum atlanticum Fechter, 1975: 64, figs 1-3, 7-8.

Gyrineum louisae - FECHTER, 1975: figs 4-6, 9. — CERNOHORSKY, 1978c: 62, pl. 17, fig. 5. — KAY, 1979: 225, fig. 79L. — BEU, 1985: 56. — ROBINSON, 1990: 133, figs 1 a-c. — HENNING & HEMMEN, 1993: 27, pl. 3, fig. 9.

TYPE DATA. — *Gyrineum louisae*: holotype in B.P. Bishop Museum, Hawaii (LEWIS, 1974: 11); from 330 m, off Pokai Bay, Oahu, Hawaii, taken by M.V. "*Pele*". — *Gyrineum atlanticum*: holotype in Zoologischen Staatssammlung, München, Katalog Nr. 1, no. M9c/33 (FECHTER, 1975: 63); from Great Meteor Bank, central Atlantic, 314-323 m, 29°59.5' N, 28°22.5' W, taken by R.V. "Meteor", 24 July 1967.

NEW CALEDONIA RECORDS. — **Norfolk Ridge.** SMIB 8: sta. DW159 (Fig. 19 g), DW163 (Fig. 6 p). — BERYX 11: sta. DW40 (Figs 19 d, h). Local depth range 245-310 m.

OTHER MATERIAL EXAMINED. — **Réunion.** MD 32 Réunion: sta. DR47, 21°23' S, 55°37' E, off Réunion I., Indian Ocean, 205-215 m (2 MNHN; Figs 19 a-c, e-f, i. 1 NZGS WM14604).
French Polynesia. M.V. *"Pele"* Sta. FH-1, haul 3, 80-81 m, off Baie Hanavave, west coast of Fatu Hiva, Marquesas Islands, 27 Sept. 1967 (1 USNM 798629).
Pleistocene, Costa Rica. Moin Formation (Pleistocene), Limón, Costa Rica (in Geology Dept, Tulane University, Louisiana): Tulane University locality TU 1240 (1). — TU 1239, same formation and area, 1.4 km south of TU 1240 (1 specimen, illustrated by ROBINSON, 1990: fig. 1, and 2 broken terminal varices).

DISTRIBUTION. — *Halgyrineum louisae* is recorded from several widely spaced localities scattered throughout the central Atlantic and central Indo-West Pacific; known at present only from Réunion, New Caledonia, the Marquesas Islands, Hawaii (type locality), and Great Meteor Bank, in depths of 80-460 m; a

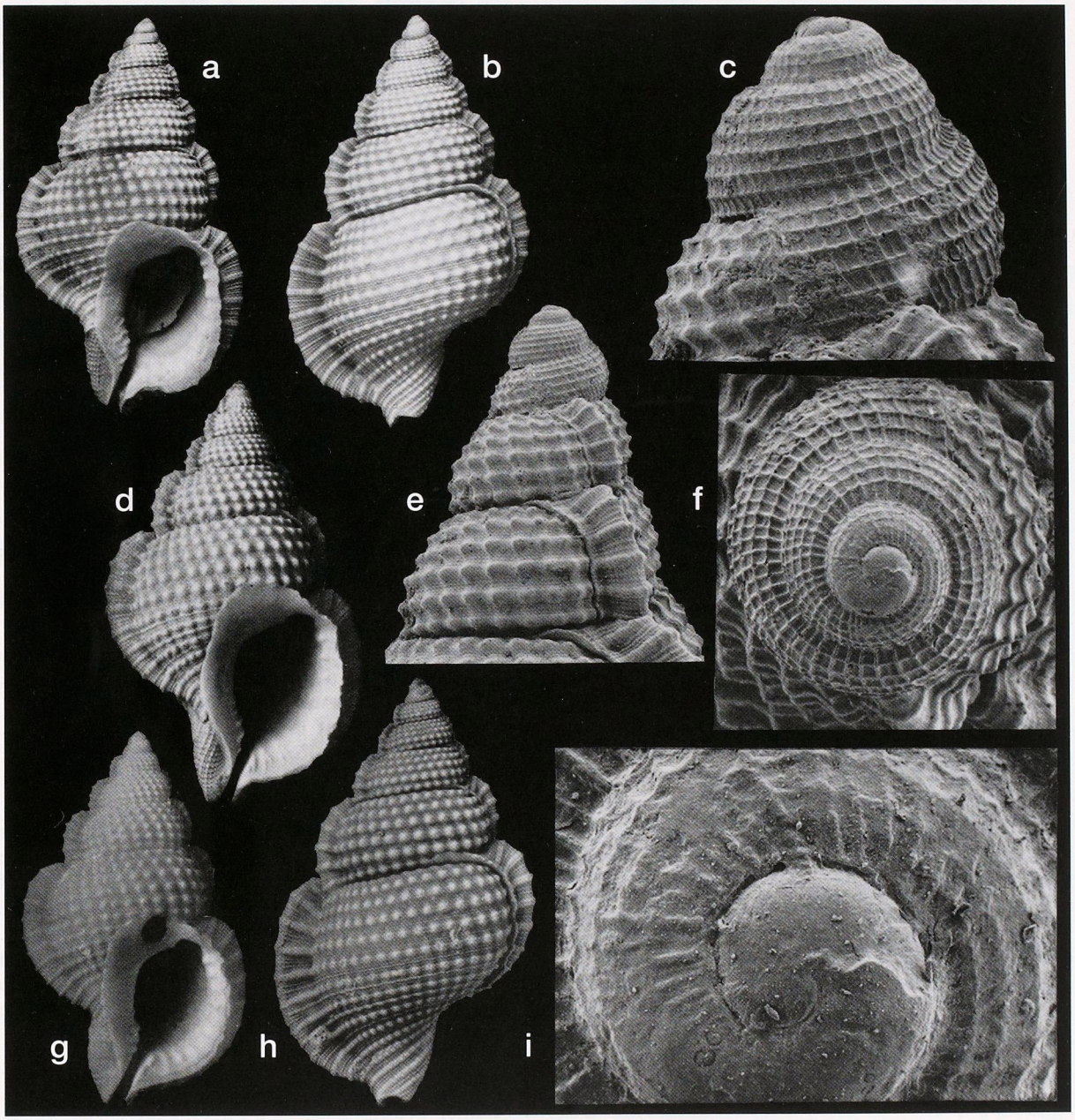

FIG. 19. — *Halgyrineum* (gen. nov.) *louisae* (Lewis). — **a-c**, **e-f**, **i**, MNHN, 2 specimens, MD32/RÉUNION: sta. DR47, off Réunion, Indian Ocean, 205-215 m. a, b. x3; c. x40; e. x13; f. x39 (showing *ca* 3.3 whorls); i. x160. — **d**, **h**, BERYX 11: sta. DW40, southern New Caledonia, 240-300 m, x3. — **g**, SMIB 8: sta. DW159, Loyalty Ridge, New Caledonia, 241-245 m, x3.

Pleistocene fossil at Limón, Costa Rica. S. Gofas (MNHN; pers comm.) reports that specimens have also been collected on the Meteor, Hyères and Irving seamounts in the Atlantic Ocean during the SEAMOUNT 2 cruise, 1993.

DIMENSIONS. — *Gyrineum louisae* (holotype): H 19, D 12 (LEWIS, 1974: 11). - *G. atlanticum* (holotype): H 26.1, D 15.9 (FECHTER, 1975: 64). - Pleistocene, Limón, Costa Rica, TU 1239: H 31.5, D not stated, *ca* 17 mm from illustration (ROBINSON, 1990: 134). - Off Réunion I., MD32 Réunion: sta. DR47, NZGS WM14604: H 21.0, D 12.1. - Pleistocene, Limón, Costa Rica, TU 1240: H 22.5, D 13.5. - New Caledonia, SMIB 8: sta. DW159: H 19.2, D 11.5; sta. DW163: H 25.9, D 16.2.

REMARKS. — The critical characters of the species are those of the genus. Nearly all specimens I have seen are uniform white, and all seem to have been empty shells when collected; the single large Norfolk Ridge specimen in SMIB 8: sta. DW163 (Fig. 7 p) has diffuse, alternating wide, cream and pale red-brown colour bands. S. Gofas (MNHN) reports that the Atlantic specimens mentioned above (collected during SEAMOUNT 2) are also pale brown, with a darker blotch at the posterior termination of each varix. It will be interesting to compare the anatomy and radula with that of *Gyrineum* species. *Gyrineum atlanticum* is based on a slightly larger Atlantic specimen. The three specimens recorded here from near New Caledonia significantly add to the known material of this rare species.

Subfamily CYMATIINAE Iredale, 1913 (1854)

(Conserved under ICZN Article 40b; placed on the Official List of Family Group Names in Zoology in ICZN Opinion 1650)

Genus *CHARONIA* Gistel, 1847

Tritonium Röding, 1798: 125. Type species (SD by COSSMANN, 1903b: 90): *Murex tritonis* Linné, 1758, Miocene to Recent, Indo-West Pacific. (Junior homonym of *Tritonium* Müller, 1776).

Triton Montfort, 1810: 587. Type species (by monotypy): *Murex tritonis* Linné, 1758. (Junior homonym of *Triton* Linné, 1758 and *Triton* Laurenti, 1768).

Charonia Gistel, 1847: 559; 1848: 170. Type species (by monotypy): *Murex tritonis* Linné, 1758.

Buccinatorium Mörch, 1877: 26. Type species (SD by CLENCH & TURNER, 1957: 193): *Triton nobile* Conrad, 1849 [= *Triton variegatum* Lamarck, 1816], Miocene to Recent, Atlantic and Mediteranean.

Semiranella de Gregorio, 1880: 99. Type species (OD): *Triton (Semiranella) gemmellari* de Gregorio, 1880, Eocene, Italy [by first reviser's action herein, = *Charonia lampas* Linné, 1758].

Eutritonium Cossmann, 1904: 123. Type species (OD): *Murex tritonis* Linné, 1758.

REMARKS. — I have previously regarded *Semiranella* as a synonym of *Sassia*. However, DE GREGORIO's (1880: 99) description and figures of *Triton (Semiranella) gemmellari* appear to be a composite of a juvenile specimen of *Charonia lampas* (DE GREGORIO, 1880: pl. 4, figs 21-22) and a *Sassia* species closely resembling, if not a synonym of, *S. bicincta* (Deshayes) (DE GREGORIO, 1880: pl. 7, fig. 62). The specimen figured by DE GREGORIO (1880: pl. 4, figs 21-22) is here selected as the lectotype of *Triton (Semiranella) gemmellari*, so *T. (Semiranella) gemmellari* becomes a further synonym of *Charonia lampas* (apparently indicating a time-range from Eocene on, in Europe) and *Semiranella* is a synonym of *Charonia*. The other nominal species referred to *Semiranella* by DE GREGORIO (1894: 30, pl. 5, fig. 117), *Triton (Semiranella) valrovinensis*, is also based on a juvenile specimen of *C. lampas*.

Charonia tritonis (Linné, 1758)

Fig. 20 a

Murex tritonis Linné, 1758: 754.

Triton marmoratum Link, 1807: 122.

Triton imbricata W.H.D. Adams, 1868: 268, fig. 1.

Murex tritonis - LINNÉ, 1767: 1222. — GMELIN, 1791: 3459. — DILLWYN, 1817: 727.

Tritonium tritonis - RÖDING, 1798: 125 (in part). — H. & A. ADAMS, 1852: 102; 1858: pl. 11, fig. 1 c. — TAPPARONE-CANEFRI, 1875a: 586.

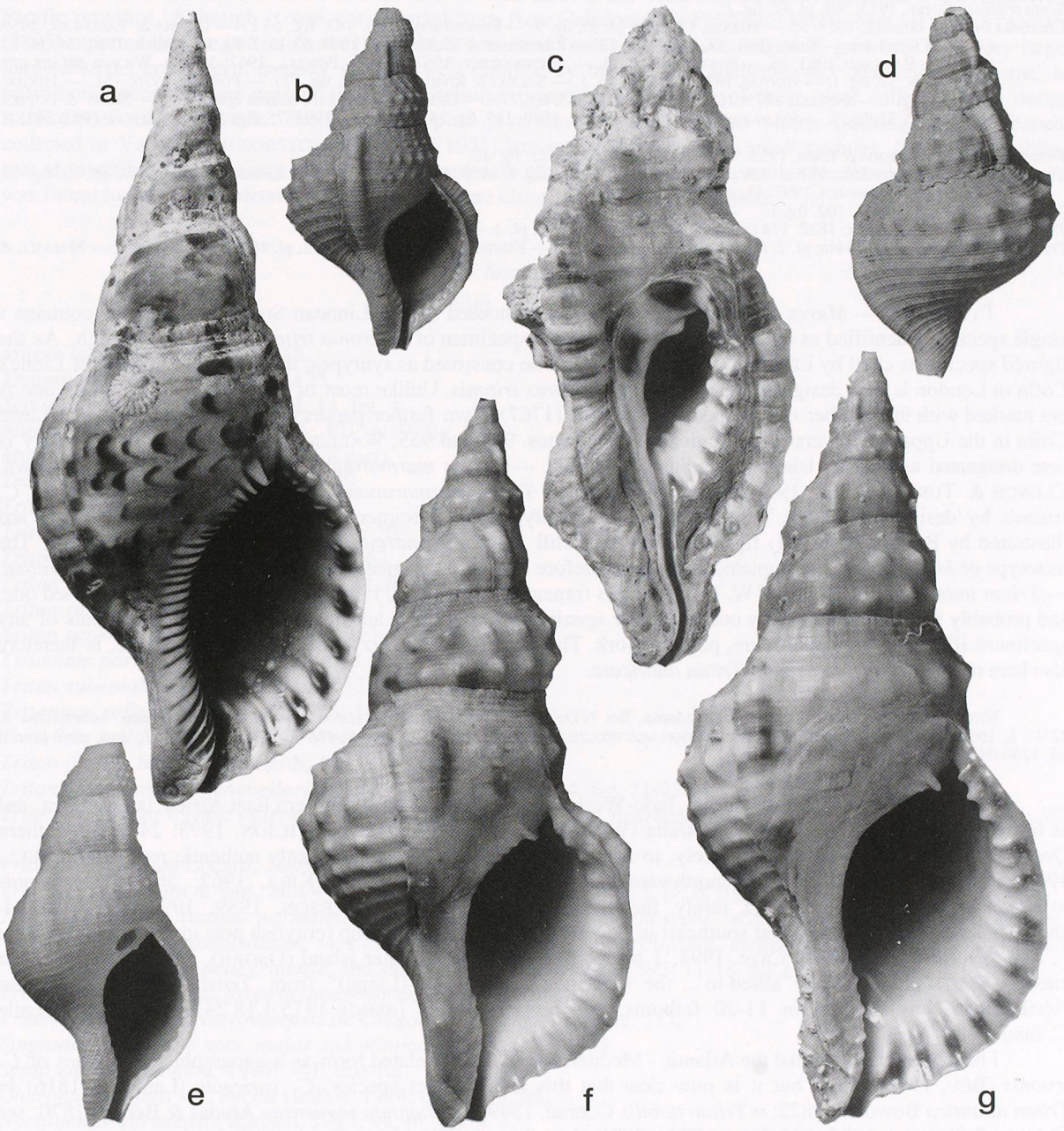

FIG. 20. — *Charonia* species and *Cymatium lotorium*. — **a**, *Charonia tritonis* (Linné), dived, 20 m, Ilot N'Do, SW lagoon, New Caledonia, x 0.67. — **b**, **d-g**, *Charonia lampas* (Linné). **b**, **d**, AMS C167135, Middle Miocene (Balcombian), Balcombe Bay, Mornington, Victoria, Australia, x1.5. **e**, MUSORSTOM 5: sta. 255, Capel Bank, Coral Sea, 280-295 m, x 2.5. **f**, *Cyana* dive 21, SW of Ile des Pins, New Caledonia, 340 m, x0.67. **g**, SMIB 3: sta. DW14, S. New Caledonia, 246 m, x0.67. — **c**, *Cymatium (Lotoria) lotorium* (Linné), LAGON: sta. 457, Atoll de Surprise, New Caledonia; x0.67.

Triton tritonis - MONTFORT, 1810: 587 (in part). — MÖRCH, 1852: 108. — KOBELT, 1878a: 242. — TRYON, 1880: 9, pl. 1, fig. 1; pl. 3, fig. 16.
Lampusia tritonis - SCHUMACHER, 1817: 250.
Septa tritonis - SUTER, 1913: 304, pl. 42, fig. 1.
Charonia tritonis - IREDALE, 1913: 55. — HIRASE, 1936: 66, pl. 95, fig. 9. — EDMONDSON, 1946: 143, fig. 63 c. — OYAMA & TAKEMURA, 1959: *Charonia* figs 4-4 a. — KIRA, 1961: 53, pl. 21, fig. 12. — RIPPINGALE & MCMICHAEL, 1961: 67, pl. 7, fig. 8. — KIRA, 1962: 56, pl. 22, fig. 12. — BARNARD, 1963: 26. — POWELL, 1964: 14. — CERNOHORSKY, 1967b: 58. — POWELL, 1967: 187. — WILSON & GILLETT, 1971: 76, pl. 52, fig. 1. — HINTON, 1972: 14, pl. 7, fig. 1. — SALVAT & RIVES, 1975: 306, fig. 177. — POWELL, 1976: 151. — HINTON, 1978: 28, fig. 1. — POWELL, 1979: 168. — KAY, 1979: 215, fig. 77F. — OKUTANI, 1986: 115, bottom centre fig. — SHORT & POTTER, 1987: 46, pl. 22, fig. 7. — SALVAT *et al.*, 1988: 21. — LAI, 1989: 119, fig. 14. — OSORIO, 1991: 75, figs 1-2. — WILSON, 1993: 243, pl. 41, fig. 14.
Tritonalia tritonis - KURODA & HABE, 1952: 92. — KIRA, 1955: 43, pl. 21, fig. 12.
Charonia tritonis tritonis - BEU, 1970a: 208, pl. 1, figs 1-4; 1971: 102, fig. 1; 1985: 57. — SPRINGSTEEN & LEOBRERA, 1986: 112, pl. 30, fig. 11. — HENNING & HEMMEN, 1993: 43, pl. 7, fig. 1.
Triton imbricata - BEU, 1971: 102, fig. 1.
Triton variegatum - LAMARCK, 1822: 178 (in part). — KIENER, 1842: 28, pl. 2. — HUTTON, 1873: 12.
Triton variegatus - REEVE, 1844a: pl. 2, fig. 3 b (in part; not fig. 3 a). — KÜSTER & KOBELT, 1871: 172, pl. 48, pl. 49 (in part). — MELVILL & STANDEN, 1895: 110.

TYPE DATA. — *Murex tritonis*: Linné's collection, housed by the Linnean Society of London, contains a single specimen identified as *Murex tritonis*, an immature specimen of *Charonia tritonis* about 20 cm high. As the figured specimens cited by LINNÉ (1758: 754) must also be construed as syntypes, the specimen present in Linné's Colln in London is here designated the lectotype of *Murex tritonis*. Unlike most of Linné's specimens, this one is not marked with the number of the species in LINNÉ (1767). Two further paralectotypes are present in the Linné Colln in the Uppsala University Zoological Museum (nos. 933 and 955; WALLIN, 1993: 80). The type locality is here designated as Ambon Island (Amboina), Indonesia. — *Triton marmoratum*: no type specimens are known. CLENCH & TURNER (1957: 196) restricted Link's name *Triton marmoratum* to the Indo-West Pacific species *C. tritonis* by designating as its "type figure" (*i.e.*, lectotype) the specimen referred to by GMELIN (1791) and illustrated by BUONANNI (1681: fig. 188), but this still leaves *T. marmoratum* without a type specimen. The lectotype of *Murex tritonis*, designated above, is therefore also here designated the neotype of *Triton marmoratum*. — *Triton imbricata*: the figure of W. H. D. Adams (repeated by BEU, 1971: 102, fig. 1) is a small, generalised one, and probably was not based on any one particular specimen. Certainly, I am not aware of the whereabouts of any specimens illustrated in this obscure, popular work. The lectotype of *Murex tritonis*, designated above, is therefore also here designated the neotype of *Triton imbricata*.

NEW CALEDONIA RECORDS. — **New Caledonia.** Ilot N'Do, 22°41' S, 166°58' E, 20 m (Fig. 20 a). — EXPÉDITION MONTROUZIER: sta. 1240 (H 385 mm), 1271 (H 310 mm).

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. DW1021, 17°43' S, 168°37' E, 124-130 m (1, dark pink juv. of 2 teleoconch whorls).

DISTRIBUTION. — Throughout the Indo-West Pacific province, from southern East Africa, the Red Sea, and as far south as Dongara in Western Australia (WILSON & GILLETT, 1971: 76; WILSON, 1993: 243), to southern Queensland, Lord Howe Island and, rarely, to northern New Zealand (two apparently authentic records; POWELL, 1964: 14; 1967: 187; 1976: 151), northwards to southern Kyushu, Japan (KIRA, 1962: 56), and eastwards to Hawaii (KAY, 1979: 215) and, rarely, the tropical eastern Pacific (EMERSON, 1989; 1991: 68; Cocos I. and Galapagos Islands); and as far southeast in Polynesia as the Pitcairn Group (crayfish pots in 20-80 m, off Ducie I., F.V. *"McLachlan"*, coll. J. Cave, 1994; 1 NMNZ M 271940) and Easter Island (OSORIO, 1991). The specimen cited by SMITH (1915: 84) as "allied to ... the well-known *C. tritonis* (Linné)", from *"Terra Nova"* sta. 134, near North Cape, New Zealand, in 11-20 fathoms, has been examined (BMNH 1915.4.18.243) and is a juvenile *C. lampas*.

I have previously treated the Atlantic - Mediterranean closely related form as a geographic subspecies of *C. tritonis* (BEU, 1970a: 209), but it is now clear that this is a distinct species, *C. variegata* (Lamarck, 1816) [= *Triton atlantica* Bowdich, 1822; = *Triton nobilis* Conrad, 1849; = *Tritonium seguenzae* Aradas & Benoit, 1870; see CLENCH & TURNER, 1957: 194; BEU, 1970a: 209]. *C. variegata* differs from *C. tritonis* in having a shorter spire, a more constricted aperture with a less flared outer lip, more strongly shouldered whorls, more prominent white ridges and larger, dark brown background areas inside the outer lip, and narrower ridges on the inner lip, and these differences show no intergradation. Also, no genetic exchange has been possible between these two taxa since the Late Pliocene uplift of the Isthmus of Panama. MAGNE & VERGNEAU-SAUBADE (1973: fig. 2) illustrated a fossil specimen of *C. variegata* (under the name *C. seguenzae*) from the Helvetian (Late Miocene) of the Aquitaine Basin.

DIMENSIONS. — New Caledonian specimen, Ilot N'Do: H 180.9, D 75.5. Maximum dimension recorded in New Caledonia 464 mm (PRIGENT, 1989: 23).

REMARKS. — *Charonia tritonis*, the very large "Triton's trumpet" (or "Toutoute" as it is popularly known in New Caledonia), needs little comment, as it is well known and occurs sporadically throughout the Indo-West Pacific province. Although it was not recorded from New Caledonia by FISCHER (1860), MELVILL & STANDEN (1895) reported that the collection they examined contained "many, in various stages of growth". This very large, hard-substrate, echinoderm predator was not well sampled by the ORSTOM shallow-water dredging programme, as only three specimens are present in the collection reported here, and two of these were collected alive during EXPÉDITION MONTROUZIER. The tiny, deep pink juvenile of two teleoconch whorls (lacking the protoconch) collected in Vanuatu (MUSORSTOM 8: sta. DW1021) has sculpture of rows of small nodules, closely resembling that of juvenile *C. lampas*, but has been compared with other, slightly larger juvenile specimens of *C. tritonis* and was found to agree in all details. The two species are closely similar at a small size.

Charonia lampas (Linné, 1758)

Figs 20 b, d-g, 21

Murex lampas Linné, 1758: 748.
Tritonium opis Röding, 1798: 125.
Septa rubicunda Perry, 1811: pl. 14, fig. 4.
Murex gyrinoides Brocchi, 1814: 401, pl. 9, fig. 9.
Murex nerei Dillwyn, 1817: 728 (in part).
Triton nodiferum Lamarck, 1822: 179.
Triton australe Lamarck, 1822: 179.
Tritonium mediterraneum Risso, 1826: 203.
Triton ventricosum Grateloup, 1833: 162.
Triton crassum Grateloup, 1840: pl. 29, fig. 20.
Triton sauliae Reeve, 1844a: pl. 5, figs 17 a-b.
Triton ranelliforme Sismonda *in* Michelotti, 1847: 252.
Tritonium partschii Hoernes, 1849: 18 (*nomen nudum).*
Triton subcolubrinum d'Orbigny, 1852: 78.
Tritonium solitarium Beyrich, 1856: 181, pl. 12, figs 1 a-b.
Tritonium nodiferum var. *glabra* Weinkauff, 1868: 75.
Triton pliniae Mayer *in* Bellardi, 1873: 209, pl. 14, fig. 3.
Triton (Semiranella) gemmellari de Gregorio, 1880: 99, pl. 4, fig. 21-22 (not pl. 7, fig. 62).
Triton gyrinoides formae *inflectilabrum, labropolitum, imperans, ficarazzense* & *singillum* de Gregorio, 1884: 99-100.
Tritonium glabrum Locard, 1886: 154, 558.
Tritonium pustulata & vars. *minor* and *varicosa* Euthyme, 1889: 273, pl. 6, figs 3-4.
Triton gyrinoides formae *normalis, flabellatum, intermedium, transeuns, scalaratum, conodentatum, cochleosocium, bicanaliculatum, verrucosum, minus-verrucosum, callosum, diramatum, carinatum, latespiratum, naniusculum, pellegrinense,* and *subnormalis* de Gregorio, 1893: 11-18, pls 1-5.
Triton gyrinoides forma *propeficarazzense* de Gregorio, 1885: 129.
Triton (Semiranella) valrovinensis de Gregorio, 1894: 30, pl. 5, fig. 117.
Simpulum nodiferum vars. *major* and *minima* Pallary, 1900: 293.
Septa englishi Newton, 1905: 341, text-fig.
Charonia nodifera var. *euclia* Hedley, 1914: 65, pl. 18, fig. 1.
Nyctilochus alfredensis Bartsch, 1915: 94, pl. 4, fig. 4.
Eutritonium salbriacense Cossmann & Peyrot, 1924: 268, pl. 16, figs 3-4.
Eutritonium (Sassia) aperturale Cossmann & Peyrot, 1924: 286, pl. 17, figs 10-11, 16.
Charonia capax Finlay, 1926: 397, pl. 20, fig. 67.
Charonia capax euclioides Finlay, 1926: 398, pl. 20, fig. 68.
Charonia euclia instructa Iredale, 1929c: 172, pl. 41, fig. 5.
Charonia powelli Cotton, 1957: 120, pl. 6, lower fig.
Charonia sauliae macilenta Kuroda & Habe *in* Habe, 1961: 46, pl. 23, fig. 10; appendix p.17.
Tritonium (Charonia) nodiferum var. *elongatus* Settepassi, 1970: *Charonia* p. ii, pls 1-3; pl. 4, fig. 13; pl. 4 a, figs 15-16; pl. 4 b, fig. 17.

Charonia mirabilis Parenzan, 1970: 156, fig. 3; pl. 32, fig. 615.
Charonia lampas weisbordi Gibson-Smith, 1976: 3, pl. 1, figs 1-5.

Murex lampas - Linné, 1767: 1216 (in part).
Charonia lampas lampas - Beu, 1970a: 211, pl. 2, figs 6, 9. — Henning & Hemmen, 1993: 45, pl. 8, fig. 1
Charonia lampas subsp. - Beu, 1976: 299, fig. 8.
Charonia lampas - Wilson, 1993: 243, pl. 41, figs 15 a-b.
Triton nodiferum - Kiener, 1842: 29, pl. 1.
Triton nodiferus - Reeve, 1844a: pl. 3, fig. 9. — Tryon, 1880: 10, pl. 1, figs 2-3; pl. 3, fig. 17; pl. 4, fig. 23.
Triton nodifer - Watson, 1886: 389.
Triton australe - Kiener, 1842: 31, pl. 3, fig. 1. — Reeve, 1842: 197, pl. 243, fig. 1; 1844a: pl. 4, fig. 12a; pl. 5, fig. 12b — Hutton, 1873: 13.
Tritonium australis - Hutton, 1880: 63.
Tritonium mediterraneum - Arnaud, 1978: 125.
Triton ventricosum - Grateloup, 1840: pl. 29, fig. 17.
Triton variegatum - Philippi, 1836: 212.
Triton colubrinum - Grateloup, 1840: pl. 29, fig. 21.
Triton (Epidromus?) colubrinum - de Gregorio, 1880: 101, pl. 4, fig. 19.
Triton sauliae - Krauss, 1848: 114.
Charonia lampas sauliae - Hirase, 1936: 66, pl. 96, fig. 1.
Charonia lampas sauliae - Beu, 1970a: 214, pl. 3, figs 15-17. — Henning & Hemmen, 1993: 47, pl. 8, fig. 2.
Triton ranelliforme - Sismonda, 1847: 39.
Lotorium rubicundum - Moss, 1908: 19, pl. 3, lower fig.
Septa rubicunda - Bucknill, 1924: 51, pl. 4, fig. 3.
Nyctilochus alfredensis - Turton, 1932: 111, pl. 24, fig. 804.
Charonia pustulata - Barnard, 1963: 25, fig. 2 e.
Charonia lampas pustulata - Beu, 1970a: 213, pl. 2, figs 8, 10; pl. 3, figs 11-14. — Henning & Hemmen, 1993: 46, pl. 8, fig. 3.
Charonia lampas rubicunda - Beu, 1970a: 215, pl. 3, fig. 13; pl. 4, figs 18-23. — Arnaud & Beurois, 1972: 870, pl. 2, figs 1-3. — Powell, 1979: 168, pl. 12, fig. 2. — Henning & Hemmen, 1993: 46, pl. 9, figs 1-3.
Charonia lampas capax - Beu, 1970a: 217, pl. 5, figs 24-29. — Powell, 1979: 168, pl. 12, fig. 1.
Charonia capax - Penniket & Moon, 1970: 36, pl. 15, figs 1-3.
Charonia rubicunda - Penniket & Moon, 1970: 38, pl. 16, figs 1-4.
Charonia cf. *nodifera* - Gibson-Smith, 1971: 242, pl. 2, figs 1-4.
Charonia rubicunda nodifera - Cosel, 1982: 54.
Charonia sauliae - Lai, 1989: 119, fig. 15.

Type data. — Many of the early-proposed nominal taxa listed in the synonymy do not, as yet, have designated type specimens. *Murex lampas*: Beu (1970a: 211) designated the specimen figured by Rondelet (1555 [*in* 1554-55]: 81) as the lectotype of *Murex lampas* (by designating this as the "type figure"), but the whereabouts of this specimen are unknown. Linné's Colln in London does not include a specimen of *C. lampas*. The Linné type Colln of the Uppsala University Zoology Museum has two specimens segregated as syntypes of *Murex lampas* but, as noted in the Introduction, these are specimens of *Cymatium lotorium* (UUZM Linné Colln no. 981) and *Cymatium grandimaculatum* (UUZM Linné Colln no. 1618) and are not considered to be valid syntypes of *Murex lampas*. The drawing by Rondelet (1555, in 1554-55: 81), repeated here (Fig. 21; left-hand fig. of two on the page, specimen without animal; here inverted) is undoubtedly both a clear representation of *Charonia lampas* of subsequent authors and a syntype of *Murex lampas*, and is here formally designated the lectotype of *Murex lampas*. — *Triton nodiferum*: Lamarck's collection, in MHNG, contains a single large specimen identified as *Triton nodiferum* inscribed inside the aperture by Lamarck, and this specimen (MHNG 1495/54; H 260) is here designated the lectotype of *Triton nodiferum*, as well as the neotype of *Tritonium opis*. No localities (other than the Mediterranean Sea) were stated for any of these three taxa, so the type locality is designated as Palermo, Sicily. — *Triton australe*: 2 syntypes in Lamarck Colln, MHNG, both typical Sydney area, New South Wales, specimens of the finely sculptured, short-spired form usually known in recent years as *Charonia rubicunda* or *C. lampas rubicunda*. The larger syntype (MHNG 1099/71) is here designated the lectotype of *Triton australe*, and is also designated the neotype of *Septa rubicunda*. This appears to be the specimen illustrated by Kiener (1842: pl. 3, fig. 1). The small, immature paralectotype is MHNG 1099/72. The type locality is here designated as Port Jackson, New South Wales, Australia. — *Tritonium mediterraneum*: Arnaud (1978: 125) noted that the type material is "presumed to be lost". — *Triton sauliae*: 1 syntype BMNH 1967597, *ex* Cuming Colln; labelled "Island of Luzon", Philippines, but this form occurs only in southern Japan; the type locality is here designated as Miura Peninsula, Honshu, Japan; the figured syntype is in the Jane Saul Colln, University Museum of Zoology, Cambridge (Bishop & Way, 1976). — *Triton pliniae*: the species was illustrated in a poorly diagnostic dorsal view by Bellardi (1873: pl. 14, fig. 3); two syntypes examined in the Mayer-Eymar collection, Naturhistorisches Museum Basel (H 5885) show that it was based on juvenile specimens of *C. lampas*. The type locality is Cassinelle, near Acqui, northern Italy, "Ligurian", *i.e.,* Late Oligocene. — The status of *Triton ranelliformis* is unclear. Michelotti

(1847: 252) published a description, attributed the name to Sismonda, noted that this was *Triton variegatum* "Lamarck" of BELLARDI & MICHELOTTI's (1840) catalogue of Piedmont gastropods, and stated that "the change of name was indicated to me by my friend Doct. E. Sismonda, in his manuscript in the form of notes, which he has had the goodness to send me". SISMONDA (1847: 39) also published the name, without a description, but with a reference to "Sismonda, Atti congr. Nap.", suggesting he might have published the name in an earlier work. The note by SISMONDA (1847: viii) that he had not listed unnamed species, as they were to be named by MICHELOTTI (1847), indicates that Sismonda felt he was the author of the name. The date and authorship deserve further investigation. — *Tritonium partschii* was soon synonymised with *C. lampas* (under the name *Triton nodiferum*) by its author (HOERNES, 1852: 201), but I have not seen type material. — *Septa englishi*: holotype, BMNH Paleo. G.17371, Late Miocene (Tortonian), from near Bustenari, Roumania, an internal mould of *Charonia lampas*. — *Charonia lampas* var. *euclia*: holotype AMS C70728, from "100 fathoms" (180 m) in the Great Australian Bight, off southern Western Australia. — *Nyctilochus alfredensis*: holotype, USNM 186785, an immature beach shell from Port Alfred, South Africa, collected by Turton. — *Charonia capax* and *Charonia capax euclioides*: both dredged off Otago, eastern South Island, New Zealand, holotypes in Auckland Institute and Museum (POWELL, 1941: 244). — *Charonia euclia instructa*: holotype AMS C57726, from "50-60 fathoms" (90-110 m), off Montague Island, southern New South Wales. — *Charonia powelli*: holotype South Australian Museum D14517, Adelaide, from Ellenbrook Beach, southern Western Australia. — *Charonia sauliae macilenta*: holotype NSMT 49895, from off Cape Ashizuri, Shikoku, Japan. — *Charonia lampas weisbordi*: holotype PRI 29700, a Pliocene fossil from the Mare Formation at Cabo Blanco, Venezuela.

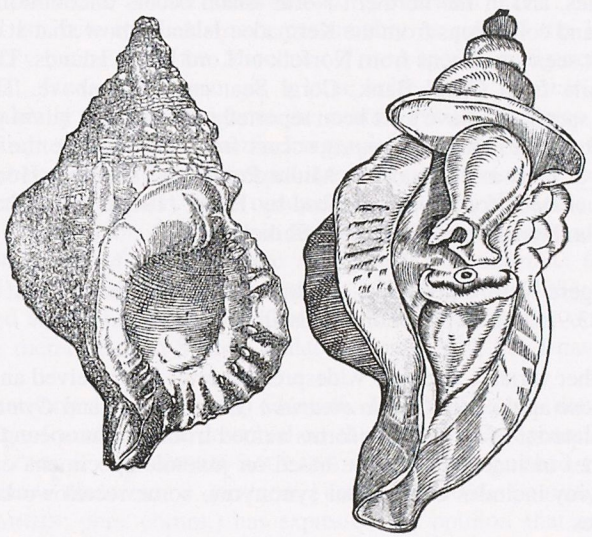

FIG. 21. — *Charonia lampas* (Linné), lectotype; reproduction of figures by RONDELET (1555: 81) of two specimens, on page cited by Linné for *Murex lampas*; left-hand figure, without animal (inverted and in mirror image here) shows specimen designated here as lectotype of *Murex lampas* Linné, 1758.

I have not seen type material of the other nominal taxa listed in the synonymy. *Charonia mirabilis* was based on an unusual specimen of *C. lampas* with spines around the margin of the outer lip, and this trivial variant was quickly synonymised with *C. lampas* by MELONE & GARAVELLI (1970).

NEW CALEDONIA RECORDS. — **Coral Sea.** MUSORSTOM 5: sta. 255, Capel Bank (Fig. 20 e).
Norfolk Ridge. SMIB 3: sta. DW14 (Fig. 20 g). — SMIB 4: sta. DW53, DW54. — CALSUB: dive 21 (Fig. 20 f). — SMIB 8: sta. DW199. These six specimens were collected in 235-410 m, and living ones in 340-410 m.

DISTRIBUTION. — *Charonia lampas* occurs throughout much of the warm-temperate to subtropical realm, **except** the tropical Indo-West Pacific and Panamic western America. It is best known in the western Mediterranean

Sea, but is largely absent from the eastern Mediterranean, where it appears to be replaced by *C. variegata*. CACHIA *et al.* (1993) recorded it from Malta, where it is sympatric with *C. variegata*. In the eastern Atlantic, specimens are not uncommon along the northwest African coast, and are known as far south as Angola and as far north as off southwestern England (TURK, 1976). S. Gofas (MNHN; pers. comm.) reported that it is common off northwest Africa, but extremely scarce south of there. A single specimen from St. Helena Island is present in MCZ (MCZ 258112, James Bay, A. Loveridge, 19 November 1964). A more startling record is an apparent antilessepsian migrant (from the Mediterranean) in the Red Sea: USNM 702568, Sta. Dahlak-1, SCUBA-dived in 0-15 m, 15°48' N, 40°05' E, Dahlak Keber Islands, Red Sea, coll. J. Stiru, *ex* Smithsonian Mediterranean Marine Sorting Centre (a large, pale, elongate specimen, H >300 mm). In recent years (*i.e.* since CLENCH & TURNER's (1957) monograph of Western Atlantic Ranellidae) it has become clear that *C. lampas* also occurs rarely along the Brazilian coast (COELHO *et al.*, 1981; RIOS, 1985: 74, pl. 26, fig. 324: "Santa Catarina to Bahia"). The Caribbean Pliocene record of *C. lampas* (as *weisbordi*, named from Venezuela; present also in the Late Miocene of the Dominican Republic; one unlocalised specimen from the Pliocene or Pleistocene of Florida present in A. Olsson Colln, USNM) indicates that it formerly had a wider range in the western Atlantic. In South Africa, *C. lampas* occurs from False Bay, Cape of Good Hope, to the northern coast of Natal (KILBURN & RIPPEY, 1982: 73). ARNAUD & BEUROIS (1972) recorded *C. lampas* from St Paul and Amsterdam Islands, southern Indian Ocean. In Australia, *C. lampas* occurs from Jurien Bay in southern Western Australia all around the southern and eastern coasts to Swain Reefs, outer Great Barrier Reef off central Queensland (WILSON, 1993: 243), but it is most familiar as the intertidal "red whelk", feeding on the ascidian *Pyura* on wave-washed rocky shores, on the central New South Wales coast near Sydney. It occurs all around the two main islands of New Zealand and at the Chatham Islands, dredged and SCUBA-dived on subtidal rocky shores and soft substrates, and in the northern North Island occurs uncommonly on intertidal rocky shores. Recent Museum of New Zealand collections from the Kermadec Islands show that it occurs moderately commonly at Raoul Island, but I have not seen specimens from Norfolk or Lord Howe Islands. The few new records from New Caledonia and a single juvenile from Capel Bank, Coral Sea, are listed above. These are separated by a huge distance from which no adult specimens have ever been reported (although the larval population may well occupy it sparsely) from the Japanese form. In Japan, *C. lampas* occurs from Taiwan (see the excellent coloured illustration by LAI, 1989: 119, fig. 15) at least as far north as Miura Peninsula, southern Honshu (OYAMA & TAKEMURA, 1959); the pale, offshore "*macilenta*" form was described by HABE (1964: 75) as "rather commonly dredged from 150-200 m from Kii Peninsula, Honshu and Tosa Bay, Shikoku".

DIMENSIONS. — Largest New Caledonian specimen, CALSUB dive 21: H 176.0, D 85.4. - Coral Sea, MUSORSTOM 5: sta. 255: H 23.9, D 12.0 (protoconch missing).

REMARKS. — This rather variable and very widespread species has received an enormous number of names, probably exceeded only by those applied to *Ranella olearium* (Linné, 1758) and *Cymatium parthenopeum*. While I have not examined the type material of most of the forms named from the European Cenozoic, it is clear from their original figures that most names included above were based on juvenile specimens or trivial sculptural variants of *C. lampas*. The above synonymy includes only actual synonyms, some recent works with good illustrations, and detailed New Zealand references.

Charonia lampas is a rather surprising new record for New Caledonia, based on no fewer than five large specimens, together with a juvenile specimen from Capel Bank, Coral Sea. In Australasia, the local geographic race of *Charonia lampas* (usually known in recent years as *C. lampas rubicunda*; BEU, 1970a) is very much a temperate taxon, occurring fairly commonly around both main islands of New Zealand, commonly around southern Australia, as far north as Fremantle in western Australia and southern Queensland on the east coast; a small number of specimens has been collected at the Kermadec Islands. Interestingly, *C. lampas* was recorded from New Caledonia (as *Tritonium nodiferum*) by EUTHYME (1889: 227, footnote) who, however, noted that "we have received it from New Caledonia absolutely conforming to the type from the Mediterranean". As was noted in the Introduction, this implies he had a brightly coloured, shallow-water specimen, and therefore that his specimen probably was wrongly localised.

This species is a good example of the taxonomic complexities that arise from attempting to recognise local races as formal geographic subspecies. The geographic races have been named on the basis of shallow-water forms, whereas specimens from relatively deep water (*ca* 100-300 m) around these same areas are all closely similar to each other all around the world, *i.e.* the diagnostic characters are displayed only by shallow-water specimens. The forms named *euclia* and *instructa* in Australia, *euclioides* in New Zealand, and *macilenta* in Japan are virtually indistinguishable, being pale (many are plain cream or white), very elongate, thin-shelled, weakly sculptured shells.

This is clearly ecophenotypic rather than genetic variation. It is not surprising, then, to find that the New Caledonian specimens (all collected at between 230 and 410 m) are this elongate, pale, weakly sculptured "deep-water form", and are not identifiable to subspecies. For this reason, the utility of subspecies is called severely into question; the names provided by many authors over the last 230 years are listed in the synonymy (although the innumerable other usages, combinations, and listings by numerous other authors have not been included) to stress my opinion that geographic subspecies serve little purpose in most of the widely distributed Ranellidae. Geographic subspecies recognised for other taxa in this report are regarded as an interim measure, reflecting an uncertain status - some will prove to be valid species, whereas others will be synonymised when their true status is known.

That individuals of *Charonia lampas* are occasionally able to survive as planktonic larvae so far from breeding populations to the southwest, and to metamorphose and grow to adulthood (the CALSUB dive 21 specimen, collected alive in 340 m, is 176 mm high; Fig. 20 f) is interesting for its significance in dispersal: it makes it conceivable that larvae are (if only rarely) exchanged between the Japanese, Australasian, South African, West African and Brazilian populations of *C. lampas*. At the time I first wrote on *C. lampas* (BEU, 1970a) no definite pre-Pleistocene fossils had been recorded in the Pacific, but now at least three Late Miocene specimens have been recorded from Japan (IWASAKI, 1970: 419, pl. 2, fig. 6; SHIKAMA, 1973: 198, pl. 16, fig. 21; OZAWA & TOMIDA, 1992: 431, pl. 59, fig. 4), a latest Miocene specimen has been recorded from New Zealand (BEU, 1976: fig. 8) and now a very well preserved, undoubted, but juvenile specimen can be recorded from the Balcombian (Middle Miocene) Fyansford Formation at Fossil Beach, Mornington, near Melbourne, Australia (Figs 20 b, d; AMS C167135; H 35.2, D 19.6). This fossil record makes it feasible that *C. lampas* entered the Pacific during Middle Miocene time, from Europe (where it has a history since at least the Late Eocene; see references, under *Charonia* generic synonymy, above, to *Triton (Semiranella) gemmellari* and *T. valrovinensis*, both based on European Eocene specimens I attribute to *C. lampas*), presumably as part of the late Tethyan fauna. *Charonia tritonis* also has a Pacific history dating from the Miocene ("*Triton* sp. 3", unfigured, of K. Martin's collections, RMNH 9810, from Tji Boerial, Java, Preangerian, is a large spire of *C. tritonis*, H 134.8, D 70.7) so it is conceivable that *C. lampas* initially spread throughout the central Pacific, but was unable to compete with the larger *C. tritonis* and became limited to the Indo-Pacific fringes, in South Africa, Australasia and Japan. This type of history seems likely for several other "Pacific fringe" species (*e.g. Cymatium exaratum*, discussed below; *C. parthenopeum*) whose ecological space appears to be occupied in the tropical Pacific by closely similar congeners (*C. vespaceum*, in the case of *C. exaratum; C. pileare* in the case of *C. parthenopeum*).

Many trivial Recent varieties (of no taxonomic significance) of *Charonia lampas* were proposed by DE GREGORIO (1884, 1885, 1893). In the earliest of these papers, DE GREGORIO (1884: 99) referred to three of these varieties having been proposed earlier in "mia nota 'Quelques formes nouvelles du *Tr. gyrinoides* Brocc. de la Méditerranée' pubblicata nelle memorie della Società malacologica belga", but I have been unable to find such a work in this journal.

An aspect of the synonymy listed here for *Charonia lampas* that has drawn negative comments from reviewers is the synonymising of many forms described on the basis of European fossils with the Recent near-cosmopolitan *C. lampas*. MAGNE & VERGNEAU-SAUBADE (1973) distinguished two species in the Aquitaine Basin, *C. ventricosa* [= *crassum* = *salbriacense* = *aperturale*] and *C. gyrinoides* [= *nodiferum*, *i.e.*, *C. lampas* of the present report]. P. Lozouet (MNHN; pers. comm.) has expressed his opinion that at least these two species are distinct. In contrast, comparison of large numbers of fossil and Recent specimens of *C. lampas (sensu lato)* over more than 30 years, examination of the type specimens of many of the listed synonyms, and examination of the original figures of all the other synonyms indicate to me that the listed fossil nominal taxa all fall within the range of variation of the world Recent population. In my opinion, there is no doubt that this is a single, variable, Eocene to Recent species.

Genus *CYMATIUM* Röding, 1798

Cymatium Röding, 1798: 129. Type species (SD by DALL, 1904: 133): *Murex femorale* Linné, 1758, Recent, Western Atlantic.

Lotorium Montfort, 1810: 583. Type species (by monotypy): *Lotorium lotor* Montfort, 1810 [= *Murex femorale* Linné, 1758].

Tritocurrus Lesson, 1842: column 65. Type species (by monotypy): *Trito currus* [*sic*] *amphytridis* Lesson, 1842 [= *Triton tigrinum* Broderip, 1833], Recent, Panamic western America.

Nyctilochus Gistel, 1848: xi. Type species (SD by BEU, 1970a: 206): *Triton tigrinum* Broderip, 1833.

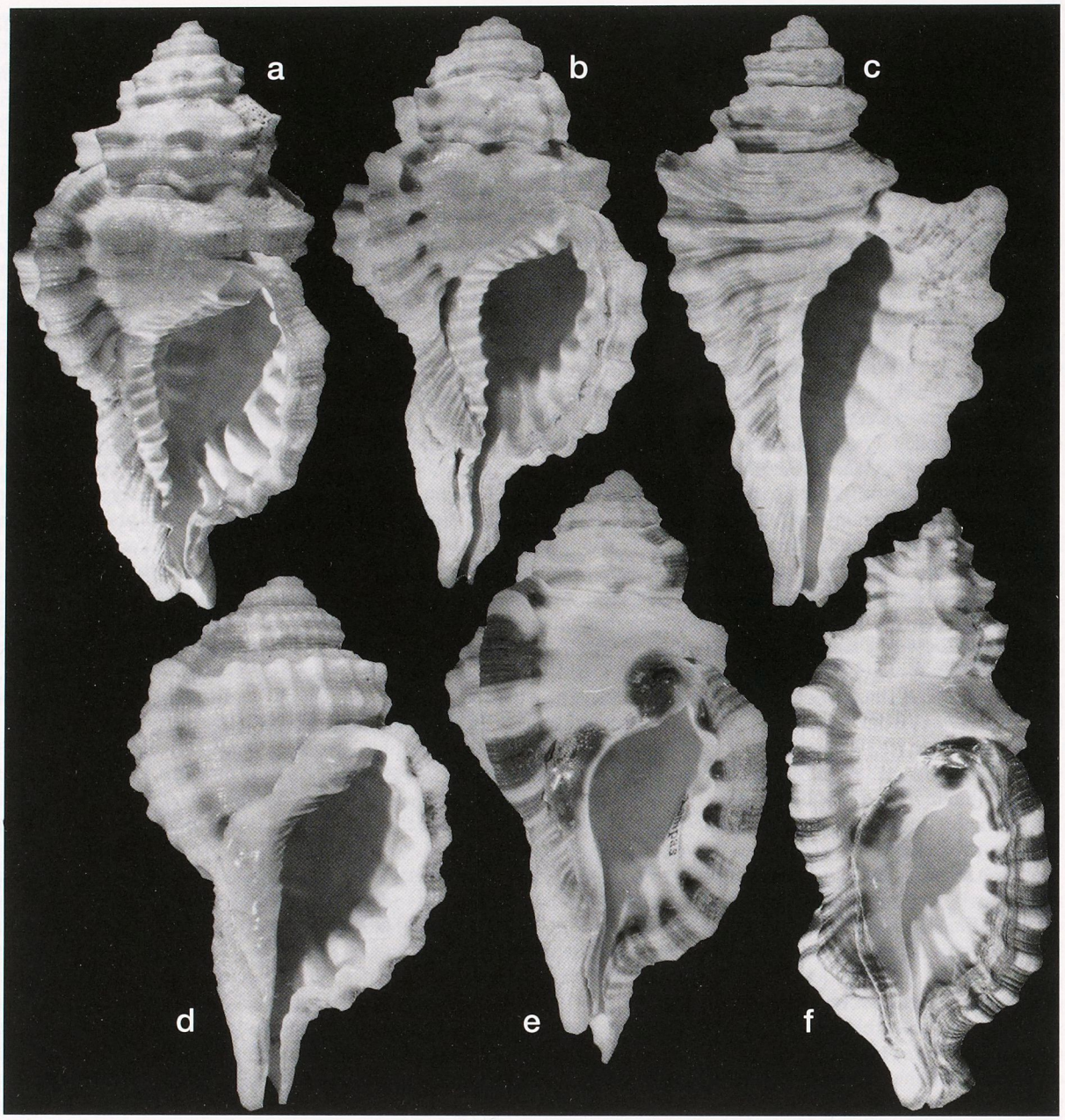

FIG. 22. — Putative syntypes of Linnean species (here considered *not* to be valid syntypes) in the Linnean type collection of the Uppsala University Zoological Museum (UUZM) (photographs by Dr A.Warén, Stockholm). — **a-c**, specimens identified as syntypes of *Murex lotorium* Linné, 1758. **a**, *Cymatium (Ranularia) pyrum* (Linné), specimen with incompletely secreted outer lip, UUZM Linné coll. no. 301; height 100 mm. **b**, *C. pyrum*, UUZM Linné coll. no. 899a; height 87 mm. **c**, *Cymatium (Cymatium) femorale* (Linné), type species of *Cymatium* Röding, 1798, UUZM Linné coll. no. 899b; height 89 mm. — **d**, *Cymatium (Ranularia) cynocephalum* (Lamarck, 1816), specimen identified as syntype of *Murex pyrum* Linné, 1758, UUZM Linné coll. no. 853; height 77 mm. — **e-f**, specimens identified as syntypes of *Murex lampas* Linné, 1758. **e**, *Cymatium (Lotoria) grandimaculatum* (Reeve, 1844), with label "*lampas*" glued inside outer lip; UUZM Linné coll. no. 1618; height 88 mm. **f**, *Cymatium (Lotoria) lotorium* (Linné, 1758), UUZM Linné coll. no. 981; height 47 mm.

REMARKS. — The limits and definitions of genera and/or subgenera related to *Cymatium* have long been a taxonomic problem. Usages over the years have ranged from that of KESTEVEN (1902), who thought **all** ranellids should be included in the one genus *Lotorium*, to the approach of IREDALE (1929, 1936) who used all subgenera of the present paper as full genera, and subdivided some of them into further genera. I have previously (particularly in BEU & CERNOHORSKY, 1986) tried to follow a "middle road", recognising a few of the most distinctive groups (*e.g. Linatella*) as genera, and most others as subgenera of *Cymatium*. The continuing search for firm, objective characters to distinguish genera and subgenera has led to a reassessment of some of the classification adopted earlier.

All my experience of research on Ranellidae has convinced me that *Cymatium* is a very large genus of several subtly differentiated subgenera. Distinctive characters of the genus are its tall, narrow protoconch of several whorls, with a clearly differentiated protoconch I and II, and with a secondary conchiolin protoconch pasted over the primary conchiolin and secondary aragonite one by a specialised pallial appendage (BANDEL *et al.*, 1994); its prominent periostracum with, in most species, thin, tall, axial lamellae fringed with long bristles, extending along the crests of either teleoconch axial costae, or varices, or both; and its radula having a central tooth much wider than it is high, with numerous denticles on the cutting edge on each side of the central cusp. All living animals I have examined have brightly coloured, large, ringed spots on the head-foot. ORR (1985: 97) illustrated a living animal of *Cymatium pyrum* with large red-brown spots, each ringed with yellow, over the entire head-foot and cephalic tentacles. This is the sole published record I am aware of of external animal characters of a *C. (Ranularia)* species, and it differs from the exterior of the *C. (Monoplex) pileare* head-foot (ORR, 1985: 98) only in colour. Claude Berthault (ORSTOM, Nouméa) recently sent me colour photographs of living animals of several New Caledonian Ranellidae, demonstrating that *C. (Ranularia) sarcostoma* also has red-brown ringed spots on the head-foot, and both *C. (Monoplex) nicobaricum* and *C. (Monoplex) vespaceum* have blue-grey ringed spots on the head-foot. The ringed spots are evidently a generic character of *Cymatium*, and appear to differ consistently in colour between at least some subgenera. By these criteria *Charonia*, *Cabestana* and *Sassia* are genera distinct from *Cymatium*, but all other formally distinguished groups of present-day Cymatiinae are subgenera of *Cymatium*. The most similar genus in teleoconch shell characters is *Cabestana* which, however, differs markedly from *Cymatium* by its short, turbiniform protoconch, its much less bristly periostracum, and its equidimensional central radular tooth. *Cabestana* seems to be a separate offshoot from *Sassia*, differing from it only in its larger size, its more elaborate periostracum, and its more inflated, *Cymatium*-like teleoconch, and is not related to *Cymatium* in any direct phylogenetic way.

Subgenera I conclude can be recognised in *Cymatium* are reviewed here:

(1) *Cymatium (Cymatium)*: of large size (200-300 mm long, or more), with a short spire, a large, capacious last whorl, a relatively short anterior canal, and a small, very narrow, almost vestigial operculum (*i.e.* much smaller than the aperture) with an abapically terminal nucleus.

(2) *Cymatium (Gelagna)*: of medium size, with evenly inflated, highly convex whorls, essentially **no** axial sculpture, only a terminal varix developed on most specimens, sculpture of smooth, narrow, widely spaced, well raised spiral cords, the periostracum developed in living specimens into an enormous, alga-like fringe along the terminal varix, and an oval operculum with a subcentral nucleus.

(3) *Cymatium (Gutturnium)*: with heavily calloused apertural lips and a moderately long anterior canal, and so resembling some *C. (Ranularia)* species, from which it differs in its abapically terminal (rather than subcentral) opercular nucleus. Contains only the one species, *C. muricinum*; perhaps to be included in *C. (Monoplex)*.

(4) *Cymatium (Linatella)*: with thin, inflated, *Tonna*-like teleoconch (*i.e.*,with a low spire and subspherical, capacious last whorl), only a terminal varix developed on most specimens, a moderately short spire and anterior canal, a shoulder angulation on the whorls, sculpture of low, wide, closely spaced spiral cords, and an oval operculum with a subcentral nucleus. Although I have previously treated *Linatella* as a distinct genus, it is now clear that it contains only the single species *C. cutaceum* and differs from other *Cymatium* subgenera in only subtle characters.

(5) *Cymatium (Lotoria)*: relatively large (150-c.200 mm long), with a smaller aperture than in *Cymatium (sensu stricto)*, a short spire, a moderately long anterior canal, one or two large, distinctive black patches on the inner apertural lip, and an oval, relatively large operculum (*i.e.* one that closes the aperture on retraction into the shell) with an abapically terminal nucleus. Some species (*e.g. C. grandimaculatum*) resemble *C. (Ranularia)* species in all characters other than the position of the opercular nucleus.

FIG. 23. — *Cymatium* species. — **a** *Cymatium (Monoplex) nicobaricum* (Röding), EXPÉDITION MONTROUZIER: sta. 1303, Plateau Karembé, Secteur de Koumac, New Caledonia, 0-8 m, x1. — **b**, *Cymatium (Gelagna) pallidum* (Parth), NZGS WM13283, Masirah I., Oman, x1.5. — **c**, *Cymatium (Monoplex) gemmatum* (Reeve), LAGON: sta. 458, Atoll de Surprise, 40 m, New Caledonia, x2. — **d**, *Cymatium (Gutturnium) muricinum* (Röding), EXPÉDITION MONTROUZIER: sta. 1304, Infernet Channel, Secteur de Koumac, New Caledonia, 12-15 m, x1. — **e**, *Cymatium (Gelagna) succinctum* (Linné), NZGS WM15008, Mactan I., Cebu, Philippines, x1. — **f**, *Cymatium (Monoplex) fittkaui* Parth, MUSORSTOM 4: sta. DW187, north of New Caledonia, 65-120 m, x1.5. — **g**, *Cymatium (Monoplex) tenuiliratum* (Lischke), SMIB 8: sta. DW154, Norfolk Ridge, New Caledonia, 235-252 m, x1. — **h**, *Cymatium (Reticutriton) pfeifferianum* (Reeve), EXPÉDITION MONTROUZIER: sta. 1261, Touho Channel, New Caledonia, 45-56 m, x1.25. — **i**, *Cymatium (Monoplex) comptum* (A. Adams), MUSORSTOM 4: sta. DW187, north of New Caledonia, 65-120 m, x1.5. — **j**, *Cymatium (Monoplex) penniketi* sp.nov., holotype MNHN (*ex* NZGS WM13281), Masirah I., Oman, x1.5. — **k**, *Cymatium (Monoplex) vespaceum* (Lamarck), LAGON: sta. 966, New Caledonia, x1.25. — **l**, *Cymatium (Septa) occidentale* (Mörch), CHALCAL 1: sta. P15, Chesterfield-Bellona Plateau, Coral Sea, x2. — **m**, *Cymatium (Monoplex) thersites* (Reeve), NZGS WM15537, Exmouth, Western Australia, x1.25.— **n**, *Cymatium (Monoplex) exaratum* (Reeve), LAGON: sta. 334, Grand Récif Sud, New Caledonia, 47 m, x1.25. — **o**, *Cymatium (Septa) mixtum* Arthur & Garcia-Talavera, NZGS WM15270, Trincomalee, Sri Lanka, x1.5. — **p**, *Cymatium (Septa) hepaticum* (Röding), EXPÉDITION MONTROUZIER: sta. 1290, intertidal, Paagoumène, New Caledonia, x1.25. — **q**, *Cymatium (Septa) rubeculum* (Linné), EXPÉDITION MONTROUZIER: sta. 1245, intertidal, Grand Récif Mengalia, New Caledonia, x1.25.

(6) *Cymatium (Monoplex)*: much the largest group of generalised *Cymatium* species, with quite small to moderately large shells (30 to 200 mm high), periostraca bearing fringed axial lamellae on many prominent axial costae, varices present all down the teleoconch at each 240° growth pause in most species (but irregular, or only the terminal varix present, in a few species), and an operculum with an abapically terminal nucleus. This definition incorporates into *C. (Monoplex)* the group of smaller species, related to *C. vespaceum* and *C. exaratum*, for which IREDALE (1936: 307) proposed *Cabestanimorpha* but which, in recent years, most authors have included in *C. (Turritriton)*.

(7) *Cymatium (Ranularia)*: with a small to moderately large shell (c. 50-150 mm high), a short to very short spire but moderately long to very long anterior siphonal canal, and an operculum with a nucleus that is subcentral to (in most species) situated near the centre of the inner-lip margin.

(8) *Cymatium (Reticutriton)*: of moderate size (70-100 mm high), moderately to very elongate, with highly convex whorls, and sculpture of many narrow, well raised, closely spaced spiral cords crossed by many similarly spaced but lower and narrower axial costae; numerous (10-12) narrow, closely spaced ridges inside the outer lip; operculum oval with an abapically terminal nucleus; both included living species have a multiwhorled but relatively low, widely conical protoconch.

(9) *Cymatium (Septa)*: a distinctive group of uniform species of moderately small size (40 to 70 mm high), with prominent spiral cords but only low, narrow axial costellae, evenly fusiform shells, varices present all down the teleoconch at each 240° growth pause, a small, short protoconch for the genus, a brightly coloured or (in most species) spirally banded teleoconch colour pattern, and an operculum with an abapically terminal nucleus.

(10) *Cymatium (Turritriton)*: limited here to the species with three threads on each spiral cord (trifid ribs), reviewed by BEU & KNUDSEN (1987). The subgenus includes the smallest species of *Cymatium* (c. 20-50 mm high), with relatively short protoconchs for the genus, and an oval operculum with an abapically terminal nucleus. *C. (Turritriton) labiosum* has a highly distinctive radula (BEU, 1968a: fig. 21 f; BANDEL, 1984: fig. 158; pl. 10, fig. 2) with a central tooth that is taller than it is wide, with a tall, narrow, waisted basal plate not reported from any other Ranellidae and, although this seems likely to be a subgeneric character, the radula has not been described for either of the other living species, *C. gibbosum* (Broderip, 1833) and *C. kobelti* (Maltzan, 1884).

Subgenus *GELAGNA* Schaufuss, 1869

Lagena "Klein" Mörch, 1852: 110. Type species (SD by DALL, 1904: 139): *Triton clandestinus* Lamarck, 1816 [= *Murex succinctus* Linné, 1771], Miocene to Recent, Indo-West Pacific and Atlantic. (not *Lagena* Walker & Boys, 1784 [Foraminifera], nec *Lagena* Röding, 1798, nec *Lagena* Schumacher, 1817).

Gelagna Schaufuss, 1869: 3. Type species (SD by IREDALE, 1917: 325): *Triton clandestinus* Lamarck, 1816 [= *Murex succinctus* Linné, 1771].

Paralagena Dall, 1904: 132. Replacement name for *Lagena* Mörch, 1852, preoccupied.

REMARKS. — As noted above, the subgenus *Cymatium (Gelagna)* contains species with evenly and strongly inflated whorls, virtually no axial sculpture, and spiral sculpture of prominent, narrow, rather widely spaced, smooth spiral cords. There is no reported fossil record, and the subgenus contains only the two species reviewed here, the widespread *C. succinctum* and the recently described East African species *C. pallidum*.

Cymatium (Gelagna) pallidum (Parth, 1996)

Figs 23 b, 24 d-j

Linatella (Gelagna) pallida Parth, 1996: 303, figs 2 a-c.

Linatella (Gelagna) n. sp. - BOSCH *et al.*, 1995: 101, fig. 365.

TYPE DATA. — Holotype: Zoologische Staatsammlung München, nr. 1996 484, from "deep water" north of Mogadishu, Somalia; 3 paratypes from same locality, one from Fort Dauphin, Madagascar, and 1 from Tuléar, Madagascar, in Colln M. Parth (PARTH, 1996).

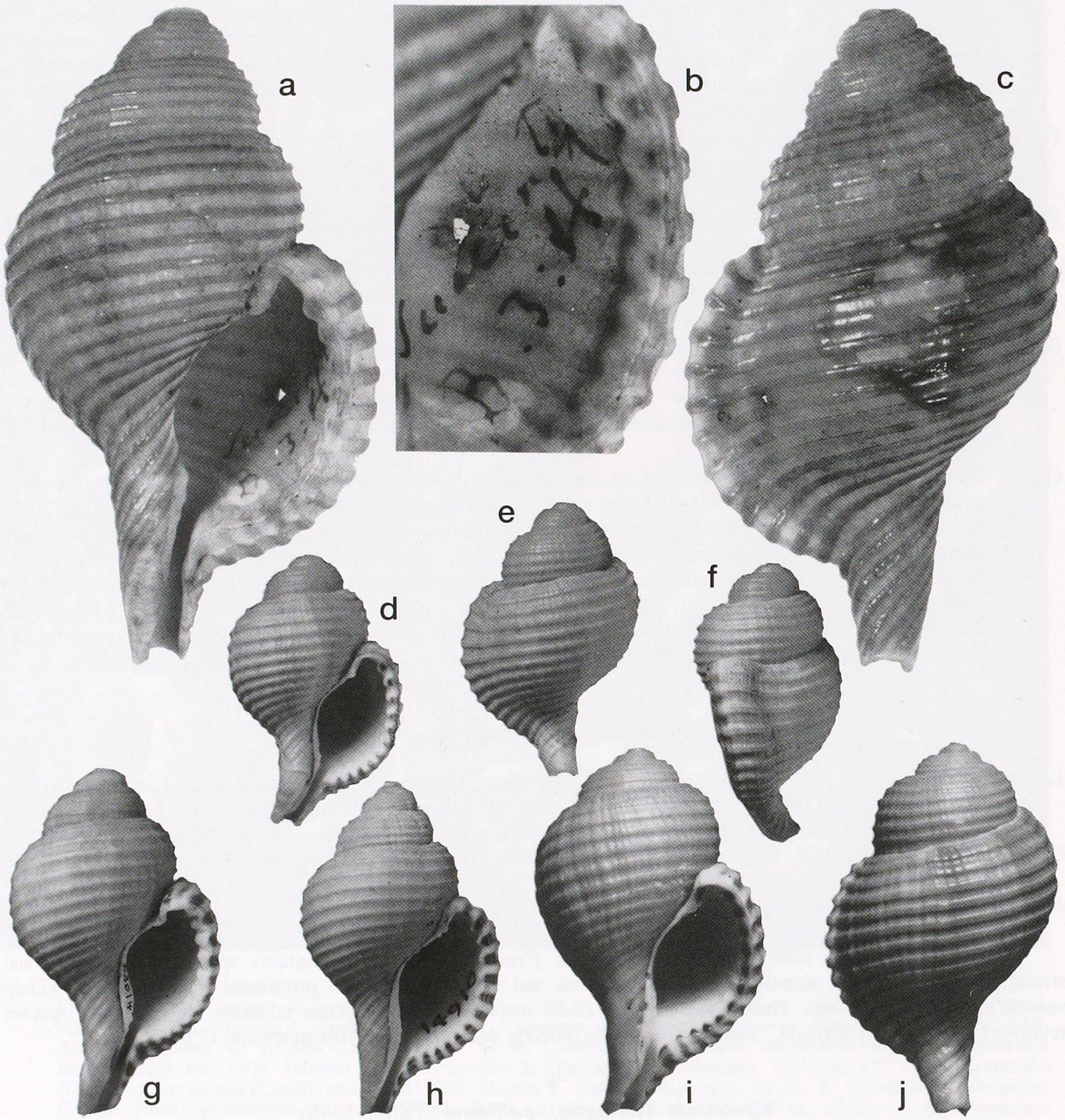

FIG. 24. — *Cymatium (Gelagna)* species. — **a-c**, *Cymatium (Gelagna) succinctum* (Linné), lectotype, in Linnean Society collection, London. **a**, **c**. x2. **b**, interior of outer lip, showing Linné's inscription, x4; BMNH photos by Paul Lund. — **d-j**, *Cymatium (Gelagna) pallidum* (Parth), all x1.5. **d-f**, NMP D4453, Mbotyi, Transkei, South Africa, coll. Mrs Quickleberg. **g**, NMP D3014, Mzamba, Transkei, South Africa. **h**, NZGS WM14910, Grand Récif de Tuléar, Madagascar. **i-j**, NZGS WM13283, Masirah I., Oman.

OTHER MATERIAL EXAMINED. — **South Africa.** Mzamba, Transkei, beach drift, coll. R. Kilburn & D. Herbert, May 1986 (6 NMP D3014; Fig. 24 g). — Same locality, coll. R. Kilburn, 1969 (2 NMP 4626). —Same locality, coll. R. Kilburn & R. Fregona, June 1982 (2 NMP B4473). — Same locality, coll. W. Massier (1 NZGS WM1512). — Mbotyi, Transkei, beach, coll. R. Kilburn & D. Herbert, May-June 1985 (5 NMP C8125). — Mbotyi, Transkei, beach, coll Mrs Quickleberg, july 1978 (6 NMP D4453; Figs 24 d-f). — Port Shepstone, Natal, coll. H.C. Burnup, 1916 (1 NMP D7150). — Port Shepstone, Natal, coll. Falcon (2 NMP 5796). — Sezela, Natal, coll. H.C. Burnup (1 NMP 181). — Two Mile Reef, Sodwana Bay, Zululand, dived 10-13 m, coll. D. Herbert, 13 September 1987 (1 NMP E373).
Madagascar. Grand Récif de Tuléar, after hurricane, coll. M. Blöcher (4 NZGS WM14910, Fig. 24 h; 1 AMS C202738; 1 MNHN).
Somalia. Off Somalia, East Africa, from native fishermen, Bozzetti Colln (2).
Oman. Masirah I., south coast of Oman, beach, coll. Don & Eloise Bosch (14 NZGS WM13283, including specimen figured by BEU & CERNOHORSKY, 1986: 259, figs 30-31; 1 USNM 880166, Figs 23 b, 24 i-j).

DISTRIBUTION. — Apparently confined to Madagascar and the coasts of East Africa and southeastern Arabia, from Transkei, South Africa, to Oman. DRIVAS & JAY (1988: 62) illustrated a typical specimen of *C. succinctum* from Réunion Island, and *C. pallidum* apparently has not been collected in the Red Sea, India, Sri Lanka, or Western Australia. The WAM collection includes two specimens of *C. succinctum* from Western Australia (East Montaliver Islet, NW Australia, one large; Barrow I.,Western Australia, one) but no material of *C. pallidum.*

DIMENSIONS. — Somalia, Bozzetti Colln, largest seen: H 50.7, D 30.4. - NMP 5796: H 39.7, D 25.3. - NMP D3014: H 43.2, D 26.8. - NZGS WM13283: H 37.7, D 24.0.

REMARKS. — This species was intended to be described as new here, and the figures have been retained for comparison with *C. succinctum. Cymatium pallidum* differs from the much more widely distributed *C. succinctum* by having a unicoloured exterior, lacking the markedly darker coloration of the spiral cords that is so obvious in *C. succinctum*; by its shorter and wider form, caused mainly by its spire being much lower and its whorls more strongly convex than those of *C. succinctum*; in apparently having a shorter anterior canal (the canal is slightly to severely damaged in all available material of *C. pallidum*); and in having a much lower and wider terminal varix than that of *C. succinctum*. It is interesting to note that, although the external coloration is so uniform in *C. pallidum*, the coloration of the interior of the outer lip is identical to that of *C. succinctum*. The shape and coloration of adult *C. pallidum* closely resemble those of juvenile (H<20 mm) *C. succinctum*, suggesting the possibility that *C. pallidum* arose from *C. succinctum* by a heterochronic process such as paedomorphosis.

Cymatium (Gelagna) succinctum (Linné, 1771)

Figs 23 e, 24 a-c

Murex succinctus Linné, 1771: 551.
Neptunea doliata Röding, 1798: 116.
Triton clandestinum Lamarck, 1816: pl. 433, fig. 1; "Liste des objets", p. 8.
Triton confinis Brancsik, 1896: 211, pl. 5, figs 1 a-b.

Murex succinctus - HANLEY, 1855: 456.
Argobuccinum succinctum - HEDLEY, 1908: 456.
Gelagna succincta - RIPPINGALE & MCMICHAEL, 1963: 63, pl. 6, fig. 28. — ABBOTT & DANCE, 1982: 125. — SALVAT *et al.,* 1988: 103, pl. 13, fig. 5. — LAI, 1989: 126, fig. 52.
Cymatium (Linatella) succinctum - BERNARD, 1984: 60, pl. 22, fig. 94.
Linatella (Gelagna) succincta - BEU & CERNOHORSKY, 1986: 257, figs 28-33. — RIOS, 1985: 77, pl. 27, fig. 338. — SPRINGSTEEN & LEOBRERA, 1986: 112, pl. 30, fig. 15. — HENNING & HEMMEN, 1993: 110, pl. 20, figs 5-6.
Cymatium (Gelagna) succinctum - WILSON, 1993: 244, pl. 41, fig. 3.
Buccinum caudatum var. β - GMELIN, 1791: 3471.
Murex clandestinus - DILLWYN, 1817: 723.
Triton clandestinum - LAMARCK, 1822: 187. — KIENER, 1842: 35, pl. 11, fig. 2. — DESHAYES, 1843: 639.
Triton clandestinus - REEVE, 1842: 197, pl. 243, fig. 2. — REEVE, 1844a: pl. 4, fig. 13. — KÜSTER & KOBELT, 1871: 184, pl. 52, figs 5-6.
Ranularia (Lagena) clandestinus - MÖRCH, 1852: 110.
Tritonium (Gelagna) clandestinum - SCHAUFUSS, 1869: 29.
Triton (Linatella) clandestinus - KOBELT, 1878a: 248. — TRYON, 1880: 15, pl. 9, fig. 58.
Tritonium (Lagena) clandestinum - TAPPARONE-CANEFRI, 1881: 37.
Gelagna clandestina - HIRASE, 1936: 66, pl. 96, fig. 2. — HABE, 1961: 45, pl. 22, fig. 12; 1964: 72, pl. 22, fig. 12.
Cymatium clandestinum - KURODA & HABE, 1952: 51. — WEAVER, 1966: 108, pl. 27, bottom right two figs.
Cymatium (Linatella) clandestinum - KILIAS, 1973: 125, fig. 91. — KAY, 1979: 220, fig. 79 A. — BERNARD, 1981: 17, right fig.
Linatella clandestina - CERNOHORKY, 1967a: 325, pl. 46, fig. 26. — BOSCH *et al.,* 1982: 80, lower fig.
Gelagna cynocephala - HABE & KOSUGE, 1966a: 61, pl. 24, fig. 5.

TYPE DATA. — *Murex succinctus*: at the time of writing their paper, BEU & CERNOHORSKY (1986) were not aware that Linné's collection reported on in *Regni animalis* appendix to *Mantissa plantarum* (LINNÉ, 1771) is housed by the Linnean Society of London. Through the courtesy of Solene Morris (formerly of BMNH), I have received photographs (Figs 24 a-c) of the single specimen in Linné's Colln in London identified as *Murex succinctus*; clearly this is the species usually known by this name or, more commonly, as *Cymatium clandestinum*. The interior of the outer lip is inscribed "*succincta* B.3: 47" (Fig. 24 b) so there is no doubt this is an authentic Linnean specimen. This specimen in Linné's Colln is here designated the lectotype of *Murex succinctus*. The type locality is here designated as Bohol I., Philippine Islands. Two further paralectotypes of *Murex succinctus* are present in the Linné Colln in the Uppsala University Zoological Museum (UUZM nos. 1565 a & b; WALLIN, 1993: 79). — *Neptunea doliata*: as noted previously (BEU & CERNOHORSKY, 1986), RÖDING (1798) provided the name *Neptunea doliata* for GMELIN's (1791: 3471) variety β of *Buccinum caudatum*, and RÖDING's cited figure (LISTER, 1685-1697: pl. 940, fig. 36) clearly shows *Cymatium succinctum*. As no type specimens are known for any of Röding's species, the specimen in Linné's Colln, housed by the Linnean Society of London, designated above as the lectotype of *Murex succinctus*, is also here designated the neotype of *Neptunea doliata*. — *Triton clandestinum*: LAMARCK's (1816) species is represented in MHNG by the lectotype, designated by BEU & CERNOHORSKY (1986: 258) (MHNG 1100/16/2), and two paralectotypes (MHNG 110/16/1, 110/16/3), all of which are conspecific with *Cymatium succinctum*. — *Triton confinis*: BRANCSIK (1896) stated that his material (holotype ?; syntypes ?) is in "Musei budapestini"; not seen. His drawing (repeated by BEU & CERNOHORSKY, 1986: 259, fig. 33) clearly shows *Cymatium succinctum*. The type locality is Astrolabe Bay, Papua New Guinea.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 572, 65 m. — EXPÉDITION MONTROUZIER: sta. 1299, 12-14 m.

DISTRIBUTION. — The Red Sea, and the central and eastern Indian Ocean; throughout the tropical western Pacific from Okinawa (BEU & CERNOHORSKY, 1986: 258) southward to Fitzroy Island, southern Queensland, Australia, and to New Caledonia, eastward to Hawaii (WEAVER, 1966; KAY, 1979; BEU & CERNOHORSKY, 1986: 258), and the Galapagos Islands (EMERSON, 1991: 68); West Africa, so far recorded only from Gabon (BERNARD, 1981, 1984); in the Western Atlantic recorded only from Bahia, Brazil (RIOS, 1985: 77, pl. 27, fig. 338).

DIMENSIONS. — New Caledonia, LAGON: sta. 572: H 21.0, D 12.9. - Mactan I., Cebu, Philippines, NZGS WM15008 (Fig. 23 e): H 31.8, D 62.3. - Up to at least 101.1 mm high (PARTH, 1996: fig. 1 a). Maximum size recorded in New Caledonia 49.8 mm (PRIGENT, 1994a).

REMARKS. — This species is easily recognised by its evenly and strongly convex whorls, its sculpture being strongly dominated by bright red-brown, raised, narrow spiral cords on a paler brown background, without axial costae, and by having only a terminal varix on all but a very few specimens. It also reaches a much larger size than *C. pallidum*. Two specimens are present in the collections from New Caledonia.

Subgenus *GUTTURNIUM* Mörch, 1852

Gutturnium Mörch, 1852: 109. Type species (SD by DALL, 1904: 133): *Triton tuberosum* Lamarck, 1822 [= *Distorsio muricina* Röding, 1798], Miocene to Recent, Indo-West Pacific and E. & W. Atlantic.

Afrocanidea Connolly, 1929: 178. Type species (OD): *Afrocanidea gemma* Connolly, 1929 [= *Distorsio muricina* Röding, 1798], Recent, Indian Ocean? (see below).

REMARKS. — When CONNOLLY described *Afrocanidea*, he placed it with doubt in the family Buccinidae, and compared it with the south-east Asian brackish- and fresh-water buccinid genus *Canidia* H. Adams, 1862 [= *Clea* A. Adams, 1855]. The holotype was said to come from Shimbi Hills, Kenya. *Afrocanidea* has remained a mystery taxon, and authors have erred on its relationships with *Clea*: treated with doubt as a subgenus by THIELE (1929: 317) and WENZ (1943: 1205), as a valid subgenus by STAROBOGATOV (1970: 44), and placed in its synonymy by VAUGHT (1989: 47). However, workers on the non-marine mollusc faunas of East Africa have recently doubted its continental origin. BROWN (1980: 13; see also BROWN, 1994: 14) hypothesized that it was a "shell of marine origin carried far inland by people", an opinion echoed by VERDCOURT (1983: 205) who treated it as "probably a displaced marine shell". Examination by P. Bouchet (com. pers.) of the holotype (Fig. 25) reveals that it is the larval shell of *Cymatium muricinum*. The name of the type species was given by Connolly as

Afrocanidea gemmula, but it was described and illustrated as *A. gemma*, and it has been refered to in the literature under that name.

Cymatium (Gutturnium) muricinum (Röding, 1798)

Figs 23 d, 25

Distorsio muricina Röding, 1798: 133.
Tritonium nodulus Link, 1807: 122.
Triton tuberosum Lamarck, 1822: 185.
Ranella gyrinata Risso, 1826: 203, pl. 8, fig. 115.
Triton crispus Reeve, 1844a: pl. 17, fig. 68.
Triton antillarum d'Orbigny, 1842: 161, pl. 23, fig. 20.
Triton pyriformis Conrad, 1849: 211.
Litiopa obesa C.B. Adams, 1850: 71.
Triton productum Gould, 1852: 240.
Triton albocingulatus Deshayes, 1863: E113.
Afrocanidea gemma Connolly, 1929: 178.

Cymatium (Gutturnium) muricinum - Clench & Turner, 1957: 225, pl. 112, figs 5-6; pl. 113, fig. 8; pl. 126, figs 1-3; pl. 127. — Abbott, 1974: 165, pl. 7, fig. 1764. — Kay, 1979: 217, fig. 77 E. — Beu, 1985: 58, fig. 13. — Rios, 1985: 75, pl. 27, fig. 327. — Springsteen & Leobrera, 1986: 112, pl. 30, fig. 12. — Garcia-Talavera, 1987: 252, pl. 1, fig. 6. — Lai, 1989: 119, fig. 16. — Henning & Hemmen, 1993: 53, pl. 11, figs 4-5. — Wilson, 1993: 244, pl. 41, fig. 6.
Gutturnium muricinum - Habe, 1961: 45, pl. 22, fig. 10; 1964: 72, pl. 22, fig. 10. — Wilson & Gillett, 1971: 78, pl. 53, figs 4-4 a.
Cymatium muricinum - Weaver, 1966: 108, pl. 27, central 2 figs — Hinton, 1972: 12, pl. 6, figs 12-14. — Salvat & Rives, 1975: 306, fig. 174. — Hinton, 1978: 29, fig. 5. — Garcia-Talavera, 1981: 111, pl. 4, fig. 3. — Short & Potter, 1987: pl. 23, fig. 9. — Drivas & Jay, 1988: 64, pl. 17, fig. 6. — Salvat *et al.*, 1988: 102, pl. 13, fig. 1.
Tritonium (Ranularia) nodulus "Martini" - Tapparone-Canefri, 1881: 35.
Triton tuberosum - Kiener, 1842: 12, pl. 14, fig. 2. — Deshayes, 1843: 635.
Triton tuberosus - Reeve, 1844a: pl. 1, figs 1 a-b.
Triton (Gutturnium) tuberosus - Kobelt, 1878a: 361. — Tryon, 1880: 23, pl. 13, figs 111-113.
Tritonium (Gutturnium) tuberosum - Martin, 1884: 129.
Cymatium tuberosum - Edmondson, 1946: 142, fig. 61 f.
Cymatium (Gutturnium) tuberosum - Wissema, 1947: 151.
Ranella gyrinata - Arnaud, 1978: 119.
Triton crispus - Reeve, 1844c: 118.
Triton (Gutturnium) crispus - Tryon, 1880: 24, pl. 13, fig. 114.
Triton productum - Johnson, 1964: 132.
Triton (Gutturnium) mauritianum - Tryon, 1880: 24.
Cymatium (Ranularia) gutturnium - Ladd, 1982: 41, pl. 7, figs 9-10.

Type data. — *Triton tuberosum*: 3 syntypes MHNG 1100/4, labelled "Oc. Indien"; the syntype with the most completely calloused aperture (MHNG 1100/4/2; the original of Kiener, 1842: pl. 14, fig. 2) is here designated the lectotype of *Triton tuberosum* and is also here designated the neotype of both *Distorsio muricina* and *Tritonium nodulus*. The type locality is here designated as Ambon Island (Amboina), Indonesia. — *Ranella gyrinata*: supposedly from the Mediterranean, lectotype designated by Arnaud (1978: 119) in MNHN, a typical specimen of *Cymatium muricinum*. — *Triton crispus*: holotype BMNH 196739, without locality, a typical juvenile specimen of *Cymatium muricinum*. — *Triton antillarum*: 2 syntypes, BMNH 1854.10.4.406, labelled "Martinique"; both are typical *C. muricinum*. The figured syntype (d'Orbigny, 1842: pl. 23, fig. 20) is the larger, 43.5 mm high, and is here designated the lectotype. — *Triton pyriformis*: no type material known to me; Clench & Turner (1957: 225) pointed out that Conrad (1849) cited the same illustration in Martini (1777, vol. 3: pl. 112, figs 1050-1051) as was cited by Röding (1798) for *Distorsio muricina*, and by Lamarck (1822) for *Triton tuberosum*. (No type is designated here because of the possibility of type material remaining in a U.S. museum). — *Litiopa obesa*, based on a protoconch of *C. muricinum* (Turner, 1956: 136), holotype MCZ 186594. — *Triton productum*: no type material known (Johnson, 1964: 132); the lectotype of *Triton tuberosum*, designated above, is here designated also the neotype of *Triton productum*. — *Triton albocingulatus*: 3 syntypes, labelled "Bourbon" [= Réunion], in MNHN; the largest (H 53.6, W 29.5) is here designated the lectotype. This name was, however, proposed expressly for the form of *C. muricinum* illustrated by Reeve (1844a: pl. 1, fig. 1 a) and, as Deshayes (1863) merely provided this indication and no description, Reeve's figured specimen must also be construed as a paralectotype. — *Afrocanidea gemma*: holotype BMNH 1937.12.30.4936 (Fig. 25), said to be from Shimbi Hills, Kenya [error! See discussion under *Afrocanidea*].

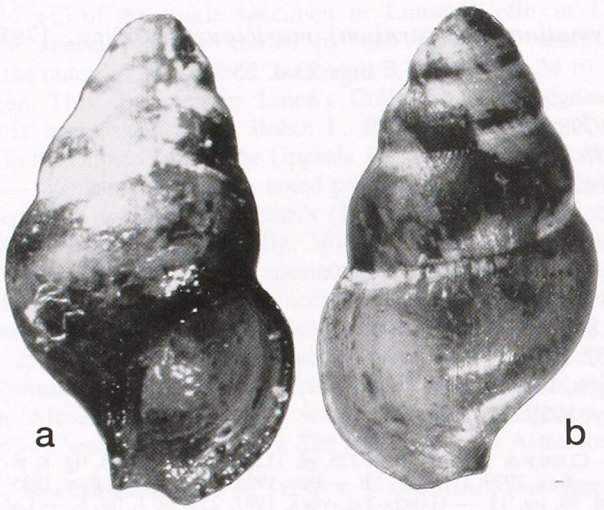

FIG. 25. — *Cymatium (Gutturnium) muricinum* (Röding). Larval shell, holotype of *Afrocanidea gemma* Connolly, BMNH 1937.12.30.4936, x16.5.

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. D44. — CORAIL 2: sta. DW121, DW150.
New Caledonia. LAGON: sta. 66, 215, 216, 225, 284, 581, 791, 855, 867, 932, 942, 948, 962, 1029. — EXPÉDITION MONTROUZIER: sta. 1237, 1240, 1241, 1242, 1245, 1252, 1276, 1285, 1286, 1291, 1292, 1299, 1301, 1303, 1304 (Fig. 23 d), 1305.
Loyalty Ridge. MUSORSTOM 6: sta. DW432.
These 35 samples were collected from the intertidal zone to 79 m, but most living specimens were collected on hard substrates by EXPÉDITION MONTROUZIER in intertidal and shallow subtidal depths.

DISTRIBUTION. — Red Sea; Indian Ocean, from eastern South Africa to the Gulf of Arabia; throughout the tropical western Pacific, from Kii Peninsula, Honshu, Japan (HABE, 1964: 72) to Shark Bay in Western Australia (WILSON & GILLETT, 1971) and to southernmost Queensland in eastern Australia; as far east as Hawaii (KAY, 1979) and the Galapagos Islands (EMERSON, 1991: 68), with a single record from mainland Panama (Isla Gobernadora; EMERSON, 1983: 119, figs 15-16); in the western Atlantic, at Bermuda and from Jupiter Inlet, Florida (CLENCH & TURNER, 1957: 226) south to Paraná, Brazil (RIOS, 1985: 75); in the eastern Atlantic, known only from the Canary Islands (GARCIA-TALAVERA, 1983: 111) and the Cape Verde Islands (specimen in MNHN).

DIMENSIONS. — New Caledonia: LAGON: sta. 581: H 49.0, D 25.9. - Coral Sea, Chesterfield-Bellona Plateau, CHALCAL: sta. D44: H 54.2, D 38.6.

REMARKS. — *Cymatium muricinum* is one of the most common intertidal and shallow subtidal tonnoideans throughout the entire Indo-West Pacific province, and also occurs less commonly in both the eastern and western Atlantic. It is easily recognised by its moderately long anterior siphonal canal, by its heavily calloused, thick, smooth aperture, white around the exterior but dark brownish red deep within the aperture, and by its unusually wide protoconch with very convex outlines but weakly indented sutures. It resembles species of *C. (Ranularia)* in most characters but has an operculum with an abapically terminal rather than a left midlateral nucleus, and a somewhat taller spire than most species of *C. (Ranularia)*. It also occupies a much shallower habitat than any *C. (Ranularia)* species. Colour photographs of a living New Caledonian specimen, sent by Claude Berthault (ORSTOM, Nouméa), show that the head-foot bears smaller and more widely spaced pinkish brown ringed spots than any other species of *Cymatium* I have seen.

Cymatium muricinum is a major predator in *Tridacna* mariculture trials throughout the Pacific, and the significance of this and *C. aquatile, C. pileare* and *C. nicobaricum* has been reviewed extensively by GOVAN (1994, 1995), who cited many other relevant references.

This is one of several shallow-water to intertidal, hard-substrate species that were poorly sampled by Programme "LAGON"; specimens were collected in 6 to 79 m, but few were alive, and specimens from greater than 25 m all appear to have been dead shells carried down from a shallower habitat. However, this and all the other common, widespread, shallow-water Indo-West Pacific ranellids and bursids have had their New Caledonian records greatly amplified by the subsequent EXPÉDITION MONTROUZIER.

Subgenus *LINATELLA* Gray, 1857

Linatella Gray, 1857: 39. Type species (by monotypy): "*L. cingulata*" [= *Cassidaria cingulata* Lamarck, 1822; = *Fusus cutaceus* Lamarck, 1816; = *Buccinum caudatum* Gmelin, 1791], Pliocene to Recent, Indo-West Pacific and Atlantic.

REMARKS. — This subgenus was revised by BEU & CERNOHORSKY (1986) and was treated as a full genus in subfamily Cymatiinae. Under *L. wiegmanni* (Anton, 1838), BEU & CERNOHORSKY (1986: 25) commented that the single operculum we had seen had an abapically terminal nucleus and, if this proved to be the normal operculum, this species is not as closely related to the species we called *L. caudata* (Gmelin) as teleoconch characters would seem to suggest. I have now examined many specimens of *"L." wiegmanni* with opercula in natural position, and a number of opercula were kindly sent by Mrs. B.J. Piech, demonstrating that *"L." wiegmanni* does, indeed, have an abapically terminal opercular nucleus. It is clear, then, that opercular nucleus position is (a) **not** a character showing relationship between *"L." caudata* and *"L." wiegmanni* - indeed, it appears positively to demonstrate they are **not** consubgeneric; and (b) not necessarily a character differentiating full genera. Comparison of a range of specimens has shown that *"Linatella" wiegmanni* shares far more characters with weakly varicate *C. (Monoplex)* species, such as *C. parthenopeum* and the West African *C. tranquebaricum* (Lamarck, 1816), than it does with *"L." caudata.* Specimens with a dark brown inner lip, bearing white transverse ridges, particularly resemble *C. parthenopeum.* Examination of Miocene molluscs from the Dominican Republic suggests the possibility that *"L". wiegmanni* evolved from the Miocene *Cymatium (Monoplex) cercadicum* (Maury, 1917), another species that develops only the terminal varix. Accordingly, *"L." wiegmanni* is transferred to *C. (Monoplex). Linatella* is left containing the single species *L. caudata* and, in view of its superficial similarity to such *C. (Monoplex)* species as *C. wiegmanni*, it seems preferable to regard *Linatella* as yet another subgenus of *Cymatium.*

Cymatium (Linatella) cutaceum (Lamarck, 1816)

Buccinum caudatum Gmelin, 1791: 3471 (a secondary homonym of *Murex caudatum* Gmelin, 1791).
Fusus cutaceus Lamarck, 1816: pl. 427, figs 4 a-b; "Liste des objets", p. 6.
Cassidaria cingulata Lamarck, 1822: 216.
Fusus voigtii Anton, 1838: 77.
Triton undosum Kiener, 1842: 44, pl. 6, fig. 2.
Ranularia (Lagena) rostratus "Martini" Mörch, 1852: 110.
Triton (Linatella) poulsenii Mörch, 1877: 33.
Purpura (Polytropa) bantamensis Martin, 1899: 135, pl. 21, figs 310, 310 a, 311.
Cymatium (Linatella) krenkeli Cox, 1930: 118, pl. 12, figs 20, 21 a-b.
Cymatium (Linatella) floridanum Mansfield, 1930: 94, pl. 12, fig. 10.
Cymatium (Linatella) cingulatum peninsulum M. Smith, 1937: 113, pl. 1, fig. 2; pl. 44, fig. 5.
Linatella neptunia Garrard, 1963: 43, pl. 7, figs 7-8.

Linatella (Linatella) caudata - BEU & CERNOHORSKY, 1986: 244, figs 1-2, 5-22 (with further synonymy). — HENNING & HEMMEN, 1993: 107, pl. 20, fig. 3.
Cymatium (Linatella) cutaceum - WILSON, 1993: 244, pl. 41, fig. 7.

REMARKS. — Despite a range from southern Japan to northern New Zealand, from East Africa to Hawaii, and in both the eastern and western Atlantic (as far north as off Chincoteague Inlet, Virginia; MERRILL & PORTER, 1966), *C. cutaceum* apparently has not been collected yet in New Caledonia. However, the opportunity is taken here to clarify the species name on its transfer to *Cymatium (Linatella).*

The complication with the species name is that both *Buccinum caudatum* Gmelin (1791: 3471) and *Murex caudatum* Gmelin (1791: 3535) now apply to species of *Cymatium*, *i.e.* they are secondary homonyms. As the name *Murex caudatum* Gmelin, *i.e. Cymatium (Ranularia) caudatum* (see below), is much the better known and more widely used of these two, the writer, acting as first reviser, selects *Murex caudatum* Gmelin as the name to be used as the senior homonym by all authors who regard *Buccinum caudatum* Gmelin, 1791 and *Murex caudatum* Gmelin, 1791 as applying to species of the genus *Cymatium*.

Type specimens, synonymy, range and fossil record were reviewed by BEU & CERNOHORSKY (1986), and the synonymy (above) merely lists the published synonyms. The next youngest name available for this species is *Fusus cutaceus*. The lectotype of *Fusus cutaceus* (which is also the lectotype of *Cassidaria cingulata* and the neotype of *Buccinum caudatum*), MHNG 1100/74/1, was illustrated by BEU & CERNOHORSKY (1986: figs 7-8). This species will therefore be known in future as *Cymatium (Linatella) cutaceum* (Lamarck, 1816). Unfortunately, this name will also cause some confusion with the well known Mediterranean species *Cabestana cutacea* (Linné, 1767), which may be the reason for Lamarck's changing the name from *Fusus cutaceus* in 1816 to *Cassidaria cingulata* in 1822. As long as the Mediterranean species is retained in the distinct genus *Cabestana* this confusion should be minimal.

Subgenus ***LOTORIA*** Emerson & Old, 1963

Lotoria Emerson & Old, 1963a: 4. Type species (OD): *Cymatium (Lotoria) perryi* Emerson & Old, 1963, Recent, northern Indian Ocean to the Gulf of Arabia.

Cymatium (Lotoria) lotorium (Linné, 1758)

Fig. 20 c

Murex lotorium Linné, 1758: 749.
Cymatium rhinoceros Röding, 1798: 129.
Triton distortum Lamarck, 1816: pl. 415, fig. 3; "Liste des objets", p. 4.

Murex lotorium - LINNÉ, 1767: 1217. — GMELIN, 1791: 3533. — DILLWYN, 1817: 698.
Triton lotorium - LAMARCK, 1822: 182. — J. SOWERBY & G.B. SOWERBY I, 1825: pl. 227, fig. 1. — KIENER, 1842: 11, pl. 9, fig. 1. — REEVE, 1842: 198, pl. 244, fig. 1. — DESHAYES, 1843: 631. — REEVE, 1844a: pl. 6, fig. 19 b (in part). — KÜSTER & KOBELT, 1871: pl. 10, fig. 3 (in part).
Triton (Cymatium) lotorium - KOBELT, 1878a: 250. — TRYON, 1880: 19, pl. 10, fig. 76; pl. 11, fig. 79 (in part).
Cymatium lotorium - HIRASE, 1936: 65, pl. 95, fig. 1. — RIPPINGALE & MCMICHAEL, 1961: 66, pl. 7, fig. 3. — KIRA, 1962: 56, pl. 22, fig. 15. — WILSON & GILLETT, 1971: 76, pl. 52, fig. 4. — HINTON, 1972: 12, pl. 6, fig. 5. — SALVAT & RIVES, 1975: 304, fig. 168. — HINTON, 1978: 29, figs 3-3 a. — SHORT & POTTER, 1987: 46, pl. 22, fig. 6. — DRIVAS & JAY, 1988: 62, pl. 16, fig. 11. — SALVAT *et al.*, 1988: 100, pl. 12, fig. 10.
Cymatium (Ranularia) lotorium - KIRA, 1955: 43, pl. 21, fig. 16.
Cymatium (Lotoria) lotorium - EMERSON & OLD, 1963a: 4, figs 3, 5. — BEU, 1985: 58. — SPRINGSTEEN & LEOBRERA, 1986: 112, pl. 30, fig. 10. — LAI, 1989: 120, fig. 17. — HENNING & HEMMEN, 1993: 56, pl. 11, fig. 1. — WILSON, 1993: 244, pl. 41, fig. 1. — BOSCH *et al.*, 1995: 97, fig. 351.
Tritonium (Lotorium) rhinoceros - TAPPARONE-CANEFRI, 1881: 28.

TYPE DATA. — No specimen of *Cymatium lotorium* is present in Linné's collection housed by the Linnean Society of London. The Linné type Colln of the Uppsala University Zoological Museum contains three specimens identified as syntypes of *Murex lotorium* (WALLIN, 1993), but these are not conspecific with the species identified by this name throughout this century (*Cymatium pyrum*, UUZM Linné Colln no. 301; *C. pyrum*, UUZM Linné Colln no. 899a; *C. femorale*, UUZM Linné Colln no. 899b) and, as noted in the Introduction, these are not considered to be valid syntypes. Under ICZN Opinion 1135, *Murex lotorium* is to be interpreted as the species figured by REEVE (1844a: pl. 6, fig. 19 b) and this specimen (BMNH 1967696) is here designated the neotype of *Murex lotorium*. The neotype is without locality; the type locality is here designated as the Philippine Islands. — *Cymatium rhinoceros*: as no type specimens are known for any of RÖDING's (1798) species, the same specimen (BMNH 1967696) is also here designated the neotype of *Cymatium rhinoceros*. — *Triton distortum*: Lamarck's Colln in MHNG does not contain any material identified as *Triton distortum*, but this is presumably because LAMARCK (1822: 182) later realised that Linné's name *Murex lotorium* applied to the same species; Lamarck's Colln contains two specimens of *Cymatium lotorium* labelled "*Triton lotorium* Lamarck, type". The larger of these, with a completely secreted aperture, appears to be the specimen illustrated by LAMARCK (1816: pl. 415, fig. 3) and is certainly the specimen illustrated by KIENER (1842: pl. 9, fig. 1), and is here designated the lectotype

of *Triton distortum* (MHNG 1099/93). The paralectotype (MHNG 1099/89) has an incompletely secreted outer lip. Both are labelled "Océan indien".

NEW CALEDONIA RECORDS. — **North of New Caledonia.** LAGON: sta. 457 (Fig. 20 c).

DISTRIBUTION. — *Cymatium lotorium* occurs from central East Africa (southern limit unknown to me), Madagascar (NZGS WM14907) and Mauritius (DRIVAS & JAY, 1988: 62; also NZGS WM13882) eastward into the western Pacific, where it ranges from southern Japan (to southern Honshu; KIRA, 1962: 56) to the Capricorn Group of islands, on the southern Great Barrier Reef, Queensland, Australia (NZGS WM12701), and as far east as the Marquesas Islands (SALVAT & RIVES, 1975: 304, fig. 168). Not reported from Hawaii by KAY (1979). It is replaced in the northern Indian Ocean and Gulf of Arabia by *C. perryi*, although BOSCH *et al.* (1995: 97) recorded a single specimen of *C. lotorium* from Muscat, Oman. In view of recent doubts about whether *C. lotorium* occurs in the Red Sea (MIENIS, 1990a; none of the previously recorded specimens could be located by MIENIS) it is worth recording an authentic Red Sea specimen: alive in 10 m of water on a large rock, Massawa, Ethiopia, coll. D. Peled, May 1968, in Peled Colln (H 110.0, D 50.5; seen, A.G. BEU).

DIMENSIONS. — H 146.3, D 68.9 (New Caledonian specimen).

REMARKS. — *Cymatium lotorium* has a large, distorted, bright orange shell with two large black blotches on the inner lip. It was not reported from the New Caledonian area by FISCHER (1860) or MELVILL & STANDEN (1895), and only a single specimen is present in the MNHN collections reported on here. This specimen is from Atoll de Surprise in the extreme north of New Caledonia. SALVAT & RIVES (1975: 304) recorded it only from the Marquesas Islands, within their study area of Polynesia. However, SALVAT *et al.* (1988: pl.12, fig. 10) illustrated a specimen from New Caledonia.

Subgenus ***MONOPLEX*** Perry, 1811

Monoplex Perry, 1811: pl. 3. Type species (SD by DALL, 1904: 134): *Monoplex australasiae* Perry, 1811 [= *Murex parthenopeus* Salis Marschlins, 1793], Miocene to Recent, Mediterranean, Atlantic, South Africa, northern Indian Ocean and Gulf of Arabia, Australia and New Zealand to Kermadec Islands, New Caledonia, central Japan, Taiwan and Hawaii.

Lampusia Schumacher, 1817: 350. Type species (SD by HERRMANNSEN, 1847: 575): *Murex pilearis* Linné, 1758, Miocene-Recent, Indo-West Pacific.

Cabestanimorpha Iredale, 1936: 307. Type species (OD, IREDALE, 1936: 336): *Triton exaratus* Reeve, 1844, Pleistocene-Recent, Australia, New Zealand, New Caledonia, Hawaii, Japan.

Dissentoma Pilsbry, 1945: 59. Type species (OD): *Dissentoma prima* Pilsbry, 1945 [= *Murex parthenopeus* Salis Marschlins, 1793].

Cymatriton Clench & Turner, 1957: 210. Type species (OD): *Tritonium nicobaricum* Röding, 1798, Recent, Indo-West Pacific and E & W Atlantic.

Cymatium (Monoplex) aquatile (Reeve, 1844)

Fig. 34 a

Triton aquatilis Reeve, 1844a: pl. 7, fig. 24.
?*Triton aquatile occidentale* Mörch, 1877: 19 (*nomen nudum*).
?*Cymatium pileare* var. *cruzana* Nowell-Usticke, 1959: 60.

Triton aquatilis - REEVE, 1844c: 114.
Tritonium aquatile - TAPPARONE-CANEFRI, 1881: 25.
Cymatium aquatile - HIRASE, 1936: 66, pl. 95, fig. 6. — DRIVAS & JAY, 1988: 62, pl. 16, fig. 9.
Cymatium (Monoplex) aquatile - BEU, 1985: 58. — BEU & KAY, 1988: 197, figs 1, 12-16, 21-32. — LAI, 1989: 123, fig. 34. — HENNING & HEMMEN, 1993: 61, pl. 14, fig. 5. — WILSON, 1993: 245, pl. 41, fig. 2. — BOSCH *et al.*, 1995: 98, fig. 353.
Cymatium (Septa) aquatile - WOLFE, 1975a: 6, fig. 3 left, fig. 5 right. — KAY, 1979: 220, fig. 76 E, not 77 A [= *C. pileare*]. — SPRINGSTEEN & LEOBRERA, 1986: 112, pl. 30, fig. 16.
Triton (Simpulum) pileare - TRYON, 1880: 12, pl. 6, figs 34-35 (in part).
Cymatium (Septa) pileare - CLENCH & TURNER, 1957: 216 (in part).

Triton (Simpulum) pilearis var. *aquatilis* - KOBELT, 1878a: 245.
Cymatium bayeri - POPPENOE & KLEINPELL, 1978: pl. 5, fig. 61.
Cymatium nicobaricum - SALVAT *et al.*, 1988: 101, pl. 12, fig. 11.

TYPE DATA. — *Triton aquatilis*: 2 syntypes BMNH 1967626, from "Philippine Islands", *ex* H. Cuming Colln. The larger (H 111.4, D 52.4) is the specimen figured by REEVE (1844a: pl. 7, fig. 24), and is here designated the lectotype. — *Triton aquatile occidentale* and *Cymatium pileare* var. *cruzana*: no type material is known (BEU & KAY, 1988: 199; FABER, 1988: 76).

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW46.
New Caledonia. LAGON: sta. 489, 551, 571, 588, 702, 757, 820, 900, 1128. — EXPÉDITION MONTROUZIER: sta. 1241 (Fig. 34 a), 1242, 1245, 1276, 1282, 1286, 1296, 1303, 1319, 1330. — LAGON DE NOUMÉA: sta. 1356. — BATHUS 1: sta. DW1236.
Loyalty Ridge. MUSORSTOM 6: sta. DW436.
The depth range in these 23 samples is intertidal to 60 m.

DISTRIBUTION. — Throughout most of the tropical realm of the world, from eastern South Africa and the Gulf of Arabia (including the Red Sea) to southern Japan and as far south as Barrow I., Western Australia (WILSON, 1993: 245) and the Capricorn Group, southern Great Barrier Reef, Queensland (NZGS WM11641), and New Caledonia, eastward throughout Polynesia to Hawaii (KAY, 1979) and to Cocos Island, Costa Rica (EMERSON, 1991: 68), and from two poorly localised specimens from the mainland coast of Panamic Western America (EMERSON, 1991: 68); in the western Atlantic, from the Bahamas and Florida south to Curaçao and Trinidad (possibly **not** occurring in northeastern South America); in the eastern Atlantic recorded definitely only from the Canary Islands (La Palma; NZGS WM15201 , specimen presented by F. GARCIA-TALAVERA) and the Cape Verde Islands (in MNHN, collected by Bouvier, *ex* H. Fischer Colln; BEU & KAY, 1988: 200, figs 27, 29).

DIMENSIONS. — EXPÉDITION MONTROUZIER: sta. 1241: H 83.7, D 41.7. Maximum size recorded in New Caledonia ca. 100 mm (PRIGENT, 1995).

REMARKS. — The review of species of the *Cymatium pileare* group by BEU & KAY (1988) includes a discussion of the characters separating *C. aquatile* from *C. pileare* and other closely related species, as well as information on type specimens, fossil record, distribution and dimensions of *C. aquatile*; most need not be repeated here. *C. aquatile* is distinguished from *C. pileare* by its wider shape, its smaller maximum size, its uniform pale yellow-orange to deep orange-red colour (rather than tan to bluish grey, with banded varices and obscure paler and darker brown spiral bands, on *C. pileare*), its markedly larger protoconch and, principally, by its uniform pale orange aperture, with short, coarse teeth inside the outer lip, quite distinct from the bright red aperture with long transverse ridges inside the outer lip, and a dark brown columella with pale transverse ridges in *C. pileare*. Claude Berthault (ORSTOM, Nouméa) recently sent me colour photographs of a living specimen of *C. aquatile*, collected at between 7 and 9 m in New Caledonia, along with others of a specimen of *C. pileare* collected at the same site. In common with the exterior of the head-foot of all other *C. (Monoplex)* species I have seen animals of, both these bear large, ringed, circular to oval spots scattered densely over a pale greyish background, and particularly densely on the sides of the foot, but whereas the spots are a pale reddish brown in *C. pileare*, they are a much brighter and more obvious brownish red to almost crimson in *C. aquatile*, and a yellow marginal area between densely placed spots is markedly more obvious in *C. aquatile* than in *C. pileare*.

Cymatium aquatile is common in intertidal and shallow subtidal depths throughout much of the tropical realm but, like *C. pileare, C. muricinum, C. mundum* and *C. nicobaricum* (among others), is not common in trawled material from below about 20-30 m. Consequently, although New Caledonian specimens gathered in shallow water are present in many of the world's museums, these near-shore species were poorly represented in the LAGON samples studied here. This deficiency has, however, been filled for all these species by the EXPÉDITION MONTROUZIER samples.

Cymatium (Monoplex) comptum (A. Adams, 1855)

Figs 23 i, 26 a-k

Triton comptus A. Adams, 1855: 312.
Triton ridleyi Smith, 1890a: 489, pl. 30, fig. 1.
Cymatium gracile var. *gurabonicum* Maury, 1917: 107, pl. 17, fig. 10.
Cymatium (Lampusia) pileare var. *borneana* Cox, 1948: 39, pl. 4, figs 1 a-b.

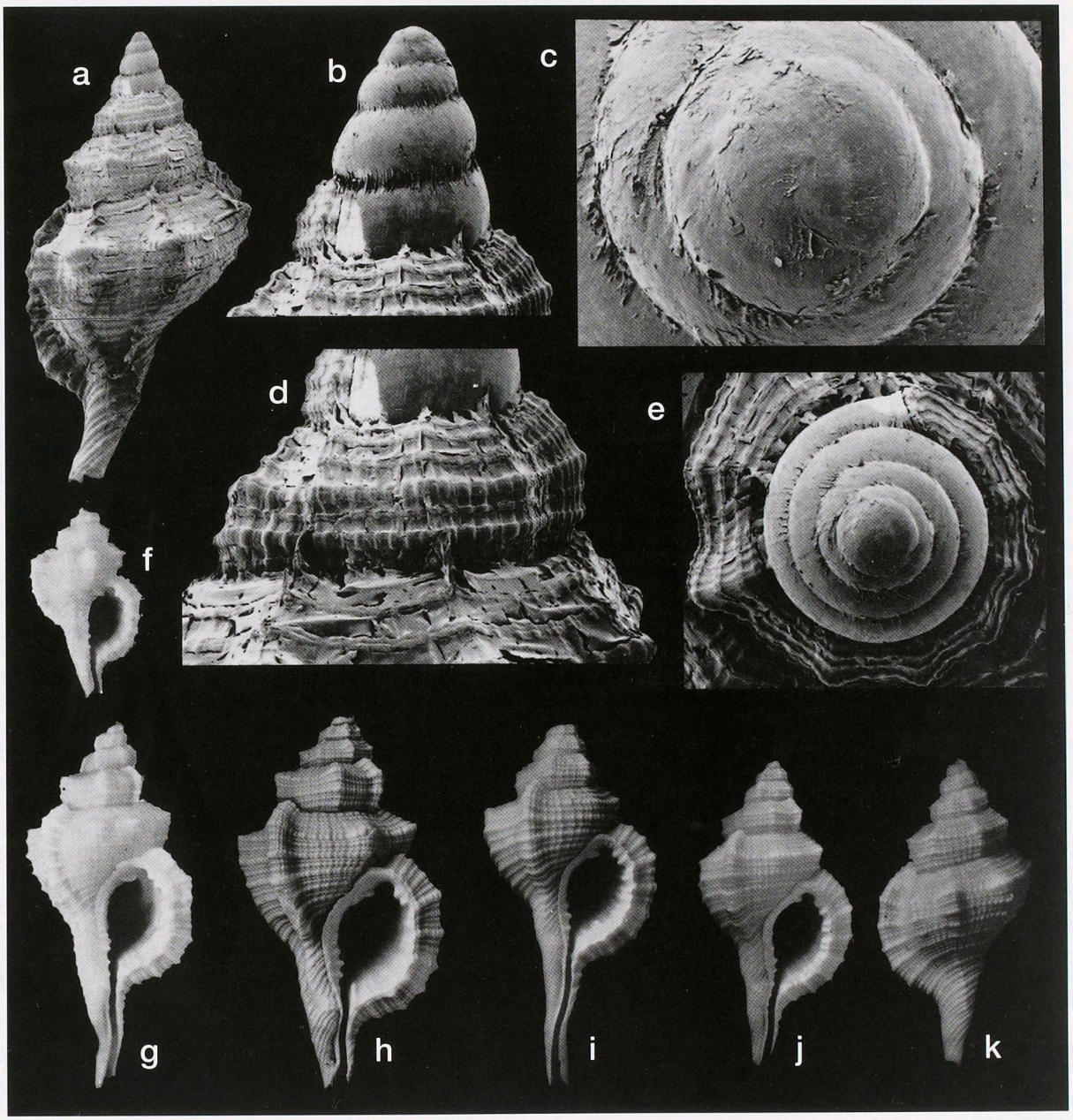

FIG. 26. — *Cymatium (Monoplex) comptum* (A. Adams). — **a-e**, CORAIL 2: sta. DW41, Chesterfield Plateau, Coral Sea, 52 m; a. x4; b. x15; c. x67; d. x16; e. x20. — **f**, holotype of *Triton ridleyi* E.A. Smith, BMNH 1888.6.27.42, Fernando de Noronha I., Brazil, x1.6. — **g**, lectotype of *Triton comptum* A. Adams, BMNH 1967684/1, "China", x1.6. — **h**, CORAIL 2: sta. DW99, Chesterfield Plateau, Coral Sea, 52 m, x2. — **i**, LAGON: sta. 1163, Belep Islands, New Caledonia, 48 m, x2. — **j-k**, MUSORSTOM 4: sta. DW187, north of New Caledonia, 65-120 m, x1.5.

Triton comptus - TRYON, 1880: 33.
Cymatium comptum - YEN, 1942: 215, pl. 18, fig. 112. — KURODA & HABE, 1952: 51. — LEAL, 1991: 116.
NOT *Cymatium comptum* - DRIVAS & JAY, 1988: 64, pl. 17, fig. 11 [= *C. vespaceum*].
Cymatium (Septa) comptum - RIOS, 1985: 75, pl. 27, fig. 329. — SPRINGSTEEN & LEOBRERA, 1986: 113, pl. 31, figs 3 a-b.
Cymatium (Turritriton) comptum - BEU, 1985: 60. — GARCIA-TALAVERA, 1987: 253, pl. 2, fig. 5. — LAI, 1989: 125, fig. 44. — HENNING & HEMMEN, 1993: 99, pl. 21, fig. 5.
Cymatium (Monoplex) comptum - WILSON, 1993: 245.
Lampusia gracile - DALL, 1889: 227, pl. 29, fig. 2.
Cymatium (Septa) gemmatum - CLENCH & TURNER, 1957: 222, pl. 110, fig. 2; pl. 113, fig. 6; pl. 125, figs 1-2.
Cymatium (Septa) vespaceum - WARMKE & ABBOTT, 1962: 101, pl. 18, fig. b. — ABBOTT, 1974: 163, fig. 1754. — RIOS, 1975: 79, fig. 322. — SAUNDERS, 1980: 5, upper fig. — COELHO *et al.,* 1981: 124, fig. 9.
Cymatium vespaceum - HINTON, 1978: 30, fig. 9. — GARCIA-TALAVERA, 1983: 108, pl. 5, fig. 2. — COSEL, 1982: 54.
Cymatium (Turritriton) labiosum - KAY, 1979: 223, fig. 79 E.

TYPE DATA. — *Triton comptus*: lectotype (selected by YEN, 1942: pl. 18, fig. 112) and 3 paralectotypes (all BMNH 1967684), from "China", *ex* Cuming Colln. The lectotype (Fig. 26 g) is the only specimen among these definitely agreeing with A. ADAMS' (1855) description; it is a relatively large specimen (H 36.0) agreeing closely with the large range of Philippines material that has come to light in recent years. The next largest paralectotype (H 35.0) is a specimen of *Cymatium (Reticutriton) pfeifferianum*; the smaller paralectotypes have complete periostraca and are not identifiable with certainty, but appear to be *C. vespaceum* rather than *C. comptum*. — *Triton ridleyi*: holotype BMNH 1888.6.27.42, from Fernando Noronha Island, off the coast of Brazil; a very small (H 18.3, D 11.0) but otherwise typical specimen of *C. comptum* (Fig. 26 f). — *Cymatium gracile* var. *gurabonicum*: holotype, PRI 28764, a nicely preserved, but slightly incomplete, Late Miocene fossil specimen of *C. comptum* from "Los Quemados", Dominican Republic, West Indies. — *Cymatium (Lampusia) pileare* var. *borneana*: holotype (H14421) and 5 paratypes in Naturhistorisches Museum Basel; a Pleistocene fossil from the Togopi Formation, Dent Peninsula, North Borneo.

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW19, CP25, DW41 (Figs 26 a-e), DW48, DW73, DW79, DW99 (Fig. 26 h), DW115, DW156, DW160.
New Caledonia. LAGON: sta. 79, 112, 243, 328, 334, 358, 436, 439, 478, 480, 545, 597B, 713, 821, 983, 1006, 1047, 1139, 1163 (Fig. 26 i). — EXPÉDITION MONTROUZIER: sta. 1245, 1260, 1261, 1310, 1311, 1312, 1314, 1315, 1316, 1318, 1321, 1323. — LAGON DE NOUMÉA: sta. 1355.
North of New Caledonia. MUSORSTOM 4: sta. DW187 (Figs 23 i, 26 j-k).
Norfolk Ridge. BATHUS 2: sta. DW714.
These 44 lots are from the intertidal zone to depths of 124 m; specimens were taken alive from the intertidal zone to 120 m.

DIMENSIONS. — *Triton comptus* (lectotype): H 36.0, D 16.3. - *Triton ridleyi* (holotype): H 18.3, D 10.0. - *Cymatium gracile* var. *gurabonicum* (holotype): H 21.7, D 12.8. - *Cymatium pileare* var. *borneana* (holotype): H 43, D 21. - Mactan I., Cebu, largest Philippines specimen seen, NZGS WM14109: H 37.3, D 17.2. - LAGON: sta. 1355, largest New Caledonian specimen: H 38.5, D 20.2.

DISTRIBUTION. — Apparently relatively uncommon in the Indian Ocean, but seen from NE South Africa (NMP D6495, off Dog Pt, N. Zululand, 70 m, dredged R.V. *"Meiring Naudé"*, sta. ZC3, 4 June 1987; 1 lv); Mauritius (NZGS); Red Sea (NZGS WM13342 , Eilat, purch. Dov Peled); throughout the West Pacific province from eastern Australia (NZGS WM13016, Heron I., Capricorn Group, coll. N. Coleman) and New Caledonia to Taiwan, and probably southern Japan; particularly common in "deep-water" shell debris from the Philippine Islands; as far east as Hawaii (KAY, 1979: fig. 79E, specimen illustrated as *C. labiosum*; NZGS WM12437, Pokai Bay, Oahu, *ca* 40 m, SCUBA, 1959, coll. & pres. C.M. Burgess).

In the Atlantic this is the small, finely sculptured species known to early workers as "*Triton gracile* Reeve" (the syntypes of *T. gracile* are juvenile specimens of *C. pfeifferianum*), identified by CLENCH & TURNER (1957: 222) as *C. gemmatum* (the identity of the real *C. gemmatum* is discussed below), and identified by ABBOTT (1974) and subsequent workers as *C. vespaceum*. True *C. vespaceum* is almost unknown in the Atlantic, although PIECH (1993: 90) reported the first authentic specimens. Specimens of *C. comptum* are known in the western Atlantic from Florida (CLENCH & TURNER, 1957: 22) to Brazil (RIOS, 1985: 75), and in the eastern Atlantic from the Cape Verde Islands (SAUNDERS, 1980: 5) and the Canary Islands (GARCIA-TALAVERA, 1983: 108).

REMARKS. — With the question of distinguishing *Cymatium comptum* from *C. vespaceum*, with which it has been confused by almost all previous authors, the subject of the taxonomy of the "*Cymatium vespaceum* complex" is introduced. As both *C. comptum* and *C. vespaceum* occur in some numbers in the MNHN New Caledonian collections, and clearly the distinctions between them must be clarified, all the similar and apparently closely related species of this group are revised here. Species included are:

C. comptum (A. Adams, 1855), Indo-West Pacific and E. & W. Atlantic.
C. exaratum (Reeve, 1844), Australia-New Zealand, New Caledonia, Hawaii and Japan [= *kiiensis* G.B. Sowerby III, 1915]; *possibly* in the western Atlantic.
C. penniketi sp. nov., Gulf of Arabia.
C. thersites (Reeve, 1844), central Indo-West Pacific, but rare other than in northern Western Australia.
C. vespaceum (Lamarck, 1816), Indo-West Pacific and, very rarely, western Atlantic.

The coloured illustrations and list of distinctions published by SPRINGSTEEN & LEOBRERA (1986: 113, pl. 31; *C. comptum* figs 3 a-b; *C. vespaceum* fig. 2) very clearly define the differences between these two similar, very widespread, largely sympatric species: *C. comptum* is "often confused with *C. vespaceum* but differs in the following ways; the shell is lighter in weight (*i.e.* thinner), nearly always brightly coloured (brown, red, orange), lacking the greyish tints of *vespaceum*; the sutures are more deeply impressed; the varices are more prominent; the denticles inside the outer lip are finer and closer; the nodules are larger and fewer in number, the surface sculpturing is much finer and the spiral cords remain single on the varices, whereas in *vespaceum* they divide into two". A very significant further difference is that, although the protoconchs of the two species are about the same height, that of *C. comptum* is markedly wider than that of *C. vespaceum*. Distinction between these species can often be more difficult (particularly with broken or very small specimens) than this list of differences suggests, as all species in this group have seven nodules (each bearing two low ridges on most specimens) inside the outer lip, several similar, prominent ridges on the lower columella, and a very similar shape. Both also occur as a dark reddish brown to almost black colour form with a pale basal band, although it is uncommon in both species. However, unicoloured forms, normal in *C. comptum*, are uncommon in *C. vespaceum* and, as the name ("wasp-like") suggests, the varices on most *C. vespaceum* are banded with paler and darker red-brown to bluish grey, producing a much more banded colour pattern than on most *C. comptum*. Apart from the colour pattern, the wider, thinner varices, the markedly finer, crisper sculpture and the thin, well raised apertural ridges give *C. comptum* a consistently different overall appearance from *C. vespaceum*. The size is also different; *C. comptum* is the smallest of the five species in this group, reaching about 40 mm in height but not commonly exceeding about 33 mm, whereas *C. vespaceum* commonly exceeds 40 mm in height and reaches about 65 mm.

The details of the primary spiral cords are the principal characters distinguishing the species of this group. In *C. comptum*, only, all cords are narrow, and remain entirely undivided and narrow where they cross the varices. In *C. vespaceum* the cords are slightly wider than in *C. comptum*, and the uppermost two cords, at the shoulder angle and immediately below, develop a very narrow median groove where they cross the varices. The prominence of the groove increases as the shell grows, and on some specimens 50 mm or more high the median groove is quite prominent over the varices, and extends weakly across the last intervariceal interval. In *C. penniketi* sp. nov. the cords also all remain undivided, although they become wider and more flat-topped over the varices than elsewhere. In *C. thersites* the uppermost two spiral cords are weakly grooved for their full length, quite a prominent groove develops over the varices, and some large specimens have faint grooves over the varices on the third and fourth cords below the shoulder angle. In *C. exaratum* the most deeply grooved cords are seen, as all specimens have a deep, prominent groove subdividing the two uppermost spiral cords each into two closely spaced cords, the next lower three cords all bear weak median grooves where they cross the varices, and a few specimens have a weak median groove on the third and fourth cords over the intervariceal intervals. As well as these sculptural distinctions, and protoconch differences outlined below, the species have markedly different distributions.

LEAL (1991: 115) considered *Triton ridleyi* to be an earlier name for *C. (Ranularia) rehderi* A. H. Verrill, 1950, a distinctive, endemic Atlantic species. However, SMITH's holotype (see above) is a small specimen of *C. comptum*.

Cymatium (Monoplex) exaratum (Reeve, 1844)

Figs 23 n, 27 a-k

Triton exaratus Reeve, 1844a: pl. 13, figs 50 a-b.
Triton obscurus A. Adams, 1855: 312 (not *Triton obscurus* Reeve, 1844).
?*Tritonium granulatum* Dunker, 1871: 166 (unrecognisable).
Lotorium (Cymatium) kiiense G.B. Sowerby III, 1915: 165, pl. 10, fig. 7.

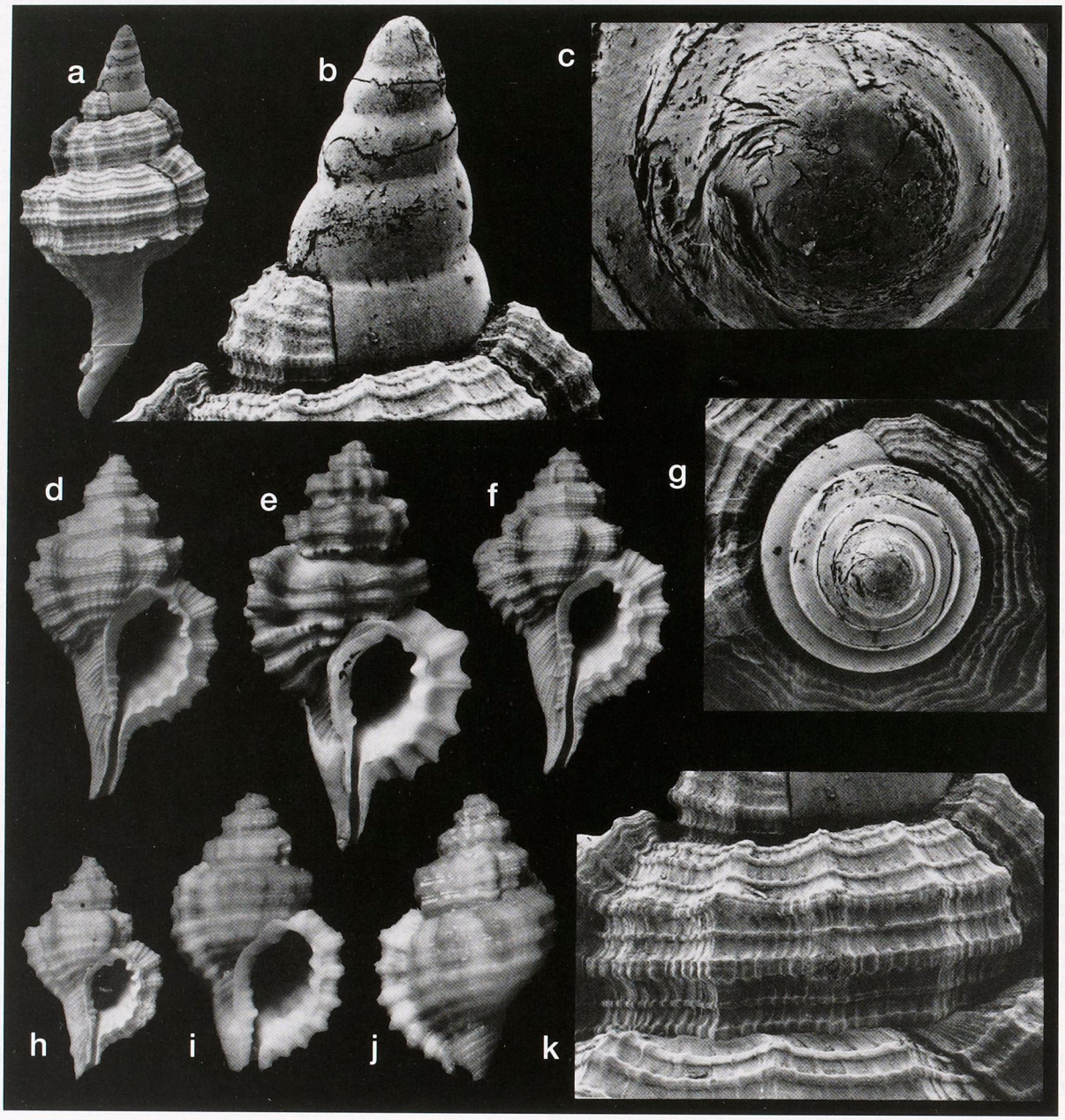

FIG. 27 — *Cymatium (Monoplex) exaratum* (Reeve). — **a-c**, **g**, **k**, CORAIL 2: sta. DW120, Chesterfield Plateau, Coral Sea, 56 m; a. x3.9; b. x15; c. x67; g, k. x16. — **d**, MUSORSTOM 6: sta. DW462, Loyalty Ridge, 200 m, x1.5. — **e**, typical large New Zealand specimen, NZGS RM5551, Tutukaka, Northland, 22 m, x1. — **f**, MUSORSTOM 4: sta. DW187, north of New Caledonia, 65-120 m, x1.5. — **h**, CHALCAL 1: sta. D58, Chesterfield-Bellona Plateau, Coral Sea, 56 m, x1.5. — **i-j**, BPBM 62160, Midway I., Hawaiian Islands, x1.5.

Cymatium zimara Iredale, 1929a: 346, pl. 38, fig. 11.
Cabestanimorpha euclia Cotton, 1945: 252, fig. 2.

Triton exaratus - REEVE, 1844c: 116. — LISCHKE, 1869: 35; 1871: 30, pl. 2, figs 15-17. — KÜSTER & KOBELT, 1876: 231, pl. 64, figs 6-7. — VERCO, 1895: 103.
Tritonium (Gutturnium) exaratum - ANGAS, 1867: 188.
Triton (Gutturniam) exaratus - KOBELT, 1878a: 361.
Triton exaratum - TRYON, 1880: 22, pl. 12, figs 102, 104.
Lotorium exaratum - PRITCHARD & GATLIFF, 1898: 265; 1906: 42.
Cymatium (Turritriton) exaratum - GATLIFF & GABRIEL, 1908: 370.
Cymatium exaratum - IREDALE, 1910: 71. — SUTER, 1913: 306; 1915: pl. 44, fig. 14. — OLIVER, 1915: 527. — HEDLEY, 1916b: 195; 1918b: M66. — POWELL, 1924: 286. — BUCKNILL, 1924: 53, pl. 4, fig. 12. — FINLAY, 1926: 398, pl. 21, figs 83-84. — COTTON & GODFREY, 1931: 10. — SHORT & POTTER, 1987: 48, pl. 23, fig. 1.
Monoplex exaratum - POWELL, 1933: 164.
Cabestanimorpha exarata - IREDALE, 1936: 307. — POWELL, 1962: 94, pl. 14, fig. 2. — PENNIKET & MOON, 1970: 44, pl. 19, fig. 1.
Septa exarata - BEU, 1976: 306, figs 1, 12 b.
Cymatium (Turritriton) exaratum exaratum - BEU, 1985: 60. — HENNING & HEMMEN, 1993: 99, pl. 21, fig. 1.
Cymatium (Monoplex) exaratum - WILSON, 1993: 245, pl. 42, figs 1 a-b.
Cymatium kiiense - HIRASE, 1936: 65, pl. 95, fig. 3(left). — KURODA & HABE, 1952: 51.
Cymatium (Cabestana) vespaceum form *kiiensis* - M. SMITH, 1948: 51, pl. 8, fig. 2.
Turritriton kiiensis - KURODA *et al.*, 1971: 126, pl. 29, figs 8-9. — AOKI & BABA, 1983: 50, fig. 16. — OKUTANI, 1986: 112, 4th fig.; 113, 14th and 16th unnumbered figs.
?NOT *Turritriton kiiensis* - OKUMURA & TAKEI, 1993: pl. 29, figs 2 a-b [?= *C. sinense*].
Cymatium (Turritriton) kiiensis - LAI, 1989: 123, fig. 36.
Cymatium (Turritriton) exaratum kiiense - BEU, 1985: 60. — HENNING & HEMMEN, 1993: 101, pl. 21, fig. 2.
Cabestanimorpha zimara - GARRARD, 1961: 14.
Monoplex cornutus - HEDLEY, 1902: 26 (not *Monoplex cornutus* Perry, 1811, unrecognisable).
Lotorium cornutum - KESTEVEN, 1902: 460, pl. 17, fig. 10. — MOSS, 1908: 23, pl. 5, fig. 7.
Cabestanimorpha tabulata - IREDALE, 1949: 20. — GARRARD, 1961: 14 (not *Tritonium tabulatum* Menke, 1843).
Cymatium (Ranularia) sarcostomum - CLENCH & TURNER, 1957: 206, pl. 118, fig. 5, only.
Turritriton tabulata - RIPPINGALE & MCMICHAEL, 1961: 67, pl. 7, fig. 7.
Turritriton loebbeckei - HABE, 1961: 45, pl. 22, fig. 9; 1964: 72, pl. 22, fig. 9.
Cabestana tabulata - MACPHERSON & GABRIEL, 1962: 161, fig. 194.
Turritriton tabulatus - WILSON & GILLETT, 1971: 78, pl. 53, fig. 5. — HINTON, 1978: 28, fig. 7.
Septa (Cabestamimorpha) tabulata - BEU, 1971: 108.
Septa (Cabestanimorpha) tabulata kiiensis - BEU, 1971: 108, pl. 7, fig. 7; pl. 8, figs 11-15, 18-21.
Turritriton tabulatus exaratus - POWELL, 1979: 165, pl. 33, fig. 2.

TYPE DATA. — *Triton exaratus*: 2 lots of 3 syntypes each, BMNH 1967633. 3 syntypes, labelled "North coast of New Holland", *ex* Cuming Colln; the specimen with "c" written in the aperture is the original of REEVE's (1844a) pl. 13, fig. 50 a, and is here designated the lectotype. BMNH 1978142, 3 further **probable** paralectotypes labelled "N. Australia, Mr Jukes", also *ex* Cuming Colln; the smallest (H 40.7, D 24.1) appears to be the original of REEVE's (1844a) pl. 13, fig. 50 b. All six specimens have strongly shouldered whorls and very strongly stepped spires; the lectotype and the 2 paralectotypes in BMNH 1967633 are pale fawn and mauvish grey shells, whereas those in BMNH 1978142 are brightly banded red-brown and white. All six appear to originate from Western Australia, to judge from their strongly stepped spires. — *Triton obscurus*: lectotype (designated by BEU, 1971) and paralectotype were then assumed by me to be specimens of *C. durbanense*, as they bear a label in A. Adams's hand saying "*T. obscurus* A. Ad. south coast of Africa". However, these specimens also bear an early label reading "Sydney under stones Mr Strange". The specimens are larger and more strongly shouldered than any *C. durbanense* I have seen and, as they have relatively narrow, widely spaced spiral cords, the upper two of which are each deeply subdivided by a median groove, they are clearly *C. exaratum* rather than *C. durbanense*. The actual type locality, therefore, appears to be Sydney, New South Wales. — *Lotorium (Cymatium) kiiensis*: lectotype (designated by BEU, 1971: 101, pl. 8, fig. 14), BMNH 1919.12.31.30, from "Kii, Japan", purchased from SOWERBY & FULTON; 2 paralectotypes, AMS C72368, "Kii, Japan" (BEU, 1971: pl. 8, figs 18-21). — *Cymatium zimara*: holotype AMS C57849 , from Sydney Harbour "*Triton*" dredgings, New South Wales. — *Cabestanimorpha euclia*: holotype, South Australian Museum, Adelaide, D 6515, from 100 m, 9 miles west of Eucla, south coast of Western Australia.

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. D52, D58 (Fig. 27 h). — CORAIL 2: sta. DW120 (Figs 27 a-c, g, k), DW125, DW154.
New Caledonia. LAGON: sta. 234 bis, 301, 324, 326, 334 (Fig. 23 n), 346, 357, 381, 542, 553, 572, 603, 742. — BATHUS 1: sta. DW1235.
North of New Caledonia. MUSORSTOM 4: sta. DW187 (Fig. 27 f).
Norfolk Ridge. CHALCAL 2: sta. DW80. — SMIB 5: sta. DW100.
Loyalty Ridge. MUSORSTOM 6: sta. DW462 (Fig. 27 d).
These 23 lots (27 specimens) are from depths of 35-200 m; specimens were collected alive in depths of 46 to 160 m.

DISTRIBUTION. — In Australia, *Cymatium exaratum* occurs commonly in central and southern Western Australia, commonly in New South Wales and southern Queensland, but rarely (if at all) around the north coast,

and uncommonly around the south coast, in Victoria, South Australia, and along the south coast of Western Australia. In central and southern Queensland it occurs sympatrically with the much more common *C. vespaceum*. In New Zealand, *C. exaratum* is limited to the warm-water northeastern province of the North Island, from the far north to East Cape; specimens occur from shallow subtidal depths (*ca.* 5-10 m) to 100 m, where they are occasionally trawled on the shelf, but more commonly taken on rocky substrates by SCUBA divers; specimens occasionally wash ashore. Specimens have also been dredged and found on beaches at Raoul Island, Kermadec Islands, and so it almost certainly occurs also at Norfolk Island and Lord Howe Island. In view of its rarity in North Queensland and the north coast of Australia, it is surprising that the range is extended here to the Coral Sea (5 specimens), New Caledonia (15 stations, all around the main islands) and the Loyalty Ridge (1 specimen). The species has not previously been reported from the Hawaiian Islands, but a single specimen (BPBM 62160) from Midway Island is present in the Bishop Museum (Figs 27 i-j). In Japan, *C. exaratum* is recorded by HABE (1964: 72) as "rather common on rocky shores between tide marks to 10 m in depth from Boso Peninsula, Honshu, to Kyushu". Although this species has never been reported from the Atlantic, the specimen figured by CLENCH & TURNER (1957: pl. 118, fig. 5) as a juvenile *"Cymatium sarcostomum"*, from St. Croix, Virgin Islands, Caribbean, has the shouldered whorls and prominent, narrow, bifid cords that distinguish *C. exaratum*. This is evidently a rare Caribbean species. The only fossil record I am aware of in the southwestern Pacific is from the Pleistocene (oxygen isotope stage 9) of Te Piki, near Cape Runaway, North Island, New Zealand (BEU, 1976: 306), but it has been reported as a Pleistocene fossil (as *Turritriton kiiensis*) from several localities in the Shimosa Group near Tokyo, Japan (O'HARA *et al.*, 1976: 94; AOKI & BABA, 1983: 50, fig. 16).

DIMENSIONS. — *Triton exaratus* (lectotype): H 46.9, D 28.3; paralectotypes, BMNH 1967633: H 47.0, D 27.9; H 41.7, D 25.7; paralectotypes, BMNH 1978142: H 48.2, D 27.9; H 41.0, D 16.0; H 40.7, D 24.1. - *Lotorium kiiensis* (lectotype): H 36.2, D 18.8. - *Triton obscurus* (lectotype): H 51.8, D 29.7; paralectotype: H 55.3, D 34.7. - *Cabestanimorpha euclia* (holotype): H 20, D 12 (COTTON, 1945: 252). - Off Tutukaka, Northland, North Island, SCUBA, 25 m, *ex* J.R. Penniket Colln, largest New Zealand specimens seen, NZGS RM5550: H 62.0, D 38.7; NZGS RM5551 (Fig. 27 e): H 62.4, D 35.1. - New South Wales, *ex* E.S. Gourlay Colln, largest Australian specimen seen, NZGS WM13795: H 60.9, D 36.8. - Midway, Hawaiian Islands, BPBM 62160: H 29.3, D 18.7. - New Caledonia, LAGON: sta. 334: H 49.2, D 26.4.

REMARKS. — *Cymatium exaratum* is the largest of the species of the *C. comptum-vespaceum* species group and, partly because of its discontinuous distribution and partly because of its variability and its confusion with other, similar species, has had a complex and chequered nomenclatural history, particularly during the middle period of this century.

Cymatium exaratum is recognisable by its short, squat shape (although some specimens, particularly those dredged on the shelf in 60-100 m, have moderately long anterior canals), its stepped spire outlines, its prominent sculpture of large, widely spaced axial costae crossed by prominent, narrow, widely spaced spiral cords, the uppermost two of which, at the shoulder angle and immediately below it, are deeply subdivided by a median groove down the whole height of the shell, and the next lowest two or three of which are weakly subdivided by a median groove where they cross the varices and, on a few large specimens, are very weakly subdivided across the rest of the last whorl. Its protoconch is tall and narrowly conical, and slightly larger than that of any other species in this group. Living specimens have a pale straw-yellow to very pale greenish brown periostracum, bearing a high, thin, bristle-fringed lamina down the crest of each axial costa.

I have previously (BEU, 1971: 108) pointed out the great similarity of *Lotorium kiiensis* [*Cymatium exaratum* of early workers on Japanese molluscs, such as LISCHKE, 1871: pl. 2, figs 15-17] to Australian and New Zealand specimen of *C. exaratum*, and treated *L. kiiensis* as a geographic subspecies of *C. exaratum*, even though significant differences were not obvious. Now that I have seen much more material of the forms from both areas, a range of specimens from New Caledonia and the Coral Sea (see below), and a specimen from Hawaii, I am unable to detect **any** significant differences at all between populations from anywhere around the Pacific, and I regard the many names listed in the synonymy as synonyms of a single species.

In his magnificently illustrated book on Japanese Mollusca, OKUTANI (1986: 112, 4th fig., on left at top of page) illustrated a living specimen of *"Turritriton kiiensis"*, clearly showing an identical bristled, lamellate periostracum and an identical red-spotted pink head-foot to those of living specimens collected in Australia and New Zealand. There is no doubt that Japanese specimens are conspecific with those from the Australasian-New Caledonian population. *Cymatium exaratum* appears to be another "Pacific fringe" species, with a distribution similar to that of Pacific records of *C. parthenopeum* and *Charonia lampas*.

I previously (BEU, 1971) regarded *Cymatium durbanense* (E.A. Smith, 1899) as an additional subspecies of *C. exaratum*, but examination of further specimens has shown that this is a distinct species with much higher, narrower and more deeply subdivided spiral cords and a shorter and wider protoconch than in Japanese and Australasian-New Caledonian populations of *C. exaratum*.

DUNKER (1871: 166) stated that *Tritonium granulatum*, from Bass Strait, is "Species eximia ad *Simpula kleinii* [sic] pertinens", presumably intending a comparison with the South African Recent species *Cymatium (Monoplex) klenei* (Sowerby). This suggests that *T. granulatum* is a synonym of *C. exaratum*, the only Bass Strait species resembling *C. klenei*. However, both this and *T. fraterculus* Dunker, 1871 are unrecognisable without type specimens; none are proposed here because of the possibility of type material remaining in Germany.

Cymatium (Monoplex) penniketi sp. nov.

Figs 23 j, 28 a-j, 29 e, h

Cymatium vespaceum - BOSCH *et al.*, 1982: 79; 1995: 100, fig. 364.

TYPE DATA. — Holotype MNHN (*ex* NZGS WM13281, Figs 23 j, 28 e, g) and 26 paratypes: 20 NZGS WM13281 (Figs 28 a-d, f, h-j), 2 MNHN, 1 AMS C202739, 1 BMNH 1996033, 1 USNM 880223, 1 AMNH 226540 from Masirah Island, south coast of Oman, Gulf of Arabia, collected and presented by Don and Eloise Bosch; 2 paratypes NZGS WM13512 from Muscat, Oman, collected and presented by Don and Eloise Bosch.

DISTRIBUTION. — I know *Cymatium penniketi* only from Don and Eloise Bosch's material from Oman. It seems likely to occur along the coast of East Africa as well; very poorly known.

DESCRIPTION. — Shell moderately small for species group (maximum H *ca* 38) but relatively short and wide, with moderately tall, strongly stepped spire, strongly shouldered whorls, and moderately long, straight, widely open anterior siphonal canal. Only terminal varix or last two varices present on all material available; penultimate varix weak and low to prominent and thin; terminal varix prominent, thin, weakly excavated abaperturally. Axial sculpture of teleoconch commencing as 15-18 low costae on early spire whorls, rapidly increasing in size and spacing down shell, so only 3-6 high, rounded, widely spaced folds in last intervariceal interval, all folds anteroposteriorly compressed and abruptly terminated at shoulder angle, fading out anteriorly below third or fourth spiral cord below shoulder angle; whole teleoconch surface crossed by low, irregular, in many cases poorly defined, wide, flat-topped axial ridges, forming low, quadrate gemmae at intersections with spiral cords and secondary and tertiary spiral threads. Spiral sculpture of narrow, well raised, widely spaced spiral cords, all remaining strictly undivided by grooves down entire teleoconch; two on early spire whorls, the third revealed as suture descends on penultimate whorl; 6 major ones passing on to terminal varix on last whorl, plus 8-10 on neck and canal; several secondary and tertiary spiral threads on sutural ramp, one secondary thread and a few (variable) tertiary threads in interspaces of 6 lower major cords. Sutural ramp wide, sloping gently, strongly concave; more marked than in related species. Aperture oval, with callused, white lips as in *C. comptum* and *C. vespaceum*; interior of outer lip bearing seven low nodules, each of which bears two narrow ridges, except uppermost (adapical) nodule which bears three ridges in most specimens; inner lip with one prominent transverse parietal ridge, 2-3 prominent transverse ridges on columellar base, and variable, low, anastomosing transverse ridges on central columella of well callused specimens. Protoconch large, tall, of 4.5-5 whorls, weakly inflated; similar in height to but wider than those of *C. comptum* and *C. vespaceum*. Exterior of teleoconch pale to medium grey-brown, pale fawn-grey on a few specimens; large nodules of last two whorls paler than background on most specimens; varices darker than background medially, but banded white at suture and again at a weakly defined pale peribasal band between third and fourth cords below shoulder angle. Interior of aperture pale to dark red-brown, clearly bisected by pale peribasal band.

DIMENSIONS. — Holotype: H 35.1, D 20.6; paratypes, NZGS WM13281: H 28.3, D 16.6; H 29.4, D 16.2; paratypes, NZGS WM13512: H 35.8, D 20.7; H 38.3, D 20.8.

REMARKS. — *Cymatium penniketi* sp. nov. shares the narrow, well raised, undivided spiral cords of *C. comptum* with the greyish overall colour pattern of *C. vespaceum*, and has a wider shape, wider and flatter sutural

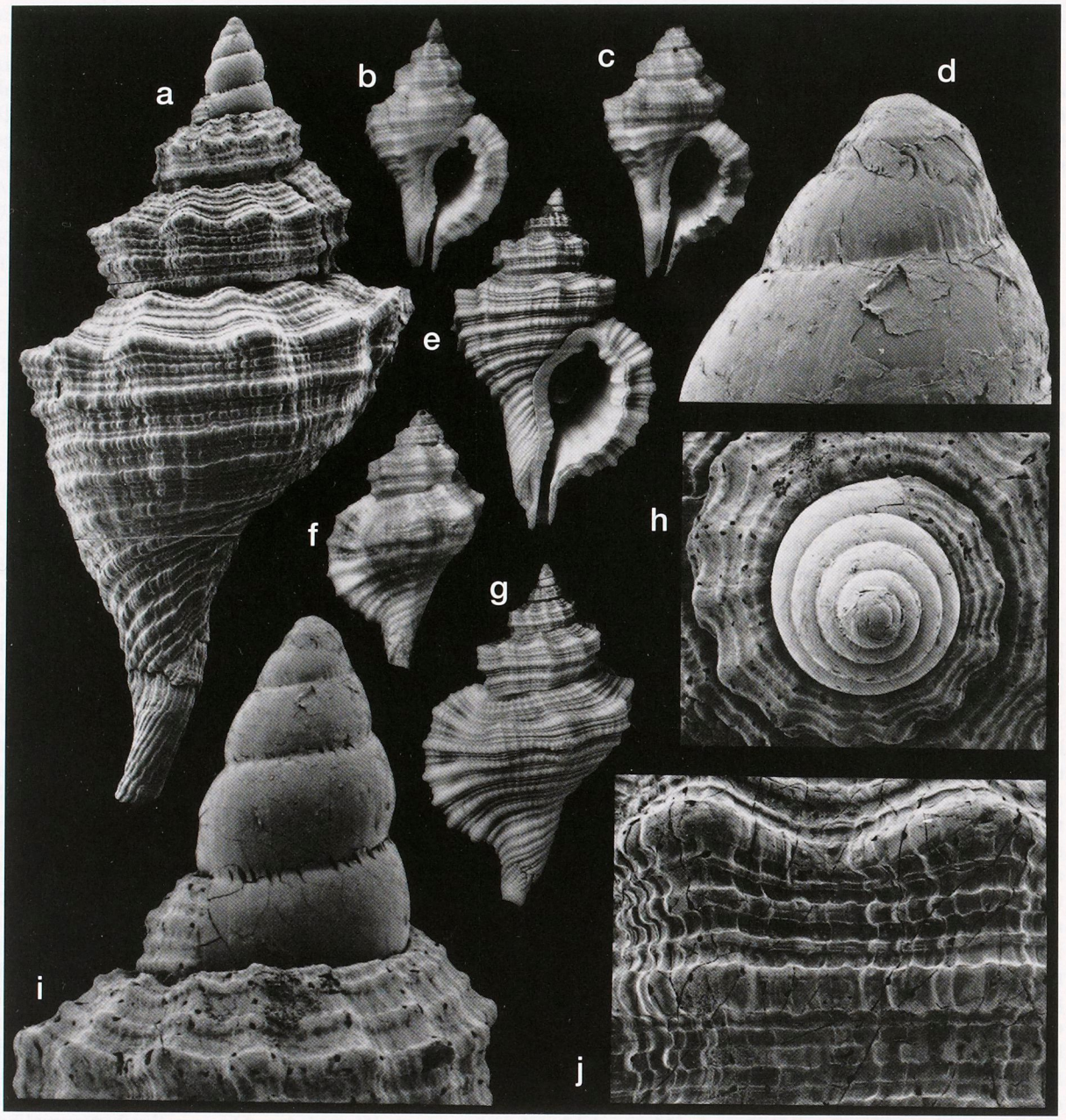

FIG. 28. — *Cymatium (Monoplex) penniketi* sp. nov., all from Masirah I., Oman. — **a-d**, **f**, **h-j**, 3 paratypes, NZGS WM13281; a. x4.3; b, c, f. x1.5; d. x35; h. x18; i. x15; j. x16. — **e**, **g**, holotype MNHN (*ex* NZGS WM13281), all data as for paratypes, x1.5.

ramp and larger nodules, and wider protoconch than either of its most similar congeners. The axial costellae also are wider and more flat-topped than in any similar species. The presence of only one or, at most, two varices is unique, also; *C. comptum* seems always to produce at least two, *C. vespaceum* and *C. exaratum* have at least three varices on large shells, and *C. thersites* has at least four varices.

ETYMOLOGY. — The species name honours my old friend Bob Penniket, formerly of Warkworth, northern New Zealand, whose large and scientifically valuable collection of Ranellidae, Bursidae and Personidae passed to the Institute of Geological & Nuclear Sciences on his untimely death in January 1991.

Cymatium (Monoplex) thersites (Reeve, 1844)

Figs 23 m, 29 f-g, j-m

Triton thersites Reeve, 1844a: pl. 13, fig. 48.

Triton thersites - REEVE, 1844c: 115. — KÜSTER & KOBELT, 1878: 243, pl. 67, figs 3-4.
Triton (Gutturnium) thersites - KOBELT, 1878a: 361.
Tritonium (Ranularia) thersites - TAPPARONE-CANEFRI, 1881: 34.
Aquillus thersites - SCHEPMAN, 1907: 181.
Triton (Gutturnium) vespaceum - TRYON, 1880: 22, pl. 12, figs 99-100 (only).
Cymatium (Monoplex) vespaceum - WILSON, 1993: 246, pl. 42, figs 3 a-b (only).

TYPE DATA. — *Triton thersites*: 2 syntypes in BMNH 1967631, without locality (Figs 29 j-k). Although neither of these appears to be the figured syntype, the larger syntype (H 47.5) is here designated the lectotype. Paralectotype, MCZ 188154, "Philippine Islands", *ex* Cuming Colln and C.B. Adams Colln. The type locality is here designated as Roebuck Bay, Broome, Western Australia.

OTHER MATERIAL EXAMINED (all in NZGS). — **Western Australia.** Roebuck Bay, Broome, 1951(13 NZGS WM10532). — Broome (16 NZGS WM14681, 1 NZGS WM8438, 1 NZGS WM15539; Figs 29 l-m). — Broome, *ex* Penniket Colln (1 NZGS WM15538). — Causeway Beach, Dampier, low tide, muddy beach, 22 Sept. 1972, N. Colman (1 NZGS WM13012). — Nor'west Cape (2 NZGS WM14673). — Port Hedland, 6 m, *ex* Penniket Colln (1 NZGS WM15540). — Dampier, *ex* Penniket Colln (2 NZGS WM15541). — 80-Mile Beach, *ex* Penniket Colln (2 NZGS WM15534). — Exmouth, low tide, August 1972, N. Coleman (1 lv NZGS WM13011). — Learmonth, Exmouth Gulf (4 NZGS WM12704). — Exmouth Gulf, Sept. 1971 (3 NZGS WM14670). — Exmouth, *ex* Penniket Colln (3 NZGS WM15537, Fig. 23 m). — Cape Keraudren (1 NZGS WM14685). — Mangrove Bay, Nor'west Cape, Aug. 1985 (1 NZGS WM14672). — Darwin (1 NZGS WM14671). — Cape Preston, intertidal (2 NZGS WM10843). — plus many other lots in Australian museums.
Eastern Australia. Yeppoon, Queensland, beach (2 NZGS WM10574). — Taylor's Reef, N. Queensland (3 NZGS WM15536).
Philippine Islands. Coron, Palawan, *ex* Penniket Colln (1 NZGS WM15535).
Mauritius, Indian Ocean. Mauritius, coll. J. Closel (2 NZGS WM13842).

DISTRIBUTION. — *Cymatium thersites* is common along the northwestern coast of Australia between Broome and Darwin, and almost all the material I have seen is from this area. However, I have seen specimens also from Mauritius, from the Philippine Islands and from Queensland, Australia, so it probably occurs uncommonly throughout the tropical Indo-West Pacific. No specimens are present in the New Caledonian collections of MNHN.

DIMENSIONS. — *Triton thersites* (lectotype): H 47.5, D 26.3; paralectotype: H 43.3, D 24.4. - Mauritius, NZGS WM13842: H 58.8, D 28.8. - Broome, NZGS WM15539: H 54.3, D 28.9. - Nor'West Cape, NZGS WM10845: H 54.0, D 31.2. - Roebuck Bay, Broome, NZGS WM10532: H 57.5, D 25.6.

REMARKS. — As *Cymatium thersites* has been regarded as part of the variation of *C. vespaceum* by almost all authors since TRYON (1880: 22) treated *Triton thersites*, *T. elongatus* and *T. gracilis* as synonyms of *T. vespaceum*, almost no synonymy can be listed, and almost no modern or fossil records have been published. The sole usage of the name I am aware of since TRYON (1880) is SCHEPMAN's (1907) record of a Pleistocene fossil from Celebes. However, examination of REEVE's types of *Triton thersites* showed that they are the highly distinctive, elaborately sculptured species, similar to *C. vespaceum*, so commonly seen in collections from northern Western Australia (notably from around Broome). Distinctive characters of *C. thersites* are its extremely prominent, narrow, sharply raised spiral cords, with flat-bottomed interspaces each much wider than one cord, its very narrow, shallow, median groove on each of the upper two major cords, the shallow narrow grooves in the uppermost 4 or 5 cords where they cross the varices, its larger size (up to *ca* 60 mm in height, and commonly over 50 mm) than all species in the group other than *C. exaratum*, its large, tall, conical protoconch similar to that of

FIG. 29. — *Cymatium thersites* and syntypes of *Triton vespaceum* Lamarck. — **a-i**, syntypes of *Triton vespaceum* Lamarck; all x2. **a-b**, paralectotype, MHNG 1100/5/2. **c-d**, lectotype, MHNG 1100/5/4, specimen figured by KIENER (1842b: pl. 3, fig. 2). **e**, **h**, paralectotype, MHNG 1100/5/3, a specimen of *C. penniketi* sp. nov. **f-g**, paralectotype, MHNG 1100/5/1, a specimen of *C. thersites* (Reeve). **i**, paralectotype, MHNG 1100/5/5, a small specimen of *C. nicobaricum* (Röding). — **j-m**, *Cymatium (Monoplex) thersites* (Reeve). **j-k**, syntypes of *Triton thersites* Reeve, BMNH 1967631, unlocalised, x1.4. **l-m**, NZGS WM15539, Broome, N. Western Australia, x1.25.

C. exaratum, its weak shoulder angle and relatively steeply sloping, concave sutural ramp, producing a shoulder that is less prominent than in either *C. exaratum* or *C. penniketi*, but similar to that of *C. vespaceum*, and its almost uniform pale grey to mauvish grey or pale red-brown colour, banded with medium red-brown on the varices on some specimens and with a basal dark brown stripe extending down the anterior siphonal canal of many specimens. The axial sculpture is highly variable in prominence and, whereas most specimens have few extremely prominent axial folds extending from the suture well down onto the base of the last whorl, forming uniquely prominent, narrow nodules where they are crossed by the spiral cords, some specimens have very low axial sculpture, and so lack obvious nodules. In summary, *C. thersites* resembles *C. vespaceum* in overall shape, but is larger, with more prominent spiral cords that are subdivided a little more strongly than in *C. vespaceum*, and are intermediate between those of *C. vespaceum* and *C. exaratum*; its cords are narrower and more prominent and less deeply subdivided than those of *C. exaratum*, and it differs from all its close relatives in its uniform pale grey coloration. Its varices are thin and prominent, and all large specimens have at least four varices.

Cymatium (Monoplex) vespaceum (Lamarck, 1822)

Figs 23 k, 29 a-i, 30 a-k

Triton vespaceum Lamarck, 1822: 185.
Triton elongatus Reeve, 1844a: pl. 15, fig. 59.
Eutritonium rembangense Wanner & Hahn, 1935: 255, pl. 19, figs 14-15.

Triton vespaceum - KIENER, 1842: 18, pl. 3, fig. 2. — DESHAYES, 1843: 636. — MENKE, 1843: 25.— REEVE, 1844a: pl. 15, figs 61 a-b. — KRAUSS, 1848: 115. — KÜSTER & KOBELT, 1871: 179, pl. 52, fig. 3.
Triton (Gutturnium) vespaceus - KOBELT, 1878a: 363.
Triton (Gutturnium) vespaceum - TRYON, 1880: 22, pl. 12, figs 94-96 [not fig. 97 which shows *C. pfeifferianum*, nor figs 99-100 which show *C. thersites*]. — SMITH, 1891: 413.
Tritonium (Ranularia) vespaceum - TAPPARONE-CANEFRI, 1881: 36.
Aquillus vespaceus - SCHEPMAN, 1907: 181.
Aquillus (Turritriton) vespaceus - SCHEPMAN, 1909: 111.
Cymatium vespaceum - IREDALE, 1910: 71. —?VERCO, 1912: 219. — OLIVER, 1915: 528. — KURODA & HABE, 1952: 51. — BARNARD, 1963: 28.
NOT *Cymatium vespaceum* - HINTON, 1978: 30, fig. 9. — GARCIA-TALAVERA, 1983: 108, pl. 5, fig. 2. — COSEL, 1982: 54 [= *C. comptum*].
NOT *Cymatium vespaceum* - BOSCH *et al.*, 1982: 79; 1995: 100, fig. 364 [= *C. penniketi*].
Triton (Simpulum) vespaceum - TESCH, 1915: 67, pl. 82, figs 147 a-b.
Cymatium respaceum (*sic*) - TURTON, 1932: 111.
Cymatium (Gutturnium) vespaceum - WISSEMA, 1947: 151.
?*Cymatium (Lampusia) vespaceum* - BEETS, 1950a: 246.
Turritriton vespaceus - HABE & KOSUGE, 1966a: 43, pl. 15, fig. 12.
Cymatium (Turritriton) vespaceum - BEU, 1985: 60. — LAI, 1989: 125, fig. 46. — PIECH, 1993: 90, figs 3-6. — HENNING & HEMMEN, 1993: 105, pl. 21, fig. 4.
Cymatium (Septa) vespaceum - SPRINGSTEEN & LEOBRERA, 1986: 113, pl. 31, fig. 2.
NOT *Cymatium (Septa) vespaceum* - WARMKE & ABBOTT, 1962: 101, pl. 18, fig. b. — ABBOTT, 1974: 163, fig. 1754. — RIOS, 1975: 79, fig. 322. — SAUNDERS, 1980: 5, upper fig. — COELHO *et al.*, 1981: 124, fig. 9 [= *C. comptum*].
NOT *Cymatium (Septa) vespaceum* - KAY, 1979: fig. 79 F [= *C. labiosum*].
Cymatium (Monoplex) vespaceum - WILSON, 1993: 246 [not pl. 42, figs 3 a-b, which shows *C. thersites*].
Triton elongatus - REEVE, 1844c: 117. — KÜSTER & KOBELT, 1876: 208, pl. 58, fig. 9.
Triton (Gutturnium) elongatus - KOBELT, 1878a: 363.
Tritonium (Ranularia) elongatum - TAPPARONE-CANEFRI, 1881: 35.
Aquillus (Turritriton) elongatus, var. - SCHEPMAN, 1909: 112.
Cymatium elongatum - TURTON, 1932: 110. — YEN, 1942: 215.
Eutritonium rembangense - PANNEKOEK, 1936: 42.
Tritonium (Gutturnium) gracile - BRAZIER, 1877: 173.
?*Cymatium pileare* - BEETS, 1950b: 333.
Cymatium (Lampusia) bayeri - KANNO *et al.*, 1982: 106, pl. 19, figs 2 a-b.
Cymatium comptum - DRIVAS & JAY, 1988: 64, pl. 17, fig. 11.

TYPE DATA. — Dr Y. Finet, MHNG, has kindly supplied photographs, colour transparencies, and notes on the five specimens now identified as syntypes of *Triton vespaceus* in Lamarck's collection. The annotations by Rosalie de Lamarck on Lamarck's copy of LAMARCK (1822) record only **two** original syntypes, so it is clear that the other 3 specimens have been added to the "syntypes" in the intervening years. The 5 specimens identified as syntypes at present are as follows: (1) MHNG 1100/5/4 (Figs 29 c-d), *C. vespaceum* of subsequent authors, the specimen figured in ventral view by KIENER (1842b: pl. 3, fig. 2, lower); the columella has been excavated by a hermit crab, as is shown clearly in KIENER's figure, and the canal is relatively straight; H *ca* 24. (2) MHNG 1100/5/2 (Figs 29 a-b), a larger specimen of *C. vespaceum* of subsequent authors (H *ca* 30) with a prominent red-

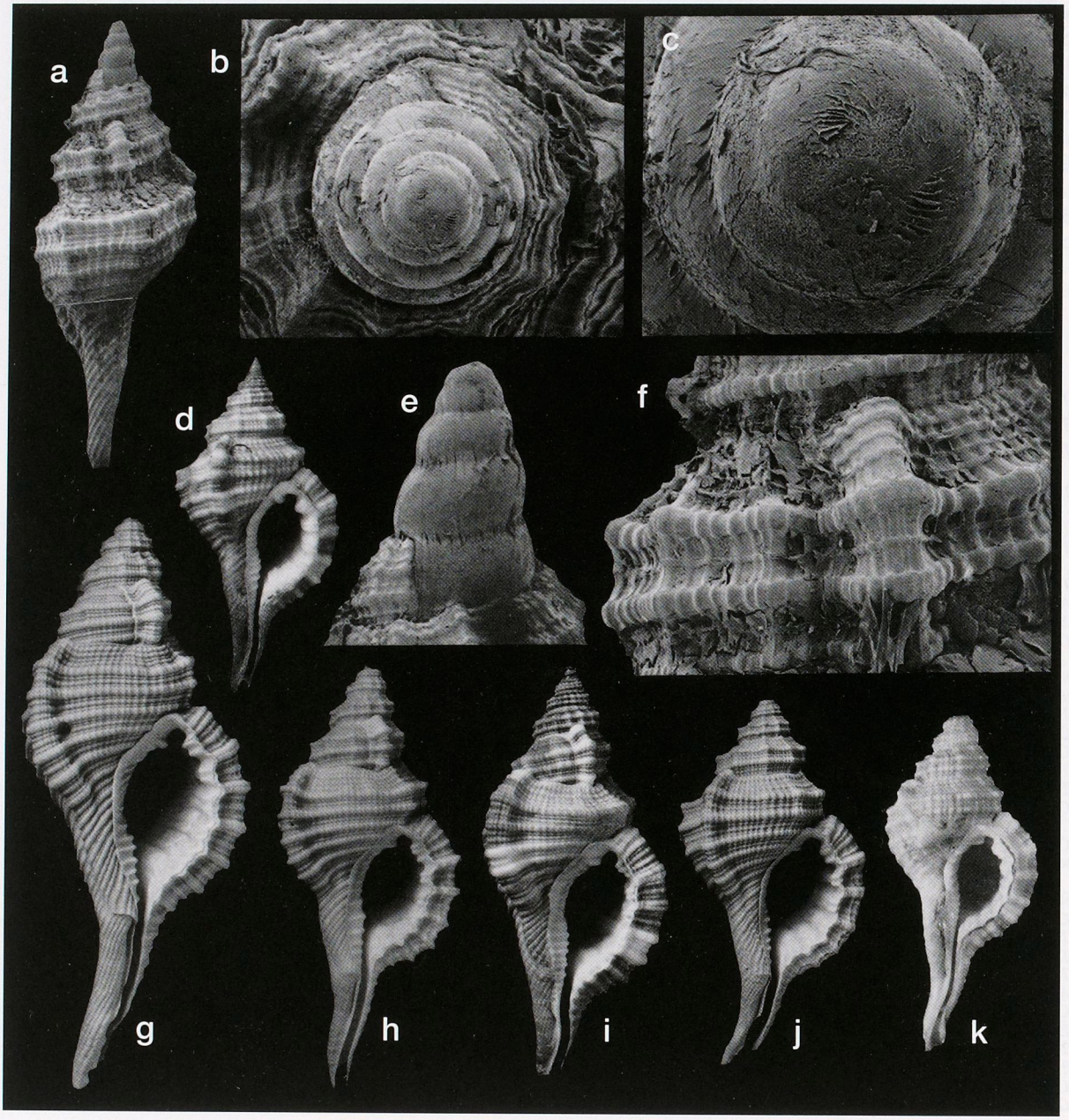

FIG. 30. — *Cymatium (Monoplex) vespaceum* (Lamarck). — **a-c**, **e-f**, LAGON: sta. 710, Secteur de Canala, New Caledonia, 30-31 m; a. x3.9; b. x20; c. x64; e, f. x15. — **d**, **i**, NZGS WM15542, Trincomalee, Sri Lanka, both x1.25. — **g**, LAGON: sta. 965, New Caledonia, 17-18 m, x1.5. — **h**, LAGON: sta. 979, New Caledonia, 15-18 m, x1.5. — **i**, LAGON: sta. 30, Nouméa, New Caledonia, 24 m, x1. — **k**, holotype of *Triton elongatus* Reeve, BMNH 1967635, "Philippine Islands", x1.5.

brown (eroded and polished) varix on the dorsum of the penultimate whorl; KIENER's upper figure (1842b: pl. 3, fig. 2 upper) seems to be an artistic combination of these two specimens, resembling 1100/5/4 in shape and the straight canal, but clearly bearing the red-brown dorsal varix of 1100/5/2. This specimen, 1100/5/2, has its canal clearly inclined to the right (in apertural view). (3) MHNG 1100/5/1 (Figs 29 f-g), a short specimen of *C. thersites*. (4) MHNG 1100/5/3 (Figs 29 e, h), apparently a specimen of *C. penniketi*. (5) MHNG 1100/5/5 (Fig. 29 i), a juvenile specimen of *C. (Monoplex) nicobaricum* (Röding). This evidence indicates that only specimens 1100/5/2 and 1100/5/4 were Lamarck's original syntypes. The specimen figured by KIENER (1842: pl. 3, fig. 2 lower), MHNG 1100/5/4 (Figs 29 c-d), is here designated the lectotype of *Triton vespaceus*. Lamarck's specimens are unlocalised; the type locality is here designated as Bohol I., Philippine Islands. — *Triton elongatus*: holotype, BMNH 1967635 (Fig. 30 k), from "Philippine Islands", *ex* Cuming Colln, a small specimen of *C. vespaceum* made "elongate" by its long anterior canal (H 33.4, D 15.3). This specimen has had a severe injury just before secreting its penultimate varix, and has regrown its shell after an irregular interval. — *Eutritonium rembangense:* I do not know the whereabouts of the holotype.

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW100, DW150.
New Caledonia. LAGON: sta. 3, 5, 21, 23, 30 (Fig. 30 i), 51, 53, 55, 56, 57, 63, 68, 99, 101, 111, 113, 121, 131, 152, 154, 169, 181, 182, 193, 198, 201, 203, 233, 251, 261, 262, 264, 287, 296, 297, 345, 449, 473, 481, 483, 517, 518, 532, 535, 549, 560, 672, 695, 710 (Figs 30 a-c, e-f), 731, 749, 757, 807, 814, 815, 816, 851, 862, 895, 905, 928, 939, 940, 951, 958, 962, 965 (Fig. 30 g), 966 (Fig. 23 k), 979 (Fig. 30 h), 980, 1025, 1046, 1068, 1069, 1143, 1155, 1174, 1182, 1190. — SW Nouvelle-Calédonie, Canal Woodin, 37 m. — Grand Récif, Nouméa, 5 m, Berthault Colln (1 lv). — EXPÉDITION MONTROUZIER: sta. 1242, 1260, 1266, 1268, 1277, 1278, 1284, 1292, 1297, 1304, 1305. — LAGON DE NOUMÉA: sta. 1355. — BATHUS 1: sta. DW1235.
Loyalty Ridge. MUSORSTOM 6: sta. DW430.
These 97 lots were collected from the intertidal zone to 49 m.

DISTRIBUTION. — Throughout much of the Indo-West Pacific faunal province, from eastern South Africa (BARNARD, 1963) and East Africa, to Mauritius (material in NZGS), but not recorded from the Gulf of Arabia; along the coast of Asia, in southern India and in Sri Lanka; south to Woodman's Point, south of Fremantle, Western Australia, and to Moreton Bay in southern Queensland, and throughout New Caledonia; through the western Pacific archipelagoes, at Tonga, Fiji, and Vanuatu, and north to at least Taiwan, but **not** recorded as far east as Hawaii (KAY, 1979). In common with most other Indo-West Pacific species that do not reach Hawaii, true *C. vespaceum* is virtually unknown in the western Atlantic, but the first authentic specimen has been recorded by PIECH (1993). Also, the lower figure identified as *Cymatium occidentale* by OLIVEIRA & TRINCHÃO (1993: fig. 2.2) appears to show *C. vespaceum* from Brazil. Reported as a fossil from Miocene and younger rocks of the Philippines and Indonesia.

DIMENSIONS. — Trincomalee, Sri Lanka, coll. I. Scott, *ex* J.R. Penniket Colln, NZGS WM15542 (Figs 30 d, i): H 52.0, D 25.2. - Queensland, *ex* J.R. Penniket Colln, NZGS WM15543: H 48.6, D 24.9. - New Caledonia, LAGON: sta. 287: H 52.5, D 21.5; sta. 965: H 60.0, D 24.7.

REMARKS. — *Cymatium vespaceum* is relatively small (to *ca* 60 mm high, but few specimens are over 40 mm high) and is easily recognised by its prominent sculpture, with crisp, narrow, widely spaced spiral cords that are subdivided only faintly by a median groove, and then only over the varices, and only on the uppermost two cords, on all but a few, very large specimens (on which the faint groove may extend over the last intervariceal interval, and to the next lowest two cords over the varices). Most specimens have a few, prominent axial folds, many close, regular, narrow axial costellae, and a relatively long anterior canal. Whereas a few specimens are uniform red-brown to almost black[1], except for the consistent pale peribasal band, much the majority of specimens is markedly banded pale brownish to mauvish grey and medium red-brown, the spiral interspaces being darker than the cords (much more markedly on early whorls than on the last one) and the varices being red-brown except where crossed by white cords immediately below the suture, at the shoulder angle, at the peribasal pale band (between the third and fourth cords below the shoulder) and at the base of the terminal varix. The protoconch is the smallest and narrowest of those of species in this group. Reeve's holotype of *Triton elongatus* represents a common form of *C. vespaceum* with a long anterior canal, and agrees with normal *C. vespaceum* samples in sculpture, size and colour. This is the species that has usually been known as *Triton* (or *Cymatium*) *gracilis* in the Indo-West Pacific, whereas *C. comptum* has usually been identified as *T. gracilis* in the western Atlantic; REEVE's (1844a) syntypes of *T. gracilis* are juvenile specimens of *C. pfeifferianum* (see below).

1. GARCIA-TALAVERA (1997) appears to have named this dark colour form of *C. vespaceum* as *C. indomelanicum*; its status is unclear. If it is really limited to the Indian Ocean, it probably is yet another valid *Cymatium* species.

The illustration by WANNER & HAHN (1935: 255, pl. 19, figs 14-15) of the holotype of *Eutritonium rembangense* shows a specimen that does not differ in any significant characters from *Cymatium vespaceum*, and this name appears to be another synonym of *C. vespaceum*, despite BEETS' (1950b: 333) synonymising *E. rembangense* with *C. pileare*. Examination of the holotype is clearly needed to confirm the identity (whereabouts not known to me). The specimen is from the Miocene Rembang fauna at locality 160, 900 m north of Soemberan (WANNER & HAHN, 1935: fig. 2), near Rembang on the north coast of Java.

Cymatium (Monoplex) fittkaui Parth, 1991

Fig. 23 f

Cymatium (Turritriton) fittkaui Parth, 1991b: 206, figs 1-2.

Cymatium (Turritriton) fittkaui - HENNING & HEMMEN, 1993: 101, pl. 22, fig. 3.

TYPE DATA. — Holotype in Zoologische Staatssammlung, München; from Bohol Island, Philippines (PARTH, 1991b: 206).

NEW CALEDONIA RECORDS. — **New Caledonia.** EXPÉDITION MONTROUZIER: sta. 1315.
North of New Caledonia. MUSORSTOM 4: sta. DW187 (Fig. 23 f). Local depth range 65-120 m (alive).

OTHER MATERIAL EXAMINED. — **Philippines.** Samar, central Philippines (1 NZGS WM13115). — Punta Engaño, Mactan I., Cebu (2 NZGS WM13184, 1 NZGS WM14123, 2 NZGS WM14269). — Sulu Sea (2 NZGS WM13527). — Mactan I., Cebu, "deep water" shell debris, pres. F.J. Springsteen (1 NZGS WM15096).

DISTRIBUTION. — Previously recorded only from the Philippine Islands, now extended to New Caledonia; probably throughout the Western Pacific archipelagoes.

DIMENSIONS. — Holotype: H 19.7; paratypes: H 19.6, H 28.8 (PARTH, 1991: 206). - New Caledonia, MUSORSTOM 4: sta. DW187: H 31.4, D 14.8. - NZGS WM13184: H 37.0, D 15.3. - NZGS WM13115: H 41.3, D 18.2.

REMARKS. — Recognition of two specimens of *Cymatium fittkaui* in the huge New Caledonian collections studied here introduces the taxonomy of another distinctive species group, the species related to *C. tenuiliratum*.

Species similar enough to *Cymatium tenuiliratum* to cause difficulties in identification, and so revised here, are:

Cymatium fittkaui Parth, 1991, Western Pacific.
pharcidum (Dall 1889), Atlantic.
tenuiliratum (Lischke, 1873), Western Pacific.

All species in this group are tall and narrow, with a relatively tall spire as well as a long anterior siphonal canal. They are also all similar in having relatively thin, widely expanded varices; a finely and evenly sculptured intervariceal surface apart from 3-5 large, prominent, narrow, laterally compressed nodules in each intervariceal interval; axial sculpture of two orders: a series of weak axial grooves that divide the spiral cords into numerous subrectangular lozenges (about 20-30 grooves in each intervariceal interval) and very many, extremely fine, low, narrow axial lirae crossing the interspaces of the finest spiral threads; and a white aperture with seven low nodules (each bearing two narrow ridges in most specimens) inside the outer lip, and a single parietal ridge and 3-5 prominent, thin transverse ridges on the base of the columella. I previously have regarded subtle differences within this theme as part of the variation of a single species *C. tenuiliratum* = *pharcidum*, but recognition of *C. fittkaui* by PARTH (1991b) and the occurrence of seven specimens of *C. tenuiliratum* in the New Caledonian collections have prompted a reassessment of the complex.

Cymatium fittkaui is the most distinctive member of this group. Its diagnostic characters are: the spire is slightly shorter than in the other species, as is the protoconch; the anterior siphonal canal consistently is inclined towards the dorsum more markedly than in the other species; the major spiral cords consist of fasciculate groups, *i.e.* each of the uppermost three major cords, around the periphery, has a lower cord closely margining it on each

side, and then a single cord, with wider interspaces than the others, in the centre of each spiral interspace; the major cord in the centre of each fasciculate group is particularly elevated over the varices and the high, narrow nodules, causing a particularly "prickly" looking sculpture unique to *C. fittkaui*; and it has a much darker and more obvious colour pattern than its close relatives, with dark red-brown bars on the varices in the major spiral interspaces, again on the spiral interspaces on the high, narrow nodules, in a subsutural band, and around the anterior canal, with additional scattered small spots on spiral cords, on a general pale brown ground, except for the stark white aperture.

Cymatium (Monoplex) tenuiliratum (Lischke, 1873)

Figs 23 g, 33 a

Triton tenuiliratus Lischke, 1873: 20.

Triton tenuiliratus - Lischke, 1874: 30, pl. 2, figs 18-19. — Küster & Kobelt, 1876: 230, pl. 64, figs 4-5. — Yokoyama, 1922: 67, pl. 3, fig. 8; 1926: 341, pl. 41, fig. 14.
Triton (Gutturnium) tenuiliratus - Kobelt, 1878a: 361. — Tryon, 1880: 22, pl. 42, fig. 105.
Cymatium (Cabestana) tenuiliratus - Smith, 1948: 9, pl. 4, fig. 2.
NOT *Cymatium (Cabestana) tenuiliratum* - Nordsieck & Garcia-Talarera, 1979: 120, pl. 25, fig. 14 [= *C. pharcidum*].
Cymatium tenuiliratum - Kuroda & Habe, 1952: 51.
Cymatium (Septa) tenuiliratum - Hatai & Hisiyama, 1952: 256. — Masuda & Noda, 1976: 204. — Springsteen & Leobrera, 1986: 113, pl. 31, fig. 1.
Turritriton tenuiliratum - Habe, 1961: 45, pl. 22, fig. 7.
Turritriton tenuiliratun (*sic*) - Habe, 1964: 72, pl. 22, fig. 8.
Reticutriton tenuiliratus - Kuroda *et al.*, 1971: 127, pl. 29, fig. 1.
Cymatium (Reticutriton) tenuiliratum - Oyama, 1973: 36, pl. 9, fig. 7. — Lai, 1989: 122, fig. 29.
Cymatium (Turritriton) tenuiliratum - Beu, 1985: 60, fig. 22. — Henning & Hemmen, 1993: 104, pl. 22, figs 1-2.
Murex sp. — Noda, 1988: pl. 7, figs 3 a-b.

Type data. — The type specimens of Lischke's Japanese taxa are held in the Löbbecke Museum und Aquazoo, Düsseldorf (R. von Cosel, MNHN, pers. comm.) and his *Cymatium* types have been examined through the kindness of the curator, Dr J. Boscheinen. They are not registered with individual numbers. The holotype of *Triton tenuliratus* (Fig. 33 a) is a small (H 37.3, D 17.2), solid, relatively short-spired, medium brown specimen. Lischke (1873) gave no locality, and later (Lischke, 1874: 30) cited only "ad litora Japoniae meridionalis"; the holotype is labelled "Süd-Japan" (unlike the holotypes of *Triton dunkeri* and *Triton loebbeckei*, which are both labelled "Nagasaki"). The type locality is here designated as Sagami Bay, Honshu.

New Caledonia records. — **New Caledonia.** LAGON: sta. 1148.
Norfolk Ridge. SMIB 4: sta. DW53. — SMIB 8: sta. DW154 (Fig. 23 g), DW157, DW158, DW165.
Local depth range 220-372 m (alive).

Other material examined. — **Japan.** Kusui, Nada-cho, Wakayama Pref., Honshu, dredged 60-100 m, *ex* Penniket Colln (1 NZGS WM15544). — Off Tanabe, Wakayama Pref., Honshu, shrimp nets, 60 m, *ex* Gourlay Colln (2 NZGS WM13843). — Tosa Bay, Shikoku, pres. Dr T. Habe (1 NZGS WM8488). — Off Cape Ashizuri, Kochi Pref., Shikoku (1 NSMT 48848). — Sagami Bay, Honshu (1 NSMT 49671). — South China Sea (1 NSMT 44063). — Shibazaki, Sushi, Kanagawa Pref., Honshu (1 NSMT 41196). — Kochi Pref., Shikoku (2 NSMT 40858). — Miura Peninsula, Kanagawa Pref., Honshu (1 NSMT 46009). —5.5 km west of Zyogashima, 100-110 m (1 NSMT 40893). — Minabe, Wakayama Pref., Honshu (1 NSMT50107). — Naganuma Formation, Naganuma, Sagami Bay, Pleistocene (1 IGPS 19216). — Narita Group, Shinagawa, Pleistocene (1 IGPS 6059). — Shimo-miyata, Miura Peninsula, Miyata Formation, Pleistocene (2 IGPS 26875). — Narita Group, Sasage, Boso Peninsula, Pleistocene (1 IGPS 19215). — + several Recent lots each in MCZ, USNM, ANSP and AMNH.
Philippine Islands. Off Samar, pres. F.J. Springsteen (1 NZGS WM13115). — Bohol Straits, pres. F.J. Springsteen (2 NZGS WM15037). — Samar, *ex* Penniket Colln (1 NZGS WM15545). — Punta Engaño, Mactan I., Cebu, pres. F.J. Springsteen (4 NZGS WM13184; 1 NZGS WM14105). — Off Balicasag I., Bohol, pres. Abbey Specimen Shells (2 NZGS WM14061). — Off Punta Engaño, Mactan I., Cebu, *ex* Penniket Colln (1 NZGS WM15546).
Indonesia. *"Albatross"* Sta. 5618, 240 m, off Ternate Is., Molucca Passage (1 USNM 239251). — Mariel King Memorial Expedition Sta. AMII/1-2, off Maikoor, Aru Islands, Moluccas (1 USNM 755473). — 200 m off east side Noekori I., Padaido Group, Schouten Islands, West Irian, 5-13 m (1 ANSP 277614).
Somalia. International Indian Ocean Expedition, *"Anton Bruun"* Sta. 9-463, off NE Somalia, 11°24' to 11°29'N, 51°35' to 51°36' E, 150 m, 17 Dec. 1964, pres. H.E. Vokes (1 NZGS WM13152).

Distribution. — In Japan, southern Honshu (northwards to Boso Peninsula), Shikoku and Kyushu; Kuroda *et al.* (1971: 127) listed many specimens from Sagami Bay, Honshu. Uncommon but reasonably well represented in collections from the Philippine Islands; seven specimens seen from New Caledonia; three specimens seen from SE Indonesia; one specimen seen from off Somalia, N. Indian Ocean. Presumably widespread but rare in the Indo-West Pacific. Widely reported in Japan as a Pliocene and Pleistocene fossil (Yokoyama, 1922: 67; 1926: 341; Hatai & Nisiyama, 1952: 256, repeating record by Yokoyama, 1926; Masuda & Noda, 1976: 204; Ogose, 1959: 33; 1960: 758; 1961: 113; Oyama, 1973: 36, pl. 9, fig. 7, repeating drawing by Yokoyama, 1922: pl. 3, fig. 8; O'Hara, 1982: 46; Noda, 1988: pl. 7, figs 3 a-b).

DIMENSIONS. — Kusui, Nada-cho, NZGS WM15544: H 35.0, D 16.4. - Off Tanabe, NZGS WM13843: H 38.9, D 18.0. - Off Cape Ashizuri, Shikoku, NSMT 48848: H 64.4, D 27.8. - Bohol Straits, NZGS WM15037: H 62.8, D 25.4. - Punta Engaño, Cebu, NZGS WM13184: H 55.9, D 20.0. - New Caledonia, SMIB 4: sta. DW53: H 49.7 (incomplete), D 22.0. - SMIB 8: sta. DW154: H 61.4, D 25.4.

REMARKS. — Specimens here included in *Cymatium tenuiliratum* are quite variable in a number of characters. Most specimens I have seen from Japan are distinctive in having all primary spiral cords deeply subdivided into two closely spaced cords by a deep median groove, but one specimen (NZGS WM15544) has only the uppermost, peripheral cord subdivided, and the rest single. Japanese specimens are also distinctive in their generally darker, warm pale red-brown coloration than Philippines shells (most of which are cream to pale fawn), and their slightly lower spires, less compressed nodules, and thicker varices than specimens from outside Japan. A specimen in the Whitehead Colln from 50-60 m, Tokyo Bay, is particularly robust and heavily nodulous, with an unusually short spire and unusually prominent spiral cords, so that it strongly resembles in almost all characters the Italian Pliocene *C. distortum* (Brocchi, 1814). *C. distortum* has the bifid cords, elongate shape and flat-faced, thin varices of *C. tenuiliratum*, but differs in having the two uppermost spiral cords much more closely spaced than the others, whereas they are all equally spaced in *C. tenuiliratum*; this has the effect of forming a raised peripheral zone bearing four closely spaced, narrow cords in some specimens of *C. distortum*. It appears feasible that *C. distortum* was the immediate ancestor of *C. tenuiliratum*.

Whereas most Philippines specimens assigned to *Cymatium tenuiliratum* differ from Japanese ones in their undivided or, at most, very faintly grooved spiral cords, as well as their paler coloration, more elongate shape, narrower nodules, and thinner, more expanded varices, all seven specimens in the present collections from New Caledonia have all primary and spiral cords on the last whorl and on the siphonal canal finely subdivided by a very narrow, shallow median groove. The single Indian Ocean specimen seen (NZGS WM13152) is a small shell (H 21.4, including an unusually large, tall protoconch) which also has all primary cords weakly subdivided by a shallow median groove. At first it appeared likely that Japanese, Philippines and New Caledonian shells represent three distinct species, but this range of variation is difficult to interpret until more material is available from a wider area and the variation of Japanese shells is better known, and at present it seems best to treat all these specimens as falling into the single species *C. tenuiliratum*. It is possible that the apparent differences result largely from Japanese specimens having been collected in shallower water than most others.

KURODA *et al.* (1971: 127) and OYAMA (1973: 36) referred this species to *Reticutriton*, where it had also been mentioned by HABE & KOSUGE (1966b: 315, Japanese text only). *Cymatium (Reticutriton)* is regarded here as a useful subgenus for a few species with unusually numerous spiral cords - the type species, *C. pfeifferianum*, has 10-11 prominent, narrow cords on the terminal varix and, correspondingly, 11-12 high, narrow ridges inside the outer lip. The only other included species are *C. lineatum* (Broderip, 1833), Galapagos Islands, and its close relative, the Californian Pliocene *"Gyrineum" elsmerense* English (1914: 215). The *C. tenuiliratum* group has the characters of tall species of *C. (Monoplex)* and in my opinion its resemblance to *C. pfeifferianum* is superficial.

Cymatium (Monoplex) pharcidum (Dall, 1889)

Lampusia? pharcida Dall, 1889: 227, pl. 36, fig. 2.

Cymatium pharcidum - GARCIA-TALAVERA, 1983: 115, pl. 4, fig. 4. — FINLAY & VINK, 1982: 133. — GARCIA-TALAVERA, 1987: 251, pl. 2, fig. 2.
Cymatium (Septa) krebsii - CLENCH & TURNER, 1957: 220, pl. 124, fig. 3 (in part; not *Triton krebsii* Mörch, 1877).
Cymatium (Cabestana) tenuiliratum - NORDSIECK & GARCIA-TALARERA, 1979: 120, pl. 25, fig. 14.
Cymatium (Turritriton) tenuiliratum - BEU, 1985: 60. — HENNING & HEMMEN, 1993: 104 (in part).

TYPE DATA. — Holotype USNM 94887, from *"Blake"* sta. 293, 150 m, off Barbados, Caribbean.

OTHER MATERIAL EXAMINED. — **Bermuda.** 2.5 miles off the southern shore of Bermuda, 220 m, coll. A. Guest & J.R.H. Lightbourn (1 DMNH 96981; 5 DMNH). — Same data, pres. R. Jensen (1 NZGS WM12447).

DISTRIBUTION. — Western Atlantic, seen only from Barbados and Bermuda, but probably sparsely distributed through the western Caribbean; eastern Atlantic: La Palma, Canary Islands (NORDSIECK & GARCIA-TALAVERA, 1979: 120; GARCIA-TALAVERA, 1983: 115, pl. 4, fig. 4; 1987: 251).

DIMENSIONS. — Holotype: H 23.6, D 11.5 (DALL, 1889: 228). - DMNH 96981: H 29.5, D 14.5; H 30.4, D 14.7; H 30.1, D 15.2. - NZGS WM12447: H 27.5, D 13.4.

REMARKS. — Examination of Dall's type of *Lampusia? pharcida* and of other authentic Atlantic specimens supports the opinion of GARCIA-TALAVERA (1987: 251) that the Atlantic member of this complex is distinct from both Indo-West Pacific species. The differences are subtle, but appear consistent: *C. pharcidum* is less elongate than *C. tenuiliratum*, but more so than *C. fittkaui*; the axial grooves are fewer in number and further apart (about 20 per intervariceal interval, compared with 30-35 in *C. tenuiliratum*) so that the rectangular lozenges of the minor spiral sculpture are markedly longer than in *C. tenuiliratum*; the tan spots in the grooves where they cross the spiral cords are larger and sparser than in *C. tenuiliratum*; and all specimens I have seen are small, reaching only about 45 mm in height and rarely over 30 mm. Examination of a range of larger specimens is desirable to see whether these differences remain consistent.

Cymatium (Monoplex) gemmatum (Reeve, 1844)

Figs 23 c, 31 a-j

Triton gemmatus Reeve, 1844a: pl. 15, figs 60 a-b.

Triton gemmatus - REEVE, 1844c: 117.
Triton (Simpulum) gemmatus - KOBELT, 1878a: 246 (in part). — TRYON, 1880: 13, pl. 7, fig. 41 [not figs 43-44 which show *C. mundum*].
Tritonium gemmatum - TAPPARONE-CANEFRI, 1881: 26.
NOT *Tritonium (Simpulum) gemmatum* - ANGAS, 1877: 179. — HEDLEY, 1918b: M66 [= *C. occidentale*].
Cymatium (Monoplex) gemmatum - BEU, 1985: 58. — EMERSON, 1991: 63, fig. 1-8. — HENNING & HEMMEN, 1993: 62, pl. 12, fig. 4.
Cymatium (Septa) gemmatum - SPRINGSTEEN & LEOBRERA, 1986: 114, pl. 31, figs 12 a-b.
NOT *Cymatium (Septa) gemmatum* - CLENCH & TURNER, 1957: 222, pl. 110, fig. 2; pl. 113, fig. 6; pl. 125, figs 1-2 [= *C. comptum*].
NOT *Cymatium (Septa) gemmatum* - KAY, 1979: 222, fig. 79 C [= *C. mundum*].
NOT *Septa gemmata* - RIPPINGALE & MCMICHAEL, 1961: 67, pl. 7, fig. 10. — HINTON, 1972: 12, pl. 6, fig. 16 [= *C. mundum*].
NOT *Cymatium gemmatum* - EDMONDSON, 1946: 143, fig. 61 g [= *C. nicobaricum*].
NOT *Cymatium gemmatum* - BARNARD, 1963: 28. — SALVAT & RIVES, 1975: 305, fig. 173. — HINTON, 1978: 30, figs 8-8a. — SALVAT *et al.*, 1988: 102, pl. 13, fig. 7 [= *C. mundum*].
Septa limberta (*sic*) - HABE & KOSUGE, 1966a: 43, pl. 15, fig. 11 [not *Tritonium limbatum* Röding, 1798].

TYPE DATA. — *Triton gemmatus*: lectotype (designated by EMERSON, 1991: 64, figs 3-4) BMNH 198055; 3 paralectotypes BMNH 198055a, in same lot; all from "Masbate", Philippine Islands (although REEVE (1844a: caption to pl. 15) published the locality as "Island of Ticao"); 3 specimens (not part of the type series) of var. β of Reeve [= *Cymatium mundum*], BMNH 196736, from "Philippines".

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. D26 (Fig. 31 h).
New Caledonia. LAGON: sta. 489, 893 (Figs 31 a-d, f, j). — EXPÉDITION MONTROUZIER: sta. 1245 (Fig. 31 e), 1259, 1306, 1318, 1321, 1323. — LAGON DE NOUMÉA: sta. 1356.
North of New Caledonia. LAGON: sta. 458 (Fig. 23 c).
Local depth range intertidal to 40 m (alive).

OTHER MATERIAL EXAMINED. — **Japan.** Amami-Oshima, S. Japan (2 NSMT 4619; 1 NSMT 46207).
Philippines. Zamboanga (1 NSMT 46205). — Sabtau I., Batanes Group (1 USNM 230871). — Marongas I., Jolo (1 USNM 230808a). — Davao City, Mindanao, May 1970, 0.5-2.5 m, M.V. *"Pele"* (1, large USNM 747813). — Punta Engaño, Mactan I., Cebu (12 NZGS WM14263, 3 NZGS WM14110, Figs 31 g, i). — As above, pres. F.J. Springsteen (*ca.* 50 NZGS WM13526, 5 NZGS WM14118). — As above, *ex* Penniket Colln (3 NZGS WM15549). — Mactan I., Cebu, pres. F.J. Springsteen (20 NZGS WM15093). — Bohol, *ex* Penniket Colln (1 NZGS WM15550). — Palawan, pres. F.J. Springsteen (6 NZGS WM13005).
Marianas Islands. Guam (1 USNM 620404).
Indonesia. Mariel King Memorial Expedition Sta. ABII, Ambon Bay, Moluccas (1 USNM 746407).
Australia. Capricorn Group, southern Great Barrier Reef, Queensland, *ex* Penniket Colln (1 NZGS WM15547).
Solomon Islands. Bunana, Gela, *ex* Gourlay Colln (1 NZGS WM13870).
Fiji. W. of Ngaratoka Pass, Vanua Levu (1 USNM 695079).
Samoa. Mutinui, W. Samoa, *ex* Penniket Colln (1 NZGS WM15548).
French Polynesia. E. of Tahueia, NE coast of Tubuai I., H.A. Rehder, 1973 (1 USNM 705501).

DISTRIBUTION. — Throughout the western Pacific archipelagos from the Amami Islands, southern Japan, to New Caledonia and eastern Australia (Capricorn Group, southern Great Barrier Reef); uncommon other than in the Philippines. Not reported from the Indian Ocean, but poorly known.

DIMENSIONS. — *T. gemmatus* (lectotype): H 28.9, D 14.5; paralectotypes: H 28.6, D 12.5; H 21.6, D 9.6; H 16.7, D 7.8. - Davao City, Mindanao, USNM 747813: H 36.2, D 16.4. - Capricorn Group, Queensland, NZGS WM15547: H 37.0, D 17.9. - Punta Engaño, Cebu, NZGS WM15549: H 32.1, D 15.4.

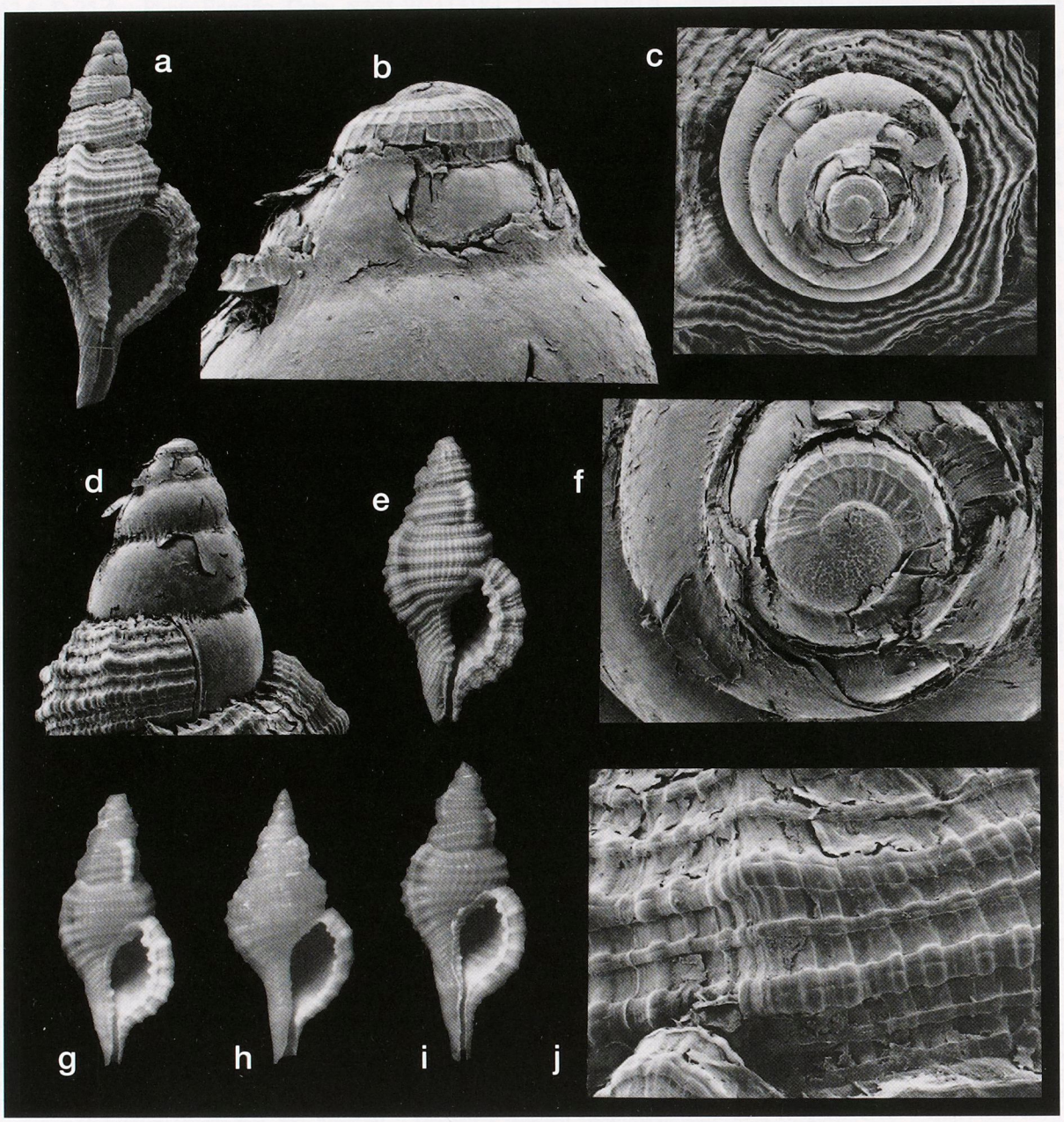

FIG. 31. — *Cymatium (Monoplex) gemmatum* (Reeve). — **a-d**, **f**, **j**, LAGON: sta. 893, Secteur de Pouébo, New Caledonia, 17 m; a. x3.9; b. x65; c. x21; d. x15; f. x65; j. x33. — **e**, EXPÉDITION MONTROUZIER: sta. 1245, intertidal, Grand Récif Mengalia, New Caledonia, x2. — **g**, **i**, NZGS WM14110, Punta Engaño, Mactan I., Cebu, Philippines, both x1.5. — **h**, CHALCAL 1: sta. D26, Chesterfield-Bellona Plateau, Coral Sea, 48 m, x3.

REMARKS. — EMERSON (1991), when recording *Cymatium mundum* from the Galapagos Islands for the first time, cleared up the long-standing confusion over the identity of *C. gemmatum*, and designated a lectotype for *Triton gemmatus* that restricts this name to the small, narrow, pale orange-brown, dominantly spirally sculptured species figured by REEVE (1844a: pl. 15, figs 60 a-b) as his typical variety (illustrated well in colour by SPRINGSTEEN & LEOBRERA, 1986: pl. 31, figs 12 a-b). The much more common and more widespread, larger, more heavily and crudely sculptured, slightly wider, cream to white species that has usually been known as *C. gemmatum* (following REEVE's illustrating this species as his *Triton gemmatus* var. β) is *C. mundum* (see below).

Cymatium (Monoplex) mundum (Gould, 1849)

Figs 32 a-j

Triton mundum Gould, 1849: 143.
Tritonium mauritianum Tapparone-Canefri, 1876: 243.

Triton mundum - GOULD, 1856: 506, pl. 17, figs 297 a-b; 1862: 66. — JOHNSON, 1964: 112.
Tritonium mundum - TAPPARONE-CANEFRI, 1881: 26.
Cymatium (Monoplex) mundum - BEU, 1985: 58. — EMERSON, 1991: 65, figs 11-25. — LAI, 1989: 125, fig. 45. — PIECH, 1993: 88, figs 1-2. — HENNING & HEMMEN, 1993: 65, pl. 12, fig. 5. — WILSON, 1993: 245, pl. 42, fig. 11.
Cymatium (Septa) mundum - SPRINGSTEEN & LEOBRERA, 1986: 116, pl. 31, fig. 13.
Cymatium mundum - SHORT & POTTER, 1987: 48, pl. 23, fig. 5. — DRIVAS & JAY, 1988: 64, pl. 17, fig. 12.
Triton gemmatus variety β - REEVE, 1844a: pl. 15, fig. 60 c. — REEVE, 1844c: 117.
Triton (Simpulum) gemmatus - KOBELT, 1878a: 246 (in part). — TRYON, 1880: 13, pl. 7, figs 43-44 .
Septa gemmata - RIPPINGALE & MCMICHAEL, 1961: 67, pl. 7, fig. 10. — HINTON, 1972: 12, pl. 6, fig. 16.
Cymatium gemmatum - BARNARD, 1963: 28. — SALVAT & RIVES, 1975: 305, fig. 173. — HINTON, 1978: 30, figs 8-8a. — SALVAT *et al.*, 1988: 102, pl. 13, fig. 7.
Cymatium (Septa) gemmatum - KAY, 1979: 222, fig. 79 C.

TYPE DATA. — *Triton mundum*: lectotype selected by JOHNSON (1964: 112), USNM 5695 (EMERSON, 1991: figs 12-13); from Tutuila, American Samoa; paralectotype, USNM 612311 (EMERSON, 1991: figs 16-17); paralectotype, MCZ 169249 (EMERSON, 1991: figs 18-19). — *Tritonium mauritianum*: types not seen, presumably in Museo Civico di Storia Naturale "Giacomo Doria", in Genoa.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 923, 955, 1100. — EXPÉDITION MONTROUZIER: sta. 1237 (Figs 32 i-j), 1241, 1242, 1245, 1277, 1279, 1286, 1289, 1291, 1292.

Loyalty Ridge. MUSORSTOM 6: sta. DW434.
These 14 lots were taken from the intertidal zone to 39 m; all EXPÉDITION MONTROUZIER samples were intertidal.

DISTRIBUTION. — Throughout the Indo-West Pacific, from Durban, South Africa (BARNARD, 1963: 29; EMERSON, 1991: 65) to the northern Indian Ocean, and from at least Taiwan southwards to southern Queensland in eastern Australia; throughout Melanesia and Polynesia, eastward to Hawaii (KAY, 1979); Galapagos Islands, three specimens recorded by EMERSON (1991: 65); Western Atlantic, two specimens recorded by EMERSON (1991: 65): NZGS WM15228, south end of Lake Worth, Palm Beach County, Florida, coll. Vera Lyman, *ex* A. D'Attilio Colln (1); LACM 115537, Gulf Stream, off Palm Beach County, Florida, coll. F. Lyman, 1940 (1).

DIMENSIONS. — *Triton mundum* (lectotype): H 29.9, D 16.7. - *Triton gemmatus* var. β (paralectotypes): H 39.0, D 20.7; H 40.8, D 20.0; H 33.5, D 18.6. - Tryon I., Capricorn Group, Queensland, *ex* Penniket Colln, largest seen (Fig. 32 g), NZGS WM15552: H 47.3, D 25.0. Maximum size recorded in New Caledonia 38.2 mm (PRIGENT, 1994b).

REMARKS. — *Cymatium mundum* is the valid name for the cream to white species, with a prominent pilose brown periostracum, and with heavier and more rugose sculpture, a shorter form (in most specimens) and wider, thicker varices than *C. gemmatum*. It occurs rather more commonly than *C. gemmatum* in the western Pacific, and in significantly shallower water. Also it ranges from Durban, South Africa, to Hawaii, the Galapagos Islands and, rarely, to the western Atlantic (EMERSON, 1991: 65) whereas *C. gemmatum* is recorded only from the western Pacific. Although the two species had been correctly identified, and illustrated in colour, by SPRINGSTEEN & LEOBRERA (1986: pl. 31), EMERSON (1991) was the first to clarify the types and to report *C. mundum* from the Galapagos Islands and the western Atlantic. Other western Atlantic material was reported by PIECH (1993).

The distinction between *Cymatium gemmatum* and *C. mundum* was first realised by TAPPARONE-CANEFRI (1881: 26), who in his synonymy of *Tritonium gemmatum*, noted: "*excl.* fig. 60 c", and who listed *T. mundum* as

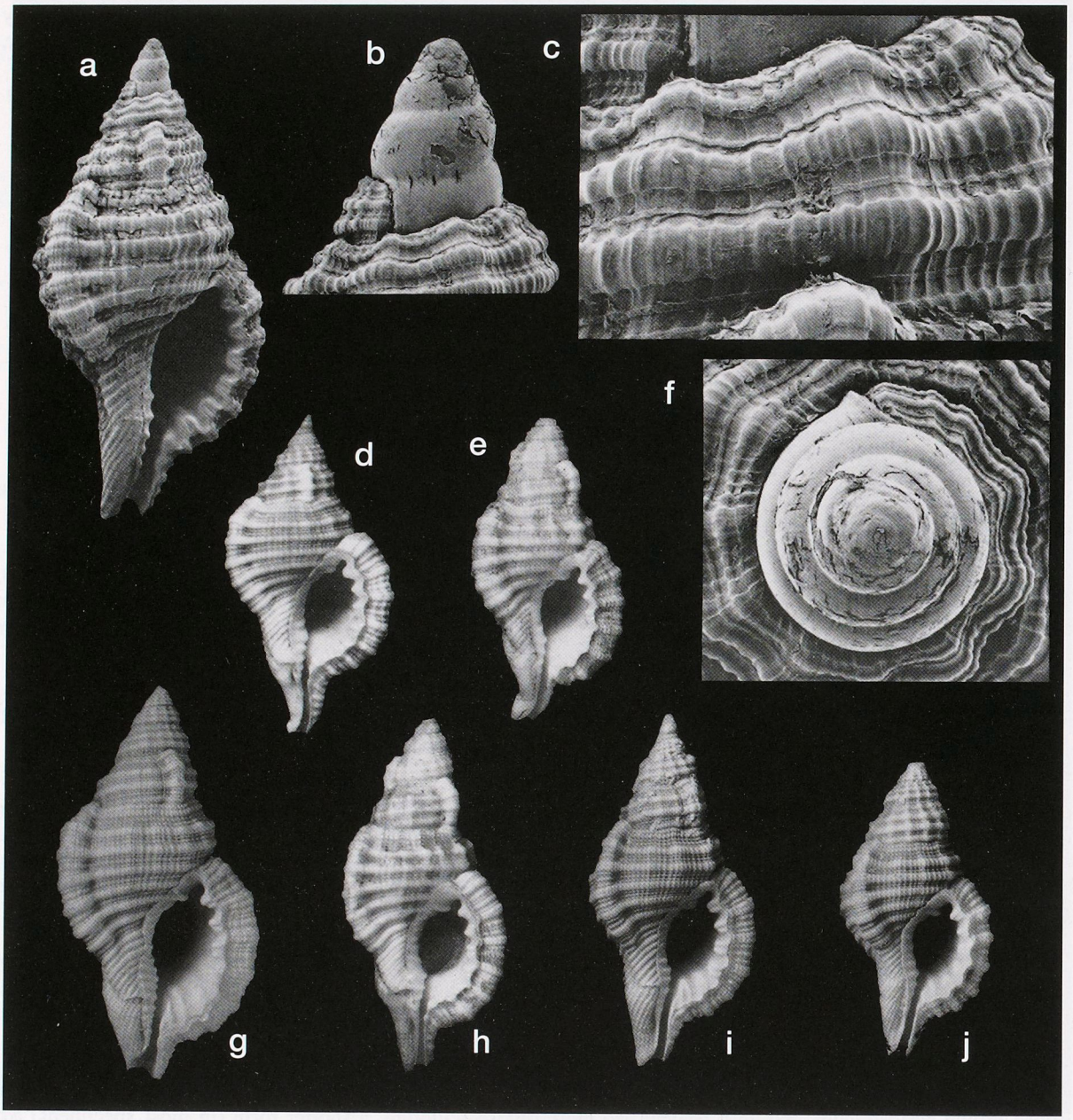

FIG. 32. — *Cymatium (Monoplex) mundum* (Gould). — **a-f**, **h**, NZGS WM13871, Mauritius, Indian Ocean, coll. J. Closel. a. x4; b. x14; c. x35; d-e, h. x1.5; f. x23. — **g**, largest specimen seen, NZGS WM15552, Tryon I., Capricorn Group, Queensland, Australia,; x1.25. — **i-j**, EXPÉDITION MONTROUZIER: sta. 1237, 0-1 m, Baie de Touho, New Caledonia, x2.

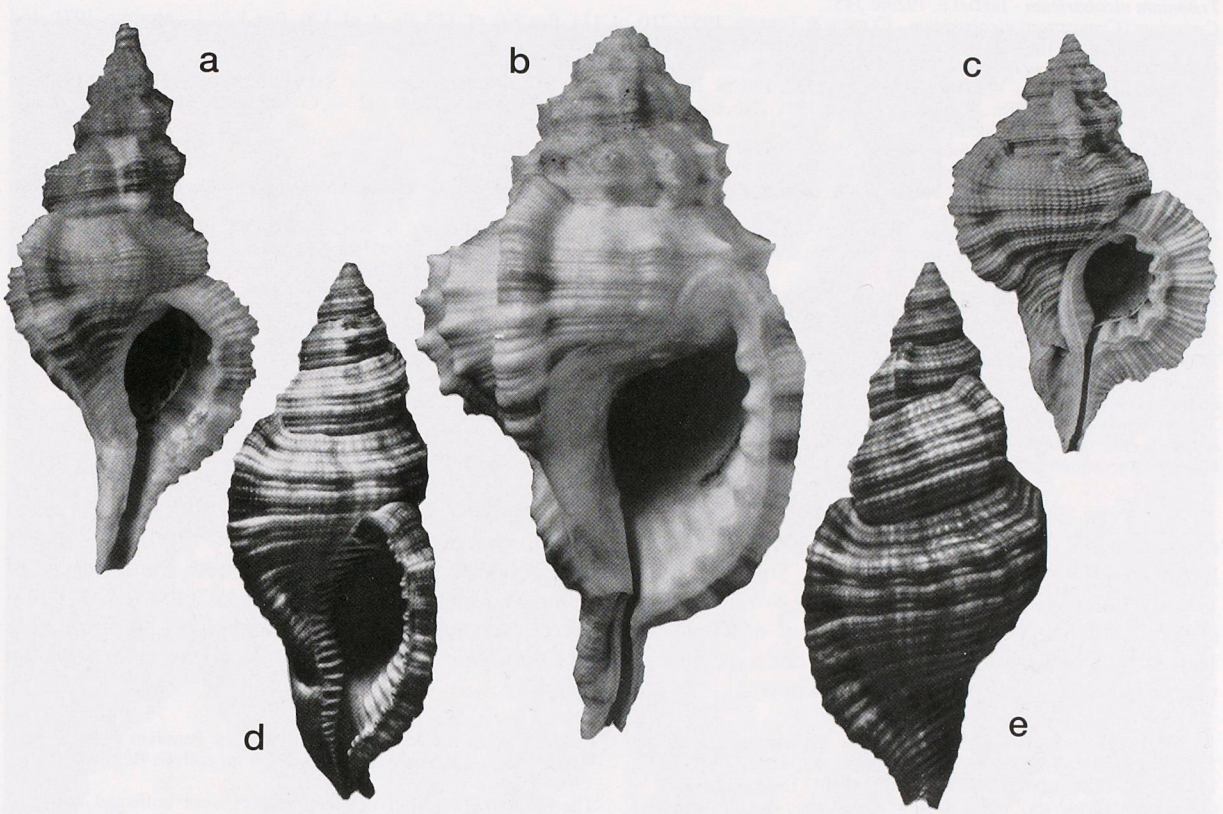

FIG. 33. — Holotypes of Lischke's Ranellidae, and lectotype of *Cymatium pileare* (Linné) — **a-c**, holotypes of Lischke's Japanese ranellid species, in Löbbecke Museum und Aquazoo, Düsseldorf (not registered). **a**, *Cymatium (Monoplex) tenuiliratum* (Lischke), holotype, "Süd-Japan", x2. **b**, *Cymatium (Ranularia) dunkeri* (Lischke), holotype, "Nagasaki", x1. **c**, *Triton loebbeckei* Lischke [= *Cymatium (Turritriton) labiosum* (Wood)], holotype, "Nagasaki", x1.5 (whitened with MgO). — **d-e**, *Cymatium (Monoplex) pileare* (Linné), lectotype designated here of *Murex pileare* Linné, 1758, specimen figured by GUALTIERI (1742: pl. 49, fig. G), in Gualtieri Collection, Museo di Storia Naturale e del Territorio, Università di Pisa, x0.75 (photos supplied by Dr Marco Zuffi).

a distinct species, including in its synonymy *T. gemmatus* var. β of Reeve (1844a: pl. 15, fig. 60 c). It should be noted that TAPPARONE-CANEFRI (1881: 26) included also *Tritonium mauritianum* in the synonymy of *T. mundum* (following TRYON (1880: 24), but *T. mauritianum* has usually been thought a synonym of *C. muricinum*.

Although this is a relatively common, shallow-water species throughout its range (except in the Galapagos Islands and the western Atlantic), and was recorded from the Loyalty Islands by MELVILL & STANDEN (1895), only four lots of small specimens are present in the LAGON samples reported on here, but this deficiency is once again made up for by 11 lots, most including living specimens, collected during EXPÉDITION MONTROUZIER.

Cymatium (Monoplex) nicobaricum (Röding, 1798)

Figs 23 a, 29 i

Tritonium nicobaricum Röding, 1798: 126.
Triton chlorostomum Lamarck, 1822: 185.
Triton chlorostomum var. *pumilio* Mörch, 1877: 29.
Triton pulchellus C.B. Adams, 1850: 60.

Tritonium nicobaricum - IREDALE, 1929a: 345.
Cymatium (Cymatriton) nicobaricum - CLENCH & TURNER, 1957: 210, pl. 111, figs 5-6; pl. 113, fig. 4; pl. 120, figs 1-3. — ABBOTT, 1974: 164 [not pl. 7, fig. 1760 = *C. aquatile*]. — COELHO *et al.*, 1981: 120, fig. 6.
Cymatriton nicobaricum - HABE, 1961: 45, pl. 22, fig. 6. — HABE, 1964: 71, pl. 22, fig. 6.
Cymatium nicobaricum - WARMKE & ABBOTT, 1962: 100, pl. 18 g. — HINTON, 1972: 12, pl. 6, fig. 3. — SALVAT & RIVES, 1975: 305, fig. 171. — HINTON, 1978: 29, fig. 11. — KAY, 1979: 216, fig. 77 D. — GARCIA-TALAVERA, 1983: 102. — COSEL, 1982: 54. — DRIVAS & JAY, 1988: 64, pl. 17, fig. 5.
NOT *Cymatium nicobaricum* - SALVAT *et al.*, 1988: 101, pl. 12, fig. 11 [= *C. aquatile*].
Lampusia nicobaricum - WILSON & GILLETT, 1971: 78, pl. 53, fig. 3.
Cymatium (Septa) nicobaricum - NORDSIECK & GARCIA-TALAVERA, 1979: 115, pl. 24, fig. 3. — RIOS, 1985: 76, pl. 27, fig. 332. — SPRINGSTEEN & LEOBRERA, 1986: 112, pl. 30, fig. 13.
Cymatium (Monoplex) nicobaricum - BEU, 1985: 58. — GARCIA-TALAVERA, 1987: 253, pl. 1, fig. 8. — LAI, 1989: 123, fig. 37. — HENNING & HEMMEN, 1993: 66, pl. 12, fig. 7. — WILSON, 1993: 245, pl. 41, fig. 9. — BOSCH *et al.*, 1995: 98, fig. 354.
Lagena chlorostoma - LESSON, 1838: 73.
Triton chlorostomum - KIENER, 1842: 19, pl. 12, fig. 2. — DESHAYES, 1843: 636.
Triton chlorostomus - REEVE, 1844a: pl. 8, fig. 25.
Tritonium chlorostomum - KOBELT, 1876a: 47. — TAPPARONE-CANEFRI, 1881: 25.
Triton (Simpulum) chlorostomus - KOBELT, 1878a: 245. — TRYON, 1880: 13, pl. 7, figs 47-48.
Triton (Simpulum) chlorostomus var. *pulchellus* - KOBELT, 1878a: 245.
Lampusia chlorostoma - DALL, 1889: 226.
Triton chlorostoma - SMITH, 1891: 413.
Lotorium chlorostomum - KESTEVEN, 1902: 460, pl. 17, fig. 12.
Cymatium gemmatum - EDMONDSON, 1946: 143, fig. 61 g.

TYPE DATA. — Lamarck's type collection in MHNG contains four shells (MHNG 1100/6) of typical *Cymatium nicobaricum* identified as syntypes of *Triton chlorostomum*, and one of them (MHNG 1100/6/3) matches KIENER's (1842, pl. 12, fig. 2) figure. This specimen, MHNG 1100/6/3, is here designated both the lectotype of *Triton chlorostomum* and the neotype of *Tritonium nicobaricum*. The specimen is unlocalised; CLENCH & TURNER (1957: 211) designated the type locality of *C. nicobaricum* as Jamaica. — *Triton pulchellus*: holotype MCZ 186135, "*ex* Amherst College", is a juvenile specimen of *C. nicobaricum*, from Jamaica. — *Triton chlorostomum* var. *pumilio*: no type specimen(s) are known.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 265, 596, 985. — EXPÉDITION MONTROUZIER: sta. 1237, 1241, 1242, 1246, 1252, 1284, 1286, 1287, 1288, 1291, 1301, 1303 (Fig. 23 a). — LAGON DE NOUMÉA: sta. 1355. —New Caledonia, *ex* J.R. Penniket Colln (1 NZGS WM15553). — New Caledonia, coll. W. Doak, *ex* Penniket Colln (1 NZGS WM15554). — Ile des Pins, in coral pools, coll. A.S.W. & S.N. Penniket, Sept. 1984, *ex* Penniket Colln (3 NZGS WM15555). — Grand Récif, Nouméa, 9 m, coll. C. Berthault, 3 July 1996 (1 lv).
The 12 EXPÉDITION MONTROUZIER samples were collected in 0-8 m; no New Caledonian specimens were collected alive in more than 17 m.

DISTRIBUTION. — Throughout the Indo-West Pacific, from Durban, South Africa (NZGS) to the northern Indian Ocean and Red Sea, as far south as the western end of Rottnest Island, off Fremantle, in Western Australia (WILSON, 1993: 246; material in NZGS); in the western Pacific from southern Japan (to Kii Peninsula, Honshu; HABE, 1964: 71) south to Sydney Harbour, New South Wales (IREDALE, 1929a: 345) and to New Caledonia, throughout Melanesia and Polynesia (SALVAT & RIVES, 1975) to Hawaii (KAY, 1979), and at Clipperton and Cocos Islands in the eastern Pacific (EMERSON, 1991: 68). In the western Atlantic, reasonably common from Palm Beach County, Florida, USA, south to Bahia, Brazil (RIOS, 1985: 76); rare in the eastern Atlantic at Madeira and the Canary Islands, and at Ascencion (NORDSIECK & GARCIA-TALAVERA, 1983: 102; GARCIA-TALAVERA, 1987: 253).

DIMENSIONS. — *Triton pulchellus* (holotype): H 15.5, D 8.9. - New Caledonia, LAGON: sta. 265: H 52.1, D 27.2. - New Caledonia, NZGS WM15555: H 62.6, D 31.5.

REMARKS. — *Cymatium nicobaricum* is highly distinctive because of its orange-red aperture with many transverse white ridges on both lips, its tall spire and moderately short to moderately long anterior canal, its very coarse sculpture of high, very wide, rounded spiral cords, with a weak median groove on each cord, crossed by very variable, coarse and irregular axial costae to coarse nodules. Most specimens have rather regularly placed brown spots on the cords where they are crossed by regular, deep axial grooves, and many smaller, closer brown spots on the varices, and many have the neck of the last whorl pale tan to medium red-brown, on an otherwise overall pale grey coloration. The varices are high and very thick, and are strongly shouldered at the bottom of the sutural ramp on most specimens. The protoconch is also distinctive, being more evenly conical (*i.e.* with more weakly impressed sutures) than in most of its congeners. Although *C. nicobaricum* is unlike other *C. (Monoplex)* species in detail, there are no discrete taxonomic characters (*e.g.* of the operculum, periostraceum, or sculpture) to separate it from *C. (Monoplex)*, and *Cymatriton* is regarded as a synonym of *Cymatium (Monoplex)*.

FIG. 34. — *Cymatium* species. — **a**, *Cymatium (Monoplex) aquatile* (Reeve), EXPÉDITION MONTROUZIER: sta. 1241, 0-2 m, Secteur de Touho, New Caledonia, x1. — **b**, *Cymatium (Ranularia) exile* (Reeve), EXPÉDITION MONTROUZIER: sta. 1287, intertidal, Récif de l'Infernet, New Caledonia,; x1. — **c**, *Cymatium (Monoplex) pileare* (Linné), EXPÉDITION MONTROUZIER: sta. 1303, 0-8 m, Plateau Karembé, New Caledonia, x1. — **d**, *Cymatium (Ranularia) springsteeni* Beu, LAGON: sta. 240, New Caledonia, 42 m, x1.1. — **e**, *Cymatium (Ranularia) pyrum* (Linné), CORAIL 2: sta. DW1, Lansdowne-Fairway Banks, Coral Sea, 59 m, x0.8. — **f**, **h**, *Cymatium (Ranularia) dunkeri* (Lischke), x1. **f**, LAGON: sta. 552, Grand Récif Sud, New Caledonia, 38 m. **h**, SMIB 8: sta. DW158, Norfolk Ridge, New Caledonia, 262-290 m. — **g**, *Cymatium (Ranularia) gutturnium* (Röding), LAGON: sta. 55, Nouméa, New Caledonia, 23 m, x1. — **i**, *Cymatium (Ranularia) sarcostoma* (Reeve), LAGON: sta. 558, Grand Récif Sud, New Caledonia, 43 m, x1.1. — **j**, *Cymatium (Ranularia) testudinarium* (A. Adams & Reeve), LAGON: sta. 542, Lagon Nord, New Caledonia, 50 m, x1.

Cymatium (Monoplex) parthenopeum (Salis Marschlins, 1793)
Figs 35 a-f

Murex costatus Born, 1778: 295 [junior homonym of *Murex costatus* Pennant, 1777].
Murex parthenopeus Salis Marschlins, 1793: 370, pl. 7, fig. 4.
Monoplex australasiae Perry, 1811: pl. 3, fig. 3.
Triton succinctum Lamarck, 1816: pl. 416, fig. 2; "liste des objets", p. 5.
Murex costulatus Risso, 1826: 197.
Triton americanum d'Orbigny, 1842: 163, pl. 23, fig. 22.
Triton brasilianum Gould, 1849: 142.
? *Triton fossatum* Gould, 1860: 329 (*species inquirendum*).
Triton abbreviatus Bellardi, 1873: 216, pl. 14, figs 6 a-b.
Triton parthenopeum vars. *milonum* and *peribrantum* de Gregorio, 1884: 95-96.
Triton parthenopeum vars. *stimum, sbilpum* and *antupum* de Gregorio, 1885: 39-40.
Triton (Simpulum) acclivis Hutton, 1873: 13, fig. 8.
Dissentoma prima Pilsbry, 1945: 59, text-fig. 1 [larval shell].
Cymatium (Cabestana) parthenopus [*sic*] var. *robusta* Belletante, 1954: 76.
Cymatium echo Kuroda & Habe *in* Kira, 1961: 53, pl. 21, fig. 13.
Cymatium (Linatella) valentinei Olsson & Petit, 1964: 562, pl. 82, figs 1-1a.
Cymatium (Monoplex) echo iwakawanum "Kuroda & Kira" Shikama, 1964: pl. 62, fig. 7 (*nomen nudum*).
Cymatium (Monoplex) parthenopaeum [*sic*] vars *elongatum, evaricosus, obesum, nodosum, subnodosum, curtum, major* and *minor* Settepassi, 1970: Cymatiidae i-iv, pls 5-9.

Murex costatus - Born, 1780: 297.
Murex parthenopeus - Salis Marschlins, 1795: 462, frontispiece. — Dillwyn, 1817: 696. — Wood, 1818: 122; 1823-1825: 127, pl. 25, fig. 30.
Triton succinctum - Lamarck, 1822: 181. — Kiener, 1842: 33, pl. 6, fig. 1. — Deshayes, 1843: 628.
Triton olearium - Reeve, 1844a: pl. 10, fig. 32. — Lischke, 1871: 48. — Bellardi, 1873: 210, pl. 14, figs 4 a-b. — Hutton, 1880: 64. — Smith, 1890b: 267 (not *Murex olearium* Linné, 1758).
Tritonium costatum - Krebs, 1864: 23.
Tritonium americanus - Krebs, 1864: 22.
Triton (Simpulum) olearium - Tryon, 1880: 11, pl. 3, fig. 19; pl. 4, fig. 24; pl. 5, figs 27, 29; pl. 6, fig. 37.
Triton parthenopes [sic] - Dunker, 1882: 28.
Triton (Simpulum) costatus - Watson, 1886: 390.
Lotorium olearium - Hutton, 1904: 75. — Moss, 1908: 22, pl. 5, fig. 1.
Septa costata - Suter, 1913: 305, pl. 43 [1915], fig. 2. — Bucknill, 1924: 51, pl. 4, fig. 2.
Cymatium parthenopeum - Iredale, 1915: 459. — Hirase, 1936: pl. 95, fig. 8. — Kilburn & Rippey, 1982: 74, fig. 30, 31; pl. 17, fig. 6.
Cymatium olearium - Maury, 1922: 116. — Barnard, 1963: 21, fig. 3 f.
Monoplex acclivis - Finlay, 1926: 398.
Cymatium (Cabestana) parthenopus [sic] - Bayer, 1933: 41. — Belletante, 1954: 76.
Monoplex parthenopeum - Powell, 1933: 160, fig. 7.
Dissentoma prima - Pilsbry, 1949: 142. — Beu & Kay, 1988: 209.
Cymatium costatum - Nicklès, 1950: 86, fig. 131.
Cymatium echo - Kuroda & Habe, 1950: 30 (*nomen nudum*). — Kuroda & Habe, 1952: 51 (*nomen nudum*). — Kira, 1955: 43, pl. 21, fig. 13 (*nomen nudum*).
Monoplex australasiae - Powell, 1952: 176. — Rippingale & McMichael, 1961: 67, pl. 7, fig. 5. — Powell, 1962: 94, pl. 14, fig. 11. — Iredale & McMichael, 1962: 54. — Macpherson & Gabriel, 1962: 162, fig. 195. — Wilson & Gillett, 1971: 76, pl. 52, fig. 6.
Cymatium (Monoplex) parthenopeum - Clench & Turner, 1957: 228, pl. 110, fig. 4; pl. 112, figs 7-8; pl. 113, figs 9-10; pl. 128, figs 1-3. — Warmke & Abbott, 1962: 101, pl. 18 f. — Weisbord, 1962: 262, pl. 25, figs 4, 6. — Kennelly, 1964: 67, pl. 16, fig. 79. — Abbott, 1974: 165, fig. 1767. — Wilson, 1993: 246, pl. 41, fig. 5.
Monoplex echo - Kira, 1962: 56, pl. 22, fig. 13.
Septa (Monoplex) parthenopea parthenopea - Beu, 1970b: 229, pl. 1, figs 2-3; pl. 3, figs 18-19; pl. 4, figs 20-28; pl. 5, figs 29-34; text-fig. 1 a.
Septa (Monoplex) parthenopea echo - Beu, 1970b: 232, pl. 1, fig. 1; pl. 3, figs 12-16.
? *Murex costulatus* - Arnaud, 1978: 113, pl. 10, fig. 152.
Monoplex parthenopeus - Powell, 1979: 165, pl. 7, figs 1-2.
Cymatium (Septa) parthenopeum - Bernard, 1984: 62, pl. 22, fig. 97.
Monoplex parthenopeum echo - Okutani, 1986: 112-113, lower left 2 figs.
Cymatium (Monoplex) parthenopeum parthenopeum - Beu & Maxwell, 1990: 355, pl. 48 g. — Henning & Hemmen, 1993: 58, pl. 13, fig. 1.
Cymatium (Monoplex) parthenopeum echo - Henning & Hemmen, 1993: 59, pl. 13, fig. 3.

Type data. — *Murex costatus* Born, 1778: holotype, a faded, orange-brown specimen (Fig. 35 e) in Naturhistorisches Museum Wien, not registered, but labelled "*Murex costatus* Born, type" inside outer lip; without

locality; the type locality is here designated as the Bay of Naples, Italy. This species (as with the others in BORN, 1778, 1780) was expressly described from a specimen in Queen Maria Theresa's collection, and BORN gave the dimensions of the specimen; this specimen can therefore be accepted as the holotype, despite the fact that, in a way that seems at first sight similar to the citations by LINNÉ (1758), BORN also cited figures of the species in previously published books, so that his readers could understand which species he was describing. For *Murex costatus*, BORN (1780: 298) cited illustrations by SEBA (1758: vol. 3, pl. 57, fig. 31) and MARTINI ([in MARTINI & CHEMNITZ], 1780: vol. 4, pl. 131, figs 1252-1253); these figures are all repeated here (Figs 35 a, c-d) and all undoubtedly show *Cymatium parthenopeum* of all later authors. — *Murex parthenopeus*: whereabouts of any original material unknown; KOHN (1975: 186-187) gave a useful, brief account of Carl Ulysses von Salis Marschlins, and also stated that "the present whereabouts of his collection is unknown". The holotype, recorded above, of *Murex costatus* Born is here designated also the neotype of *Murex parthenopeus*. The interpretation of this name relies on SALIS MARSCHLINS's (1793: pl. 7, fig. 4) illustration in a rare book; the figure was repeated as the frontispiece in the translation of his book (SALIS MARSCHLINS, 1795). As this illustration has not been repeated in any modern works, the opportunity is taken here to republish the illustration (Fig. 35 f). It shows a very elongate specimen, with the spire tilted up and looking taller than in normal orientation, but the coloration of the original (a red-brown shell, with a darker brown varix and white spots on the varix), the prominent, wide spiral cords, and the lack of varices before the outer lip leave no doubt that it represents *C. parthenopeum* of all later authors. — *Monoplex australasiae*: no type material known (see Introduction); the holotype of *Triton (Simpulum) acclivis*, NMNZ M117 (see below) is here designated the neotype of *Monoplex australasiae*. — *Triton succinctum*: 2 syntypes present in MHNG, of an original 9 recorded by Rosalie de Lamarck; MHNG 1099/85, a relatively small, typical specimen of *C. parthenopeum*, H 82.5, D 53.2, the original of KIENER (1842: pl. 6, fig. 1); and MHNG 1099/86, a much taller and narrower specimen, H 102.7, D 55.2; this specimen has a thin (incompletely secreted) outer lip, and is the original of LAMARCK (1816: pl. 416, fig. 2). There is some doubt about the identity of the second specimen, figured by LAMARCK (1816), as such tall, offshore specimens are difficult to identify, and it is faintly possible that it is a specimen of *C. keenae*; therefore the specimen figured by KIENER (1842), MHNG 1099/85, is here designated the lectotype of *Triton succinctum*. — *Murex costulatus*: a subfossil specimen ex Risso Colln in MNHN matches Risso's original illustration published by ARNAUD (1978: 145, fig. 150), and can be considered the holotype; it is a specimen of *Cymatium parthenopeum*. — *Triton americanum*: 3 syntypes, BMNH 1854.12.4.525 a-c, from "Rio de Janeiro, Brazil"; all are typical, if tall and narrow, specimens of *Cymatium parthenopeum*; the largest syntype, BMNH 1854.12.4.525a, H 95.0, D 47.7, is here designated the lectotype. — *Triton brasilianum*: holotype, USNM 5694 (JOHNSON, 1964: 47), from "Rio de Janeiro, Brazil". — *Triton fossatum*: no type material found by JOHNSON (1964: 78); from Hong Kong, China. The status and identity of this name have never been clarified and, in the absence of any type material, never can be; at this time the name remains a *species inquirendum*, requiring the designation of a neotype, but as *C. parthenopeum* does not seem to occur in Hong Kong the neotype needs to be selected with care, and this is not attempted here. — *Triton abbreviatum*: unfigured syntype remaining in Bellardi & Sacco type Colln, Museo Regionale di Scienze Naturali, Torino, no. BS 010.01.011, from the Piacenzian (Pliocene) of Rio Torsero, Italy (FERRERO MORTARA *et al.*, 1982). — *Triton (Simpulum) acclivis*: holotype, NMNZ M117; without locality; type locality here designated as Manukau Harbour, Auckland. — *Cymatium echo* was proposed as a "new name" for *C. parthenopeum* of HIRASE's (1936) usage, which KURODA & HABE thought was incorrectly applied to Japanese specimens; but this action actually constitutes the description of a new species. No type specimen is present in NSMT, and none appears ever to have been designated, but as all usages of this name before that of KIRA (1961: 53) are *nomina nuda*, the holotype seems best construed as the specimen illustrated by KIRA (1961: pl. 21, fig. 13). The whereabouts of this specimen are not known to me. — *Dissentoma prima*: holotype, ANSP 181369, "dredged off Singers Island, N Inlet, Lake Worth, Florida"; PILSBRY (1949: 142) identified this specimen as a larval shell of *Cymatium martinianum*, but BEU & KAY (1988: 209) reidentified it as *C. parthenopeum*. — *Cymatium (Cabestana) parthenopus* var. *robusta*: lectotype designated by BEU (1970b: 230) as the specimen illustrated by REEVE (1844a: pl. 10, fig. 32), supposedly from "Tahiti"(wrong); BMNH 1967693; type locality designated by BEU (1970b: 230) as the Mediterranean Sea; with 3 paralectotypes, in MNHN. This name was provided for the strongly varicate form that occurs in small numbers throughout the range of the species, and is of no taxonomic significance. — *Cymatium (Linatella) valentinei*: holotype, USNM 644661, from Pinecrest Beds (Pliocene) at Brighton, Highlands County, Forida, collected by Dr M. Valentine; a large, typical specimen of *C. parthenopeum*. — The name *C. echo iwakawanum* Kuroda & Habe, MS, for a small, elongate offshore form from Japan, has never been made available, to my knowledge, and is of no taxonomic significance; I am aware of only one published usage, by SHIKAMA (1964: pl. 62, fig. 7). — The numerous infrasubspecific varieties named by (among other authors) DE GREGORIO (1884, 1885) and SETTEPASSI

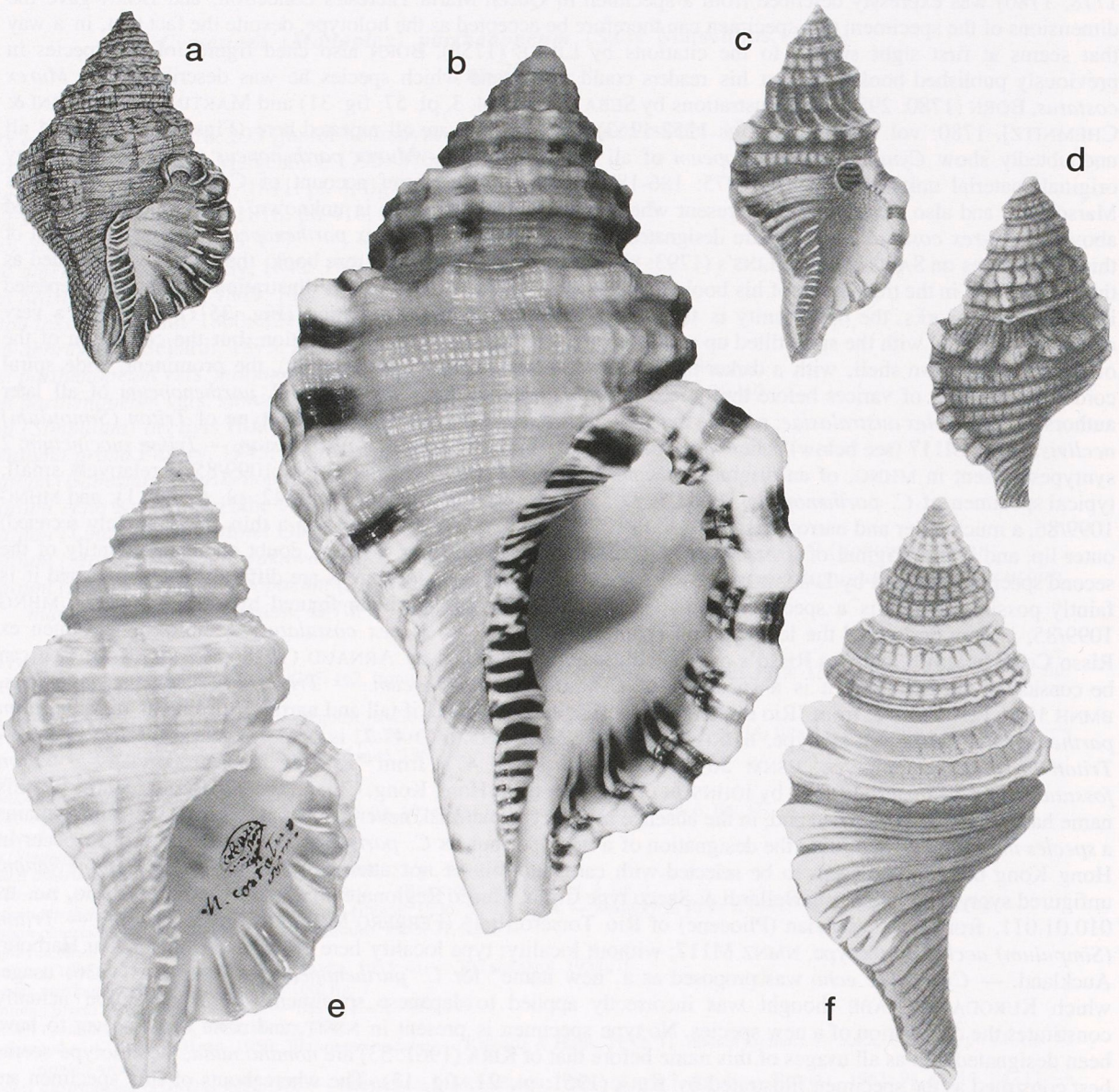

FIG. 35. — *Cymatium (Monoplex) parthenopeum* (Salis Marschlins). — **a**, **c-d**, copies of figures cited for *Murex costatus* by BORN (1780: 298). **a**, from SEBA (1758: pl 57, fig. 31), reduced and inverted. **c-d**, from MARTINI (1780: pl. 131, figs 1252-1253), reduced. — **b**, New Caledonian specimen, collected off Nouméa in 20-22 m by J.-P. Arnaud, x1.6 (photo supplied by C. Berthault). — **e**, holotype of *Murex costatus* Born, 1778, neotype of *Murex parthenopeum* Salis Marschlins, 1793, and neotype of *Monoplex australasiae* Perry, 1811, in Naturhistorisches Museum Wien, not registered, but labelled "*Murex costatus* Born, Type" inside outer lip, x0.87 (photo supplied by K. Edlinger). — **f**, figure of *Murex parthenopeus* by SALIS MARSCHLINS (1793: pl. 7, fig. 4), copied from English translation (SALIS MARSCHLINS, 1795: frontispiece, fig. 4), reduced and inverted.

(1970) are of no taxonomic significance, so it is of little consequence that I do not know the whereabouts of their type material.

NEW CALEDONIA RECORDS. — A single empty shell, collected by SCUBA at 20-22 m, between Crouy Reef, Ilot Goeland, Ilot Maitre Islet and Seche Croissant Reef, a short distance off Nouméa, by J. P. Arnaud; in Arnaud Colln, photographs sent by C. Berthault (Fig. 35 b).

DIMENSIONS. — New Caledonian specimen: H 82.2, D 48.0. - Mill Bay, Manukau Harbour, Auckland, *ex* J. R. Penniket Colln, large New Zealand specimen, NZGS RM5527: H 131.6, D 76.0. - Specimen from Gabon figured by BERNARD (1984: pl. 22, fig. 97): H 192 mm. - *Murex costatus* Born (holotype) and *Murex parthenopeus* (neotype): H 106.5, D 59.3.

DISTRIBUTION. — *Cymatium parthenopeum* is one of the most widely distributed of all benthic molluscs, occurring throughout the Mediterranean Sea (Bay of Naples, type locality), throughout the eastern and western Atlantic and the central Atlantic islands, from North Carolina to southern Brazil in the western Atlantic; from Spain south to Angola in the eastern Atlantic; in South Africa, from False Bay, Capetown, to Mozambique (KILBURN & RIPPEY, 1982) and possibly throughout East Africa; the northern Indian Ocean and Gulf of Arabia (BOSCH *et al.*, 1995); around the southwestern, southern and eastern coasts of Australia, including Tasmania, as far north as Lancelin in Western Australia (WILSON, 1993) and as far north as Moreton Bay, Queensland, and, rarely, to Cape Flattery in North Queensland (BEU, 1970b); in New Zealand, common on sand flats in northern harbours and occurring uncommonly as far south as Fiordland, southwestern South Island (material in NMNZ); at the Kermadec, Lord Howe and Norfolk Islands; rarely in New Caledonia; rarely in Hawaii (*e.g.*, 2 specimens in NZGS, *ex* Penniket Colln); common in Japan, from Kyushu to Boso Peninsula, Honshu, and uncommonly as far south as Taiwan (LAI, 1989: fig. 33). Although REEVE (1844a: pl. 10, fig. 32) stated that his figured specimen was from "Tahiti", this is definitely another mislocalisation by Hugh Cuming, and the present specimen from New Caledonia is the first authenticated record from the truly tropical western Pacific, living alongside its closely similar congener *C. pileare*; this is another "Pacific fringe" species (with *Charonia lampas* and *Cymatium exaratum*), presumably unable to compete with *C. pileare* in the central Pacific, except for the occasional successful individual.

REMARKS. — At a very late stage of preparation of this paper (June 1997), Claude Berthault (Nouméa) sent photographs of a moderate-sized, excellent specimen of *Cymatium parthenopeum* collected near Nouméa by Jean-Pierre Arnaud, the first specimen I am aware of collected in New Caledonia. *Cymatium parthenopeum* is easily recognised by its moderately large shell (to *ca* 190 mm high, and commonly 100-130 mm high), its relatively wide shape, the presence of only one or two varices before the terminal one on most specimens, although a few specimens from throughout the range have prominent varices down the entire shell, and the prominent, narrow, white ridges on a dark brown to black ground inside both the inner and outer apertural lips. Most specimens have 5 wide, very prominent spiral cords and many have a weak sixth around the last whorl, entering onto the terminal varix, and about 10-20 low, narrow, widely spaced axial ridges on early spire whorls weaken down the shell to form low nodules on the spiral cords on the last whorl. Living specimens have an extremely prominent, dark brown, thick, alga-like periostracum with many long, thin, fringed axial blades on the crests of the axial ridges, and the animal's head-foot is densely patterned with blue-green ringed spots as in *C. pileare*. Living specimens creeping in an aquarium can therefore be distinguished from *C. pileare* only by the wider shell of *C. parthenopeum* (observed together alive at Dunwich, Stradbroke Island, Moreton Bay, Queensland).

Previously (BEU, 1970b) I regarded *C. parthenopeum* as consisting of three geographic subspecies, the nominotypical one inhabiting much of the species's range, *C. parthenopeum echo* Kuroda & Habe *in* Kira, 1961 in Japan, and *C. parthenopeum keenae* Beu, 1970 in tropical western America to the Galapagos Islands. Since then, I have seen much more material of all forms from throughout the range, a small amount of material has come to light from Hawaii, and a large amount of material has come to light from a previously unreported locality, in the Gulf of Arabia and the northern Indian Ocean (BOSCH *et al.*, 1995; NZGS WM 13282, 15 specimens). The Arabian material is intermediate in some characters between Japanese and Australian-New Zealand material, having the wide, pale brown band inside the outer lip on many specimens that is also seen on many Japanese shells, but a weak sixth spiral cord on the last whorl of most specimens, as in most Australian-New Zealand specimens. As with *Charonia lampas* and *Cymatium exaratum*, described above, it is now concluded that a single variable species inhabits almost all the range of this species complex, and a separate species, *C. keenae*, occupies the tropical

eastern Pacific and Galapagos Islands. *C. keenae* differs from *C. parthenopeum* in having six equally prominent, wide cords on the last whorl (rather than 5, with or without a weak sixth, in *C. parthenopeum*), in having seven rather than six pairs or clusters of white ridges inside the outer lip, and in having much more numerous axial costae (*ca* 30-40 per whorl, rather than the 10-20 of *C. parthenopeum*) and, consquently, a much more densely fringed periostracum. Most specimens of *C. keenae* also have a taller spire than *C. parthenopeum*. The New Caledonian specimen (Fig. 34 b) is unusual in having three prominent, wide spiral cords and three narrower, equally low spiral cords on the last whorl; in having six cords it resembles *C. keenae*, but the cords are not differentiated into the two distinct size groups in *C. keenae* as they are in this specimen, and the New Caledonian specimen has the fewer, more widely spaced axial ridges of *C. parthenopeum*.

Cymatium (Monoplex) pileare (Linné, 1758)

Figs 33 d-e, 34 c

Murex pileare Linné, 1758: 749.
Triton haemastoma Valenciennes, 1832: 304.
Tritonium (Simpulum) beccarii Tapparone-Canefri, 1875a: 587, pl. 19, fig. 7.
Eutritonium gembacanum Martin; 1884: 129, pl. 7, fig. 131.
Cymatium vestitum insulare Pilsby, 1921: 320.
Saginafusus pricei perficus Iredale, 1931: 227, pl. 23, fig. 1.
Cymatium andoi Nomura, 1935: 167, pl. 8, fig. 21.
Cymatium (Monoplex) pileare orientalis Garcia-Talavera, 1987: 245, fig. 2.

Murex pileare - Linné, 1767: 1217. — Gmelin, 1791: 3534.
Triton pileare - Lamarck, 1816: pl. 415, figs 4 a-b; "Liste des objets", p. 4; 1822: 1822. — Quoy & Gaimard, 1833: 539; Atlas, pl. 40, fig. 13. — Kiener, 1842: 15, pl. 7, fig. 1. — Kobelt, 1876c: pl. 9, fig. 4.
Triton pilearis - Reeve, 1844a: pl. 7, fig. 23. — Smith, 1891: 413.
Triton (Simpulum) pilearis - Kobelt, 1878a: 245. — Tryon, 1880: 12, pl. 6, figs 31, 33, 36 (in part not of Linné, 1758).
Tritonium pileare - Tapparone-Canefri, 1881: 24 (in part).
Cymatium pileare - Hirase, 1936: 66, pl. 95, fig. 5. — Weaver, 1966: 104, pl. 26, upper right 2 figs — Hinton, 1972: 12, pl. 6, fig. 4; 1978: 29, fig. 1. — Drivas & Jay, 1988: 64, pl. 17, fig. 8. — Salvat *et al.*, 1988: 100, pl. 12, fig. 8.
Cymatium (Lampusia) pileare - Beets, 1941: 90 (with many other references); 1986: 26.
Cymatium (Septa) pileare - Clench & Turner, 1957: 216, pl. 122, fig. 1 (in part). — Kira, 1961: 54, pl. 21, fig. 14. — Kay, 1979: 221, figs 76 D, 77 A (as *C. aquatile*) and 77 B. — Springsteen & Leobrera, 1986: 112, pl. 30, fig. 14.
Septa pilearis - Kira, 1962: 56, pl. 22, fig. 14.
Lampusia pileare - Wilson & Gillett, 1971: 78, pl. 53, figs 12-12a. — Short & Porter, 1987: 46, pl. 22, fig. 2.
Cymatium (Monoplex) pileare - Beu, 1985: 58. — Beu & Kay, 1988: 203, figs 3, 17-20, 42-48. — Lai, 1989: 123, fig. 35. — Singer, 1990: 20, 27, fig. 6. — Henning & Hemmen, 1993: 67, pl. 14, fig. 1. — Wilson, 1993: 246, pl. 41, fig. 4. — Bosch *et al.*, 1995: 99, fig. 356.
Septa pileare - Okutani, 1986: 114-115, 2nd fig. left column.
Tritonium (Simpulum) beccarii - Kobelt, 1876a: 46. — Mienis, 1990b: 10, fig.
Cymatium beccarii - Singer, 1990: 21, fig. 6 a.
Tritonium olearium - Röding, 1798: 126.

Type data. — Type specimens and localities of the several synonyms were listed by Beu & Kay (1988). As the syntype in Linné's collection in London is a specimen of the Mediterranean species now universally known as *Cymatium corrugatum* (Lamarck, 1816), Beu & Kay (1988) designated as the lectotype of *Murex pileare* the specimen illustrated in the single figure cited by Linné (1758: 749), which is Gualtieri (1742: pl. 49, fig. G). Fortunately, as noted in the introduction, Gualtieri' s collection is still present in the Museo di Storia Naturale e del Territorio, Università di Pisa, Certosa di Calci, Pisa, and the Curator of Zoology, Dr Marco Zuffi, has kindly supplied photographs (Figs 33 d-e) of the lectotype. Although, unlike most other specimens illustrated by Gualtieri, the lectotype is not numbered inside the aperture, it is the only specimen of *C. pileare* in the collection, so there is no doubt that it is the specimen illustrated by Gualtieri. The type locality is here designated as Ambon Island (Amboina), Indonesia. The present review has made it clear that *Cymatium pileare* var. *borneana* Cox (1948: 39) was wrongly included in this synonymy; the holotype is a specimen of *C. comptum*. — *Cymatium pileare orientalis*: holotype in Natural Science Museum of Tenerife, Canary Islands, No. TF.MCM.T24 (Garcia-Talavera, 1987: 249); illustrated in colour by Garcia-Talavera (1987: fig. 2, left fig). — Since the report by Beu & Kay (1988), in which we were unsure of the status of *Tritonium beccarii*, the holotype has been refigured by Mienis (1990b) and by Singer (1990: 21, fig. 6 a); it is a small, narrow specimen of *C. pileare*, from Massawa, Ethiopia; in Museo Civico di Storia Naturale "Giacomo Doria", in Genoa.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 131, 517, 564, 565, 814, 843, 852, 937, 1002, 1129. — EXPÉDITION MONTROUZIER: sta. 1242, 1303 (Fig. 34 c), 1311, 1319.
These 12 lots were taken in the intertidal zone to 60 m and, like *C. muricinum* and *C. nicobaricum*, this shallow-water species is probably under-represented. Again, intertidal specimens from New Caledonia are found in many museums.

DISTRIBUTION. — *Cymatium pileare* occurs throughout the Indo-West Pacific province, from Durban, South Africa, along the coast of East Africa to the Gulf of Arabia and throughout the Red Sea, southwards as far as Rottnest Island in Western Australia (WILSON & GILLETT, 1971: 78) and as far as Sydney Harbour in eastern Australia, northwards to southern Honshu, Japan (KIRA, 1962: 56), and throughout Melanesia and Polynesia, to Hawaii (BEU & KAY, 1988).

DIMENSIONS. — New Caledonia, LAGON: sta. 131: H 70.0, D 33.4; sta. 1002: H 79.1, D 34.0.

REMARKS. — BEU & KAY (1988) revised *Cymatium pileare* and the similar species *C. aquatile*, *C. intermedium*, *C. martinianum* (d'Orbigny, 1842), and *C. macrodon* (Valenciennes, 1832), and outlined their distributions and type specimens. *C. pileare* is the large, elongate species with a red aperture, dark brown inner lip bearing pale transverse ridges, and long, narrow ridges inside the outer lip, extending well into the aperture. Almost simultaneously, GARCIA-TALAVERA (1987: 245) attempted to restrict the application of the name *Murex pileare* to the Atlantic species *C. martinianum*, and provided the new name *C. pileare orientalis* for the Pacific species. This action cannot stand, as the lectotype of *Murex pileare*, designated by BEU & KAY (1988: 205), and discussed above, is clearly the Pacific species. Distinctions between *C. pileare* and *C. aquatile* in the colour of the head-foot exterior of the living animal are desribed above, under *C. aquatile.*

Subgenus *RANULARIA* Schumacher, 1817

Ranularia Schumacher, 1817: 253 (misspelled *Ranula* on p. 77). Type species (SD by GRAY, 1847: 133): "*Murex clavator* Chemnitz, 1795" (non-binominal) [= *Ranularia longirostra* Schumacher, 1817; *M. clavator* Chemnitz cited in its synonymy (= *Tudicla gutturnium* Röding, 1798)], Miocene to Recent, western Pacific.

Tritonocauda Dall, 1904: 133. Type species (OD): *Murex caudatus* Gmelin, 1791, Recent, Indo-West Pacific.

Retusum Jousseaume, 1892: 344. Type species (by monotypy): *Triton retusum* Lamarck, 1822 [= *Monoplex oboesus* Perry, 1811], Recent, northern Indian Ocean.

REMARKS. — BEU (1987: 291-307) revised the taxonomy of eight Indo-West Pacific *C. (Ranularia)* species, several of which occur in New Caledonia. BEU & CERNOHORSKY (1986: 258) revised the nomenclature of the Atlantic and eastern Indian Ocean species *C. (Ranularia) cynocephalum*. The opportunity is provided here to revise most other Indo-West Pacific species.

Cymatium (Ranularia) is a distinctive and undoubtedly monophyletic subgenus in which the teleoconch has a moderately short to very short spire and a very long anterior siphonal canal, and the operculum has its nucleus near the centre of the columellar edge. Most species are uncommonly found as shallowly as the intertidal zone, or even in easy diving depths; most records are from dredgings on the mid to outer shelf on soft substrates. Consequently, this group was sampled more successfully around New Caledonia than were the common intertidal species of *C. (Gutturnium)* and *C. (Monoplex)*, considering the fact that specimens of all *C. (Ranularia)* species are much scarcer in museum collections than those of other *Cymatium* subgenera.

Cymatium (Ranularia) armatum (G. B. Sowerby III, 1897)

Figs 36 a-b

Lotorium armatum G.B.Sowerby III, 1897: 137, pl. 11, fig. 1.

Cymatium (Ranularia) armatum - CERNOHORSKY, 1975: 213, figs 1-4; 1978c: 61, pl. 17, fig. 1. — ARTHUR, 1983b: 5. — BEU, 1985: 59. — PARTH, 1988: 20. — HENNING & HEMMEN, 1993: 74, pl. 17, fig. 2.

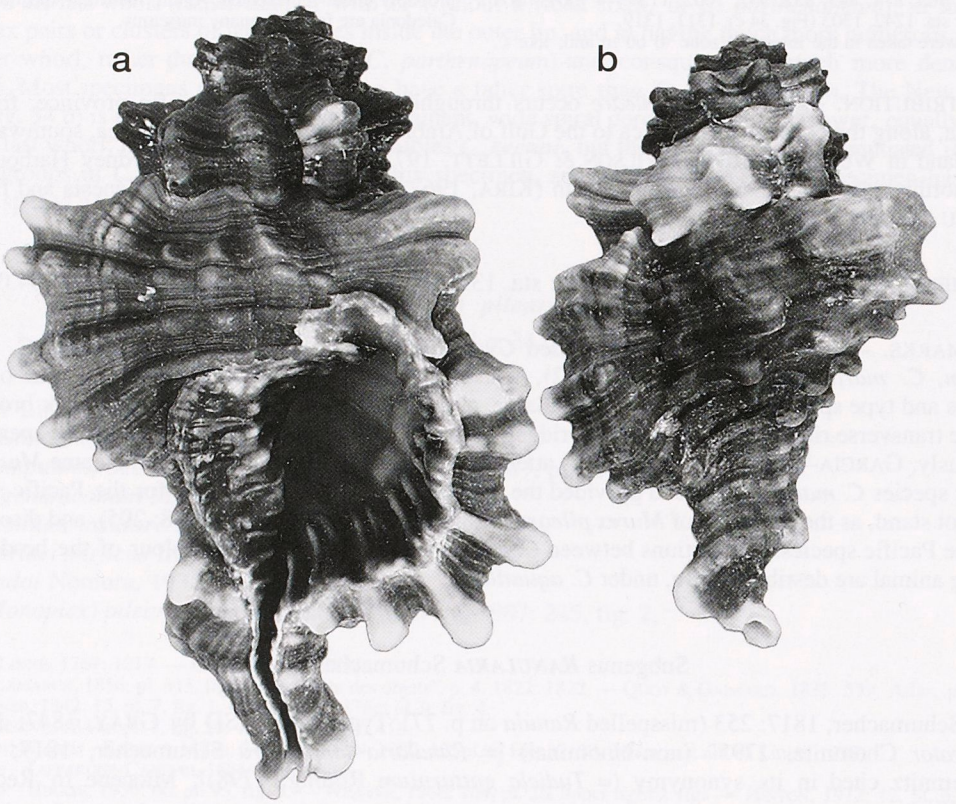

Fig. 36. — *Cymatium (Ranularia) armatum* (G.B.Sowerby III), collected at 2 m on rocky slope, west coast of Ile Ngéa, east of Nouméa, New Caledonia, by H. Burban, 1996 (photos supplied by H. Burban). a. x1.3; b. x1.

TYPE DATA. — Holotype BMNH 1897.4.30.2, from "Marquesas Islands ?", *ex* Thomas Colln. SOWERBY (1897: 137) noted that Mr Thomas did not record localities for his specimens, "although he found a considerable proportion of them himself, particularly at Tahiti and among the Marquesas Islands ... The *Lotorium* is probably from the same source". The locality is therefore speculation on SOWERBY's part, and the localities of the few specimens collected subsequently (North Queensland, New Caledonia, Vanuatu) indicate that SOWERBY was almost certainly wrong.

NEW CALEDONIA RECORDS. — One specimen (Figs 36 a-b) found in a small bay on the west coast of Ile Ngéa, a short distance due east of Nouméa, on a rocky slope, at 2 m depth, with a specimen of *C. pyrum*; colour photographs sent by Claude Berthault (ORSTOM, Nouméa) and black-and-white photographs sent by H. Burban, Nouméa, of a specimen collected by H. Burban and now in his collection. — Near Balade, NE coast of New Caledonia, one specimen (H 80.6 mm), at 2 m depth, private collection in Nouméa (Berthault, com. pers.).

OTHER RECORDS. — The other seven specimens I am aware of of this rare species are listed here.
Vanuatu. Pango Point, Efate, after a storm, coll. H. Dale, 2 specimens (CERNOHORSKY, 1975: 213). — Another Vanuatu specimen, recorded and illustrated by PARTH (1988).
Eastern Australia. A small specimen from Port Douglas, North Queensland, Whitehead Colln (ARTHUR, 1983b). — A specimen collected alive at night at *ca*12 m, in the vicinity of Slashers Reef, off Townsville, Queensland (anonymous article and excellent colour photo in "Townsville Shellclub Newsletter", supplement to the Aug.-Sept. 1985 issue). — A specimen collected at 10 m on top of a coral reef at Faraday Reef, North Queensand, by T.C. Good (LOCH, 1987, short note in "Townsville Shellclub Newsletter", no.13, April-May 1987, p.16).
Unlocalised. A small specimen in ANSP, *ex* Hal Lewis Colln.
A total of ten specimens is therefore known to me.

DISTRIBUTION. — Assuming that the reported type locality for *Cymatium armatum* is incorrect, the localities listed above indicate a restricted range, from North Queensland, Australia, to Vanuatu, including New Caledonia.

DIMENSIONS. — Holotype: H 67.5, D 41.4 (CERNOHORSKY, 1975: 214). - Pango Pt, Efate: H 57.4, D 40.4 (CERNOHORSKY, 1975: 214). - Unlocalised, ANSP: H 47.8 D 36.2. - New Caledonia, Nouméa: H 82.8, D 49.0.

REMARKS. — *Cymatium armatum* is well known because it is the rarest of the large, spectacular Ranellidae, and it is a lucky coincidence that a large, attractive specimen from New Caledonia came to light just in time to be included in this paper. *C. armatum* has a brownish orange to yellowish orange background colour, with paler spiral cords and pale, cream to almost white nodules on the varices on the last whorl, and so is closest in general appearance to *C. pyrum*. It differs from *C. pyrum* in its slightly taller spire and its markedly shorter and more strongly twisted anterior siphonal canal and, in particular, in its very much more prominent spiral cords and axial folds, raised into very large nodules at their intersections, particularly on the dorsum of the last whorl. The prominent spiral cords form very large nodules over the varices, the uppermost two more closely spaced than the lowest three. The aperture is markedly smaller than in *C. pyrum*, but is similar in appearance to that of *C. pyrum*, being brownish orange to medium red-brown, with numerous coarse transverse ridges on both lips. The transverse ridges are low and no paler than the background in small specimens, but very prominent and contrastingly paler in large specimens. The protoconch and operculum have not been described, but there can be little doubt that *C. armatum* is correctly placed in *C. (Ranularia)*.

Cymatium (Ranularia) caudatum (Gmelin, 1791)

Figs 37 a-d, 40 f

Murex caudatus Gmelin, 1791: 3535.
Tritonium varicosum Link, 1807: 122.
Triton canaliferus Lamarck, 1822: 184.
Tritonocauda caudata vulticula Iredale, 1936: 308, pl. 23, fig. 1.

Tritonium caudatum - GRAY, 1839: 111. — ANGAS, 1877: 179. — HEDLEY, 1901: 16.
Triton (Gutturnium) caudatus - KOBELT, 1878a: 362. — TRYON, 1880: 21, pl. 12. fig. 92.
Cymatium (Tritonocauda) caudatum - DALL, 1904: 133.
Cymatium caudatum - IREDALE, 1910: 71. — OLIVER, 1915: 527. — HEDLEY, 1918b: M66. — YEN, 1942: 215. — HABE & KOSUGE 1966a: 43, pl. 15, fig. 13. — HINTON, 1972: 12, pl. 6, fig. 9; 1978: 29, fig. 8. — SHORT & POTTER, 1987: 48, pl. 23, fig. 10.
Tritonocauda caudata - RIPPINGALE & MCMICHAEL, 1961: 67, pl. 7, fig. 7.
Cymatium (Ranularia) caudatum - BEU, 1985: 59. — SPRINGSTEEN & LEOBRERA, 1986: 110, pl. 30, fig. 6. — LAI, 1989: 121, fig. 25. — HENNING & HEMMEN, 1993: 75, pl. 15, fig. 6. — WILSON, 1993: 246, pl. 42, figs 6, 12.
Ranularia caudatum - OKUTANI, 1986: 114; 115, 5th fig. top row.
Triton canaliferus - KIENER, 1842: 5, pl. 13, fig. 2. — REEVE, 1844a: pl. 3, fig. 8.
Cymatium canaliferum - HEDLEY, 1916b: 195.

TYPE DATA. — GMELIN (1791: 3535) referred to a figure by MARTINI (1777: vol. 3, pl. 112, fig. 1045; copied in RICHARDSON *et al.*, 1979: 129, pl. 112, fig. 1045) which clearly shows *C. caudatum* of subsequent authors. — *Triton canaliferus*: 2 syntypes, MHNG 1100/1; both are typical *C. caudatum* of subsequent authors, with a deeply channelled suture. The specimen figured by KIENER (1842, pl. 13, fig. 2), MHNG 1100/1/1, is here designated the lectotype of *Triton canaliferus*, the neotype of *Murex caudatus*, and the neotype of *Tritonium varicosum*. The type locality is here designated as the Philippine Islands. — *Tritonocauda caudata vulticula*: holotype AMS C60660, from *"Triton"* dredgings, Sydney Harbour, New South Wales. This specimen does not differ in any significant characters from other specimens from throughout the western Pacific.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 429 (Figs 37 a-d), 656, 695, 749, 833. The five samples almost all consist of juvenile specimens; the depth range is 30 to 95 m.

DISTRIBUTION. — Apparently restricted to the main western Pacific archipelagoes, between southern Japan and Sydney, New South Wales, and apparently only as far east as New Caledonia. Most material in museums is from Taiwan, the Philippines, or Queensland, Australia, but I have also seen material from Singapore and Thailand.

DIMENSIONS. — Off Keppell Bay, Queensland, largest seen, NZGS WM13614 (Fig. 40 f): H 70.3, D 32.6. - New Caledonia, largest, LAGON: sta. 833: H 27.4, D 14.0.

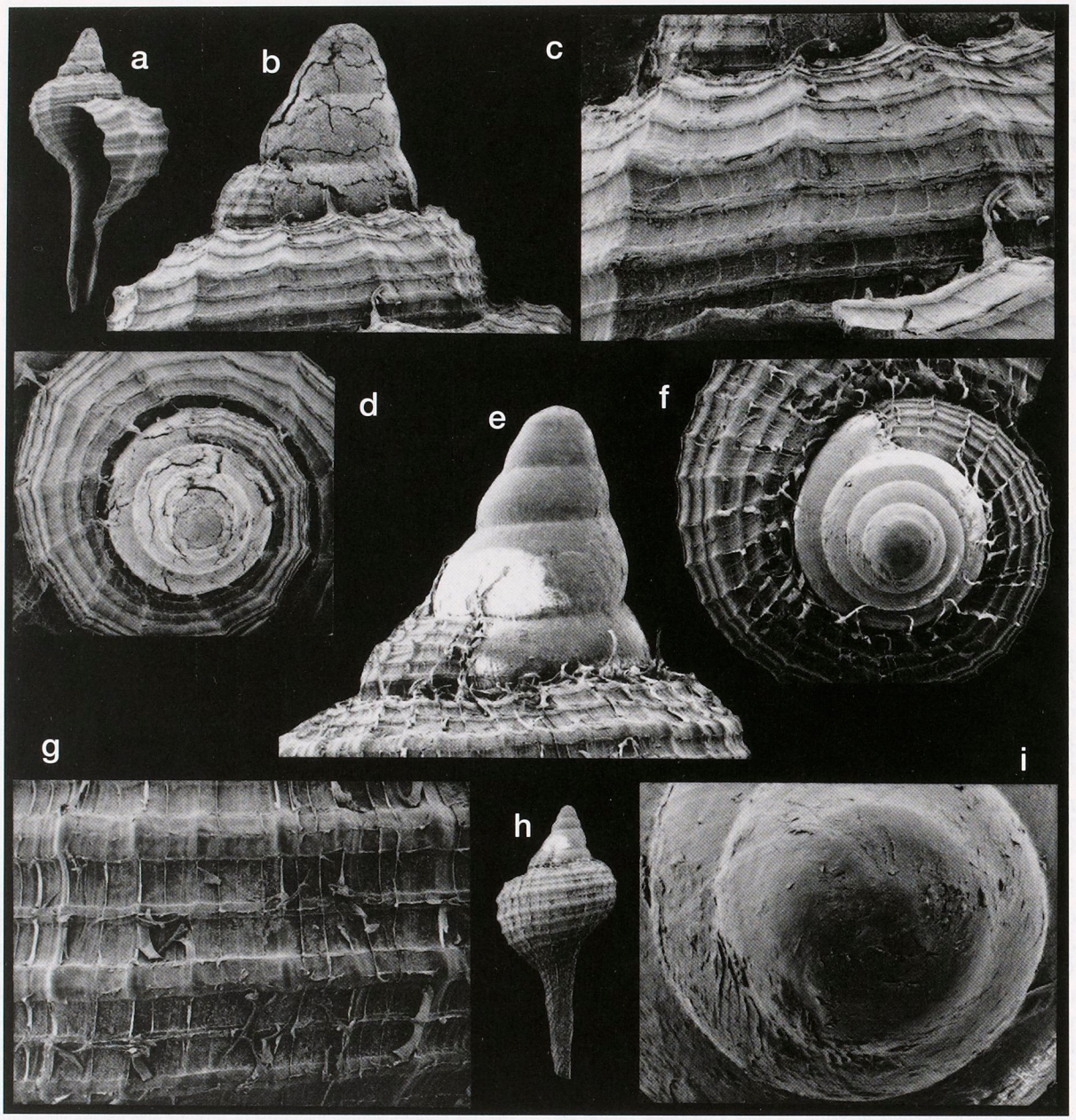

FIG. 37. — *Cymatium caudatum* and *C. gutturnium*. — **a-d**, *Cymatium (Ranularia) caudatum* (Gmelin), LAGON: sta. 429, Grand Récif Sud, New Caledonia, 95 m; a. x3.9; b. x16; c. x33; d. x14. — **e-i**, *Cymatium (Ranularia) gutturnium* (Röding), LAGON: sta. 771, Secteur de Poindimié, New Caledonia, 34 m; e. x20; f. x17; g. x29; h. x4.2; i. x68 (note low varix at end of protoconch I, visible through periostracum).

REMARKS. — *Cymatium (Ranularia) caudatum* is the name selected above, under *C. cutaceum*, as the senior homonym to have priority over *Buccinum caudatum* Gmelin 1791, which is the earliest name for *C. (Linatella) cutaceum* (Lamarck).

Cymatium caudatum is very distinctive because of its deeply channelled suture, a unique character in the subgenus *C. (Ranularia)*, and because of its very short spire, very long, narrow anterior siphonal canal, and pale fawn to completely colourless teleoconch. Specimens collected alive have a thick medium brown periostracum, with rows of long bristles on the varices. The protoconch is very small for the subgenus, tall and narrow, of about 4.5 whorls, with a smooth, even, dark brown periostracum (which makes whorl numbers difficult to count accurately).

Cymatium (Ranularia) dunkeri (Lischke, 1868)

Figs 33 b, 34 f, h, 38 a-g, 39 a-g

Triton dunkeri Lischke, 1868: 219.
Ranularia dunkeri iredalei Beu, 1968b: 25, figs 4-10.

Triton dunkeri - LISCHKE, 1869: 49, pl. 3, figs 1-2.
Ranularia dunkeri - HABE, 1961: 45, pl. 22, fig. 16; 1964: 71, pl. 22, fig. 16. — KURODA, HABE & OYAMA, 1971: 127, pl. 29, fig. 3. — HIGO & GOTO, 1993: 159.
Cymatium (Ranularia) dunkeri iredalei - BEU, 1985: 59. — HENNING & HEMMEN, 1993: 151.
Cymatium dunkeri - IREDALE, 1910: 71. — OLIVER, 1915: 527.
Cymatium pyrum - IREDALE, 1929a: 345.
Cymatium rubeculum (*sic*) - SALVAT *et al.*, 1988: 102, pl. 13, fig. 3.

TYPE DATA. — *Triton dunkeri* Lischke: holotype (Fig. 33 b) in Löbbecke Museum und Aquazoo, Düsseldorf, from Nagasaki, Japan. — *Ranularia dunkeri iredalei* Beu: holotype and 1 paratype AMS C38219, 2 paratypes NMNZ M202778, 4 paratypes NMNZ M211420, all from beach, Raoul Island, Kermadec Islands.

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. D2, CP14 (Figs 39 c-d), D37, D45 (Figs 38 b, d-g), D51, D52, D53, D55, "no further data". — CORAIL 2: sta. DW2, DW8, DW10, DW18, DW19, DW31, DW32, DW77, DW79, DW91, DW110, DW125, DW135, DW136 (Figs 39 e-f), DW138, DW139, DW156, DW157.
New Caledonia. LAGON: sta. 29, 146, 271, 296, 377, 405, 445, 495, 542, 545, 552 (Figs 34 f; 38 a), 598, 696, 716, 737, 1105. — EXPÉDITION MONTROUZIER: sta. 1312, 1321. — Lagon SW de Nouméa, Banc Gail, 27 m. — Grand Récif, Nouméa, 5 m, under a coral slab on white sand, coll. Berthault (1 lv).
North of New Caledonia. MUSORSTOM 4: sta. DW185.
Norfolk Ridge. SMIB 2: sta. DW6. — SMIB 5: sta. DW100. — SMIB 8: sta. DW158 (Figs 34 h, 39 g).
Depth range of live-taken specimens 5-90 m, fresh shells in 5-262 m.

OTHER MATERIAL EXAMINED. — **Australia.** Northwest Isle, north of Cooktown, Queensland, coll. T. Iredale, Great Barrier Reef Boring Exped., May 1929 (1 AMS). — Sydney Harbour *"Triton"* dredgings, Capts. Comtesse and Nash (6 AMS C71600). — Southern Queensland, trawled off Cape Moreton, in Colln Whitehead (1; Fig. 38 c). — Japanese material is not listed.

DIMENSIONS. — New Caledonia: LAGON: sta. 29: H 70.1, D 42.1. - Norfolk Ridge, SMIB 2: sta. DW6: H 75.8, D 45.8. - SMIB 8: sta. DW158: H 73.8, D 43.7. - Coral Sea, Chesterfield-Bellona Plateau, CHALCAL1: sta. CP14: H 86.4, D 48.0. - CORAIL 2: sta. DW135: H 66.4, D 35.9; sta. DW2: H 68.3, D 35.8.

DISTRIBUTION. — *Cymatium dunkeri* has a strange distribution, occurring in southern Japan to Taiwan (HABE, 1964; LAI, 1989) and in the southwest Pacific but apparently not in between. In the southwest Pacific, it occurs in eastern Australia (modern specimens seen from southern and northern Queensland; Sydney Harbour *"Triton"* dredgings are possibly Pleistocene fossils from beneath the harbour floor), the Kermadec Islands, throughout New Caledonia, and apparently is particularly common in the Coral Sea. It probably occurs also at Norfolk and Lord Howe islands.

REMARKS. — It is surprising to find that *C. dunkeri* is the most common *Cymatium (Ranularia)* species in both the New Caledonian (22 lots) and Coral Sea (28 lots) collections reported here. It is of particular interest, then, to note that several specimens of *C. dunkeri* in AMS from the Sydney Harbour *"Triton"* dredgings are evidently the basis of IREDALE's (1929a: 345) record of *C. pyrum* from this source. A few specimens have been seen, also, from Queensland in the intervening years. SALVAT *et al.* (1988: 102, pl. 13, fig. 3) illustrated a specimen of *C. dunkeri* from New Caledonia, but accidentally repeated the name of the following species (*C. rubeculum*) in the caption.

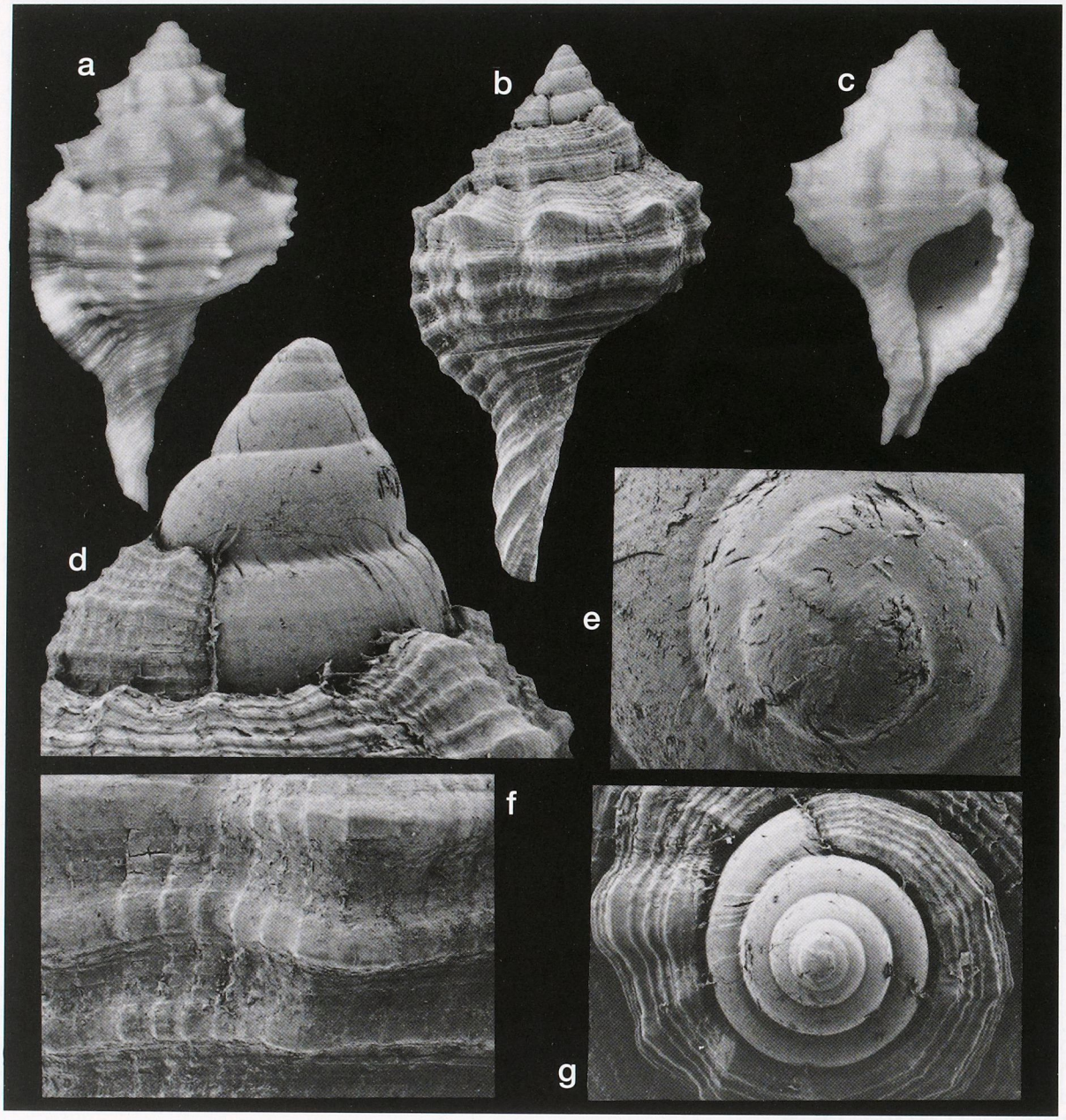

FIG. 38. — *Cymatium (Ranularia) dunkeri* (Lischke). — **a**, dorsum of specimen in Fig. 34 f, x1. — **b**, **d-g**, CHALCAL 1: sta. D45, Chesterfield Plateau, Coral Sea, 50 m; b. x4; d, f. x18; e. x100 (note low varix at end of protoconch I); g. x13. — **c**, trawled off Cape Moreton, southern Queensland, Australia, Thora Whitehead Colln, x1.

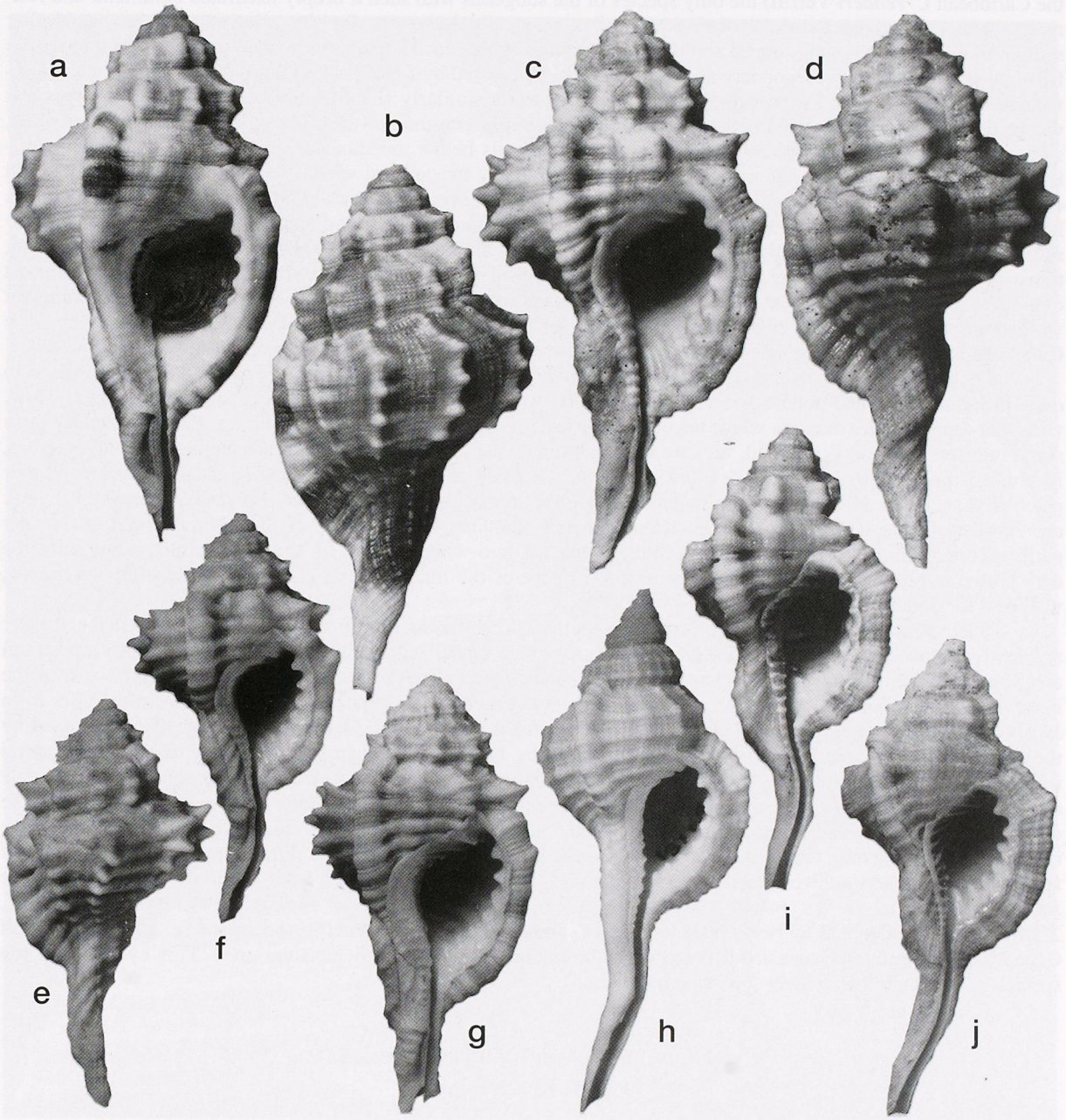

FIG. 39. — *Cymatium (Ranularia)* species. — **a-g**, *Cymatium (Ranularia) dunkeri* (Lischke). **a-b**, NZGS WM10129, off Kii Peninsula, Honshu, Japan, x1. **c-d**, CHALCAL 1: sta. CP14, Chesterfield-Bellona Plateau, Coral Sea, 66 m, x1. **e-f**, CORAIL 2: sta. DW136, Chesterfield Plateau, Coral Sea, 37 m, x1. **g**, venter of specimen in Fig. 34 h, x1. — **h**, *Cymatium (Ranularia) sinense* (Reeve), typical adult, NZGS WM13168, Samar, Philippines, x1.5. — **i-j**, *Cymatium (Ranularia) testudinarium* (A. Adams & Reeve), the 2 New Caledonian specimens. **i**, *"Vauban"* 1978-79: sta. 9, South New Caledonia, 175-200 m, x1. **j**, specimen in Fig. 34 j, x1.

The two species *Cymatium dunkeri* and *C. pyrum* are closely similar in many characters, being (along with the Caribbean *C. rehderi* Verrill) the only species of the subgenus with such a deeply excavated columella and relatively straight outer lip, as well as being of similar, unusually large size for the subgenus and having similar sculpture of wide, low, round-topped spiral cords, with interspaces each slightly wider than one cord, the interspaces filled by several wide, low, secondary and tertiary cords, all crossed by 5 to 6 large axial folds per intervariceal interval and many low, obscure axial ridges. All three also have a similarly shaped inner lip, flared over the previous whorl, particularly in a mid-columellar lobe that reaches to the penultimate varix. They also all have relatively tall, stepped spires, with three spiral cords showing on spire whorls below the shoulder angle, and they all have similarly shaped, relatively thick anterior siphonal canals, similarly twisted and with a few, similar, prominent spiral cords around the neck. It appears, then, that these are three sister species. *C. pyrum* differs from the other two in its larger maximum size, its uniform brownish orange to reddish orange exterior and aperture, its much more strongly ridged aperture, with seven very prominent, long ridges inside the outer lip and many long, weakly anastomosing, transverse white ridges crossing the orange inner lip, and its very small, narrow protoconch. *C. rehderi* differs most obviously from the two similar Pacific species in the entire inner lip being dark brown, apart from prominent white transverse ridges. The protoconch of *C. dunkeri* (present on the many dredged juveniles in the New Caledonian and Coral Sea collections) is large but relatively short, widely conical, of four weakly inflated whorls.

Diagnostic characters of *C. dunkeri* are its consistent, narrow, relatively subdued axial folds, bearing low to quite prominent, pointed nodules where crossed by the spiral cords, its consistent axial sculpture of many low, wide, flat-topped ridges over the whole teleoconch surface, its 3-4 low, wide minor spiral cords in the upper three spiral interspaces, its low, rounded, very weakly sculptured varices, its 8 low short ridges inside the white outer lip, its almost smooth inner lip (with a few low ridges on the basal columellar angle) bearing a large, dark tan colour patch on the parietal area, and its strongly banded exterior colour pattern, with a dark brown band around the neck and two dark brown patches on each varix, and generally medium tan remainder of the surface apart from a paler peribasal band and pale crests on the axial folds, producing two white patches on the varices, alternating with the dark brown patches. The white callous lobe of the left edge of the inner lip extends over and, in some specimens, well past the penultimate varix.

Specimens of *Cymatium dunkeri* from the southwest Pacific differ from Japanese shells in their much paler and more subdued colour pattern. Most of the surface is pale tan to yellowish fawn, with two slightly darker tan areas on each varix; a few specimens have tan spiral bands between the main spiral cords. The parietal area of the inner lip is uniform reddish tan in a large, diffuse area. Most specimens from the southwest Pacific also differ from Japanese specimens in having much higher and narrower axial folds, bearing large sharp nodules where crossed by the spiral cords, particularly around the shoulder angle; by having fewer, narrower secondary cords in the spiral interspaces; by having much less obvious, low, very narrow axial ridges over the teleoconch surface, scarcely discernible on the last whorl of many specimens; by having slightly longer and more prominent nodules inside the outer lip; by having more marked ridges on the inner lip; and by the inner lip callus consistently being more restrained, extending only to the adapertural edge of the penultimate varix. These differences are so marked that at first I considered the southwest Pacific specimens to belong in a species distinct from *C. dunkeri*. However, some Japanese specimens (*e. g.*, BMNH 1909.11.2.27&28; "Japan; purchased of Messrs SOWERBY & FULTON", 2 specimens) are identical to New Caledonian ones, and a few southwest Pacific specimens (*e. g.* Fig. 38 c; off Cape Moreton, southern Queensland, Thora Withehead colln) are identical to Japanese ones. This evidently is one species, occurring in two widely separated populations.

Cymatium (Ranularia) exile (Reeve, 1844)

Figs 34 b, 40 a-e, g-h

Triton exilis Reeve, 1844a: pl. 4, fig. 11.

Triton exilis - REEVE, 1844c: 111.
Triton (Gutturnium) exilis - TRYON, 1880: 21, pl. 11, fig. 88.
Cymatium exile - KURODA & HABE, 1952: 51.
Cymatium (Ranularia) exile - SHIKAMA, 1963: pl. 46, fig. 8. — BEU, 1985: 59, fig. 18. — SPRINGSTEEN & LEOBRERA, 1986: 110, pl. 30, fig. 4. — BEU, 1987: 296, figs 81-85. — LAI, 1989: 112, fig. 22. — HENNING & HEMMEN, 1993: 78, pl. 16, fig. 5.
Ranularia exilis - HABE & KOSUGE, 1966a: 43, pl. 15, fig. 15.
Cymatium (Ranularia) exilis - KILIAS, 1973: 137, fig. 100.
Cymatium exilis - HINTON, 1978: pl. 29, figs 10-10a.
Triton clavator - J. SOWERBY & G.B. SOWERBY I, 1826: pl. 226, fig. 3. — REEVE, 1842: 198, pl. 243, fig. 3.

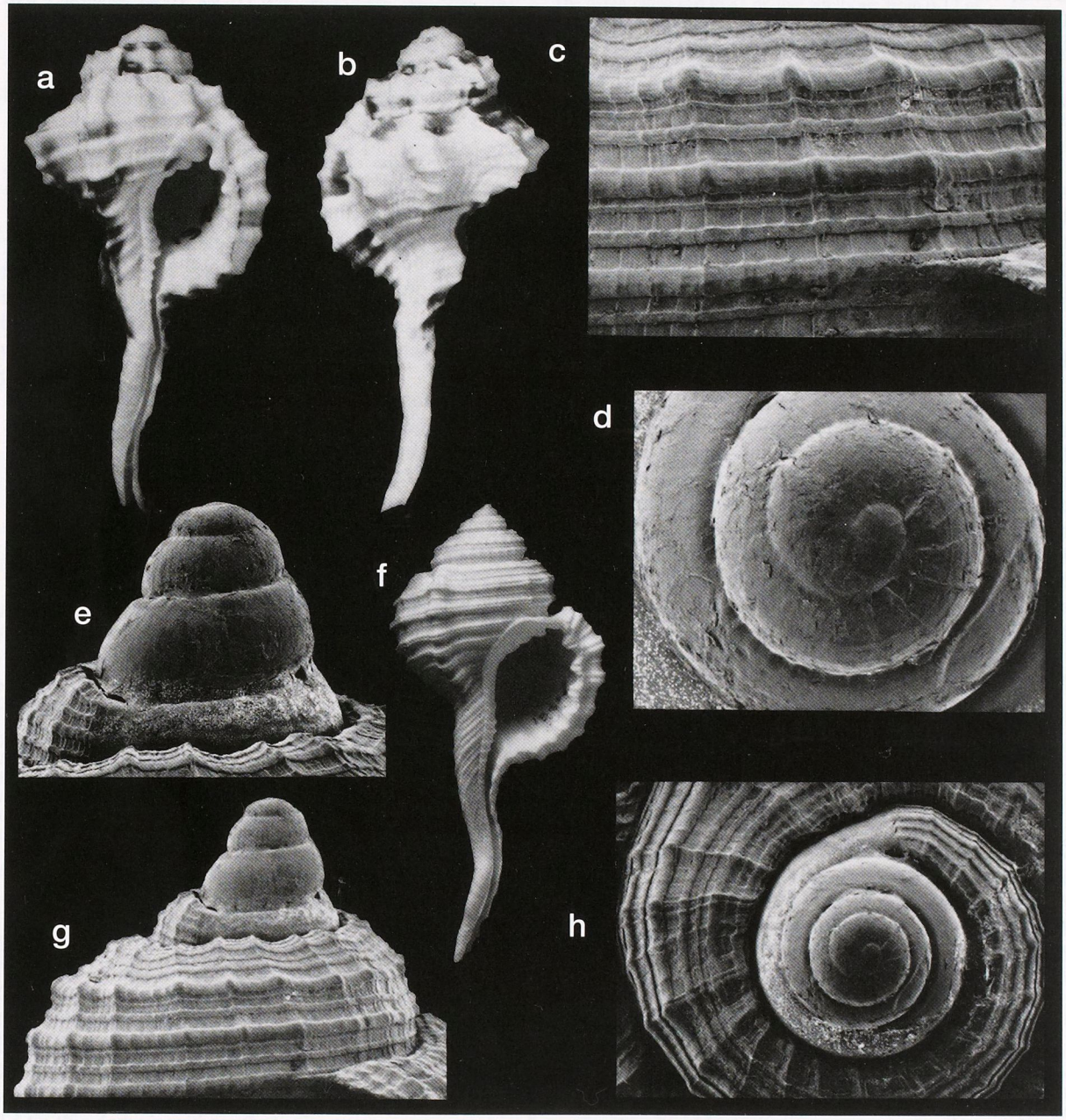

FIG. 40. — *Cymatium caudatum* and *C. exile*. — **a-e**, **g**, **h**, *Cymatium (Ranularia) exile* (Reeve). **a-b**, NZGS WM13497, Mactan I., Cebu, Philippines; typical large Philippines shell, x1.5. **c-e**, **g-h**, NZGS WM15089, Mactan I., Cebu, Philippines; c. x35; d. x70; e. x30; g. x17; h. x26. — **f**, *Cymatium (Ranularia) caudatum* (Gmelin), typical adult, NZGS WM13614, Keppell Bay, Queensland, Australia, x1.

TYPE DATA. — *Triton exilis*: 3 syntypes BMNH 1967595, from the "Philippine Islands", *ex* H. Cuming Colln, and 1 MCZ 188153, "Cebu, Philippines", *ex* H. Cuming Colln and C.B. Adams Colln. The largest in BMNH (1967595/1), H 61.5 mm, is REEVE's (1844a) figured specimen (identified by "c" inscribed inside the aperture) and is here designated the lectotype.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 1129, 40 m. — EXPÉDITION MONTROUZIER: sta. 1287, intertidal (Fig. 34 b). — South side of Ile Uéré, Nouméa, dived 9 m, on coral, algae and white sand, 1 specimen in R. Jeanpierre Colln (colour photo sent by C. Berthault, ORSTOM).

DISTRIBUTION. — BEU (1987: 298) pointed out that *Cymatium exile* seemed to occur in two widely separated populations, in the Philippine Islands and the Red Sea. The new record from New Caledonia and HINTON's (1978: pl. 29, figs 10-10 a) record from Papua New Guinea show that it probably occurs uncommonly throughout the western Pacific archipelagoes, from New Caledonia and northern Australia as least as far north as Taiwan (LAI, 1989: 112). Red Sea specimens are consistently only about two thirds the maximum size of western Pacific ones, but are otherwise indistinguishable. There are still no records from the Indian Ocean.

DIMENSIONS. — Lectotype, BMNH 1967595: H 61.5, D 28.5 (BEU, 1987: 298). - New Caledonia, EXPÉDITION MONTROUZIER: sta. 1287: H 52.3, D 23.2.

REMARKS. — BEU (1987: 296, figs 81-85) compared *Cymatium exile* with similar Indo-West Pacific species. *C. exile* is easily recognised by being the smallest of all *C. (Ranularia)* species, by its low spire and short last whorl, its long, narrow anterior siphonal canal, its low, thin, inner apertural lip bearing many coarse transverse ridges, the relatively few, large, sharp nodules around the periphery of most specimens, and its unusually bright colour pattern of large, bright red-brown colour splashes around the sutural ramp, around the base of the last whorl, and on the varices, on a cream to white background. The single adult specimen in the present collections (Fig. 34 b) was, surprisingly, collected alive in the intertidal zone, and retains its operculum and protoconch. As is normal for the subgenus, the oval operculum has its nucleus at the mid-point of the columellar margin. The protoconch is small, narrow, of 3.5 weakly inflated whorls, and closely comparable to that of specimens from the Red Sea and the Philippine Islands.

The small juvenile from LAGON: sta. 1129 was recognised by comparison with the fine EXPÉDITION MONTROUZIER specimen.

Cymatium (Ranularia) gutturnium (Röding, 1798)

Figs 34 g, 37 e-i

Tudicla gutturnium Röding, 1798: 145.
Tritonium macrourum Link, 1807: 122.
Monoplex formosus Perry, 1811: pl. 3, fig. 5.
Ranularia longirostra Schumacher, 1817: 253.
Ranularia labiata Schumacher, 1817: 253.
Murex clavator Dillwyn, 1817: 701.

Cymatium (Ranularia) gutturnium - SMITH, 1948: 5, pl. 3, fig. 7. — KILIAS, 1973: 138, fig. 101 (in part). — SPRINGSTEEN & LEOBRERA, 1986: 110, pl. 30, fig. 2. — BEU, 1987: 291, figs 64-68. — LAI, 1989: 121, figs 23-24. — HENNING & HEMMEN, 1993: 72, pl. 15, fig. 1. — WILSON, 1993: 247, pl. 42, figs 9 a-b.
NOT *Cymatium (Ranularia) gutturnium* - LADD, 1982: 41, pl. 7, figs 9-10 [= *C. muricinum*].
Cymatium gutturnium - KURODA & HABE, 1952: 51. — HINTON, 1972: 12, pl. 6, fig. 8; 1978: 29, fig. 9. — SALVAT *et al.*, 1988: 102, pl. 13, fig. 2.
NOT *Cymatium gutturnium* - WEAVER, 1966: 104, pl. 26, lower right 2 figs — ABBOTT & DANCE, 1982: 123, fig. in top row [= *C. springsteeni*].
NOT *Cymatium (Gutturnium) gutturnium* - KAY, 1979: fig. 78 A [= *C. sarcostoma*].
NOT *Runularia gutturnia* - OKUTANI, 1986: 114-115, 9th fig. [= *C. springsteeni*].
Cymatium formosum - HIRASE, 1936: 65, pl. 95, fig. 4.
Triton clavator - LAMARCK, 1822: 185. — KIENER, 1842: 4, pl. 10, fig. 2. — DESHAYES, 1843: 635. — REEVE, 1844a: pl. 3, fig. 7.
Triton (Gutturnium) clavator - KOBELT, 1878a: 362. — TRYON, 1880: 21, pl. 11, fig. 86.
Tritonium (Ranularia) clavator - TAPPARONE-CANEFRI, 1881: 31.
Cymatium (Ranularia) clavator - ALTENA, 1942: 102 (in part). — WISSEMA, 1947: 150 (in part).

TYPE DATA. — Reviewed by BEU (1987: 292-293). Neotype (selected by BEU, 1987) of *Tudicla gutturnium*, *Tritonium macrourum*, *Monoplex formosus*, *Ranularia longirostra*, *R. labiata*, and *Murex clavator*: USNM 849016, from Visayan Sea, Philippine Islands.

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW154.
New Caledonia. LAGON: sta. 55 (Fig. 34 g), 324, 542, 744, 747, 771 (Figs 37 e-i), 820. — EXPÉDITION MONTROUZIER: sta. 1277, 305.
The depth range is 0 to 81 m, live adults are from 0-12 m.

DISTRIBUTION. — *Cymatium gutturnium* is apparently limited to the western Pacific archipelagoes from Taiwan to northeastern Australia and New Caledonia, and eastward to Hawaii; in the Indian Ocean known only from Réunion Island (1 MNHN), not known from the Red Sea.

DIMENSIONS. — Visayan Sea, Philippines, NZGS WM13141: H 86.5, D 42.3. - New Caledonia, LAGON: sta. 55 largest: H 63.6, D 30.6.

REMARKS. — The characters, variation and types of *Cymatium gutturnium* were reviewed by BEU (1987: 291). It is recognisable by its bright orange to orange-red aperture, made more conspicuous by the inner lip being flared quite widely over the previous whorl in large adults, by its low spire and long, narrow canal that is recurved in many specimens, by its sculpture of narrow, rounded, well-raised spiral cords crossed by narrow axial costae, and by its colour pattern of dark red-brown axial stripes down the axial costae, on a pale fawn background. The protoconch is similar to that of *C. caudatum* in most characters, including height and number of whorls, but is proportionally wider.

Cymatium (Ranularia) pyrum (Linné, 1758)

Figs 34 e, 41

Murex pyrum Linné, 1758: 749.

Murex pyrum - LINNÉ, 1767: 1218. — GMELIN, 1791: 3534. — DILLWYN, 1817: 700 (in part).
Cymatium pyrum - RÖDING, 1798: 129. — HEDLEY, 1909b: 451; 1923: 311. — HIRASE, 1936: 65, pl. 95, fig. 2. — WEAVER, 1965: 1, figs 1-2; 1966: 104, pl. 26, central 2 figs — HINTON, 1972: 12, pl. 6, fig. 6; 1978: 29, figs 6-6 a. — SHORT & POTTER, 1987: 46, pl. 22, fig. 3. — DRIVAS & JAY, 1988: 62, pl. 16, fig. 10. — SALVAT *et al.*, 1988: 100, pl. 12, fig. 9.
NOT *Cymatium pyrum* - IREDALE, 1929a: 345 [= *C. dunkeri*].
Triton pyrum - LAMARCK, 1822: 183. — KIENER, 1842: 7, pl. 11, fig. 1 (as "*pirum*" on p.7). — DESHAYES, 1843: 633. — REEVE, 1844a: pl. 10, fig. 33. — KOBELT, 1876c: pl. 9, fig. 3.
Triton (Cymatium) pyrum - KOBELT, 1878a: 250. — TRYON, 1880: 19, pl. 10, fig. 74.
Tritonium (Ranularia) pyrum - TAPPARONE-CANEFRI, 1881: 29.
Ranularia pyra - HABE, 1961: 45, pl. 22, fig. 13. — OKUTANI, 1986: 114-115, 2nd fig. right column.
Ranularia pyrum - HABE, 1964: 72, pl. 22, fig. 13. — WILSON & GILLETT, 1971: 76, pl. 52, fig. 5.
Cymatium (Gutturnium) pyrum - KAY, 1979: 218, fig. 78 C (as *C. sarcostomum*), but not fig. 78 B [= *C. springsteeni*].
Cymatium (Ranularia) pyrum - BEU, 1985: 59. — SPRINGSTEEN & LEOBRERA, 1986: 112, pl. 30, fig. 7. — LAI, 1989: 120, figs 19-20. — HENNING & HEMMEN, 1993: 82, pl. 17, fig. 1. — WILSON, 1993: 247, pl. 42, fig. 8.
Ranularia sarcostoma - RIPPINGALE & MCMICHAEL, 1961: 66, pl. 7, fig. 2.

TYPE DATA. — There are no syntypes of *Murex pyrum* in Linné's Colln in London, as was reported by DANCE (1967: 22). A single "syntype" (Fig. 22 d) in the Linné type Colln of the Uppsala University Zoology Museum (WALLIN, 1993) is a specimen of *Cymatium (Ranularia) cynocephalum* (in the sense of BEU & CERNOHORSKY, 1986: 260, fig. 3) and, as noted in the Introduction, is not considered to be a valid syntype. LINNÉ (1758: 750) cited illustrations by RUMPHIUS (1705: pl. 26, fig. E, queried), GUALTIERI (1742, pl. 37, fig. F), DEZALLIER D'ARGENVILLE (1742: pl. 13, fig. O), and REGENFUSS (1758: pl. 6, fig. 60; pl. 5, fig. 50). In the 12th edition of *Systema naturae*, LINNÉ (1767: 1218) deleted the first of the two REGENFUSS figures. These figures all seem to show *C. pyrum* of authors, although that by D'ARGENVILLE could have been meant for *C. sarcostoma*. To tie this name permanently to the customary orange-red species it is desirable to propose a lectotype from among these figured specimens. The figure by GUALTIERI (1742: pl. 37, fig. G; repeated here as Fig. 41) is clearly *Cymatium pyrum* of subsequent authors, and presumably shows a specimen that could still be recognised in Gualtieri's Colln in Pisa; this specimen is here designated the lectotype of *Murex pyrum*. This species is unique among Linnean ranellids in having no synonyms.

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW1 (Fig. 34 e).
New Caledonia. LAGON: sta. 16, 71. — West coast of Ilot Ngéa, east of Nouméa, 2 m, coll. H. Burban (1). — Reef southwest of Ilot Crouy, southwest of Nouméa, coll. R. Jeanpierre (1 lv; the specimen bears large reddish brown ringed spots on the head-foot, as in the specimen mentioned above in the discussion of subgenera, illustrated by ORR [1985: 97]).

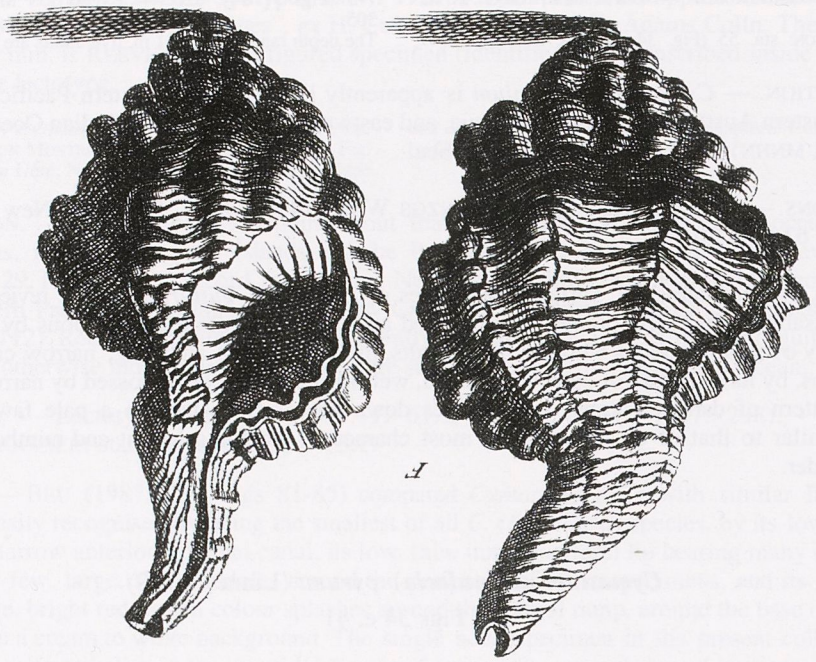

FIG. 41. — *Cymatium (Ranularia) pyrum* (Linné), lectotype; reproduction (inverted) of figure by GUALTIERI (1742: pl. 37, fig. F). [Specimen drawn with aperture tilted slightly towards observer, rather than in standard orientation with coiling axis vertical].

DISTRIBUTION. — *Cymatium pyrum* occurs throughout the Indo-West Pacific faunal province, from East Africa and Mauritius (DRIVAS & JAY, 1988) to the northern Indian Ocean, from southern Japan (to Sagami Bay, Honshu; HABE, 1964: 72) to Queensland, Australia and to New Caledonia, and eastward through Polynesia to Hawaii (KAY, 1979).

DIMENSIONS. — CORAIL 2: sta. DW1: H 107.1, D 57.8. - Tryon I., Capricorn Group, Queensland, NZGS WM10163: H 114.6, D 56.9. Maximum size recorded in New Caledonia 122.6 mm (PRIGENT, 1995).

REMARKS. — This is a very well known, large, uniform brownish orange to reddish orange species. Its differences from the closely related *C. dunkeri* are discussed above. The name *pyrum* (Latin, pear) is a noun in apposition, and is not to be declined. Available specimens do not have a complete protoconch.

Cymatium (Ranularia) sarcostoma (Reeve, 1844)

Fig. 34 i

Triton sarcostoma Reeve, 1844a: pl. 7, fig. 21.

Triton sarcostoma - REEVE, 1844c: 113.
Tritonium (Gutturnium) sacrostoma (*sic*) - BRAZIER, 1877: 173.
Triton (Gutturnium) sarcostoma - KOBELT, 1878a: 360. — TRYON, 1880: 20, pl. 10, fig. 75.
Tritonium (Ranularia) sarcostoma - TAPPARONE-CANEFRI, 1881: 30.
Ranularia sarcostoma - HABE & KOSUGE, 1966a: 44, pl. 15, fig. 17.
Cymatium (Gutturnium) sarcostomum - KAY, 1979: 218, fig. 78A (as *C. gutturnium*) but not fig. 78 C [= *C. pyrum*].
Cymatium (Ranularia) sarcostomum - BEU, 1985: 59. — SPRINGSTEEN & LEOBRERA, 1986: 110, pl. 30, fig. 1. — LAI, 1989: 121, fig. 21. — HENNING & HEMMEN, 1993: 83, pl. 17, fig. 3. — WILSON, 1993: 247, pl. 42, fig. 5 [not figs 7 a-b, which show *C. cynocephalum*].
NOT *Cymatium (Ranularia) sarcostomum* - CLENCH & TURNER, 1957: 206, pl. 118, fig. 5 [= *C. exaratum*].

Cymatium (Gutturnium) gallinago - COX, 1948: 38, pl. 3, figs 9 a-b.
?Cymatium (Ranularia) dunkeri - LAI, 1989: 122, fig. 30.

TYPE DATA. —3 syntypes BMNH 1967600, from "I. of Ticao", Philippine Islands, *ex* Cuming Colln. The figured syntype, marked "c" inside the aperture, H 64.5 and D 34.0, is here designated the lectotype.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 375, 558 (Fig. 34 i), 979. — Grand Récif, Nouméa, 9 m, coll. Berthault (1 lv). — Another specimen from "New Caledonia", apparently collected intertidally or by diving by G. Lee in 1983, is present in NZGS (WM15556, *ex* J.R. Penniket Colln). Confirmed local depth range 9-67 m.

DISTRIBUTION. — *Cymatium sarcostoma* occurs throughout the northeastern Indian Ocean (several seen in collections from southern India) and the western Pacific, from Taiwan to northeastern Australia (as far south as Fairfax I., Bunker Group, southern Great Barrier Reef, Queensland; AMS C69053) and New Caledonia, and eastwards through Polynesia to Hawaii (KAY, 1979).

DIMENSIONS. — New Caledonia. LAGON: sta. 558: H 75.2, D 36.5; sta. 979: H 56.7 (canal incomplete), D 34.0.

REMARKS. — *Sarcostoma* (from the Greek *stoma* = mouth; neuter) is a noun in apposition, and Reeve's original ending should be retained. *Cymatium sarcostoma* is a distinctive species, resembling *C. cynocephalum* in overall appearance, in shape and sculpture, and in external coloration of many specimens, although *C. sarcostoma* has a more uniform and a consistent yellow-brown to pale orange-brown exterior than *C. cynocephalum*. Also, few specimens have the very large peripheral nodules seen on many *C. cynocephalum*. The most obvious difference is in aperture colour, which is uniform pale flesh-orange (hence the species name) in *C. sarcostoma*, but white with a large, prominent, red-brown parietal colour area in *C. cynocephalum*. CLENCH & TURNER (1957: 204-208) were confused about the characters of the "two" western Atlantic species they identified as *C. caribbaeum* and *C. sarcostoma*, as they actually had only the one species *C. cynocephalum* before them (see BEU & CERNOHORSKY, 1986: 258, for clarification of the application of *Triton cynocephalum*); all Atlantic specimens have a white aperture with a red-brown parietal area, and CLENCH & TURNER identified the more finely sculptured specimens as *C. caribbaeum* and the more coarsely sculptured specimens as *C. sarcostoma*. However, *C. sarcostoma* occurs only in the western Pacific, whereas *C. cynocephalum* (= *caribbaeum* Clench & Turner, 1957) replaces it in the Atlantic and western Indian oceans. Available specimens all lack a complete protoconch.

Cymatium (Ranularia) sinense (Reeve, 1844)

Fig. 39 h

Triton sinensis Reeve, 1844a: pl. 6, fig. 18.
Ranularia sinensis defranata Iredale, 1936: 308, pl. 23, fig. 2.

Triton sinensis - REEVE, 1844c: 113.
Triton (Gutturnium) sinensis - KOBELT, 1878a: 360. — TRYON, 1880: 20, pl. 11, fig. 85.
Tritonium sinense - HEDLEY, 1901: 16.
Lotorium sinense - KESTEVEN, 1902: 461, pl. 17, fig. 14.
Cymatium sinense - HEDLEY, 1918b: M66. — YEN, 1942: 215, pl. 17, fig. 107. — HINTON, 1972: 12, pl. 7, fig. 7; 1978: 29, fig. 7.
Ranularia sinensis - HABE, 1961: 45, pl. 22, fig. 14; 1964: 71, pl. 22, fig. 14. — KURODA *et al.*, 1971: 128, pl. 29, fig. 2. — OKUTANI, 1986: 114; 115, 2nd fig. from right in 2nd row.
Cymatium (Ranularia) sinense - LADD, 1982: 41, pl. 7, fig. 7,88. — SPRINGSTEEN & LEOBRERA, 1986: 110, pl. 30, fig. 3. — LAI, 1989: 122, fig. 31. — WILSON, 1993: 247, pl. 42, fig. 10.
Cymatium (Ranularia) sinense sinense - BEU, 1987: 306, figs 113-116. — HENNING & HEMMEN, 1993: 84, pl. 16, fig. 2.
?Turritriton kiiensis - OKUMURA & TAKEI, 1993: pl. 29, figs 2 a-b.
Ranularia sinensis defranata - IREDALE & MCMICHAEL, 1962: 54.

TYPE DATA. — *Triton sinensis*: 3 syntypes, BMNH 1967598, from "China". The specimen figured by REEVE (1844a: pl. 6, fig. 18), H 91.5, identified by "c" inside the aperture, is here designated the lectotype. — *Ranularia sinensis defranata*: holotype, AMS C60661, from Sydney Harbour *"Triton"* dredgings, New South Wales. This specimen differs from other eastern Australian specimens of *C. sinense* only in its shorter spire, but spire height is enormously variable in this species.

NEW CALEDONIA RECORDS. — LAGON: sta. 649, 64-65 m.

DISTRIBUTION. — A form I originally named as a subspecies, *Cymatium sinense arthuri* (BEU, 1987: 306) occurs in the Red Sea, but as its protoconch is considerably smaller than that of western Pacific specimens of *C. sinense*, this is presumably a distinct species. *C. sinense* is not reported from the Indian Ocean; it occurs uncommonly throughout the western Pacific archipelagoes from southern Japan (to Kii Peninsula, Honshu; HABE, 1964: 71) to northern New South Wales, in eastern Australia; the Sydney Harbour record is possibly based on Pleistocene fossils dredged from below the harbour floor. There seem to be no records from localities east of New Caledonia.

DIMENSIONS. — Bohol Straits, Philippines, largest seen, NZGS WM14450: H 77.5, D 34.9. - New Caledonia, LAGON: sta. 649: H 31.8, D 14.5.

REMARKS. — As *Cymatium sinense* is one of the more common *C. (Ranularia)* taxa trawled on the shelf off Queensland and northern New South Wales, in eastern Australia, it is not surprising to find a specimen among the material from New Caledonia. Indeed, *C. sinense* was among the species recorded from the Loyalty Islands by MELVILL & STANDEN (1895). However, only a single immature specimen is present from New Caledonia, and throughout the rest of the western Pacific archipelagoes (*e.g.*, in the Philippines) *C. sinense* is one of the least common *Cymatium* species.

C. sinense is easily recognised by most specimens having an unusually tall spire for a member of *C. (Ranularia)*, by its prominent, narrow spiral cords crossed by many narrow axial costae, by its white to, at most, pale yellowish brown coloration, and by its unusually large protoconch. In addition, the uppermost 3 spiral cords (one at the shoulder angle and the two immediately anterior to it) are all deeply subdivided by a median spiral groove. The protoconch (NZGS WM10143, prawn-trawlers off An-Ping, Taiwan) is very narrowly conical, of about 4.5 whorls, and similar to that of *C. caudatum*, but about twice the size.

The specimen from the Late Pliocene Ananai Formation at Tosa Bay, Shikoku, Japan, identified by OKUMURA & TAKEI (1993, pl. 29, figs 2 a-b) as *Turritriton kiiensis* is larger, more elongate, and with a longer anterior canal than *Cymatium exaratum* (see above), and appears to have the uppermost 3 (rather than 2) spiral cords subdivided by a median groove. It seems to represent *C. sinense* rather than *C. exaratum*, although this is not certain as not all apertural characters are visible.

Cymatium (Ranularia) springsteeni Beu, 1987

Fig. 34 d

Cymatium (Ranularia) springsteeni Beu, 1987: 303, figs 105-112.

Cymatium (Ranularia) springsteeni - HENNING & HEMMEN, 1993: 85, pl. 15, fig. 2.
Cymatium gutturnium - WEAVER, 1966: 104, pl. 26, lower right 2 figs — ABBOTT & DANCE, 1982: 123, fig. in top row.
Cymatium (Gutturnium) gutturnium - KAY, 1979: 216, fig. 78 B (as *C. pyrum*).
Runularia gutturnia - OKUTANI, 1986: 114-115, 9th fig.

TYPE DATA. — Holotype USNM 849008, from Panglao, Bohol, Philippine Islands, pres. F.J. Springsteen; 25 paratypes from the Philippine Islands in NZGS (BEU, 1987: 306).

NEW CALEDONIA RECORDS. — LAGON: sta. 240, 42 m (Fig. 34 d).

DISTRIBUTION. — I have seen specimens of *C. springsteeni* from the Red Sea, from Mozambique, from off southern India, from Sri Lanka, from the Philippine Islands (most material), from New Caledonia, and from off Kii Peninsula, Honshu, Japan. The specimens also clearly belong here that were illustrated (as *C. gutturnium*) from Japan by OKUTANI (1986: 115) and from Hawaii by WEAVER (1966) and by KAY (1979). While the species presumably occurs throughout the Indo-West Pacific between these limits, its distribution is unclear at present.

DIMENSIONS. — New Caledonia, LAGON: sta. 240, H 59.8, D 26.2. - Trincomalee, Sri Lanka, NZGS WM15557: H 78.8, D 36.0.

REMARKS. — Until recently, *Cymatium springsteeni* has been confused with *C. gutturnium*; many museum lots consist of the two species together. *C. springsteeni* differs from *C. gutturnium* in having a pale flesh-

pink rather than a deep orange aperture, in its smaller maximum size, its lower spire, its lower varices flattened parallel to the direction of coilng, its narrower and more steeply inclined callous rim on the inner lip, and its prominent, widely spaced, raised, dark brown cords on the anterior siphonal canal (less prominent and not distinguished by colour from the background in *C. gutturnium*). The distribution and fossil record of *C. springsteeni* are obscure, as specimens have been confused in the past with *C. gutturnium*. The protoconch (NZGS WM15557, Trincomalee, Sri Lanka, *ex* Penniket Colln) is very short and rather wide for a *C. (Ranularia)* species, with an unusually wide apex, and considerably shorter and wider than that of *C. gutturnium*.

Cymatium (Ranularia) testudinarium (A. Adams & Reeve, 1850)

Figs 34 j, 39 i-j

Triton testudinarius A. Adams & Reeve, 1850: 37, pl. 8, figs 3 a-b.

Triton testudinarius - KÜSTER & KOBELT, 1876: 222, pl. 62, figs 2-3.
Triton (Gutturnium) testudinarius - KOBELT, 1878a: 360. — TRYON, 1880: 20, pl. 11, fig. 84.
Cymatium (Ranularia) testudinarium - SMITH, 1948: 6, pl. 3, fig. 5. — BEU, 1985: 59. — SPRINGSTEEN & LEOBRERA, 1986: 112, pl. 30, fig. 8. — LAI, 1989: 122, fig. 27. — HENNING & HEMMEN, 1993: 86, pl. 18, fig. 4.
Cymatium testudinarium - DRIVAS & JAY, 1988: 64, pl. 17, fig. 7.

TYPE DATA. —3 syntypes BMNH 1967686, from "China Sea". The figured syntype, much the largest of the three (H 74.3), is here designated the lectotype of *Triton testudinarius*.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 542 (Figs 34 j, 39 j).
Norfolk Ridge. *"Vauban"* 1978-79: sta. 9 (Fig. 39 i).
Local depth range 50-175 m.

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. DW1021, 17°43' S, 168°37' E, 124-130 m (2 half-grown, MNHN).

New Guinea. Rabaul, New Britain, coll. B.T.J. Mouvo (1, juv. AMNH 130235). — 1.6 km east of Dawi, E. Padaido Islands, Dutch New Guinea [= Irian Jaya], dredged 45-90 m, coll. Ostheimer, Orr & Powell, 2 Apr. 1956 (2 ANSP 206107). — Matupi I., Rabaul, New Britain, coll. E.H. Schlosser, 1961 (1 ANSP 274851). — Dutch New Guinea[= Irian Jaya], *ex* Hal Lewis Colln (1 ANSP 340276).

DISTRIBUTION. — Indian Ocean: Réunion (DRIVAS & JAY, 1988); Western Pacific: seen only from the Philippine Islands, New Guinea - New Britain, Vanuatu and New Caledonia. A specimen from Taiwan was illustrated by LAI (1989: 122, fig. 27). *C. testudinarium* presumably occurs uncommonly throughout the area delimited by these few records.

DIMENSIONS. — Lectotype: H 74.3, D 33.3; paralectotypes: H 47.2, D 23.2; H 33.7, D 17.6. - New Caledonia, *"Vauban"*: sta. 9: H 72.6, D 36.0. - LAGON: sta. 542: H 73.3, D 32.8. - Sulu Sea, Philippines, largest seen, NZGS WM13317: H 77.8, D 38.7.

REMARKS. — *Cymatium testudinarium* has been an apparently rare and poorly known species since it was named by ADAMS & REEVE in the *Samarang* report, until in recent years much material has become available from the Philippine Islands, and the species is now commonly seen in collections. It is a very distinctive species, because of its rather tall, conical, stepped spire, its bright orange-tan coloration, its distinctive wide, thin, flat-faced varices, and the dark brown parietal and columellar area on the inner lip. Again this species displays the distinctive character of having the uppermost 3 spiral cords each subdivided by a median cord, as in *C. sinense*. The protoconch is the largest seen on a *C. (Ranularia)* species, 4.5 mm high, very narrowly conical, of about 4.5 whorls, with a pale greenish olive periostracum; it is similar to but larger than that of *C. sinense*.

Because of its dark brown parietal and columellar area and subdivided uppermost 3 spiral cords, the western Atlantic endemic species *C. (Ranularia) rehderi* has been thought by some authors (*e.g.* ABBOTT, 1974: 165; PIECH, 1995: 13) to be closely related to *C. testudinarium*. However, the large adult specimen in the collection of C.J. Finlay (from Cuba; illustrated by CLENCH & TURNER, 1957: pl. 119, fig. 2) and a similar large, wide specimen from Salvador, Bahia, Brazil, illustrated by RIOS (1994: 88, pl. 29, fig. 343) demonstrate that *C. rehderi* is probably just as closely related to *C. pyrum* and *C. dunkeri* as it is to *C. testudinarium;* it differs from *C. pyrum* and *C. dunkeri* in its yellowish to pale reddish brown exterior and its darker parietal area, but is closely similar to these three species in size, in shape, in sculptural details, and in its deeply excavated columella and only weakly convex outer lip outline.

Subgenus ***RETICUTRITON*** Habe & Kosuge, 1966

Reticutriton Habe & Kosuge, 1966b: 315, 330. Type species (OD): *Triton pfeifferianum* Reeve, 1844, Miocene to Recent, Indo-West Pacific and western Atlantic.

Cymatium (Reticutriton) pfeifferianum (Reeve, 1844)

Figs 23 h, 42 a-g

Triton pfeifferianus Reeve, 1844a: pl. 4, fig. 14
Triton gracilis Reeve, 1844a: pl. 15, figs 58 a-b.
Cymatium (Gutturnium) bayeri Altena, 1942: 104, figs 2 a-b.

Triton pfeifferianus - REEVE, 1844c: 112. — KÜSTER & KOBELT, 1872: 194, pl. 55, figs 4-5.
Triton (Simpulum) pfeifferianus - KOBELT, 1878a: 247.
Triton (Gutturnium) pfeifferianus - TRYON, 1880: 23, pl. 13, fig. 107.
Aquillus (Turritriton) pfeifferianus - SCHEPMAN, 1909: 112.
Cymatium pfeifferianum - HEDLEY, 1909a: 360; 1909b: 452; 1918a: 277 (reprint p. 15). — HINTON, 1972: 12, pl. 6, fig. 11, 1978: 29, fig. 12. — DRIVAS & JAY, 1988: 64, pl. 17, fig. 4. — OLIVEIRA & TRINCHÃO, 1993: 314, figs 1(2), 2(3), 3-4.
Cymatium (Gutturnium) pfeifferianum - ALTENA, 1942: 103. — WISSEMA, 1947: 151.
Reticutriton pfeifferianum - HABE & KOSUGE, 1966a: 43, pl. 15, fig. 14; 1966b: 315, 330.
Cymatium (Reticutriton) pfeifferianum - BEU, 1985: 59. — PIECH, 1993: 90, figs 7-10. — HENNING & HEMMEN, 1993: 88, pl. 20, fig. 2. — WILSON, 1993: 248, pl. 42, fig. 2.
Cymatium (Septa) pfeifferianum - SPRINGSTEEN & LEOBRERA, 1986: 116, pl. 31, fig. 15.
Cymatium (Reticutriton) pfeifferia (*sic*) - LAI, 1989: 122, fig. 28.
Triton gracilis - REEVE, 1844c: 117. — KÜSTER & KOBELT, 1878: 243, pl. 67, fig. 5.
NOT *Triton gracilis* - BRAZIER, 1877: 173 [= *C. vespaceum*].
Cymatium gracile? - POPENOE & KLEINPELL, 1978: pl. 5, figs 60, 63.
NOT *Lampusia gracile* - DALL, 1889: 227, pl. 29, fig. 2. [= *C. comptum*]
Triton (Gutturnium) vespaceum - TRYON, 1880: 22, pl. 12, fig. 97 (only).
NOT *Cymatium bayeri* - POPPENOE & KLEINPELL, 1978: pl. 5, fig. 61 [= *C. aquatile*].
NOT *Cymatium (Lampusia) bayeri* - KANNO *et al.*, 1982: 106, pl. 19, figs 2 a-b[= *C. vespaceum*].

TYPE DATA. — *Triton pfeifferianus*: 3 syntypes BMNH 1967596 (Figs 41 a-c); without locality; type locality here designated as Bohol Island, Philippine Islands. The specimen figured by REEVE (1844a: pl. 4, fig. 14; Fig. 42 b), H 66.0, identified by the letter "c" written inside the aperture, is here designated the lectotype. — *Triton gracilis*: 2 syntypes (Figs 42 f-g) BMNH 1966543/1, 2 from "Philippines", *ex* Cuming Colln. Both specimens were illustrated by REEVE (1844a: pl. 15, figs 58 a-b). The specimen figured by REEVE (1844a: pl. 15, fig. 58 b) (BMNH 1966543/1) is here designated the lectotype. — *Cymatium bayeri*: holotype seen in RMNH, a Pliocene fossil from the Kendeng Formation of Java (loc. M128, map sheet 110A, Poetjangan layers, layer 2).

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 797, 92 m. — EXPÉDITION MONTROUZIER: sta. 1261, 45-56 m (Fig. 23 h).

DISTRIBUTION. — *Cymatium pfeifferianum* occurs throughout the Indo-West Pacific province and in the Atlantic. In the Indian Ocean it occurs from East Africa and the Red Sea, at Mauritius and Réunion (DRIVAS & JAY, 1988), to Kimberley in northern Western Australia, in the western Pacific from Taiwan to Queensland, Australia (HEDLEY, 1909a, b; WILSON & GILLETT, 1971; WILSON, 1993: 248) and to New Caledonia. I am not aware of any records from east of New Caledonia. *C. pfeifferianum* has only very recently been reported from Brazil, in the western Atlantic, by OLIVEIRA & TRINCHÃO (1993) and by PIECH (1993).

DIMENSIONS. — *Triton pfeifferianus* (lectotype): H 66.0, D 27.5; paralectotypes: H 82.5, D 34.0; H 60.2, D 24.9. - *T. gracilis* (lectotype): H 27.7, D 13.0; paralectotype: H 26.0, D 12.6. - *C. bayeri* (holotype): H 37.2, D 20.8. - New Caledonia, LAGON: sta. 797: H 19.0, D 9.9. - EXPÉDITION MONTROUZIER: sta. 1261: H 46.3, D 19.7. - Gulf of Carpentaria, N. Australia, trawled, typical large adult, NZGS WM13877: H 73.8, D 29.0.

REMARKS. — This distinctive species has not previously been recorded from New Caledonia although, as it is common in northern Australia, its occurrence is not unexpected. Nevertheless, there are only three small specimens in the collections reported here. The 2 smaller specimens closely resembles REEVE's (1844a) syntypes of *Triton gracilis* (Figs 42 f-g); there is no doubt that these specimens are merely small specimens of the same

FIG. 42. — *Cymatium (Reticutriton)* and *C. (Turritriton)* species. — **a-g**, *Cymatium (Reticutriton) pfeifferianum* (Reeve). **a-c**, syntypes of *Triton pfeifferianus*, BMNH 1967596, without locality, x0.9. **a**, **c**, paralectotypes. **b**, lectotype, BMNH 1967596/1, REEVE's figured syntype. **d**, typical large adult, NZGS WM13877, trawled, Gulf of Carpentaria, northern Australia, x1. **e**, juvenile to show large *C. (Reticutriton)* protoconch, NZGS WM14250, Mactan I., Cebu, Philippines, x3. **f-g**, lectotype (f) and paralectotype (both figured by REEVE) of *Triton gracilis* Reeve, BMNH 1966543/1 & 2, "Philippine Islands", x1.5. — **h-l**, *Cymatium (Reticutriton) elsmerense* (English), LACM Invert. Paleo. locality 305, K Ranch, Palm City, near Mexican border, San Diego Co., California, Pliocene, all x1.5. — **m-o**, *Cymatium (Turritriton) labiosum* (Wood), all x2. **m**, LAGON: sta. 296, Grand Récif Sud, New Caledonia, 26 m. **n**, LAGON: sta. 1143, Belep Islands, New Caledonia, 54 m. **o**, SMIB 6: sta. DW106, Grand Passage, New Caledonia, 165-195 m.

species REEVE (1844a) named *Triton pfeifferianus*. As first reviser, I select *Triton pfeifferianus* as the valid name to be used for the species named both *Triton pfeifferianus* and *Triton gracilis* by REEVE (1844a).

Cymatium pfeifferianum is easily recognised by its elongate form, with both a tall spire and a long anterior siphonal canal, by its obvious but fine, reticulate sculpture of many, narrow spiral cords crossed by numerous low, closely spaced axial ridges, by bearing an unusually large number (11-12) of narrow, prominent, closely spaced, long transverse ridges inside the outer lip, by its strongly convex whorls, and by its large, obvious protoconch (Fig. 42 e), conical and multiwhorled as in other *Cymatium* species, but much lower and wider than in most others. It is moderately variable in spire height, in the presence and prominence of nodules (some specimens have 2 or 3 prominent nodules in each intervariceal interval, whereas others lack them) and in the prominence of the fine axial ridges. The holotype of *Cymatium bayeri* is a very short, stout specimen of *C. pfeifferianum* with unusually weak axial ridges, but similar specimens can be found in modern samples. Several other species, occurring fossil in the Philippine Islands, have since been misidentified as *C. bayeri* (*C. vespaceum*, KANNO *et al.*, 1982; *C. aquatile*, POPENOE & KLEINPELL, 1978).

The endemic Galapagos Islands species *Cymatium lineatum* is the only other living species that seems referable to *C. (Reticutriton)*. It differs from *C. pfeifferianum* in its wider and shorter shape and its darker purplish red-brown colour, but has similarly inflated whorls and reticulate sculpture, 10-12 ridges inside the outer lip, and a widely conical protoconch. The only other species I am aware of that is referable to *C. (Reticutriton)* is *"Gyrineum" elsmerense* English (1914: 215), from the Pliocene of San Diego, California; it is similar to *C. pfeifferianum* in many characters, but shorter, with slightly coarser reticulate sculpture, and with very prominent varices (Figs 42 h-l).

Subgenus *SEPTA* Perry, 1810

Septa Perry, 1810: caption to pl. 2. Type species (by monotypy): *Septa scarlatina* Perry, 1810 [= *Murex rubecula* Linné, 1758], Recent, Indo-West Pacific.

Simpulum Mörch, 1852: 108. Type species (SD by CLENCH & TURNER, 1957: 214): *Murex rubecula* Linné, 1758. [Not a junior homonym of *Simpulum* Fabricius, 1823, introduced in a work placed on the Official Index by ICZN Opinion 521].

REMARKS. — The species of *Cymatium (Septa)* were revised by BEU (1987: 274-291). ARTHUR & GARCIA-TALAVERA (1990) have since added the species *C. mixtum*. Little new can be added here to these reviews.

Cymatium (Septa) hepaticum (Röding, 1798)

Fig. 23 p

Tritonium hepaticum Röding, 1798: 126.

Triton rubecula var. γ - REEVE, 1844 a: pl. 9, fig. 29 d.

Triton rubecula - KIENER, 1842: 20, pl. 18, fig. 2.

Cymatium hepaticum - KURODA & HABE, 1952: 51. — CERNOHORSKY, 1967a: 317, pl. 44, fig.14; 1967b: 48, pl.4, fig. 14. — HINTON, 1972: 12, pl6, fig. 10. — SALVAT & RIVES, 1975: 305, fig. 170 (in part, second fig. only). — HINTON, 1978: pl. 30, fig. 6. — ABBOTT & DANCE, 1982: 123, second fig. from left in bottom row. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 6.

Septa hepatica - RIPPINGALE & MCMICHAEL, 1961: 63, pl. 6, fig. 29. — HABE, 1964: 72, pl. 22, fig. 11. — HABE & KOSUGE, 1966: 42, pl. 15, fig. 9. — WILSON & GILLET, 1971: 78, pl. 53, figs 11-11 a.

Cymatium (Septa) hepaticum - SHIKAMA, 1963: pl. 47, fig. 4. — ARTHUR, 1983a: 8 (in part). — BEU, 1985: 59. — SPRINGSTEEN & LEOBRERA, 1986: 113, pl. 30, fig. 19. — BEU, 1987: 282, figs 29-36. — ARTHUR & GARCIA-TALAVERA, 1990: 5-6, fig. in row 3, D-E, 8. — HENNING & HEMMEN, 1993: 92, pl. 19, fig. 9. — WILSON, 1993: 247, pl. 42, figs 16 a-b.

TYPE DATA. — Neotype (designated by BEU, 1987: 282), USNM 124168, from Mauritius I., Indian Ocean.

NEW CALEDONIA RECORDS. — **New Caledonia.** EXPÉDITION MONTROUZIER: sta. 1245, 1290 (Fig. 23 p), 1311, 1316, 1318, 1331. — LAGON DE NOUMÉA: sta. 1352. Local depth range intertidal to 27 m (alive).

DISTRIBUTION. — *Cymatium hepaticum* occurs throughout the Indo-West Pacific province, from the southern Great Barrier Reef north to the Ryukyu Islands, southern Japan, and from East Africa eastwards to eastern Polynesia (SALVAT & RIVES, 1975: 305, left fig. in fig. 170; Marquesas Islands) but I am aware of no records

from Hawaii. It is a moderately common shell in the western Pacific archipelagoes, living in shallow water around coral reefs, but is much less common than the sympatric *C. closeli* in the Indian Ocean.

DIMENSIONS. — Amami Islands, southern, largest seen, USNM 343782: H 64.4, D 43.2. - One Tree I., Capricorn Group, Queensland, NZGS WM11635: H 63.0, D 29.6. - EXPÉDITION MONTROUZIER: sta. 1290: H 41.3, D 21.2. Maximum size recorded in New Caledonia 65.0 mm (PRIGENT, 1995).

REMARKS. — *Cymatium hepaticum* is immediately recognisable by its brightly banded orange and dark brown colour pattern, with two white splashes on each varix. It is the largest species in the subgenus, reaching 65mm in height, whereas few other specimens of *C. (Septa)* species are seen larger than 50mm in height. Other characters are similar to those of *C. rubeculum*.

Although *C. hepaticum* is a fairly common species throughout the western Pacific, and specimens from New Caledonia are commonly seen in collections (*e.g.* ARTHUR & GARCIA-TALAVERA, 1990: 6, row 3, fig. D), there are few records in the MNHN collections reported on here. No specimens were taken in Programme LAGON, and only one small one (H 10.3) is present in sta. 1352, from Grand Récif Aboré, Nouméa Lagoon, but one live and two empty adult and two live and one empty juvenile specimens were collected during EXPÉDITION MONTROUZIER.

Cymatium (Septa) mixtum Arthur & Garcia-Talavera, 1990

Fig. 23 o

Cymatium (Septa) mixtum Arthur & Garcia-Talavera, 1990: 5, figs 1-3; 6, row 1, figs A-F; 8-9.

Cymatium (Septa) mixtum - HENNING & HEMMEN, 1993: 94, pl. 19, fig. 5.

TYPE DATA. — Holotype (ARTHUR & GARCIA-TALAVERA, 1990: 5, fig. 1; 6, row 1, fig. B) in Museo Insular de Ciencias Naturales, Tenerife; from off southern India. Four paratypes in A.R. ARTHUR Colln ("The lagoon", 45 km south of Jeddah, Saudi Arabia, one; southern India, one; New Caledonia, two); one paratype in M. PARTH Colln ("East Indies"); three paratypes in Museo Insular de Ciencias Naturales, Tenerife (Philippines, one; Phuket, Thailand, two); four paratypes in BMNH (BMNH 1989027/4, New Caledonia, *ex* H. Cuming Colln; BMNH 1989029/1-3, Mauritius, Indian Ocean, *ex* D'A.W. Thompson Colln).

DISTRIBUTION. — *C. mixtum* presumably occurs uncommonly throughout the Indo-West Pacific province including the Red Sea, but is recorded so far only from Jeddah, Red Sea; southern India; Mauritius; Sri Lanka; Thailand; Philippine Islands; and New Caledonia.

DIMENSIONS. — Holotype H 23.3, D 13.8; largest paratype (BMNH 1989027/4, New Caledonia): H 36.7, D 19.6. - Trincomalee, Sri Lanka, Thailand, NZGS WM15270 (Fig. 23 o): H 34.9, D 18.2.

REMARKS. — *Cymatium mixtum* resembles *C. hepaticum* in appearance, being spirally banded in orange-brown and medium to dark brown, but differs in its rather more subdued coloration, its shorter, wider shape, and its more obvious, bright white peribasal band (only slightly paler than other spiral cords in other *C. (Septa)* species, except for the very prominent, wide band in *C. bibbeyi*). The character that distinguishes *C. mixtum* from all other species in the subgenus, though, is the particularly fine, low, numerous, closely spaced axial riblets, even more numerous than those of *C. occidentale,* producing only a very weak nodulation on the major spiral cords.

I have seen no specimens of this least common of *C. (Septa)* species from New Caledonia, but ARTHUR & GARCIA-TALAVERA (1990: 5, figs 3-4; 6, row 1, figs E-F; 11) illustrated and recorded 3 paratypes of *C. mixtum* from New Caledonia. As this appears to be a rare but widespread species in the Indo-West Pacific, there is no reason to doubt the New Caledonian records (coll. A. Arthur, 2 paratypes; BMNH, 1 paratype *ex* H. Cuming Colln). The specimens from Trincomalee, Sri Lanka (NZGS WM15270), *ex* J.R. Penniket Colln, reported previously (BEU, 1987: 287) as *C. occidentale*, were correctly interpreted by ARTHUR & GARCIA-TALAVERA (1990: 10) as *C. mixtum,* and one of these is illustrated here for completeness (but the Mauritius shells from J. Closel's Colln are *C. occidentale* so these are, indeed, at least partly sympatric).

Cymatium (Septa) occidentale (Mörch, 1877)

Fig. 23 l

Triton (Lampusia) rubecula occidentale Mörch, 1877: 29.
Septa? blacketi Iredale, 1936: 307, pl. 23, fig. 3.
Cymatium (Septa) beui Garcia-Talavera, 1985: 28, figs 1-2, 5.

Triton rubeculum occidentale - Tryon, 1880: 12.
Cymatium (Septa) rubeculum occidentale - Clench & Turner, 1957: 214, pl. 110, fig. 3; pl. 113, fig. 5; pl. 121, figs 1-3. — Kilias, 1973: 190, fig. 136. — Abbott, 1974: 164, fig. 1759. — Rios, 1975: 79, fig. 320. — Coelho *et al.*, 1981: 121, fig. 7.
Cymatium rubeculum occidentale - Nowell-Usticke, 1959: 60, pl. 3, fig. 11. — Garcia-Talavera, 1983: 112, pl. 4, fig. 2.
Cymatium (Septa) occidentale - Arthur, 1983a: 8, fig. — Beu, 1985: 59. — Rios, 1985: 76, pl. 27, fig. 333. — Garcia-Talavera, 1987: 250, 253, pl. 1, fig. 2. — Beu, 1987: 286, figs 37-45. — Arthur & Garcia-Talavera, 1990: 7, row 2, figs A-F. — Henning & Hemmen, 1993: 94, pl. 19, fig. 4. — Wilson, 1993: 247, pl. 42, figs 14 a-b.
Cymatium occidentale - Leal, 1991: 118.
Septa blacketi - Iredale & McMichael, 1962: 54.
Tritonium (Simpulum) gemmatum - Angas, 1877: 179. — Hedley, 1918b: M66.

Type data. — *Triton rubecula occidentale*: holotype ANSP 36874, *ex* Swift Colln, from St Thomas, Virgin Islands, Western Atlantic. — *Septa? blacketi:* holotype AMS C60662, from Nielsen Park, Watson's Bay, Sydney Harbour, New South Wales. — *Cymatium beui*: holotype in Museu Insular de Ciencias Naturales de Tenerife, Canary Islands (Garcia-Talavera, 1985), from Oahu, Hawaiian Islands.

New Caledonia records. — **Coral Sea.** CHALCAL 1: sta. P15, 50 m (Fig. 23 l). — CORAIL 2: sta. DW92, 8 m.

Distribution. — *Cymatium occidentale* occurs sparsely throughout the Indo-West Pacific (specimens seen from Mauritius; Ryukyu Islands; Philippine Islands; Queensland, Australia (several); New South Wales, Australia; Coral Sea; common in Hawaii); sparse but widespread in the western Atlantic, from southern Florida to Rio Grandé do Norte, Brazil and at Fernando de Noronha Island (Rios, 1985: 76); eastern Atlantic: recorded only from Tenerife, Canary Islands (Garcia-Talavera, 1983; 1985).

Dimensions. — Coral Sea, CHALCAL: sta. P15: H 29.5, D 15.1. - CORAIL 2: sta. DW92: H 25.1, D 14.3.

Remarks. — *Cymatium occidentale* resembles the common and well known *C. rubeculum* closely in shape and most other characters, but differs in being uniform pale brown (apart from its peribasal white band) rather than rich red to orange-red, and in having much finer, more closely spaced and more numerous axial ridges. A specimen in the collection of Mrs T. Whitehead, Brisbane, was collected alive under a slab of coral on a reef-top, on Lady Musgrave Island, central Queensland; this specimen is a significantly darker brown colour than the usual empty shells.

Cymatium occidentale is relatively common in the Hawaiian Islands, and not uncommon in the western Atlantic in some areas (most specimens in museums come from southern Florida), but also occurs rarely at localities throughout the Indo-West Pacific and in the eastern Atlantic. However, at most localities in the western Pacific it is very much less common than *C. hepaticum*, a much larger species with bright yellow and dark brown spiral bands. It may also have been among specimens seen by Melvill & Standen (1895), who reported that their material identified as *C. rubeculum* from the Loyalty Islands was very variable in colour.

Cymatium (Septa) rubeculum (Linné, 1758)

Fig. 23 q

Murex rubecula Linné, 1758: 749.
Septa scarlatina Perry, 1810: 5, pl. 2, fig. 2.

Murex rubecula - Linné, 1767: 1218.
Tritonium rubecula - Röding, 1798: 127. — Tapparone-Canefri, 1881: 27.
Triton nubecula (*sic*) - Lamarck, 1816: pl. 413, figs 2 a-b, "Liste des objets", p. 4.
Triton rubecula - Lamarck, 1822: 188. — Deshayes, 1843: 640. — Reeve, 1844a: pl. 9, fig. 29 a.
NOT *Triton rubecula* var. γ - Reeve, 1844 a: pl. 9, fig. 29 d [= *C. hepaticum*].

NOT *Triton rubecula* - KIENER, 1842: 20, pl. 18, fig. 2[= *C. hepaticum*].
Triton (Simpulum) rubecula - KOBELT, 1878a: 245 (in part).
Triton (Simpulum) rubeculum - TRYON, 1880: 12, pl. 7, fig. 40 (in part).
Aquillus rubeculus - SCHEPMAN, 1909: 111.
Septa rubecula - IREDALE, 1929b: 280. — RIPPINGALE & MCMICHAEL, 1961: 67, pl. 7, fig. 11. — IREDALE & MCMICHAEL, 1962: 54. — HABE & KOSUGE, 1966a: 43, pl. 15, fig. 11. — WILSON & GILLETT, 1971: 78, pl. 53, figs 10-10 a. — HINTON, 1972: 12, pl. 6, fig. 17.
Cymatium (Lampusia) rubeculum - WISSEMA, 1947: 148.
Cymatium rubeculum - WEAVER, 1966: 108, pl. 27, bottom centre 2 figs — SALVAT & RIVES, 1975: 304, fig. 169. — HINTON, 1978: 30, fig. 5. — SHORT & POTTER, 1987: 48, pl. 23, fig. 3 a. — DRIVAS & JAY, 1988: 64, pl. 17, fig. 10. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 4 [not fig. 3, = *C. iredalei*].
Cymatium (Septa) rubeculum rubeculum - KILIAS, 1973: 187, fig. 134 (in part). — BEU, 1987: 288, figs 1-2, 4-5, 52-57.
Cymatium (Septa) rubecula - LADD, 1977: 34, pl. 11, fig. 8.
Cymatium (Septa) rubeculum - KAY, 1979: 223, fig. 79D. — ARTHUR, 1983a: 8, illus. — SPRINGSTEEN & LEOBRERA, 1986: 113, pl. 30, fig. 20. — ARTHUR & GARCIA-TALAVERA, 1990: 7, row 5, figs A-D. — LAI, 1989: 124, figs 38-39. — HENNING & HEMMEN, 1993: 90, pl. 19, fig. 1. — WILSON, 1993: 248, pl. 42, figs 15 a-b. — BOSCH *et al.*, 1995: 100, fig. 362.
Septa scarlatina - PERRY, 1811: pl. 14, fig. 2.

TYPE DATA. — Linné's Colln, housed by the Linnean Society of London, contains 5 syntypes of *Murex rubecula*. Only the two smallest of these are the red *Cymatium rubeculum* of subsequent authors, and BEU (1987: 290) designated the smallest syntype as the lectotype. Six additional paralectotypes are present in the Linné Colln of the Uppsala University Zoological Museum (WALLIN, 1993: 79). The lectotype of *Murex rubecula* is here also designated the neotype of *Septa scarlatina*. The type locality is here designated as the Philippine Islands.

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. P15. — CORAIL 2: sta. DW110, DW133, DW136.
New Caledonia. LAGON: sta. 97, 160, 536, 662, 682, 754, 830, 1158. — LAGON DE NOUMÉA: sta. 1352. — EXPÉDITION MONTROUZIER: sta. 1237, 1245 (Fig. 23 q), 1316. — BATHUS 1: sta. DW692.
These 17 lots are from 0-150 m, but living specimens were taken only in 0-40 m.

DISTRIBUTION. — *Cymatium rubeculum* occurs throughout the Indo-West Pacific province, from East Africa and from the Ryukyu Islands, southern Japan to the Dampier Archipelago in Western Australia (WILSON, 1993: 248) and to the southern Great Barrier Reef in eastern Australia (BEU, 1987: 270), and eastward throughout Melanesia and Polynesia to Hawaii (KAY, 1979).

DIMENSIONS. — New Caledonia, LAGON: sta. 97: H 38.0, D 19.7; sta. 160: H 35.4, D 17.9.

REMARKS. — *Cymatium rubeculum* is a common, widespread species in shallow water throughout the Indo-West Pacific, where it is easily recognised by its small size (rarely exceeding 45 mm in height), dominantly spiral sculpture, bright crimson red to orange-red colour with a narrow white peribasal band, and numerous relatively coarse axial ridges crossing the spiral cords. The subspecies *C. rubeculum marerubrum*, occurring in the Red Sea, has much wider and more prominent spiral cords than *C. rubeculum rubeculum*, but specimens from the northwestern Indian Ocean intergrade in prominence of the spiral sculpture.

Subgenus *TURRITRITON* Dall, 1904

Turritriton Dall, 1904: 134. Type species (OD): *Triton gibbosus* Broderip, 1833, Recent, Panamic western America.
Tritoniscus Dall, 1904: 134. Type species (OD): *Triton loroisii* Petit de la Saussaye, 1852 [= *Murex labiosus* Wood, 1828], Pliocene to Recent, Indo-West Pacific and E & W Atlantic.
Particymatium Iredale, 1936: 307. Type species (OD): *Triton strangei* A. Adams & Angas, 1864 [= *Murex labiosus* Wood, 1828].

Cymatium (Turritriton) labiosum (Wood, 1828)

Figs 33 c, 42 m-o

Murex labiosus Wood, 1828: 15, pl. 5, fig. 18.
Tritonium rutilum Menke, 1843: 25.
Triton loroisii Petit de la Saussaye, 1852: 53, pl. 2, fig. 8.

Triton strangei A. Adams & Angas, 1864: 35.
Triton loebbeckei Lischke, 1870: 23.
Triton (Gutturnium) orientalis G. & H. Nevill, 1874: 29.

Triton labiosus - Reeve, 1844a: pl. 14, fig. 52. — Küster & Kobelt, 1872, 203, pl. 57, figs 3-4. — Smith, 1891: 413.
Tritonium labiosum - Angas, 1871: 87.
Tritonium (Cabestana) labiosum - Brazier, 1877: 173. — Tapparone-Canefri, 1881: 28.
Triton (Cabestana) labiosus and var. *loroisii* - Kobelt, 1878a: 249.
Triton (Simpulum) labiosus - Tryon, 1880: 17, pl. 9, figs 64-68.
Cymatium labiosum - Iredale, 1910: 73. — Oliver, 1915: 528. — Hedley, 1918b: M66. — Turton, 1932: 110, pl. 24, fig. 782. — Garcia-Talavera, 1983: 106. — Bandel, 1984: 100, fig. 158, pl. 10, fig. 2. — Drivas & Jay, 1988: 64, pl. 17, fig. 13. — Leal, 1991: 116.
Cabestana labiosa - Powell, 1933: 159, pl. 26, fig. 9.
Cymatium (Cabestana) labiosum - Clench & Turner, 1957: 201, pl. 111, figs 9-10; pl. 116, fig. 1. — Warmke & Abbott, 1961: 100, pl. 18, fig. a. — Coelho *et al.*, 1981: 117, fig. 3.
Tritoniscus labiosus - Habe, 1961: 45, pl. 22, fig. 4; 1964: 71, pl. 22, fig. 4. — Kuroda *et al.*, 1971: 127, pl. 29, fig. 7. — Okutani, 1986: 113, bottom right fig.
Turritriton labiosus - Beu, 1971: 109, figs 5-6. — Powell, 1976: 152. — Hinton, 1978: 30, figs 10-10 a. — Powell, 1979: 164, pl. 33, fig. 3. — Short & Potter, 1987: 48, pl. 23, fig. 2.
Cymatium (Tritoniscus) labiosus - Abbott, 1974: 164, fig. 1763.
Cymatium (Tritoniscus) labiosum - Nordsieck & Garcia-Talavera, 1979: 117, pl. 24, fig. 8.
Cymatium (Turritriton) labiosum - Kay, 1979: 223, fig. 79 F (as *C. vespaceum*), but not fig. 79 E [= *C. comptum*]. — Beu, 1985: 60, fig. 23. — Springsteen & Leobrera, 1986: 114, pl. 31, fig. 11. — Garcia-Talavera, 1987: 253, pl. 2, fig. 7. — Beu & Knudsen, 1987: 74, figs 3, 6-14. — Lai, 1989: 125, figs 47-49. — Henning & Hemmen, 1993: 102, pl. 22, figs 4-5. — Wilson, 1993: 248, pl. 42, figs 4 a-b. — Bosch *et al.*, 1995: 100, fig. 363.
Cymatium labiosum - Hedley, 1916b: 195. — Cosel, 1982: 54.
Cymatium (Septa) labiosum - Rios, 1985: 76, pl. 27, fig. 331.
Lotorium rutilum - Kesteven, 1902: 462, pl. 17, fig. 21.
Triton (Cabestana) strangei - Kobelt, 1878a: 249.
Triton strangei - Smith, 1879: 816, pl. 4, figs 13-14. — Iredale, 1915: 459.
Lotorium strangei - Kesteven, 1902: 462, pl. 17, fig. 20.
Cymatium strangei - Iredale, 1929b: 280.
Particymatium strangei - Iredale, 1936: 307. — Powell, 1952: 176. — Iredale & McMichael, 1962: 54.
Triton loebbeckei - Lischke, 1871: 36, pl. 4, figs 13-14. — Küster & Kobelt, 1876: 228, pl. 64, figs 2-3.
Triton (Gutturnium) loebbeckei - Kobelt, 1878a: 361.
NOT *Turritriton loebbeckei* - Habe, 1961: 45, pl. 22, fig. 9; 1964: 72, pl. 22, fig. 9 [= *C. exaratum*].
Triton (Gutturnium) orientalis - Kobelt, 1878a: 361.
Triton orientalis - Küster & Kobelt, 1878: 261, pl. 69, fig. 8.
Aquillus (Turritriton) labiosus var. *orientalis* - Schepman, 1909: 111.

Type data. — I am unaware of the existence of any type material of *Murex labiosus*; no possible type material is now recognisable in BMNH and, in Wilkins's (1957) discussion of Wood's names, he did not mention this species. I also do not know the whereabouts of any type material of *Tritonium rutilum* (from Western Australia). Dance (1966: 294) noted of Menke's collection: "acquired by M. J. Landauer and dispersed". — *Triton loroisii*: 5 syntypes in MNHN (*ex* Journal de Conchyliologie Colln, not catalogued when examined in 1979), from Guadeloupe, Lesser Antilles, western Atlantic. — *Triton loebbeckei*: holotype (Fig. 33 c) in Löbbecke Museum und Aquazoo, Düsseldorf, not registered; labelled "Nagasaki, Japan". — *Triton orientalis*: types in the Indian Museum, Calcutta (G. & H. Nevill, 1874: 21), not seen; from the Adaman Islands, "dredged by Mr Wood-Mason" in 1872; G. & H. Nevill (1874: 29) did not illustrate this species, but identified it by referring to Reeve's (1844a: pl. 11, fig. 38 a) figure, identified by Reeve as *Triton labiosus*; *i.e.*, the type specimens are evidently elongate, strongly varicate shells resembling the holotype of *Triton loebbeckei*; G. & H. Nevill (1874: 29) stated that the type material consists of four specimens, dredged alive. — *Triton strangei*: holotype BMNH 1870.10.26.99, from Moreton Bay, southern Queensland, and "idiotype" (paratype?), presented by G.F. Angas, in MCZ (Clench & Turner, 1957). The holotype of *Triton strangei* is here designated the neotype of both *Murex labiosus* and *Tritonium rutilum*; the type locality of *Cymatium labiosum* then becomes Moreton Bay. Wood (1828) gave no locality for *Murex labiosus*, so Clench & Turner (1957: 202) designated the type locality as Guadeloupe, but this is superseded by the present designation.

New Caledonia records. — **Coral Sea.** CHALCAL 1: sta. D10, D51. — CORAIL 2: sta. DW2, DW9, DW18, DW116, DW118, DW144, DW164.
New Caledonia. LAGON: sta. 9, 79, 80, 82, 98, 159, 296 (Fig. 42 m), 313, 517, 522, 534, 542, 603, 688, 701, 714, 788, 801, 809, 856, 867, 898, 1105, 1129, 1143 (Fig. 42 n), 1182. — EXPÉDITION MONTROUZIER: sta. 1277, 1312, 1314, 1319, 1321, 1323. — LAGON DE NOUMÉA: sta. 1356.
North of New Caledonia. MUSORSTOM 4: sta. CC146, CP148. — SMIB 6: sta. DW106 (Fig. 42 o).
Loyalty Ridge. MUSORSTOM 6: sta. DW431.
These 45 lots were taken in 10 to 195 m, but only one live was in depth greater than 70 m.

DISTRIBUTION. — *Cymatium labiosum* ranges from eastern South Africa (Natal: KENSLEY, 1973: 128; NZGS WM15724) and Mozambique (NZGS WM15564) to Oman, northern Indian Ocean (NZGS WM13276) and throughout the Red Sea (Eilat: SINGER, 1990: 26, fig. 11; NZGS WM13343), in the western Pacific from central Honshu, Japan (Boso Peninsula: HABE, 1964; Kamo, Yamagata Pref., Japan Sea coast of Honshu: BEU & KNUDSEN, 1987: 80) south to northeastern North Island, New Zealand (at least 15 lots now known, including 3 in NZGS; southernmost known to me is Mokohinau Islands, Auckland) and eastwards throughout Melanesia and Polynesia to Hawaii (KAY, 1979). In the western Atlantic, *C. labiosum* ranges from Cape Hatteras, North Carolina (PORTER, 1970) southwards throughout Florida and the Caribbean (CLENCH & TURNER, 1957) to Bahia, northern Brazil (RIOS, 1985: 76) and Fernando de Noronha (LEAL, 1991: 378). In the eastern Atlantic, it is reported from the Canary Islands and the Cape Verde Islands (NORDSIECK & GARCIA-TALAVERA, 1979: 117; COSEL, 1982: 54; GARCIA-TALAVERA, 1983: 106; 1987: 253, pl. 2, fig. 7).

DIMENSIONS. — *Triton strangei* (holotype), *Murex labiosus* (neotype): H 36.1, D 25.4. - *Triton loebbeckei* (holotype): H 37.6, D 23.6. - Sri Lanka, NZGS WM15558: H 37.6, D 27.3. - Black I., Queensland, NZGS WM15559: H 40.4, D 24.4. - New Caledonia: MUSORSTOM 4: sta. CC146: H 29.1, D 18.3. - SMIB 6: sta. DW106: H 29.8, D 22.5.

REMARKS. — *Cymatium labiosum* is highly distinctive, because of its small size (adult specimens range in height from about 12 to 40 mm, but few are taller than 25 mm), its prominent but irregularly placed varices, its prominent, wide spiral cords each bearing three prominent spiral riblets on their crests, the whole surface crenulated by fine axial costellae and, on most specimens, its few, prominent axial nodules in each intervariceal interval. While many specimens develop only the terminal varix, a few specimens in all large samples develop all varices regularly each 240° down the teleoconch, others develop any number in between these extremes, and most have a random varix position. The colour is just as variable, from white to almost black through all shades of yellow, greenish yellow, orange, brown, red and dark grey, and many specimens have narrow spiral banding of contrasting colours. All specimens have a moderately to very short spire, a short, stout anterior canal, a relatively large, subcircular, white aperture with prominent teeth inside the outer lip, and a moderately well developed to extremely prominent shoulder angle.

Cymatium labiosum is also remarkable for its enormous distribution, being the most widely distributed of all the teleplanic tonnoideans. Its distribution is so complete throughout the Indo-West Pacific that it could be used to define the province, were it not that it consistently extends that extra distance beyond the usually accepted tropical range. While it has not yet been recorded in Panamic western America, it safely can be predicted that specimens will eventually be found in this last area of the tropical marine realm.

The attribution of the species name to WOOD (1828) calls for comment. A range of opinions on the authorship of new names in WOOD's (1828) supplement to the *Index Testaceologicus* has been published over the years. GRAY (*in* SAUNDERS, 1872: 7) included in his list of his own publications: "61. The new species in the supplement to 'Index Testaceologicus' of W. Wood, 1828", although, as was pointed out by DANCE (1972: 160), Gray himself had earlier noted (GRAY, 1858: 55) that many of the names had been altered "by the late Dr Goodall as the work passed through the press". It has long been customary in New Zealand to attribute the very abundant and well-known tuatua (Veneridae), *Paphies subtriangulata* (proposed in WOOD, 1828: 4) to "Gray, 1828" (*e.g.*, BEU & DE ROOIJ-SCHUILING, 1982: 215). Indications that Gray might best be considered the author of some or all of the new names in WOOD (1828) were published by DALL (1921), who added "(Gray)" at the end of the reference to WOOD (1828), and by WOODWARD (1915: 2353), who published a MS note by Gray to the effect that he was author of the new names, but "several of them were altered by Mr. Wood". According to DANCE (1972) and the discussion by WILKINS (1957: 157-158), most of the names may well have been composed by Gray but were adopted by Wood from labels publicly displayed in the British Museum, so that the responsibility for illustrating and publishing them definitely belongs with William Wood. In view of the fact that some of WOOD's (1828) new names are simply those of Gray (MS), some were modified by Wood, and some were modified by Goodall, without any idea of which is which, it seems preferable to attribute **all** new names in this work to Wood.

Genus *SASSIA* Bellardi, 1873

Sassia Bellardi, 1873: 219. Type species (SD by COSSMANN, 1903b: 93): *Triton apenninicum* Sassi, 1827, Miocene and Pliocene, Europe.

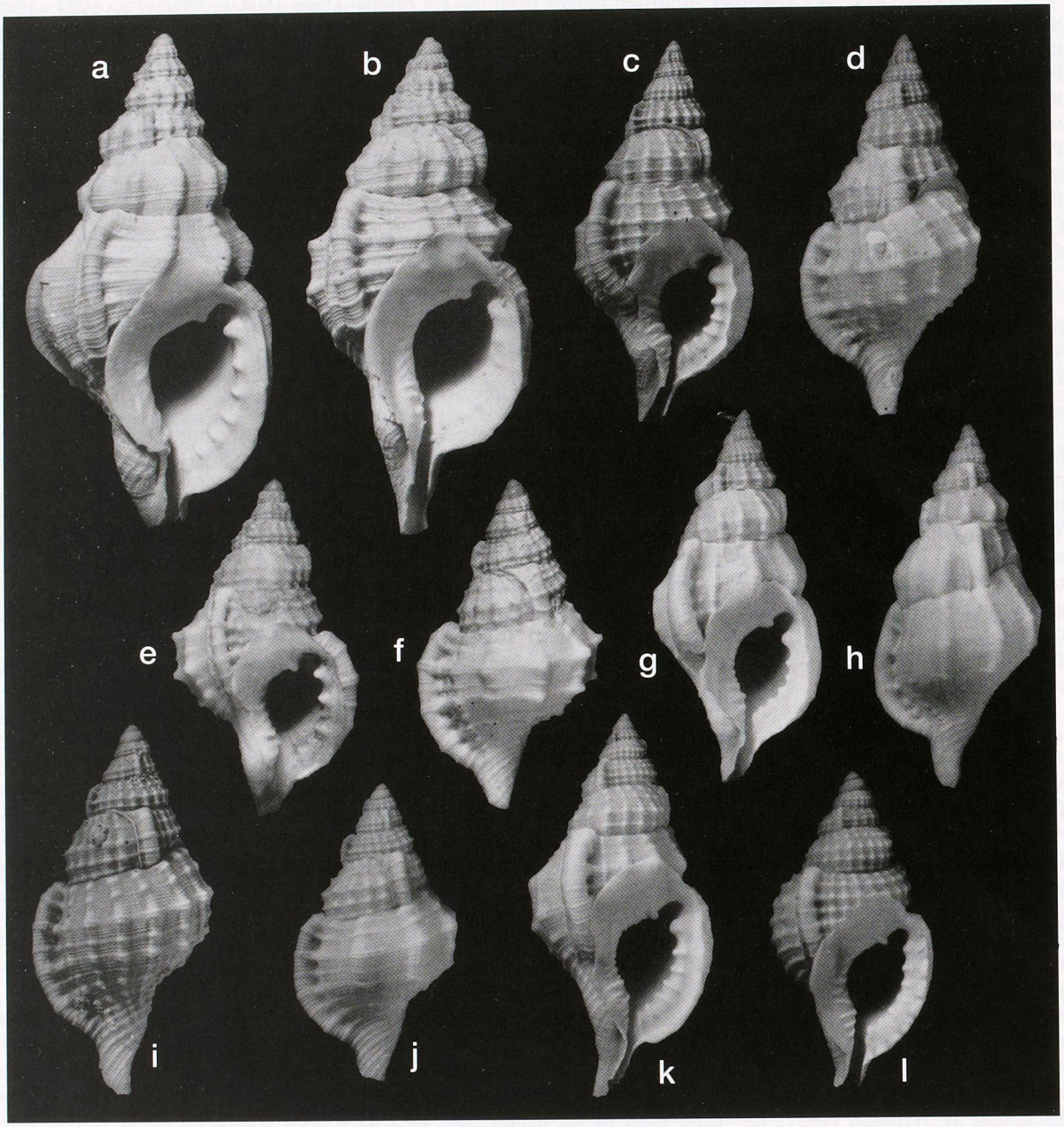

FIG. 43. — *Sassia* species. — **a-k**, *Sassia remensa* (Iredale). **a**, holotype of *S. marshalli* Beu, NZOI 231, NZOI Sta. K844, off the Kermadec Islands, 290 m, x2. **b**, specimen of form previously regarded as "typical" *S. remensa*, NZOI Sta. J709, NW of White I., Bay of Plenty, New Zealand, 328-406 m, x2. **c-d**, specimen scored as "large *remensa* form", CHALCAL 2: sta. DW79, southern New Caledonia, 243 m, x1.5. **e-f**, specimen resembling Italian Pliocene *S. apenninica* (Sassi), from early ORSTOM sample, off New Caledonia, 22°29.7' S, 166°21' E, 250-350 m, x1.5. **g-h**, **k**, specimens scored as "large *marshalli* form" (g, h) and "large intermediate" (k), SMIB 5: sta. DW70, Norfolk Ridge, 270 m, x1.5. **i-j**, specimens scored as "medium *remensa* form" (i) and "medium intermediate" (j), MUSORSTOM 6: sta. DW460, Loyalty Ridge, 420 m, x2. — **l**, *Sassia* sp. nov.?, Raevavae I., eastern French Polynesia, 400 m, x2.5.

Monocirsus Cossmann, 1889: 116. Type species (OD): *Triton (Monocirsus) carinulatus* Cossmann, 1889, Eocene, France.

Cymatona Iredale, 1929c: 177. Type species (OD, IREDALE, 1929c: 189): *Nassaria kampyla* Watson, 1885, Pliocene to Recent, New Zealand and southeastern Australia.

Charoniella Powell & Bartrum, 1929: 426. Type species (OD): *Charonia (Charoniella) arthritica* Powell & Bartrum, 1929, Early Miocene, New Zealand [not *Charoniella* Thiele, 1929 = *Austrotriton* Cossmann, 1903].

Austrosassia Finlay, 1931: 7. Type species (OD): *Septa parkinsonia* Perry, 1811, Pleistocene and Recent, southwest Pacific.

Phanozesta Iredale, 1936: 309. Type species (OD) Iredale, 1936: 336: *Phanozesta remensa* Iredale, 1936, Recent, southwest Pacific.

Proxicharonia Powell, 1938: 373. Replacement name for *Charoniella* Powell & Bartrum, 1929, preoccupied.

Sassia remensa (Iredale, 1936)

Figs 43 a-k, 44

Phanozesta remensa Iredale, 1936: 309, pl. 23, fig. 4; pl. 24, fig. 5.
Sassia (Sassia) marshalli Beu, 1978: 31, figs 9-11.

Phanozesta remensa - GARRARD, 1961: 14. — IREDALE & MCMICHAEL, 1962: 55.
Sassia (Sassia) nassariformis remensa - BEU, 1978: 31, figs 6, 13, 15-16.
Sassia (Sassia) apenninica remensa - BEU, 1985: 61. — HENNING & HEMMEN, 1993: 114, pl. 23, figs 1-2.
Sassia (Sassia) apenninica - WILSON, 1993: 248, pl. 40, fig. 19.

TYPE DATA. — *Phanozesta remensa*: holotype AMS C60663, and 1 paratype C170383, "from 110 fathoms [200 m] east of Sydney", New South Wales. — *Sassia marshalli*: holotype NZOI 231, from NZOI sta. K844, off the Kermadec Islands, 30°11.2' S, 178°33.8' W, 290 m, 29 July 1974 (Fig. 43 a); paratype (fragment), NZOI P326, from NZOI sta. K826, north of Raoul I., Kermadecs, 28°48' S, 177°48' W, 390-490 m, 25 July 1974.

NEW CALEDONIA RECORDS. — The 207 samples were taken in depths of 110 to 660 m, but only one sample was collected in less that 230 m. The material is classified by size and form of specimens present, with the abbreviations: I - intermediate (between *marshalli* and *remensa* forms); L - large; M - *marshalli* form; med - medium-sized; R - *remensa* form; and S - small.

Coral Sea. MUSORSTOM 5: sta. 255, 256, 299, 300, 301, 302, 304, 306, 307, 336, 361, 362, 372, 375, 378, 379.

New Caledonia. BIOGEOCAL: sta. DW253, DW291, DW307, DW308. — BATHUS 1: sta. DW688, DW690, CP702. — HALIPRO 1: sta. CP877. — SW Nouvelle-Calédonie, Passe de Boulari, 400 m.

North of New Caledonia. LAGON: sta. 444. — MUSORSTOM 4: sta. DW159, CP179, DW196. — BATHUS 4: sta. DW887, CP889, DW902, CP907, DW924, DW925, DW927, DW929, DW931, DW943.

Norfolk Ridge. *"Vauban"* 1978-79: sta. 3. — BIOCAL: sta. DW38, DW64, DW65, DW77, DW83, CP105, CP108. — CHALCAL 2: sta. CP19, CP20, DW69, DW70, DW71, DW79 (Figs 43 c-d). — MUSORSTOM 4: sta. DW222, DW226, DW230. — SMIB 1: sta. DW2. — SMIB 2: sta. DW1, DW8, DW14, DW15, DW20, DW23. — SMIB 3: sta. DW8, DW9, DW10, DW14, DW17, DW18, DW26. — SMIB 4: sta. DW40, DW41, DW42, DW43, DW44, DW45, DW46, DW48, DW49, DW50, DW51, DW53. — SMIB 5: sta. DW70 (Figs 43 g-h, k), DW71, DW72, DW73, DW74, DW75, DW76, DW77, DW80, DW81, DW87, DW88, DW89, DW90, DW91, DW92, DW93, DW94, DW97, DW98, DW104, DW105. — SMIB 8: sta. DW154, DW155, DW157, DW159, DW160, CP161, CP162, DW163, DW165, DW170-172, DW173, DW174, DW175, DW176, DW177, DW178, DW182, DW187, DW189, DW197-199. — SMIB 10: sta. DW208, DW210. — BERYX 11: sta. DW11, CP17, DW18, CP21, CP22, CP23, CP25, DW40, CP44, CP45. — BATHUS 2: sta. DW724, DW729, DW730, DW731, DW733, DW742, DW758, CP759, CP760, CP761, CP765. — BATHUS 3: sta. CP805, CP806, CP811, CP814, DW816, DW818, DW827, DW829, DW838, CP847.

Loyalty Ridge. MUSORSTOM 6: sta. DW391, DW392, DW398, DW399, CP401, DC402, DW406, DW407, CP408, DW410, DW413, DW417, DW418, DW419, DW421, DW422, DW423, DW428, DW439, DW451, DW452, DW453, D457, DW459, DW460 (Figs 43 i-j), DW464, DW465, DW472, DW478, DW479, DW480, DW481, DW482, DW487. — VOLSMAR: sta. DW38, DW40, DW41.

New Hebrides Arc. VOLSMAR: sta. DW7, DW16, DW17, DW49, DW50, DW51. — SMIB 9: sta. DW16.

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. CP962, 20°20' S, 169°49' E, 370-400 m (1LI, 2medI). — Sta. CP963, 20°20' S, 169°49' E, 400-440 m (3medI). — Sta. DW964, 20°20' S, 169°49' E, 360-408 m (1medR, 1medM). — Sta. DW965, 20°20' S, 169°51' E, 361-377 m (2medI). — Sta. DW967, 20°19' S, 169°53' E, 295-334 m (2SR, 1medI). — Sta. DW977, 19°25' S, 169°29' E, 410-505 m (2SR, 2medR). — Sta. DW978, 19°23' S, 169°27' E, 408-413 m (2SR, 1medR, 1medI).

DISTRIBUTION. — A few specimens of *Sassia remensa* have been collected off the northeastern North Island of New Zealand, as far south as White Island, Bay of Plenty; in Australia, it seems to have been collected only off the New South Wales shelf, in about 130 m and greater, off Broken Bay and Botany Bay (GARRARD, 1961). However, the present material has shown that it is common on the slope in 230-600 m throughout the area from the Coral Sea and the Norfolk Ridge, around New Caledonia and the Loyalty Islands, to the Gemini Seamounts and Vanuatu. There is no reason to suppose this is its complete range, and only much more extensive sampling in

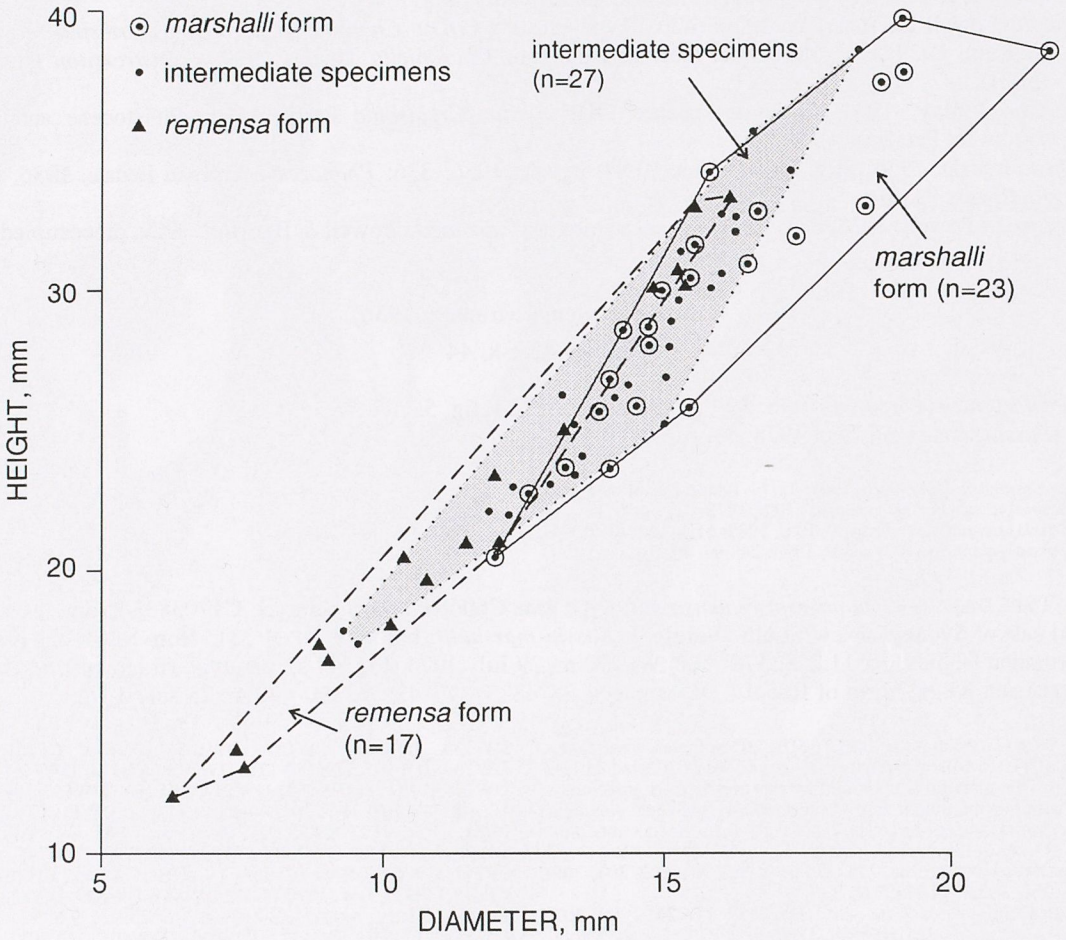

FIG. 44. — Scatter diagram comparing proportions of *Sassia remensa* forms in the New Caledonian region.

other areas of the western Pacific will establish (a) the complete range of *S. remensa*, and (b) its relationship to other *Sassia* species.

DIMENSIONS. — Coral Sea, MUSORSTOM 5: sta. 304, Nova Bank: H 38.5, D 21.8; H 30.8, D 16.4 (both classed as large *marshalli* form). - Loyalty Ridge, MUSORSTOM 6: sta. DW406: H 33.1, D 16.2 (large *remensa* form); H 32.8, D 16.0 (large intermediate form). - Norfolk Ridge, SMIB 4: sta. DW41: H 37.2, D 18.8 (large *marshalli* form). - SMIB 8: sta. 170-172: H 32.9, D 15.5 (large *remensa* form); sta. DW165: H 38.5, D 17.4 (large intermediate form).

REMARKS. — One of the most useful aspects of the New Caledonian collections is their large lots of *Sassia* specimens. The 210 *Sassia* samples contain a total of 1076 specimens. An initial survey of all this material showed that it is exceedingly variable, containing a large number of juveniles resembling Iredale's *"Phanozesta" remensa* (named from off New South Wales, in 200 m), a moderately large number of half-grown to adult

specimens resembling *Sassia marshalli* (named from off the Kermadec Islands, in 290 m and in 390-490 m), a relatively small number of half-grown to adult specimens resembling *S. remensa*, and a range of intermediate specimens. Therefore, while listing the material, I recorded the numbers of the various forms and intermediates, as a way of analysing the variation. Fig. 44 is a scatter diagram comparing the dimensions of 67 specimens, from several reasonably large samples selected randomly, as a way of comparing the dimensions of different forms visually.

Sassia remensa was based on specimens of elongate form, with bright red-brown colour spots on a golden brown ground, retaining prominent spiral and axial sculpture, with small, rounded, prominent nodules at the intersections, down onto the last whorl. The white aperture has flaring lips and the inner lip particularly flares over the previous whorl; the interior of the outer lip bears seven nodules, the uppermost much the largest. The low, rounded varices have conspicuous abapertural hollows, buttressed by the spiral cords. The protoconch (BEU, 1978: 33, fig. 6) is turbiniform, with conspicuous reticulate sculpture. *Sassia marshalli* was based on specimens identical to *S. remensa* in protoconch, apertural and variceal characters, and with sculpture and colour of the early teleoconch whorls identical to those of *S. remensa*, but with the last two whorls stark white in colour, lacking nodules and all prominent spiral sculpture, and markedly more inflated than in *S. remensa*. The result is a largely white, weakly sculptured shell that appears much shorter and wider than *S. remensa*. The result of the counting of forms present in the 210 New Caledonian samples is: 501 *S. remensa* form, including **all** of the small juveniles and most specimens up to half-grown; 167 *S. marshalli* form, including most of the largest adult specimens; and 408 intermediate specimens. The graphical comparison in Fig. 44 confirms this variation: no specimens over about 33 mm high were assigned to the *remensa* form, most of the wider specimens between 20 and 40 mm high were assigned to the *marshalli* form (with only a very narrow overlap between these two fields), and specimens identified as "intermediate" occupy a large area overlapping these extremes. It is clear, then, that all these specimens are conspecific; all specimens begin their benthic life as a brightly coloured, strongly sculptured form and, whereas some retain this colour, shape and sculpture until maximum teleoconch size, the majority develop at least somewhat weaker sculpture, and between a third and half of specimens lose prominent spiral sculpture progressively as they grow, and concomitantly lose coloration and develop a more strongly convex whorl surface, resulting in a stark white, weakly sculptured shell that I formerly took for a separate species. *S. marshalli* is merely part of the variation of *S. remensa*.

Formerly (BEU, 1978: 31; 1985: 61) I regarded *Sassia remensa* as very closely related to *S. nassariformis* (G.B. Sowerby III, 1902), living in the Indian Ocean and off South Africa, and *S. semitorta* (Kuroda & Habe *in* Habe, 1961) living in the northwest Pacific. There is little doubt that all these taxa form a monophyletic group directly descended from the closely similar European Neogene *S. apenninica*, but their exact relationship, and the taxonomic rank to be accorded in consequence, has long remained unclear. The New Caledonian samples make it quite clear that, while some specimens closely resemble Italian Pliocene specimens of *S. apenninica* (Figs 43 e-f), *S. remensa* is a distinct southwest Pacific taxon, as the weakly sculptured, white *marshalli* form has not been seen from either the fossil population or the rest of the Indo-Pacific region; in particular, the large amount of northwest Pacific material I have seen (Japan; a large collection from Sagami Bay in NSMT, of which 10 now in NZGS WM12412; Taiwan, 4; Philippine Islands, 13) does not include **any** specimens approaching the *marshalli* form, and it seems best to regard *S. semitorta* [= *S. sakuraii* Habe, 1961] as a species distinct from *S. remensa*. The only material I have seen from intermediate areas (Guam - photos sent by R. SALISBURY; Hawaii - photos sent by Alison KAY) appears to belong in the following taxon, and the geographic ranges of *S. remensa* and *S. semitorta* are unclear at present. *S. nassariformis* is also considered to be a separate species, differing from *S. remensa* and *S. semitorta* in its more inflated whorls, its slightly smaller protoconch, and its lower axial costae but more prominent, more evenly placed, narrowly rounded nodules at the sculptural intersections.

Sassia sp. nov.?

Fig. 43 l

MATERIAL EXAMINED. — French Polynesia, Raevavae, 23°50'54 S, 147°42'73 W, 400 m, coll. J. Poupin-SMCB, 3 Dec. 1990 (1 MNHN).

DIMENSIONS. — H 21.8, D 11.4

REMARKS. — A single specimen of *Sassia* dredged off Raevavae Island, in French Polynesia, sent for identification with other tonnoideans (see *Bursa latitudo*, reported below), seems to belong in a species distinct from *S. remensa*. This specimen is shorter and has more evenly rounded whorls than any nodulous specimens of *S. remensa*, and has sculpture of more numerous rows of small, even nodules (5 rows on penultimate whorl, 9 on last whorl, extending onto terminal varix). It also differs from *S. remensa* in its more nearly circular aperture, with a more excavated and more widely flared inner lip, in having much more prominent transverse ridges on the lower part of the inner lip, and in having a row of small, bright red-brown spots on the outer part of the outer-lip flange, corresponding in position to the exterior spiral cords.

In its more evenly granulous surface, its more inflated, evenly rounded whorls, and its more nearly circular aperture with a more flared inner lip, the Raevavae specimen more closely resembles the Indian Ocean *S. nassariformis* than it does *S. remensa*. Colour photographs of apparently the same species have been sent to me by Mr R. Salisbury, representing two specimens dredged off Guam, Marianas Islands, and others have been sent by Professor Alison Kay, of specimens dredged off Hawaii. As these are the only specimens I have seen of this species, its variation and distribution are unclear at present.

A further apparently unnamed species of *Sassia* is represented by numerous specimens dredged off Western Australia (in WAM). These are small, uniformly cream, and biangled but weakly nodulous. Because of the relatively deep-water habitat, the taxonomy of Indo-Pacific *Sassia* species related to *S. remensa* is still poorly known.

Family BURSIDAE Thiele, 1925

REMARKS. — RIEDEL (1995) significantly altered the classification followed here, by including Bursinae as a subfamily of Ranellidae. Bursidae is retained here as a separate family, for the following reasons:

1. The lack of a fossil record before the Eocene means that the early history of Bursidae remains unknown, and a position within Ranellidae expresses a closer phylogenetic relationship than the evidence permits.

2. The presence of three, rather than two, large accessory salivary glands (BEU, 1981: 268; figs 6-7) and of a large, flattened proboscis tip for grasping whole "worms" (BEU, 1981: figs 1 b, 7) are distinctive anatomical characters (synapomorphies) suggesting that the Bursidae is not particularly closely related to the Ranellidae.

3. One of the earliest fossil taxa of Bursidae is *Olequahia* Stewart, 1926 (Eocene-Oligocene, western North America), which has a shell form similar to that of the more unspecialised Cassidae, but with a posterior apertural canal (BEU, 1988: pl. 1). This suggests that the Bursidae is more closely related to the Cassidae than to the Ranellidae.

4. The radula of the Bursidae has a distinctive central tooth with a narrow, arched base and two large basal processes (BEU, 1981: figs 2-5; 1987: figs 168, 206) for interlocking the whole row of central teeth (again probably a consequence of its feeding habit, pulling whole "worms" from their tubes; HOUBRICK & FRETTER, 1969: 423-424, fig. 4). The central tooth closely resembles that of *Tonna* and *Eudolium*, but interlocking processes are not present in any other tonnoideans. This character suggests that the Bursidae is more closely related to *Tonna* than to the Ranellidae.

The Bursidae certainly resemble the Ranellidae in such obvious (but possibly independently derived) shell characters as the retention of varices at the end of each growth episode, and in the general form of the aperture and the anterior siphonal canal. However, retention of varices is no guide to close phylogenetic relationship, as varices routinely are retained in several genera of the Cassidae (*Cassis, Cypraecassis* and *Phalium*). The phylogenetic relationships of tonnoidean families are to a large degree obscured by their specialisation for markedly different prey. The radula resembling that of *Tonna*, the three accessory salivary glands, and the lack of the prominent ranellid periostracum suggest that the Bursidae are no more nearly related to the Ranellidae than to any other tonnoideans, and that it is preferable to rank Bursidae as a separate family at present.

Genus *BURSA* Röding, 1798

Bursa Röding, 1798: 128. Type species (SD by JOUSSEAUME, 1881: 174): *Bursa monitata* Röding, 1798 [= *Murex bufonius* Gmelin 1791, by first reviser's action of WINCKWORTH, 1945: 137], Recent, Indo-West Pacific.

Lampasopsis Jousseaume, 1881: 175. Type species (OD): *Ranella rhodostoma* Beck *in* G.B. Sowerby II, 1835, Recent, Indo-West Pacific.
Lampadopsis Fischer, 1884: 656. An unjustified emendation of *Lampasopsis* Jousseaume, 1881.
Colubrellina Fischer, 1884: 656. Type species (by monotypy): *Ranella candisata* "Lamarck" [= *Tritonium candisatum* Röding, 1798 (= *Murex conditus* Gmelin, 1791)], Recent, western Pacific.
Pseudobursa Rovereto, 1899: 6. Unnecessary replacement name for *Bursa* Röding, 1798.
Bufonariella Thiele, 1929: 284. Type species (by monotypy): *Murex scrobilator* Linné, 1758, Pleistocene to Recent, Mediterranean and West Africa.
Annaperenna Iredale, 1936: 310. Type species (OD; IREDALE, 1936: 337): *Ranella verrucosa* G.B. Sowerby I, 1825, Recent, southwest Pacific.
Dulcerana Iredale *in* Oyama, 1964: 332. Type species (OD): *Tritonium granulare* Röding, 1798, Recent, Indo-West Pacific. [Unavailable (no differentiation from similar taxa) from IREDALE, 1931: 213 or from COTTON, 1945: 261 (as *Dulcerona*; error)].
Tritonoranella Oyama, 1964: 332. Type species (OD): *Triton ranelloides* Reeve, 1844, Pleistocene and Recent, southern Japan.

REMARKS. — The subdivision of *Bursa* is, like subgenera of *Cymatium*, a question of whether imprecise, intergrading characters can be used at the generic level. After years of searching for firm characters to define such subgenera as *Colubrellina* and *Tritonoranella*, I have concluded that all characters used previously (*e.g.*, by BEU, 1981) are matters of degree rather than reliable generic characters, and I am forced to the conclusion that *Bursa* is a large genus containing species with short to tall spires, weak to coarse sculpture, heavy and thick to light, thin shells, with varices variable in position (although usually each 180°-200° around the shell, they are at each 240° in *B. ranelloides* and the *B. latitudo* species group) and with or without a red colour area on the parietal lip. All the species are united by their oval operculum with an abapically terminal nucleus, and by their evenly inflated shell form (not dorsoventrally compressed, as in *Bufonaria* and *Marsupina*). Within this group the one species that stands out, because of its much taller spire than all other species, is *Bursa condita*, but even so there is a gradation from short-spired species, such as *B. bufonia*, through moderately tall-spired species, such as *B. granularis* and the endemic Hawaiian *B. luteostoma*, to the extreme of *B. condita*. This is a case where the subgenus *Colubrellina* might be considered justified for *B. condita*, but seems to me just an extreme species in a single varied genus. As far as I have seen, the anatomy of species included here in *Bursa* is extremely uniform. More work is required on radulae to assess their potential taxonomic value.

Bursa condita (Gmelin, 1791)

Figs 45 a-d

Murex conditus Gmelin, 1791: 3565.
Tritonium candisatum Röding, 1798: 126.

Colubrellina (Dulcerana) condita - OYAMA & TAKEMURA, 1960: *Colubrellina* fig. 12. — HABE, 1961: 46, pl. 23, fig. 12.
Colubrellina condita - HABE, 1964: 75, pl. 23, fig. 12.
Bursa (Colubrellina) condita - CERNOHORSKY, 1972b: 200, figs 12-13. — BEU, 1985: 64. — SPRINGSTEEN & LEOBRERA, 1986: 120, pl. 33, fig. 5. — COSSIGNANI, 1994: 68.
Bursa condita - WILSON, 1993: 226.
Murex candisatus - DILLWYN, 1817: 699.
Ranella candisata - LAMARCK, 1822: 150. — J. SOWERBY & G.B. SOWERBY I, 1823: part 19, pl. 233, fig. 1. — KIENER, 1841: 35, pl. 13, fig. 1 [as *candicata* in text]. — DESHAYES, 1843: 542. — REEVE, 1844b: pl. 1, fig. 5.
Apollon candisatus - KOBELT, 1876b: 327.
Ranella (Lampas) candisata - TRYON, 1880: 41, pl. 22, fig. 43.
Colubraria granulata - SCHUMACHER, 1817: 251 (in part).

TYPE DATA. — GMELIN (1791) and RÖDING (1798) both cited as an illustration of their species the excellent coloured drawings by CHEMNITZ (1788, vol. 10: pl. 162, figs 1544-1545), which is clearly the present species of *Bursa*. Until recently, no specimens of *B. condita* in MHNG have been recognised as having belonged to Lamarck, who identified the species as *Ranella candisata*. Dr Y. Finet (MHNG) reported in January 1993 that Rosalie de Lamarck's annotation on Lamarck's copy of LAMARCK (1822) indicates that Lamarck originally had one specimen, and a search in the general collection brought to light a specimen that satisfied the requirements of being Lamarck's specimen: it is the only one from the collection of Baron Delessert (who purchased Lamarck's Colln,

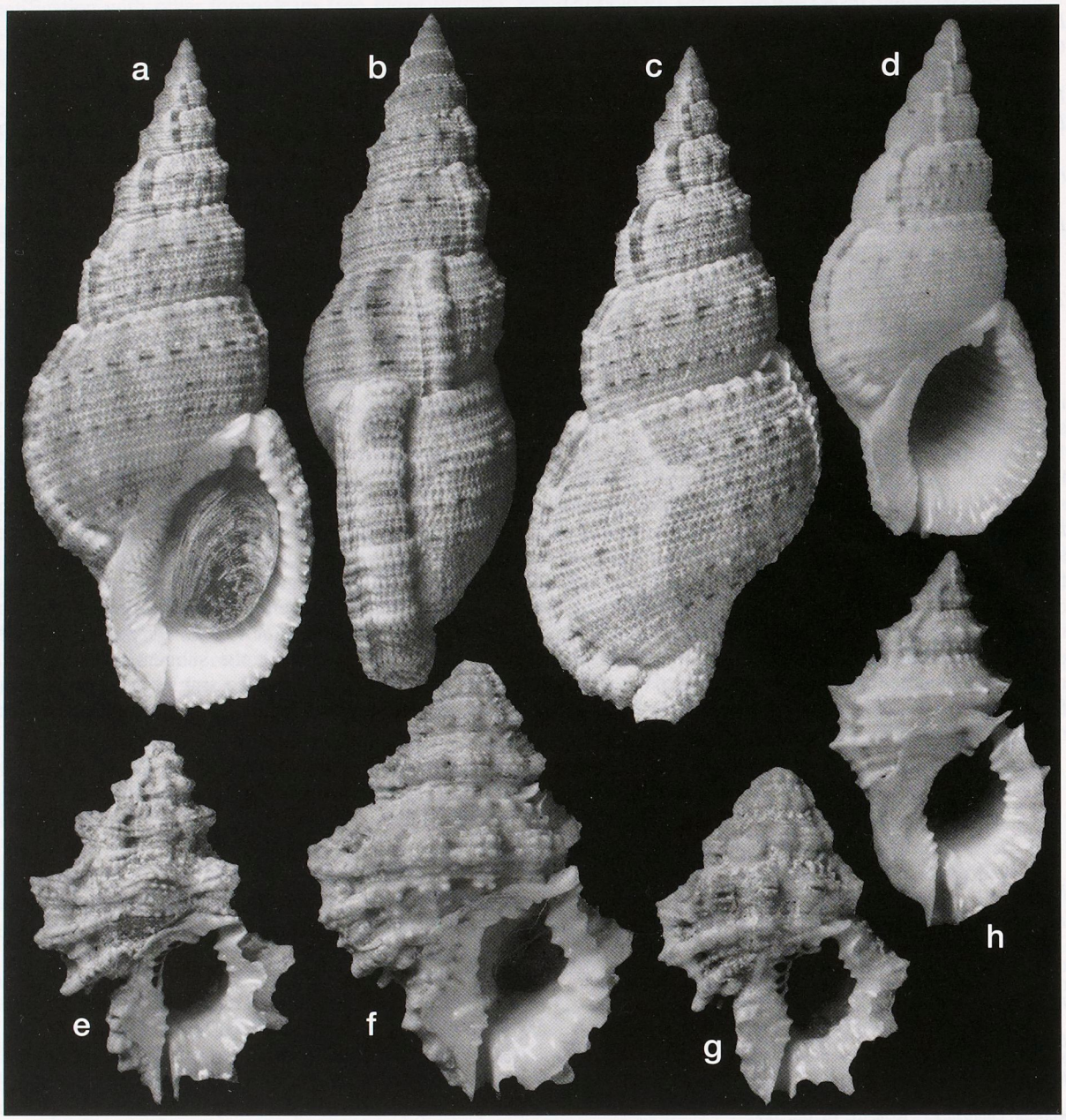

FIG. 45. — *Bursa* species. — **a-d**, *Bursa condita* (Gmelin), all x1. **a-c**, Michaelmas Cay, Queensland, Australia, 10 m, D. Shasky Colln. **d**, "Nouvelle-Calédonie", Jousseaume Colln, MNHN. — **e**, **g**, *Bursa cruentata* (Sowerby). **e**, MUSORSTOM 6: sta. DW431, Loyalty Ridge, New Caledonia, 21 m, x1.5. **g**, CORAIL 2: sta. DW92, Chesterfield Plateau, Coral Sea, 8 m, x2. — **f**, *Bursa asperrima* Dunker, NZGS WM12441, off Nanakuli, Oahu, Hawaii, coll. C.M. Burgess, x1.5. — **h**, *Bursa fijiensis* (Watson), SMIB 2: sta. DW14, S. New Caledonia, 405-444 m, x1.25.

and from whom it was acquired by MHNG), and it is 70 mm high, which matches LAMARCK's (1822: 150) height of "2 pouces 9 lignes" (= approx. 71 mm). This specimen was originally glued to a tablet labelled "*Ranella candisata* Lam. (Oc. Indien)", and was accompanied by a half-specimen (sawn longitudinally) of the western Atlantic bursid *Marsupina bufo* (Bruguière, 1792), which is still glued to the tablet by its sawn face. The original Lamarck specimen (MHNG 993.102) is here designated the neotype of both *Murex conditus* Gmelin, 1791, and of *Tritonium candisatum* Röding, 1798. The type locality is designated as Ambon Island (Amboina), Indonesia.

NEW CALEDONIA RECORDS. — **New Caledonia.** "Nouvelle-Calédonie" (1 MNHN *ex* Jousseaume Colln; Fig. 45 d). — EXPÉDITION MONTROUZIER: sta. 1270.

DISTRIBUTION. — Although a range including the Indian Ocean would not be surprising for *Bursa condita*, I am aware of records only from the central western Pacific archipelagoes. The northernmost record is the Amami Islands, south of Kyushu, southern Japan (HABE, 1964: 75) and the southernmost record I am aware of is Tryon Island, Capricorn Group, southern Great Barrier Reef, Queensland (2 specimens AMS). I know of no records from east of Vanuatu.

DIMENSIONS. — On Michaelmas Cay, Queensland, D. Shasky Colln, collected alive (Figs 45 a-c): H 103.7, D 44.2. - New Caledonia, Jousseaume Colln: H 80.1, D 37.2. - *Murex conditus* (neotype MHNG 993.102): H 70.0, D 32.8. - EXPÉDITION MONTROUZIER: sta. 1270: H 94.7, D 42.0.

REMARKS. — *Bursa condita* has been well known in the literature since pre-Linnean times, and yet is among the rarest of all bursids in the living fauna. It is easily recognised by having the tallest spire and narrowest shape of all Bursidae, by its fine, evenly granulous sculpture, with a row of small nodules at the periphery of most specimens, by its very low, wide varices that are about 10° apart rather than aligned, and by its white, flared, strongly plicate aperture in which the narrow ridges inside the outer lip extend well into the aperture. The exterior is fawn to pale red-brown, with poorly defined axial colour bands, darker varices, and fine red-brown maculations on the three to six main spiral cords.

The magnificent specimen (Figs 45 a-c) collected alive at 10 m on the face of the coral reef at Michaelmas Cay, North Queensland, Australia, by Don Shasky, on 24 July 1981, is valuable for confirming that *Bursa condita* has an operculum with an abapically terminal nucleus, as in the other species assigned to *Bursa*. It also has a protoconch very similar to that of *B. granularis*, and a thin, patchy intritacalx preserved as a cream chalky deposit between the surface granules. To my knowledge, *B. condita* has never before been recorded from New Caledonia, and it is represented in the MNHN/ORSTOM collections reported here by only a single specimen, collected alive during EXPÉDITION MONTROUZIER. This specimen, also, is useful for confirming the terminal opercular nucleus. The protoconch, although similar to that of *B. granularis* in shape, differs in its smaller size; on this specimen it is 2.0 mm high and 1.8 mm in maximum diameter; the apex is slightly abraded, so that the sculpture on protoconch I and early II is not preserved. The irregular apex illustrated by PARTH (1991c) is evidently the severely abraded early teleoconch whorls.

Bursa cruentata (G.B. Sowerby II, 1835)

Figs 45 e, g

Ranella cruentata G.B. Sowerby II, 1835: pl. 85, figs 5, 5*.

Ranella cruentata - G.B. SOWERBY II, 1841: 51. — KIENER, 1841: 13. pl. 7, fig. 2. — REEVE, 1842: 196, pl. 241, figs 5, 5*; 1844b: pl. 5, fig. 20. — KOBELT, 1876b: 330. — SCHMELTZ, 1877: 81. — TAPPARONE-CANEFRI, 1881: 49.
Lampas cruentata - MÖRCH, 1852: 105.
Ranella (Lampas) cruentata - TRYON, 1880: 39, pl. 21, fig. 24 (only).
Lampasopsis (*sic*) *cruentatum* - JOUSSEAUME, 1881: 176 (reprint p. 5).
Bursa cruentata - OSTERGAARD, 1939: 72. — CERNOHORSKY, 1967a: 312, pl. 43, fig. 7. — HOUBRICK & FRETTER, 1969: 416, figs 1-2 A. — WILSON & GILLETT, 1971: 80, pl. 54, fig. 5. — HINTON, 1972: 12, pl. 6, fig. 27; 1978: 32, fig. 10. — KAY, 1979: 227 (but not fig. 80 B). — BEU, 1985: 63. — SPRINGSTEEN & LEOBRERA, 1986: 123, pl. 34, fig. 7. — DRIVAS & JAY, 1988: 60, pl. 15, fig. 7. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 18. — LAI, 1987: 21, figs 5-6. — WILSON, 1993: 226, pl. 43, fig. 8. — COSSIGNANI, 1994: 46.
Lampadopsis cruentata - HABE & KOSUGE, 1966a: 4b, pl. 16, fig. 9.

TYPE DATA. — 3 syntypes, BMNH 1950.11.28.10-12, including Sowerby's figured syntype, here designated the lectotype; type locality "Ticao, of the Philippines".

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW70, DW92 (Fig. 45 g).
New Caledonia. LAGON DE NOUMÉA: sta. 1352. — EXPÉDITION MONTROUZIER: sta. 1245, 1316, 1318.
Loyalty Ridge. MUSORSTOM 6: sta. DW431 (Fig. 45 e).
These seven samples were collected from the intertidal zone to 54 m, but living specimens only down to 30 m.

DISTRIBUTION. — *Bursa cruentata* is moderately common throughout the Indian Ocean, in the western Pacific from southern Japan south to northern Australia, the Coral Sea and New Caledonia, and eastwards to the Hawaiian Islands. Records from the eastern Pacific refer to *B. asperrima* (see "Remarks", below).

DIMENSIONS. — Loyalty Ridge, MUSORSTOM 6: sta. DW431: H 37.9, D 27.5. - Chesterfield Plateau, CORAIL 2: sta. DW70: H 27.3 (spire apex incomplete), D 21.2; sta. DW92: H 26.5, D 19.6.

REMARKS. — *Bursa cruentata* is a moderately common, widespread Indo-West Pacific species easily recognisable by its moderately tall spire, its short posterior siphonal canal, not forming a semitubular spine, its strongly digitate outer lip margin, and the blood-red to dark maroon-brown lines or splashes on the parietal area of the inner lip, broken up by the prominent white plicae. The exterior of most specimens is white or cream, with brown to violet splashes on the nodule tips of fresh, clean shells, but a few specimens are markedly darker, with prominent dark brown maculations.

Bursa cruentata is frequently confused with another, closely similar species, *B. asperrima* (DUNKER 1862: 238; 1863: 57, pl. 19, figs 5-6; Fig. 45 f). This species differs from *B. cruentata* most obviously in lacking the parietal red colour spots, but other **slight** differences seem consistent in the material seen: *B. asperrima* differs from *B. cruentata* in its wider shape, particularly wider at the shoulders, and in its more strongly protruding digitations around the outer lip. Like previous workers, I have been inclined to regard this form as merely part of the variation of *B. cruentata*, but the incomplete sympatry of the two forms indicates they are distinct species. The critical population is that at Clipperton Island, in the eastern Pacific: 12 specimens from Clipperton Island in the Museum of Paleontology, University of California, Berkeley (1, B6120; 1, B6111; 8, B4237; 1, B6554; 1, B6553) are all typical specimens of *B. asperrima*, and *B. cruentata* does not appear to occur at Clipperton Island. EMERSON (1991) recorded other Clipperton Island specimens and two Galapagos Islands specimens of *B. asperrima*. Collections from the Hawaiian Islands appear to contain *B. asperrima* and *B. cruentata* in about equal numbers, but from further westward in the western Pacific there are almost no records of *B. asperrima* (despite its apparently spurious type locality of "China"). The only verified western Pacific records I am aware of (I know of none from the Indian Ocean) of *B. asperrima* are specimens illustrated in publications as "*Bursa cruentata*" or "*Lampadopsis cruentata* var.", but left out of the above synonymy list because in my opinion they illustrate *B. asperrima*: OYAMA & TAKEMURA (1963: *Lampadopsis-Tutufa* pl. 1, fig. 5), from Hachijo Island, southern Japan; SALVAT & RIVES (1975: 307, fig. 180), from Makemo Island, Tuamotu Islands; and OKUTANI (1986: 116; 117, middle fig. in second column from left), presumably from Japan. The occurrence of *B. asperrima* at Niue Island also seems to be indicated by CERNOHORSKY's (1970: 180) record of specimens of *B. cruentata* at Niue with and without "distinct black columellar bars". YEN (1942: 217, pl. 19, fig. 114) reillustrated DUNKER's figured syntype (BMNH 1968566/1) of *B. asperrima* and designated it the lectotype. A further somewhat surprising record of this species group is *Bursa consobrina* (Mayer, 1871), from the Late Miocene of Italy, illustrated by BELLARDI (1873: 239, pl. 15, fig. 8); BELLARDI's figure shows a specimen apparently indistinguishable from modern Indo-West Pacific specimens of *B. cruentata*. The New Caledonian and Coral Sea specimens recorded here are all typical, relatively narrow specimens of *B. cruentata* with red parietal colour spots.

Bursa fijiensis (Watson, 1881)

Figs 45 h, 46 a-i, 58 c

Ranella fijiensis Watson, 1881: 270.

Ranella fijiensis - WATSON, 1886: 397, pl. 34, figs 7 a-b.
Bursa (Bufonariella) fijiensis - BEU, 1978: 26, fig. 10.
Bursa (Colubrellina) fijiensis - BEU, 1985: 64. — COSSIGNANI, 1994: 73-74.

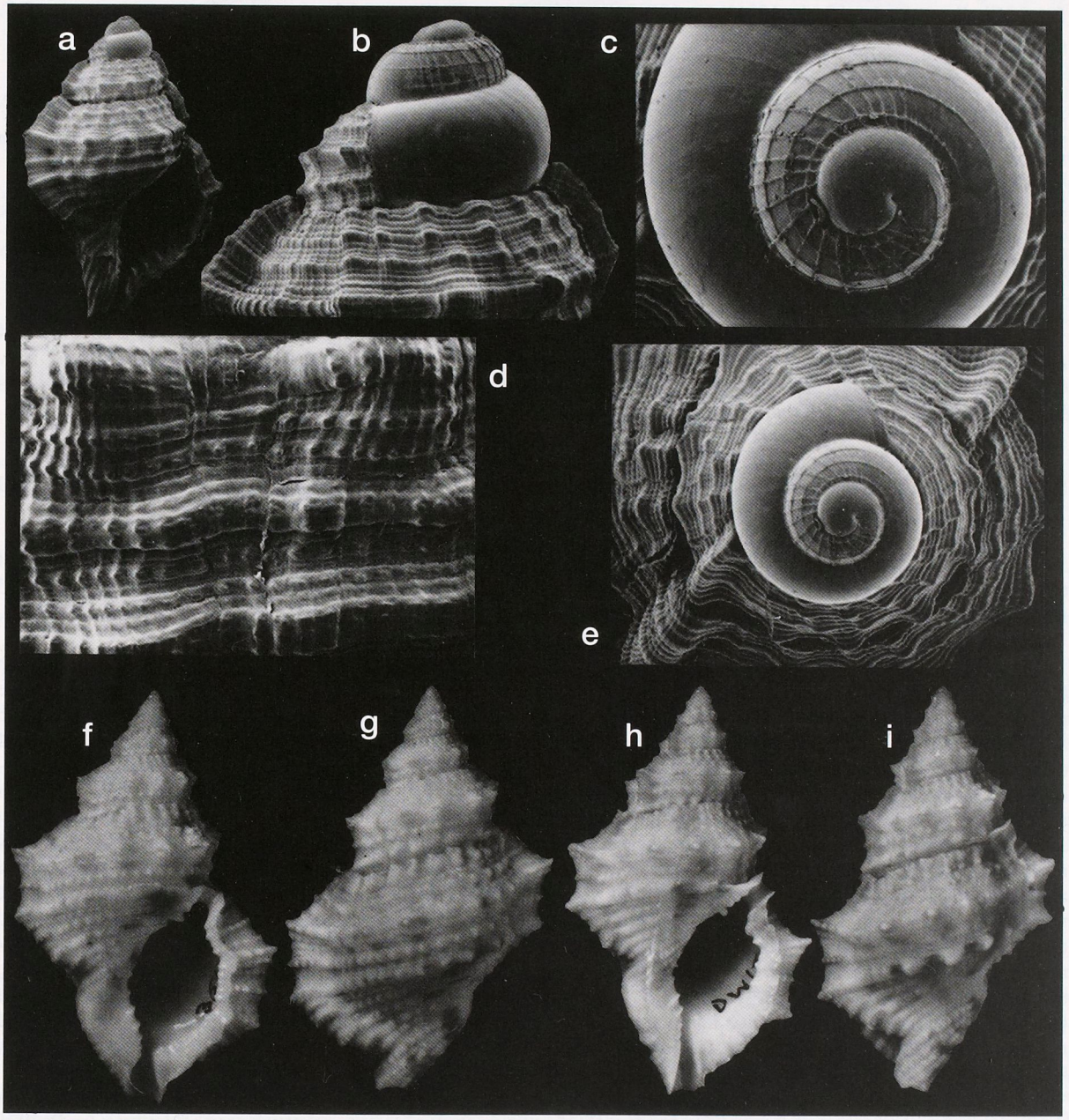

FIG. 46. — *Bursa fijiensis* (Watson). — **a-g**, MUSORSTOM 5: sta. 361, Chesterfield Plateau, Coral Sea, 400 m; a. x3.8; b, e. x16; c. x34; d. x26. **f-g**, specimen resembling holotype, x1.25. — **h-i**, SMIB 8: sta. DW189, Norfolk Ridge, New Caledonia, 400-402 m; x1.25.

TYPE DATA. — Holotype BMNH 1887.2.9.1217 (BEU, 1978: 26; COSSIGNANI, 1994: 73), from *"Challenger"* sta. 173, 19°9'35" S, 170°41'50" E, off Fiji, in 576 m. Paratype, BMNH 1887.2.9.1218, from *"Challenger"* sta. 204A, 12°43' N, 112°9' E, 183-210 m, Philippine Islands (a fragmentary specimen of *B. awatii*).

NEW CALEDONIA RECORDS. — **Coral Sea.** MUSORSTOM 5: sta. 306, 337, 338, 361 (Figs 46 a-g), 362, 379.
New Caledonia. BATHUS 1: sta. DW688.
North of New Caledonia. MUSORSTOM 4: sta. DW196. — SMIB 6: sta. DW120, DW126. — BATHUS 4: sta. CP906, DW908, DW914, DW925, DW927, CP928, DW929, DW931. — HALICAL 1: sta. DW01-04, DW01, DW02, DW04.
Norfolk Ridge. MUSORSTOM 4: sta. DW222, DW223, DW230. — CHALCAL 2: sta. DW69. — SMIB 2: sta. DW4, DW8, DW14 (Fig. 45 h). — SMIB 4: sta. DW66, DW69. — SMIB 5: sta. DW79. — SMIB 8: sta. DW154, DW187, DW189 (Figs 46 h-i, 58 c), DW197-199. — SMIB 10: sta. DW208. — BATHUS 2: sta. DW729, DW730. BATHUS 3: sta. DW830, DW838.
Loyalty Ridge. MUSORSTOM 6: sta. DW406, DW410, DW422, DW428, DW458, DW459, CP464, DW472, DW487.
These 51 samples were taken in 252-600 m, but only 10 were from less than 400 m.

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. DW978, 19°23' S, 169°27' E, 408-413 m (1). — Sta. CP982, 19°22' S, 169°26' E, 408-410 m (1). — Sta. CP1103, 15°04' S, 167°08' E, 163-165 m (2). — Sta. DW1105, 15°03' S, 167°07' E, 154-179 m (4 very large; 1 NZGS WM15779).

DISTRIBUTION. — H. Heinrich Mühlhäusser (Freiburg) has recently sent me photographs of a specimen of *B. fijiensis* from the Philippine Islands. So, although I have seen material so far only from off Fiji, off New Caledonia and the Loyalty Islands, on the Norfolk Ridge, in the Coral Sea, and off Vanuatu, *Bursa fijiensis* seems likely to occur over a wider area, probably throughout the western Pacific archipelagoes.

DIMENSIONS. — Holotype: H 53.5, D 35.0. - New Caledonia, SMIB 6: sta. DW120: H 56.6, D 32.3; sta. DW126: H 48.2, D. 28.8; H 46.5, D 28.1. - SMIB 8: sta. DW189: H 49.6, D 29.9; H 48.4, D 28.6; H 44.7, D 28.4. - Vanuatu, MUSORSTOM 8: sta. DW1105: H 66.1, D 36.4; H 64.7, D 37.8; H 63.7, D 43.5.

REMARKS. — One of the most surprising and satisfying aspects of the current report is the recognition of the long-sought *Bursa fijiensis* as a fairly common deep-water species around New Caledonia, collected at 45 stations. This species has not been collected since a single specimen was taken during the voyage of H.M.S. *"Challenger"*, in 1874, the paratype not being conspecific with the holotype.

The holotype, reillustrated by BEU (1978: fig. 10) and COSSIGNANI (1994: 73), suggested that, although the teleoconch surface has fairly even granulous sculpture, resembling that of *Bufonaria* species, and the varices are placed strongly towards the sides of the shell, producing a more compressed appearance than is usual in *Bursa* species (and so perhaps again suggesting a position in *Bufonaria*), the overall appearance is more like that of elongate *Bursa* species such as the common shallow-water species *B. granularis*. Examination of preserved, live-collected material confirms a position in *Bursa*; the operculum has an abapically terminal nucleus. *B. fijiensis* differs from *B. granularis* in its consistent pale fawn coloration, with scattered tan spots on the spiral cords on most specimens, and with dorsal axial tan streaks or wide axial bars on many, in its slightly more dorsoventrally compressed shape, in its more widely extended varices, in its more consistently present shoulder and peribasal angulations, developing more marked angulations on the varices than are present in *B. granularis*, and in its more widely flared lips with more numerous, more prominent ridges. Some specimens (Fig. 45 h) have widely flared apertures similar to that of *B. quirihorai*. The protoconch is small, low-turbiniform, of 2.25 whorls, with weak reticulate sculpture on the first whorl of protoconch II (Figs 46 b-c, e). Most of the specimens from off Vanuatu, taken during MUSORSTOM 8, closely resemble New Caledonian ones, but the 4 specimens from the shallowest site (sta. DW1105, 154-179 m) are much larger than any others seen (up to 66.1 mm high), are unusually elongate, and are darker in colour than any New Caledonian ones, with more numerous dark axial streaks than on New Caledonian specimens.

It seems unlikely that this first detailed sampling programme in south-western Pacific offshore waters has discovered the entire range of *Bursa fijiensis*; it probably occurs throughout the southern area of the western Pacific, and even throughout the western Pacific, in the depths where it has been collected around New Caledonia and Vanuatu and in the Coral Sea (one Norfolk Ridge sample in 57-59 m; one Vanuatu sample in 154-179 m; the rest in 260-580 m).

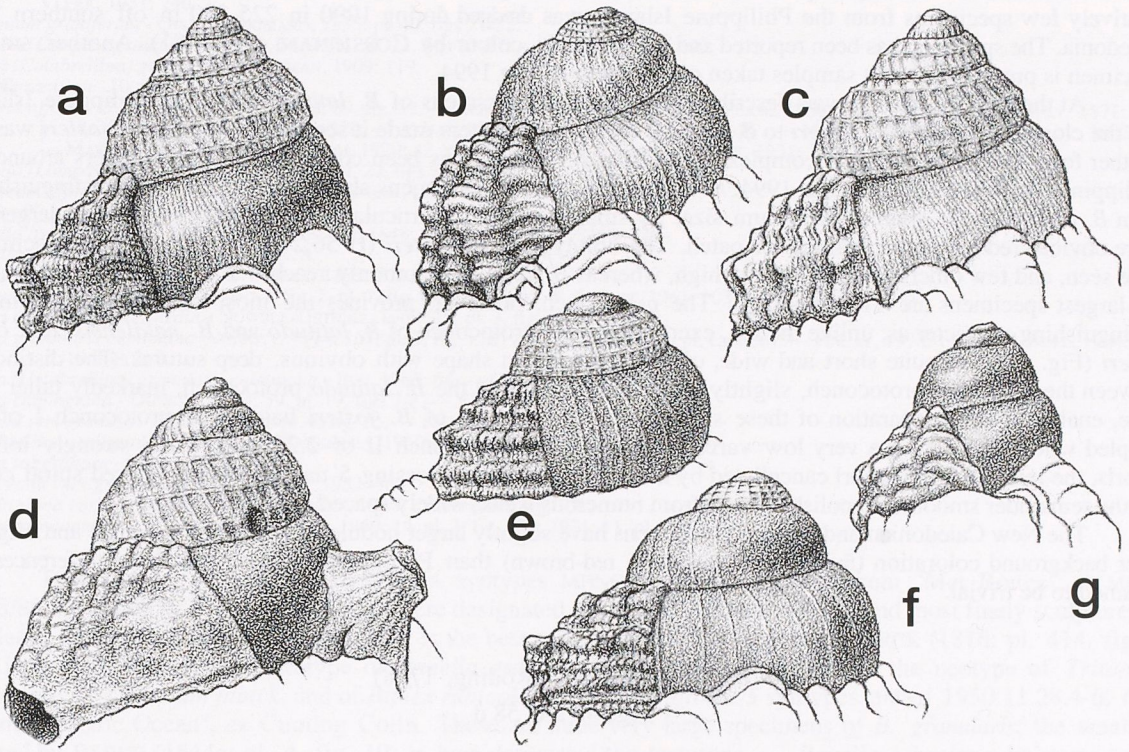

FIG. 47. — *Bursa* protoconchs; all x10 (drawn by Ron Brazier). — **a**, **c**, *Bursa latitudo* Garrard, New Caledonia. **a**, SMIB 3: sta. DW29, 405 m. **c**, BIOCAL: sta. CP105, 330-335 m. — **b**, *Bursa lucaensis* Parth, NZGS WM15024, Punta Engaño, Mactan I., Cebu, Philippines. — **d**, *Bursa natalensis* Coelho & Matthews, Bermuda, W. Atlantic; Abbey Shells Colln. — **e**, *Bursa quirihorai* Beu, SMIB 3: sta. DW18, New Caledonia, 338 m. — **f**, *Bursa fosteri* Beu, paratype, NZGS WM14441, Mactan I., Cebu, Philippines. — **g**, *Bursa rhodostoma* (Beck *in* G.B. Sowerby II), Guadalcanal, Solomon Is. (Vanuatu); Abbey Shells Colln (specimen in Fig. 52 h).

Bursa fosteri Beu, 1987

Figs 47 f, 58 h

Bursa (Colubrellina) latitudo fosteri Beu, 1987: 325, figs 195-199, 202-206.

Bursa (Colubrellina) latitudo fosteri - COSSIGNANI, 1994: 81.

TYPE DATA. — Holotype USNM 849013, tangle nets in 100-200 m, north side of Panglao Peninsula, Bohol, Philippine Islands, coll. Quirono Hora, 1 paratype from type locality in Abbey Specimen Shells, Santa Barbara, 4 paratypes from Punta Engaño, Mactan I., Cebu (2 NZGS WM13166 and 2 in Colln F.J. Springsteen), 2 paratypes from Mactan I., Cebu (NZGS WM14441), 1 paratype, off Cebu, (NSMT 55501).

NEW CALEDONIA RECORDS. — **North of New Caledonia.** SMIB 6: sta. DW130 (Fig. 58 h).

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. CP1132, 15°38' S, 167°03' E, 161-182 m (1).

DISTRIBUTION. — *B. fosteri* is recorded only from the Philippine Islands, Vanuatu and New Caledonia but, like many other taxa reported here, no doubt occupies the western Pacific archipelagoes between these extremes.

DIMENSIONS. — Holotype: H 56.2, D 32.7. - New Caledonia, SMIB 6: sta. DW130: H 36.6, D 22.9.

REMARKS. — A single specimen of the distinctive species *Bursa fosteri*, previously known only from relatively few specimens from the Philippine Islands, was dredged during 1990 in 225-230 m off southern New Caledonia. The specimen has been reported and illustrated in colour by COSSIGNANI (1994: 81). Another, smaller specimen is present in MNHN samples taken off Vanuatu during 1994.

At the time this species was described I had seen no specimens of *B. latitudo* from the Philippine Islands, and the close similarity of *B. fosteri* to *B. latitudo* in many characters made it seem plausible that *B. fosteri* was yet another form in the "*B. latitudo* complex". Now that *B. latitudo* has been collected in some numbers around the Philippines (*e.g.*, see COSSIGNANI, 1994: 83-84) comparison of specimens shows that *B. fosteri* is distinguishable from *B. latitudo* in its smaller maximum size, its smaller nodules (particularly on the varices), and its larger and more obvious red-brown parietal colour patch. The holotype of *B. fosteri* (H 56.2 mm) is the largest specimen I have seen, and few others are over 50 mm high, whereas *B. latitudo* commonly reaches 90-100 mm in height, and the largest specimens are 110 mm high. The protoconch, however, provides the most marked and convincing distinguishing character as, unlike the tall, exert, mamillate protoconch of *B. latitudo* and *B. natalensis*, that of *B. fosteri* (Fig. 47 f) is quite short and wide, of low turbiniform shape with obvious, deep sutures. The distinction between the *B. fosteri* protoconch, slightly wider than high, and the *B. latitudo* protoconch, markedly taller than wide, enables a rapid separation of these species. The protoconch of *B. fosteri* has a low protoconch I of 0.5 dimpled whorls, ending at a very low varix, followed by a protoconch II of 2.25 evenly and strongly inflated whorls, the initial 0.3-0.5 whorl cancellated by narrow axial riblets crossing 5 narrow, widely spaced spiral cords, but the remainder smooth and polished apart from numerous weak, widely spaced axial ridgelets.

The New Caledonian and Vanuatu specimens have slightly larger nodules on the shoulder angle and slightly paler background coloration (fawn rather than pale red-brown) than Philippines shells, but these differences are assumed to be trivial.

Bursa granularis (Röding, 1798)

Figs 48 a-e, 58 d

Tritonium granulare Röding, 1798: 127.
Tritonium jabick Röding, 1798: 127.
Biplex rubicola Perry, 1811: pl. 5, fig. 5.
Ranella granifera Lamarck, 1816: pl. 414, fig. 4; "Liste des objets", p. 4.
Ranella affinis Broderip, 1833a: 179.
Ranella livida Reeve, 1844b: pl. 6, fig. 28.
Ranella cubaniana d'Orbigny, 1842: 165, pl. 23, fig. 24.
Bursa cumingiana Dunker, 1862: 238.
Bursa alfredensis Turton, 1932: 107, pl. 24, fig. 781.
Bursa kowiensis Turton, 1932: 108, pl. 24, fig. 782.
Bursa cubaniana intermedia Nowell-Usticke, 1959: 62, pl. 3, fig. 13.
Bursa corrugata lineata Nowell-Usticke, 1959: 62, pl. 3, fig. 12.

Apollon granulare - MÖRCH, 1852: 106.
Bursa (Apollon) granularis - H. & A. ADAMS, 1853: 106.
Ranella granularis - TAPPARONE-CANEFRI, 1875a: 607; 1881: 52.
Bursa granularis - HEDLEY, 1916b: 196. — COOKE, 1916: 8. —BARNARD, 1963: 17. — HINTON, 1972: 12, pl. 6, fig. 22. — SALVAT & RIVES, 1975: 307, fig. 179. — HINTON, 1978: 32, fig. 8. — KAY, 1979: 227, fig. 80A. — GARCIA-TALAVERA, 1983: 141. — KILBURN & RIPPEY, 1982: 73, pl. 16, fig. 14. — SHORT & POTTER, 1987: 44, pl. 21, fig. 2. — DRIVAS & JAY, 1988: 62, pl. 16, fig. 4. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 12. — LEAL, 1991: 111, pl. 16, figs C-D. — WILSON, 1993: 226, pl. 43, figs 11 a-b, 12.
Dulcerana granularis - IREDALE, 1931: 213. — RIPPINGALE & MCMICHAEL, 1961: 69, pl. 7, fig. 19. — IREDALE & MCMICHAEL, 1962: 55.
Colubrellina granularis - HABE, 1961: 47, pl. 24, fig. 5. — OKUTANI, 1986: 116; 117, top left fig.
Colubrellina (Dulcerana) granularis - HABE, 1964: 76, pl. 24, fig. 5. — WILSON & GILLETT, 1971: 80, pl. 54, figs 7-7 b.
Bursa (Colubrellina) granularia (sic) - RIOS, 1985: 79, pl. 28, fig. 347.
Bursa (Colubrellina) granularis granularis - BEU, 1985: 64. — COSSIGNANI, 1994: 75-77.
Bursa (Colubrellina) granularis - SPRINGSTEEN & LEOBRERA, 1986: 123, pl. 34, figs 2 a-b. — LAI, 1987: 21, figs 7-8.
Bursa (Collubrellina) granulare - SKWARKO & SUFIATI, 1994: n3.
Bursa (Bufonariella) granularis - BOSCH *et al.*, 1995: 102, fig. 373.
Dulcerana jabick - IREDALE, 1931: 213.
Dulcerona (sic) jabick - COTTON, 1945: 261.
Colubrellina jabick - OYAMA & TAKEMURA, 1960: *Colubrellina* figs 3-4.
Ranella granifera - LAMARCK, 1822: 153. — KIENER, 1841: 16, pl. 11, fig. 1. — DESHAYES, 1843: 548. — MENKE, 1843: 24. — REEVE, 1844b: pl. 6, fig. 30. — KRAUSS, 1848: 113. — KÜSTER & KOBELT, 1871: 143, pl. 39, fig. 1. — KOBELT, 1876a: 51; 1876b: 329; 1876 [in

1876-78]: pl. 10, fig. 7. — ANGAS, 1877: 180. — SCHMELTZ, 1877: 81. — BRAZIER, 1879: 186. — SMITH, 1891: 413. — VAN DER VLERK, 1931: 240.
Tritonium graniferum - QUOY & GAIMARD, 1835: pl. 40, figs 21-22.
Ranella (Lampas) granifera - TRYON, 1880: 41, pl. 22, figs 35-37. — WATSON, 1886: 399.
Bursa (Colubrellina) granifera - SCHEPMAN, 1909: 119.
Bursa granifera - HEDLEY, 1918b: M67.
Ranella affinis - G.B. SOWERBY II, 1835: pl. 89, fig. 12. — REEVE, 1844b: pl. 4, fig. 19. — PEASE, 1868: 107. — KÜSTER & KOBELT, 1871: 142, pl. 38a, fig. 5. — KOBELT, 1876b: 329. — ANGAS, 1877: 180. — SCHMELTZ, 1877: 81. — MARTIN, 1899: 147. — HEDLEY, 1902: 26. — MARTIN, 1919: 88, 130. — TESCH, 1920: 42, pl. 129, fig. 154. — VAN DER VLERK, 1931: 240.
Ranella (Lampas) affinis - TRYON, 1880: 42, pl. 22, figs 38-41.
Gyrineum affine - HEDLEY, 1899: 457. — SCHEPMAN, 1907: 182.
Bursa affinis - EDMONDSON, 1946: 143, fig. 61i.
Ranella livida - REEVE, 1844d: 138. — KRAUSS, 1848: 113. — KOBELT, 1876b: 329.
Ranella cubaniana - KOBELT, 1876b: 328.
Gyrineum affine var. *cubanianum* - DALL, 1889: 224.
Bursa cubaniana - ABBOTT, 1958: 57, fig. 2, pl. 1, fig. k. — WARMKE & ABBOTT, 1961: 103, pl. 18, fig. i.
Bursa cubaniana intermedia - NOWELL-USTICKE, 1969: 15, pl. 3, fig. 634.
Bursa granularis cubaniana - ABBOTT, 1974: 167, pl. 7, fig. 1781 (as *B. granularis* in pl. caption). — FINLAY, 1978: 149. — BANDEL, 1984: 102, pl. 10, figs 3, 8.
Bursa (Colubrellina) granularis cubaniana - BEU, 1985: 64. — COSSIGNANI, 1994: 78.
Bursa cumingiana - DUNKER, 1864: 59, pl. 19, figs 7-8. — KOBELT, 1876b: 329.
Ranella semigranosa - REEVE, 1844b: pl. 6, fig. 25. — KRAUSS, 1848: 113.
Colubrellina semigranosa - OYAMA & TAKEMURA, 1960: *Colubrellina* fig. 5-7.
Bursa subgranosa - COOKE, 1916: 8.
Dulcerana versigranulata (*sic*) - JACKSON, 1952: 46.
Colubrellina corrugata - OYAMA & TAKEMURA, 1960: *Colubrellina* fig. 1,2.
Bursa corrugata lineata - NOWELL-USTICKE, 1969: 14, pl. 3, fig. 632; 1971: 11, pl. 2, fig. 632.

TYPE DATA. — *Ranella granifera*: 4 syntypes MHNG (1 MHNG 1098/84 from "Mer Rouge"; 3 MHNG 1098/85, no locality). The type locality is here designated as the Red Sea. The largest and most finely sculptured of the latter three syntypes, MHNG 1098/85/1, is the best match for the drawing in LAMARCK (1816: pl. 414, fig. 4) and is here designated the lectotype of *Ranella granifera*; it is also here designated the neotype of *Tritonium granulare*, of *Tritonium jabick*, and of *Biplex rubicola*. — *Ranella affinis*: 3 syntypes BMNH 1950.11.28.4-6, from "Annaa, Pacific Ocean", *ex* Cuming Colln. These are three very large specimens of *B. granularis*; the smallest, figured by REEVE (1844a: pl. 4, fig. 19) is here designated the lectotype. — *Ranella cubaniana*: holotype BMNH 1854.10.4.412, from "Ste Lucie", a worn and damaged specimen of the Caribbean form of *B. granularis*. — *Ranella livida*: 3 syntypes BMNH 1967657, also from "Island of Annaa" and from the Cuming Colln; these are three coarsely sculptured specimens of *B. granularis*. The largest, REEVE's (1844a) figured syntype (identified by "c" inside the aperture) is here designated the lectotype. — *Bursa cumingiana*: 2 syntypes BMNH 1968530, from "New Caledonia", *ex* Cuming Colln. These are 2 short specimens of *B. granularis* whose columellae have been excavated by hermit crabs. The larger, figured syntype is here designated the lectotype. — *Bursa alfredensis* and *Bursa kowiensis*: types presumably in the collection from Port Alfred presented to the Oxford University Museum by Turton (TURTON, 1932). — *Bursa corrugata lineata*: holotype AMNH 195427, from "Krause's Lagoon, St. Croix, Virgin Islands", a small specimen of the *cubaniana* form of *B. granularis*. — *Bursa cubaniana intermedia*: type not labelled, so not recognised with certainty in Nowell-Usticke's Colln (in AMNH); nearest to NOWELL-USTICKE's (1959, pl. 3, fig. 13) figure is one in AMNH 190490 (labelled "*Bursa lineata*"), with two specimens of *B. corrugata*, from "Puerto Rico". Nowell-Usticke was clearly confused about these forms and the differences between *B. granularis* and *B. corrugata*, and in his third booklet (NOWELL-USTICKE, 1971: 11, pl. 2, no. 632) figured his former *intermedia* as *lineata*. FABER (1988: 81) also noted "type lost", and pointed out that a specimen (AMNH 198478) labelled as the neotype of *Bursa cubaniana intermedia* has no status as a type.

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. P15. — CORAIL 2: sta. DW8.
New Caledonia. LAGON: sta. 16, 79, 82, 101bis, 124, 161, 171, 200, 217, 272, 277, 283, 339, 342, 391, 452, 480, 483, 521, 546, 550, 551, 561, 592, 606, 607, 619, 623, 641, 662, 663, 692, 712, 735, 760, 766, 772 (Figs 48 a-e), 801, 850, 876, 912, 923, 1088, 1190. — EXPÉDITION MONTROUZIER: sta. 1237, 1240, 1241, 1242, 1245, 1246, 1252, 1259, 1266, 1268, 1270, 1277, 1279, 1282, 1284, 1285, 1286, 1287, 1289, 1291, 1299, 1301, 1303 (Fig. 58 d), 1304, 1307, 1310, 1312, 1315, 1316, 1318, 1323, 1330. — LAGON DE NOUMÉA: sta. 1351, 1352, 1354, 1356.
Loyalty Ridge. MUSORSTOM 6: sta. DW431, DW432, DW434.
These 85 samples were taken from the intertidal zone to 130 m, but only one was deeper than 70 m; live specimens were collected in 0-52 m, but few alive below 15 m and most alive in the intertidal zone.

DISTRIBUTION. — *Bursa granularis* is the most abundant and widely distributed of all Bursidae; *B. rhodostoma* has a similar range, but is not known from the eastern Pacific and is considerably less common. *B. granularis* occurs from Jeffreys Bay, South Africa (KILBURN & RIPPEY, 1982: 73), throughout East Africa and the Red Sea to the northern Indian Ocean, in the western Pacific from southern Japan (to Kii Peninsula, Honshu; HABE, 1964) south to Sydney Harbour, New South Wales, and throughout New Caledonia and Polynesia, to

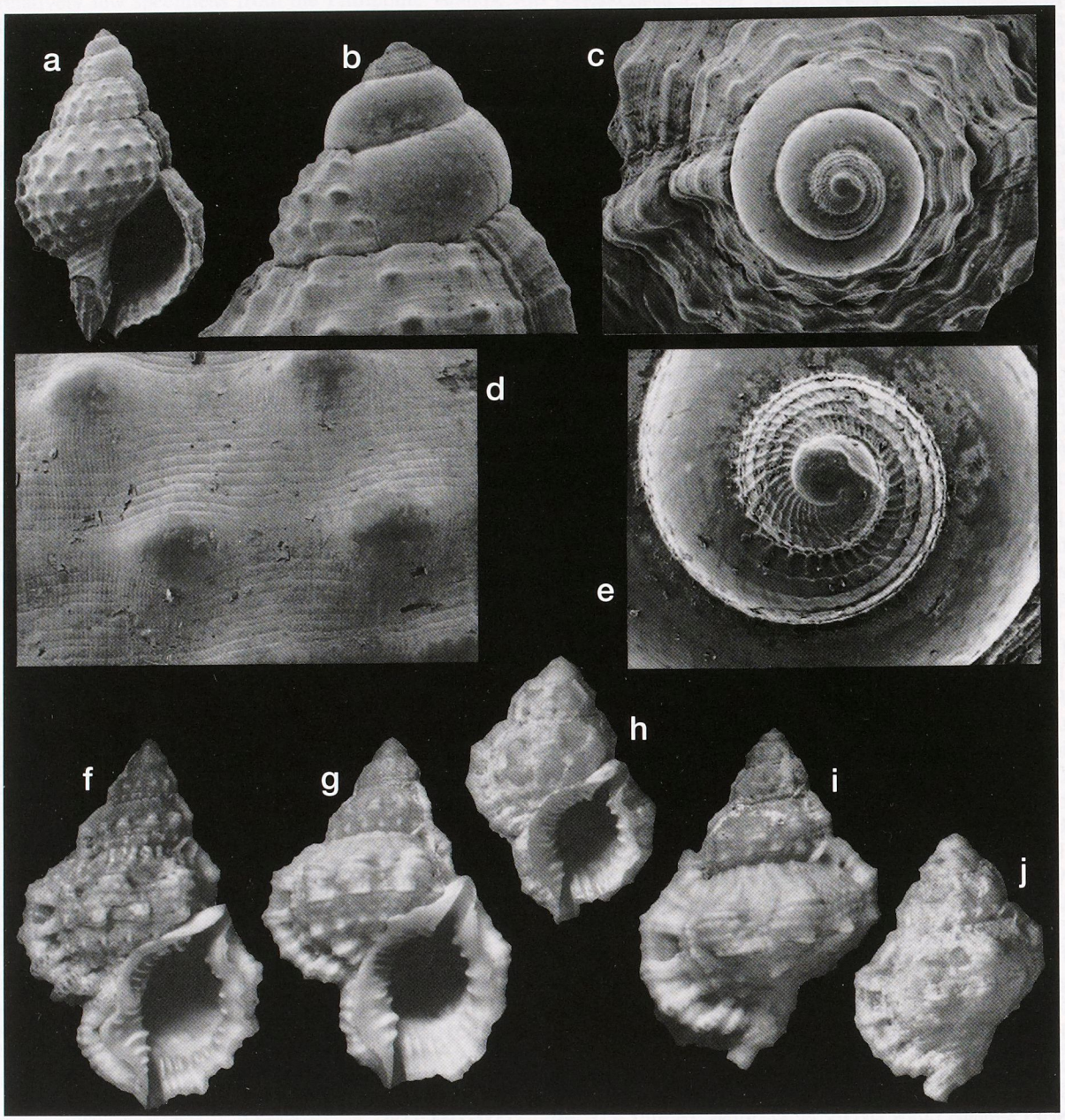

FIG. 48. — *Bursa* species. — **a-e**, *Bursa granularis* (Röding), LAGON: sta. 772, Poindimié, New Caledonia, 30 m; a. x3.8; b-c. x16; d. x26; e. x44. — **f-j**, *Bursa lucaensis* Parth. **f**, unusually large specimen, NZGS WM15024, Mactan I., Cebu, Philippines, x1.5. **g**, **i**, typical Philippines specimen, NZGS WM14525, Mactan I., Cebu, x2.5. **h**, **j**, specimen with almost complete intritacalx, early *"Vauban"*, south of Grand Récif Sud, New Caledonia, 200 m, 5 Nov. 1976, x3.

Hawaii. In the eastern Pacific, particularly large, dramatic specimens are common at Clipperton Island (UCMP 37062, 23 shells) and specimens are recorded by EMERSON (1991: table 1) from the Revillagigedo Islands, Cocos Island, and the mainland coast at Bahia Chamelo, Jalisco, Mexico (LACM 38-6). In the western Atlantic, the poorly differentiated *cubaniana* form is recorded from southeast Florida (ABBOTT, 1974: 167) southwards to Bahia, Brazil (RIOS, 1985: 79). In the eastern Atlantic, the *cubaniana* form is recorded only from the Cape Verde Islands (GARCIA-TALAVERA, 1983: 141).

DIMENSIONS. — *Ranella granifera* (lectotype, also neotype of *Tritonium granulare*): H 54.9, D 30.4. - *Ranella cubaniana* (holotype): H 51.7, D 33.1. - *Ranella affinis* (lectotype): H 62.5, D 35.7; larger paralectotype: H 80.7, D 45.3. - *Ranella livida* (lectotype): H 56.8, D 32.0. - *Bursa cumingiana* (lectotype): H 46.5, D 31.3. - *Bursa corrugata lineata* (holotype): H 25.9, D 16.8. - New Caledonia, LAGON: sta. 16: H 50.8, D 28.6. - LAGON DE NOUMÉA: sta. 1354: H 61.6, D 35.8. Maximum size recorded in New Caledonia 74.2 mm (PRIGENT, 1995: 8).

REMARKS. — *Bursa granularis* is perhaps the most common and variable of all Indo-West Pacific tonnoideans, and also occurs in the Atlantic, so it is not surprising that it has received at least 13 names, and has been referred to in publications hundreds of times. The above synonymy list contains all synonyms I am aware of, but is a very incomplete representation of the innumerable subsequent references.

Although there have been a few published records of this species as a Pliocene and Pleistocene fossil in Indonesia (SKWARKO & SUFIATI, 1994: n3), other records of Miocene to Pleistocene fossils under the name *Bursa* (or *Ranella*) *affinis* and *B. corrugata* almost certainly all refer to *B. granularis*, as I am aware of no authentic western Pacific records of *B. corrugata* [*Ranella affinis* - MARTIN, 1899: 147; 1919: 88, 130; VAN DER VLERK, 1931: 240; *Gyrineum affine* - SCHEPMAN, 1907: 182; *Bursa corrugata* - ALTENA, 1942: 107].

The valid name for the species is slightly in doubt as, when introducing the unavailable and unnecessary generic name *Dulcerana*, IREDALE (1931: 213) made a long, ambiguous statement: "Of the three species classed under *Bursa* by Hedley ... the other one, *granifera* Lamarck, apparently equivalent to *granularis* Bolten [Röding] and *jabick* Bolten [Röding], the latter having priority, is here made the type of a new genus *Dulcerana*". In his list of new taxa at the rear of this paper, IREDALE (1931: 232) listed as type species of *Dulcerana* "type *Ranella granifera* Lamarck", so it is unclear whether he intended to adopt one or the other of Röding's species names. As it stands, Iredale's statement that *jabick* Röding has priority over *granularis* Röding appears almost to have the weight of a first reviser's action, but IREDALE evidently meant it only in the sense of *jabick* coming higher on the same page than *granularis*, as subsequently, in their catalogue of New South Wales Mollusca, IREDALE & MCMICHAEL (1962: 55) used the name *Dulcerana granularis* for this species. The name *Bursa granularis* has been used universally by modern taxonomists, and a change of name at this time would impede nomenclatural stability. As first reviser, I select the name *Tritonium granulare* Röding, 1798, as the name to be used for the species named both *Tritonium granulare* and *Tritonium jabick* by RÖDING (1798: 127). Both illustrations cited by RÖDING (1798: 127) for *T. granulare* (MARTINI, 1780: vol. 4, pl. 127, figs 1226-1227) and for *T. jabick* (same plate, figs 1224-1225) are clear drawings of *Bursa granularis* [= *Ranella granifera* Lamarck, *etc.*] of subsequent authors, and there is no doubt about the synonymy of these two names. PERRY's (1811: pl. 5, fig. 5) drawing for *Biplex rubicola* is also a clear, excellent one of *B. granularis*.

As *Bursa granularis* is extremely variable in spire height, in the prominence of the spiral cords, and in the size of nodules on the cords, as well as in coloration, there is no doubt that *Ranella granifera*, *R. affinis*, *R. livida*, and *Bursa cumingiana* are based on trivial characters of no taxonomic significance. *Bursa alfredensis* and *B. kowiensis* are also based on trivial sculptural variants, *B. kowiensis* being proposed for one of the most extremely smooth, weakly sculptured forms (specimen from Durban sent by R.N. KILBURN, NZGS WM11257). Similarly, NOWELL-USTICKE's (1959: pl. 3, figs 12-13) illustrations of his named forms *lineata* and *intermedia* show that they are based on trivial shape and sculptural variants. However, two forms occurring in part of the range call for special comment.

ABBOTT (1958: 57-59) compared animals of Natal, South Africa and Grand Cayman Island, Caribbean specimens of *Bursa granularis* and, finding small differences, considered *B. cubaniana* to be a distinct Atlantic species. The differences in denticle size and number on the central teeth figured by ABBOTT (1958: figs 1 d, 2 c) are likely to be within the range of variation of one species, as they are less different than the extremes of the range of variation shown by *Cabestana spengleri* in New Zealand (BEU, unpublished). Similarly, the presence or absence of a papilla on the penis tip is likely to be the result of preservational differences, and needs re-examination in living material. The one difference that is not easily explained away is the greatly larger odontophore and radula of

Atlantic than of Natal specimens ("2 to 2.5 times as large"; ABBOTT, 1958: 59) and this, also, deserves study from many more specimens. Of the 13 Atlantic specimens in NZGS, nearly all do not display the character of fine axial threads on early teleoconch whorls, listed by ABBOTT (1958) as a distinguishing criterion of Atlantic shells; one live-collected specimen has fine axials, as do a few live-collected Pacific specimens. Similarly, the uppermost low, wide nodule inside the outer lip bearing three transverse ridges ("a grouping of 3 teeth on the upper lip"; ABBOTT, 1958: 59) is inconsistent, as smaller Atlantic specimens have only two ridges, and larger Indo-West Pacific ones all have three. LEAL (1991, pl. 16, figs C-D) published good SEM micrographs of the protoconch of *B. granularis* from Fernando de Noronha I., Brazil, showing no differences from protoconchs of Pacific specimens. The Atlantic specimens I have seen all have a consistent colour pattern, a moderately dark tan background (highly variable in tone between specimens), with a paler (cream on most specimens) diffuse peribasal band and dorsum of the anterior canal, with varices darker brown than the background but banded with cream at the three points where they are crossed by the major spiral cords. The coloration of Indo-West Pacific specimens is more variable, from uniform near-white to uniform dark brown through a large range of banding and streaking patterns; specimens with the "Atlantic" colour pattern have been seen from Grand Récif de Tuléar, Madagascar; Horseshoe Reef, Okinawa; Tuamotu Islands; and Hawaii. So, although the Atlantic form *cubaniana* is barely distinguishable from Indo-West Pacific specimens, there are some grounds for maintaining it as a separate taxon, and the radula size difference pointed out by ABBOTT (1958) deserve further study. Such situations require anatomical or genetic analysis before they can be evaluated fully, and at present the *cubaniana* form seems best regarded as part of the variation of a single widespread taxon, *B. granularis*.

The other taxonomic uncertainty with *Bursa granularis* is the specimens from southern Western Australia illustrated by BOZZETTI (1991) as "*Bursa* cf. *nodosa* (Borson)", and by WILSON (1993: pl. 43, fig. 12) as "*Bursa granularis "affinis"* form". BOZZETTI (1991) pointed out that these specimens closely resemble *B. nodosa* (Italian Miocene and Pliocene) in shape and in having three rows of large, rounded nodules on the last whorl. However, Western Australian specimens lack the finely gemmate surface of Italian fossils (shown also by their close living relative, the West African *B. scrobilator coriacea* (Reeve, 1844) which, however, has four rows of nodules on the last whorl). The Western Australian specimens are consistently very pale pinkish fawn in colour, and only a small proportion of specimens have nodules as large as those illustrated by BOZZETTI; most have a weakly nodulous or an almost smooth surface. However, the first teleoconch whorl or two of all specimens is brown and is sculptured as in normal *B. granularis*. Also, while the most extreme specimens come from southern Western Australia, from Fremantle south to Margaret River and Cape Leeuwin, specimens from further north up the coast intergrade with *B. granularis*. The more northern specimens may be darker in colour (*e.g.* NZGS WM11251, Carnac Island), or in the case of two specimens from Ningaloo Station, northern Western Australia (NZGS WM10832) may be pale pinkish fawn in colour but have sculpture intermediate between the extreme southern specimens and more normal *B. granularis*. Thus, it appears that the Western Australian form is a geographically restricted variant of *B. granularis*. Whether this is a separate taxon or simply to be included in *B. granularis* will depend on the results of anatomical and genetic studies. However, it is interesting in showing an apparently closer relationship between *B. granularis* and the Mediterranean *B. scrobilator* complex than could have been inferred from the shell morphology of normal *B. granularis* populations.

A final taxonomic point is the identity of *Bursa semigranosa* (Lamarck, 1816). Most early post-Lamarckian authors interpreted this name as applying to the weakly sculptured form of *B. granularis* that has also been named *B. kowiensis* by TURTON (1932) (*e.g.* REEVE 1844b: pl. 6, fig. 25; KOBELT, 1876b: 329); these workers thought KIENER (1841: 19, pl. 11, fig. 2) had wrongly illustrated a form of *B. corrugata* (Perry, 1811) as *B. semigranosa*. However, as I have noted previously (BEU, 1987: 249), KIENER's figured ranellids and bursids are mostly from among LAMARCK's type specimens, and are useful for giving a far better idea of these specimens than, for example, the illustrations (in many cases of the very same specimens) in "Tableau Encyclopédique" (LAMARCK, 1816). LAMARCK's syntypes of *Ranella semigranosa* (MHNG.1098/86) are two specimens of a rather weakly sculptured form of *Bursa corrugata*, labelled "Amer. centr.", but whether they represent the eastern Pacific form or the western Atlantic form is not determinable. The syntype figured by KIENER was illustrated again by COSSIGNANI (1994: 77, top left 2 figs); this specimen (MHNG 1098/86/2) is here designated the lectotype of *Ranella semigranosa*. The relevant point here is that *Ranella semigranosa* is not a synonym of *B. granularis*.

Bursa granularis is easily recognised by its unusually tall and narrow shape for a bursid, and by its thin shell, giving it an overall appearance more nearly resembling that of *Cymatium* than is usual for bursids. All specimens have three major spiral cords on the last whorl, forming nodules on the varices, and most have small to large, prominent nodules on the main cords (a few lack nodules). The width of the varices and the protrusion of the nodules on the varices are highly variable. The abapertural face of each varix is deeply excavated, and so is

buttressed by the spiral cords. The aperture is well rounded, because of an excavated columella, and the lightly flared lips are prominently ridged. In many specimens the aperture is a similar colour to the rest of the teleoconch. The protoconch is of the most common type in *Bursa*, of 2.5 whorls, rather tall turbiniform with weakly impressed sutures, with an initial finely reticulate protoconch I of 0.5 whorl, and with cancellate sculpture on the first whorl of protoconch II.

Bursa lamarckii (Deshayes, 1853)

Figs 49 a-e, 58 f

Ranella lamarkii (*sic*) Deshayes, 1853, "Explications des planches": 67, pl. 112, figs 1-2.
Bursa muehlhaeusseri Parth, 1990: 217, figs 1 a, 2 a, 3.
Bursa angioyorum Parth, 1990: 220, figs 1 b, 2 b, 4.

Bursa lamarckii - BEU, 1985: 63, fig. 40. — SPRINGSTEEN & LEOBRERA, 1986: 120, pl. 33, fig. 2. — LAI, 1987: 20, fig. 5. — WILSON, 1993: 227, pl. 43, figs 7 a-b. — COSSIGNANI, 1994: 49, illus. — BEU, 1997: 150.
Bursa bufonia - OYAMA & TAKEMURA, 1963: *Bursa* pl., fig. 9. — SHIKAMA, 1963: 64, pl. 49, fig. 1.
Ranella bufonia var. b - REEVE, 1844b: pl. 5, fig. 23 a.
Bursa venustula - HABE & KOSUGE, 1966a: 45, pl. 16, fig. 4.
Bursa muehlhaeusseri - COSSIGNANI, 1994: 42, illus.
Bursa angioyorum - COSSIGNANI, 1994: 54, 55, illus.
Bursa species - CERNOHORSKY, 1967a: 316, pl. 42, fig. 2; 1967b: 46, pl. 1, fig. 2. — HINTON, 1972: 12, pl. 6, fig. 24; 1978: pl. 32, fig. 2.

TYPE DATA. — No specimens in MNHN are identified as Deshayes's type(s) of *Ranella lamarckii*, and no specimen in the collection closely resembles Deshayes's figure. Neither has it been recognized by Dr A. Prieur, curator of paleontology at Centre des Sciences de la Terre, Université Claude Bernard, Lyon, where the former collection of Ecole des Mines has been transfered. The whereabouts of any original material is therefore unknown. REEVE (1844b: caption to pl. 5, fig. 23 a) illustrated this species very clearly, as "*Ranella bufonia* variety b", and stated that, although DESHAYES (1843: 546) had proposed to separate this form from *R. bufonia*, he thought earlier authors were correct to treat it as part of the variation of *R. bufonia*. The specimen illustrated by REEVE (1844b: pl. 5, fig. 23 a) is from "Island of Capul, Philippines (found under coral at low water)" and is from the Cuming Colln. This specimen, BMNH 1995224/1, is here designated the neotype of *Ranella lamarckii*. REEVE's figured specimen (Figs 49 b, e) is accompanied by two smaller specimens (BMNH 1995224/2-3). REEVE (1844b) stated that the figured specimen was from the Jane Saul Collection, but this is incorrect. — *Bursa muehlhaeusseri* and *B. angioyorum*: holotypes both from Cebu, Philippines, in Zoologischen Staatssammlung, München; paratypes of both in Colln M. Parth (PARTH, 1990).

NEW CALEDONIA RECORDS. — **New Caledonia.** EXPÉDITION MONTROUZIER: sta. 1270 (Fig. 58 f).

OTHER MATERIAL EXAMINED. — **French Polynesia.** Tahuata I., 09°54.5' S, 139°07.9' W, 190 m, coll. J. Poupin-SMCB (1 MNHN).

DISTRIBUTION. — Throughout the tropical Indo-West Pacific, from Madagascar (NZGS WM12478, Tuléar) and presumably East Africa to the Red Sea (2 lots NZGS), and from the southern Great Barrier Reef, eastern Australia (NZGS WM11634, One Tree I., Capricorn Group) to at least as far north as Okinawa (OYAMA & TAKEMURA, 1963: *Bursa* pl., fig. 9), the Solomon Islands (NZGS, 2 lots), and east to French Polynesia (newly reported here).

DIMENSIONS. — *Ranella lamarckii* (neotype): H 56.7, D 42.5. - New Caledonia, EXPÉDITION MONTROUZIER: sta. 1270: H 54.2, D 42.2. - Mactan Cebu, typical large Philippines specimen, NZGS WM15125: H 62.5, D 45.4.

REMARKS. — Although *Bursa lamarckii* is a reasonably common species throughout the western Pacific archipelagoes, from the Great Barrier Reef to Okinawa, confusion has reigned over its name. It was confused with *B. bufonia* (a larger species with a white to cream aperture) by OYAMA & TAKEMURA (1963) and SHIKAMA (1963), as well as in some early iconographies. It was identified as *B. venustula* (Reeve, 1844) by HABE & KOSUGE (1966a: 45), but *B. venustula* is a much smaller species (Fig. 52 l) with a rich dark purple aperture, occurring only in eastern Polynesia to my knowledge (CERNOHORSKY, 1967a: 315). The syntypes of *B. venustula* were illustrated excellently in colour by COSSIGNANI (1994: 62). Other workers have regarded *B. lamarckii* as possibly an unnamed species (CERNOHORSKY, 1967a, 1967b; HINTON 1972, 1978). As pointed out by BEU

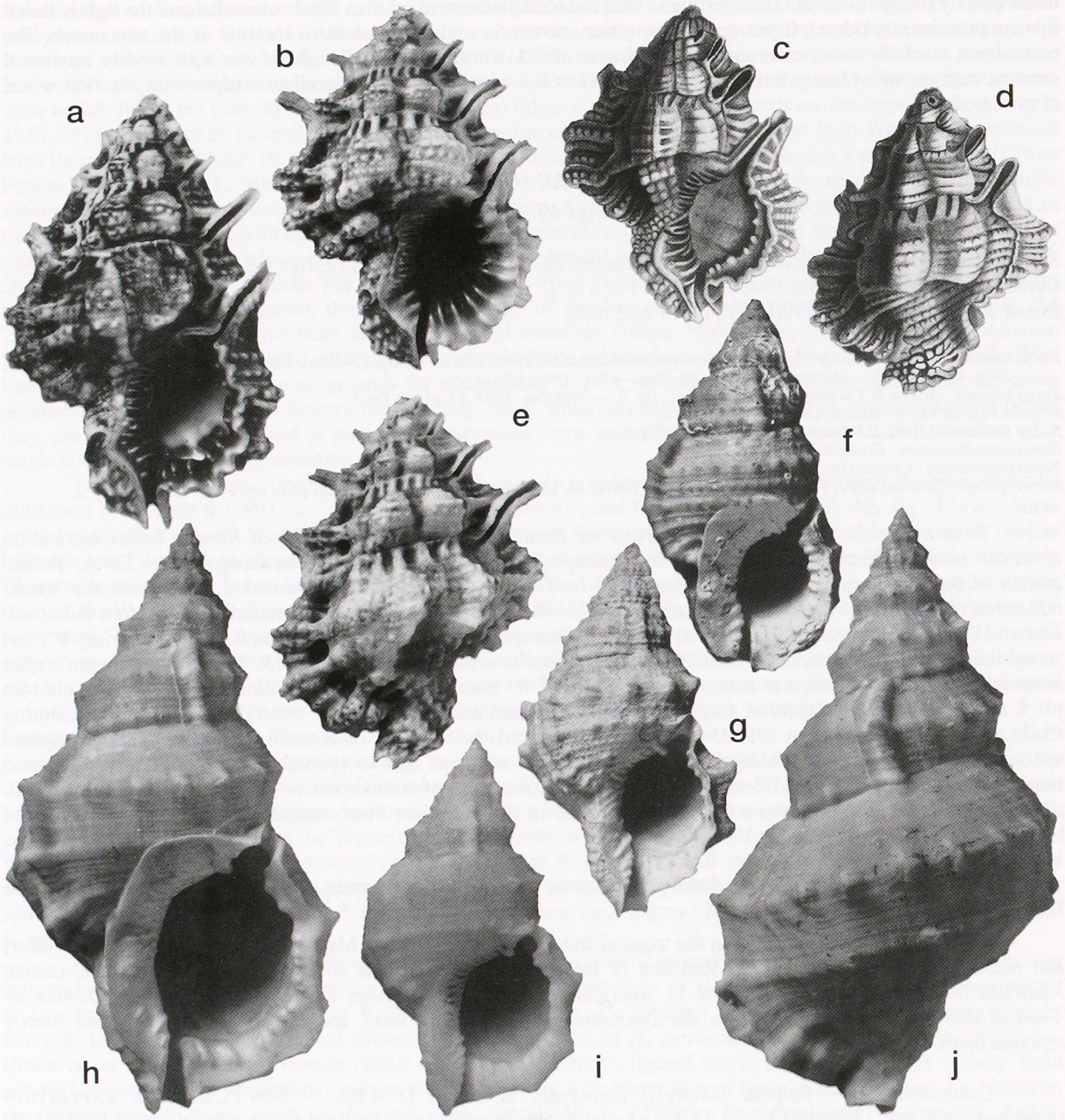

FIG. 49. — *Bursa* species. — **a-e**, *Bursa lamarckii* (Deshayes), all x1. **a**, typical large Philippines specimen; Mactan I., Cebu, F.J. Springsteen Colln. **b**, **e**, neotype of *Ranella lamarckii* Deshayes, BMNH 1995224/1, "Isle of Capul, Philippines", *ex* Cuming Colln. **c**, **d**, copy (inverted) of original figures in DESHAYES (1853: 67, pl. 112, figs 1-2). — **f-g.** *Bursa ranelloides* (Reeve), Indian Ocean, in MNHN. **f**, BENTHEDI: sta. 49, west of Passe Boueni, Mayotte I., Comores Islands, 300-450 m, x1. **g**, MD32/RÉUNION: sta. DC128, off Réunion, 280-340 m, x1.5. — **h-j**, *Bursa latitudo* Garrard, Queensland, eastern Australia; x1. **h**, **j**, holotype, F21111, Museum of Victoria, trawled, 250 m, off Moreton I. **i**, NE of Cape Moreton, trawled, 219 m, Thora Whitehead Colln.

(1997), the reason for the confusion is that DESHAYES's (1853: 67, pl. 112, figs 1-2) illustration and caption for this species were published in his rare, unfinished textbook, "Traité élémentaire de conchyliologie", and therefore have been seen by few taxonomists. The illustrations are excellent but slightly stylised, coloured drawings, and leave no doubt of the species intended (Figs 49 c-d). COX (1942) discussed the dates of publication of this work; the relevant page of the "Explications des planches" was published in 1853.

Although DESHAYES (1853) spelled the name "lamarkii", in both French and Latin, there can be no doubt that it was intended to honour his illustrious predecessor in the Paris Museum, J.B.P.A. de M. de Lamarck, and the correct spelling should be adopted following ICZN Article 32d. Several other generic and specific names are incorrectly spelled in Deshayes's "Explications des planches" (*e.g.*, *Aphysia* for *Aplysia*, p. 59; *Nerita pelerouta* for *N. peloronta*, p. x) and *lamarkii* appears to be one of several typographical errors.

The most obvious and distinctive character of *Bursa lamarckii* is its dark brown to black aperture, with numerous pale brown transverse ridges on both the inner and outer lips. Other significant characters are its moderately tall spire, its long, only narrowly open, tubular posterior canals, and the distinctive sculpture of two or three large, rounded to angular or almost square nodules at the periphery in each intervariceal interval, the whole surface crossed by several low, narrow, finely nodulous spiral cords. Although the most common form has a distinctive coloration of dark brown varices, base and anterior canal, bearing numerous white spots, and prominent dark brown axial flames between the large, pale brown to cream peripheral nodules, this coloration intergrades, through a range of browns, with the more uniformly pale brown form named *B. angioyorum* by PARTH (1990: 220), and also with the small, square-noduled, rather uniformly pale brown form named *B. muehlhaeusseri* by PARTH (1990: 217). In my opinion, the lack of any consistent apertural characters distinguishing these three forms indicates they are part of the variation of one species.

Bursa latitudo Garrard, 1961

Figs 47 a, c, 49 h-j, 50 a-h, 51 a-f, 58 g

Bursa latitudo Garrard, 1961: 15, pl. 2, fig. 2.
Bursa (Bufonariella) latitudo wolfei Beu, 1981: 289, figs 17 a-f.

Bursa lampas - TINKER, 1952: 98-99, centre fig.
Bursa finlayi - WOLFE, 1975b: 12, figs 1-2.
Bursa latitudo - KAY, 1979: 227, fig. 80 H. — PARTH, 1991c: 209. — WILSON, 1993: 227, pl. 43, fig. 13.
Bursa (Bufonariella) latitudo latitudo - BEU, 1981: 287, figs 16 g-i.
Bursa (Colubrellina) latitudo latitudo - BEU, 1985: 64. — COSSIGNANI, 1994: 80.
Bursa (Colubrellina) latitudo wolfei - BEU, 1985: 64. — COSSIGNANI, 1994: 83-84.
Bursa nigrita - WELLS *et al.*, 1990: 40, pl. 19, fig. 123.

TYPE DATA. — *Bursa latitudo*: holotype, Museum of Victoria, Melbourne, F21111, trawled off Moreton Island, southern Queensland, in 230 m (Figs 49 h, j); paratype AMS C63353 [a badly damaged specimen of *Ranella australasia* (Perry, 1811)], from the same locality as the holotype. — *Bursa latitudo wolfei*: holotype BPBM 8936, from crab trap in 58 m, off Makahu, Hawaii; 2 paratypes, off Kahuku, 120 m, Oahu, Hawaii (1 in C.S. Wolfe Colln, 1 in S. Handrahan Colln); paratype, off Haleiwa, 120 m, Oahu, Hawaii, in C.S. Wolfe Colln; paratype, off Nanakuli, Oahu, Hawaii, in Honolulu Aquarium Colln.

NEW CALEDONIA RECORDS. — **Coral Sea.** MUSORSTOM 5: sta. 294, 299.
New Caledonia. LAGON: sta. 497. — BATHUS 1: sta. DW654, CP669. — Off Le Leizour, 100 m, in traps (Fig. 51 d).
North of New Caledonia. MUSORSTOM 4: sta. DW164, CC175. — BATHUS 4: sta. DW925. — HALICAL 1: sta. DW02.
Norfolk Ridge. *"Vauban"*: Pte. Sud du Grand Récif, drague 300 m, 4 Nov. 1976. — *"Vauban"* 1978-79: sta. 15 (Fig. 50 b). — BIOCAL: sta. DW64, DW65, CP105 (Figs 47 c, 50 d). — MUSORSTOM 4: sta. DW212 (Fig. 50 e), DW222. — CHALCAL 2: sta. CH3, CH4, CH5, CP19, CP20, CP27, DW69, DW70, DW71, DW79. — SMIB 3: sta. DW8, DW9, DW10, DW14, DW18, DW20, DW29 (Fig. 47 a). — SMIB 4: sta. DW40, DW41, DW42, DW43, DW44, DW45, DW46, DW47, DW49, DW50, DW53, DW56. — SMIB 5: sta. DW70, DW71, DW72, DW73, DW74, DW75, DW76, DW77, DW85, DW87, DW88, DW91, DW92, DW93, DW94, DW97, DW101. — SMIB 8: sta. DW147, DW154, DW155, DW157, DW158, DW159, DW160, DW161, DW162, DW163, DW165, DW170-172, DW173, DW174, DW177, DW181, DW182, DW183, DW184, DW182-184, DW185, DW187, DW197-199. — SMIB 10: sta. DW203, DW207, DW208, DW210. — BERYX 11: sta. DW11, CH15, CP16, DW18, CP23, CP25, DW40. — BATHUS 2: sta. DW730. — BATHUS 3: sta. CP804, CP805, DW830.
Loyalty Ridge. MUSORSTOM 6: sta. DW399, DW407, DW418, DW422 (Fig. 50 a), DW478, DW480, DW487. — CALSUB: dive 5 (Fig. 50 c). — VOLSMAR: sta. DW41 (Fig. 58 g).
These 107 lots were taken in 100 to 660 m, but only 3 samples were taken in less than 230 m.

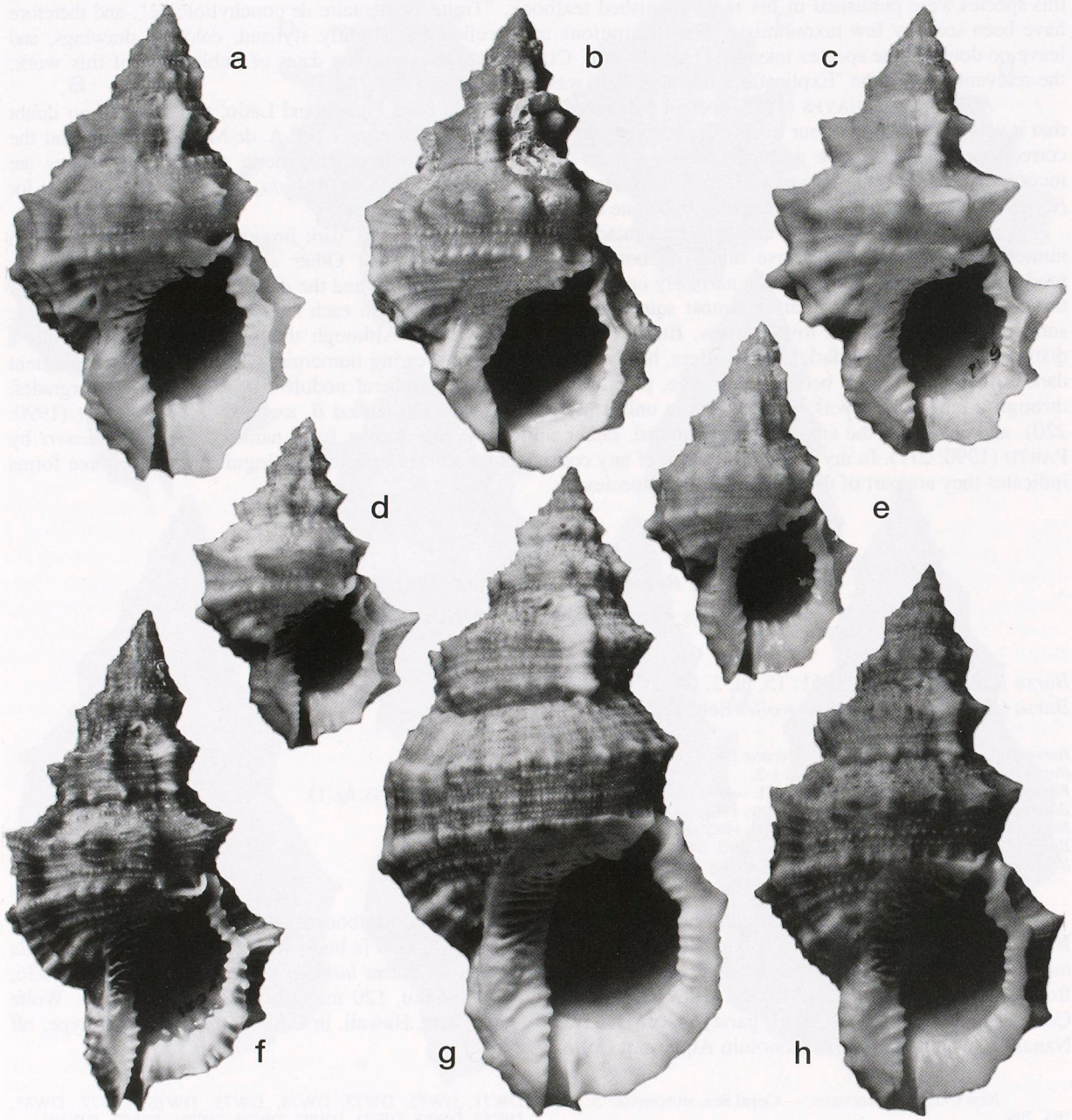

FIG. 50. — *Bursa latitudo* Garrard, all x1. — **a**, MUSORSTOM 6: sta. DW422, Loyalty Ridge, New Caledonia, 257 m. — **b**, *"Vauban"* 1978-79: sta. 15, southern New Caledonia, 390-395 m (with severely broken and partially regrown aperture). — **c**, CALSUB 1989, *Cyana* dive 5A, West of Lifou, Loyalty Islands, 954-150 m. — **d**, BIOCAL: sta. CP105, New Caledonia, 330-335 m (typical of the large number of small specimens from the New Caledonian region). — **e**, MUSORSTOM 4: sta. DW212, Norfolk Ridge, 375-380 m. — **f**, NZGS WM15340, off Bohol I., Philippines. — **g-h**, crab traps at 300-400 m, off Oahu, Hawaii, Abbey Shells Colln (from the type locality of *B. latitudo wolfei* Beu).

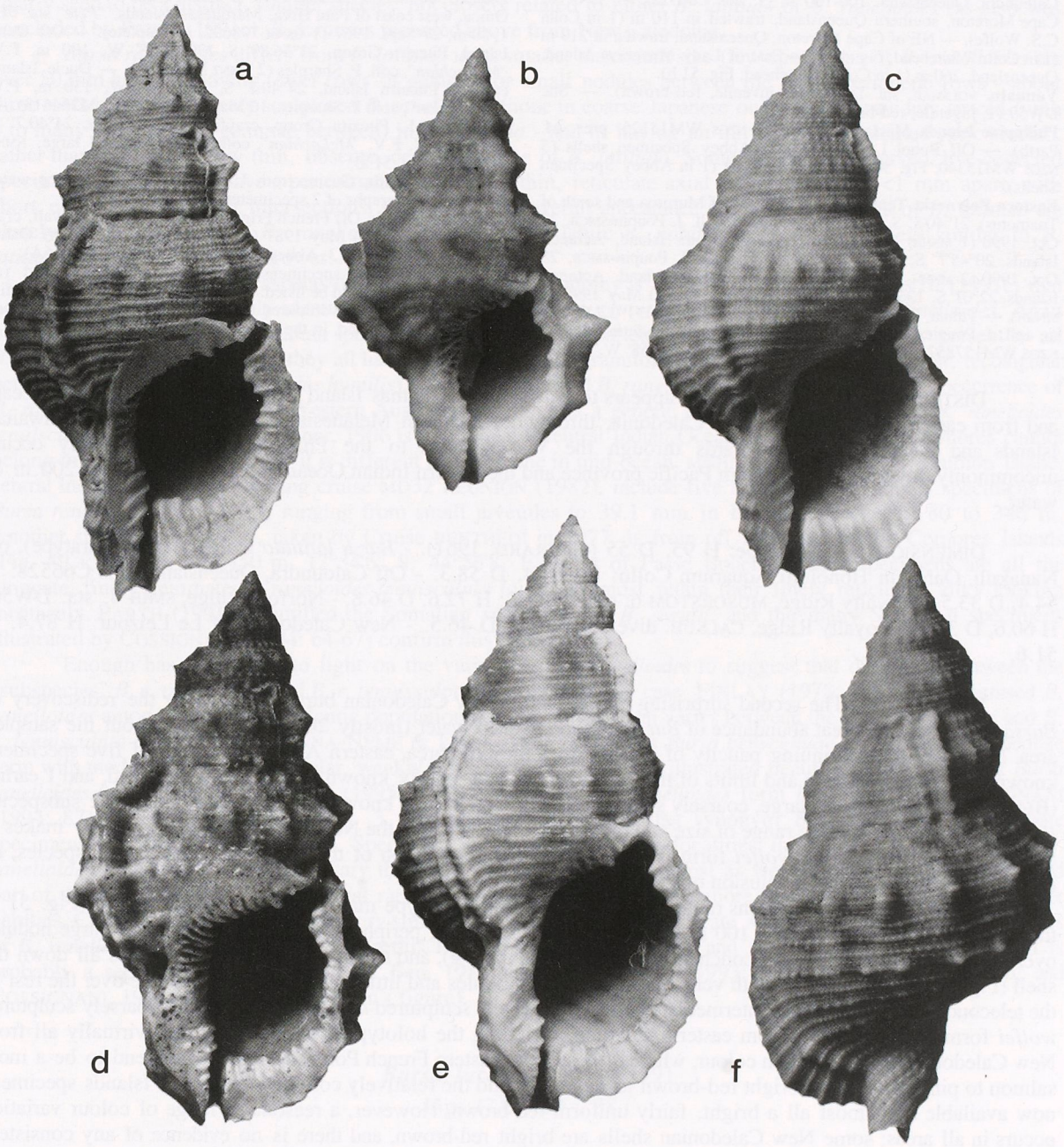

FIG. 51. — *Bursa latitudo* Garrard, all x1. — **a**, NMNZ M264618, 130 m, off Ducie I., near Pitcairn. — **b**, east of Lady Musgrave I., Queensland, Australia, 260 m, Thora Whitehead Colln. — **c**, **f**, MNHN, Tematangi I., eastern French Polynesia, 500 m. — **d**, MNHN, off Le Leizour, New Caledonia, 100 m. — **e**, MNHN, off Moorea, Society Islands, French Polynesia, 500 m, Coll. Plessis.

OTHER MATERIAL EXAMINED. — **Eastern Australia.** Off Caloundra, Queensland, 100-130 m (1 AMS C66528). — ENE of Cape Moreton, southern Queensland, trawled in 110 m (1 in Colln C.S. Wolfe). — NE of Cape Moreton, Queensland, trawled in 219 m (1 in Colln Whitehead; Fig. 49 i). — East of Lady Musgrave Island, Queensland, 260 m (1 in Colln Whitehead; Fig. 51 b).
Vanuatu. VOLSMAR: sta. DW50 (1, juvenile, red-brown). — Sta. DW59 (1, juvenile, red-brown).
Philippine Islands. Mactan I., Cebu (1 NZGS WM15126, pres. M. Parth). — Off Bohol I, "deep-water", Abbey Specimen shells (3 NZGS WM15340; Fig. 50 f). — Data as last (1 in Abbey Specimen Shells).
Eastern Polynesia. Tematangi Island (west of Mururoa and south of Tuamotus), 21°40'8" S, 140°30'6" W, 500 m, coll. J. Poupin-SMCB, 27 Oct. 1990 (1 MNHN; Figs 51 c, f). — Vanavana Island, Actaeon Islands, 20°45'7" S, 139°10'1" W, 240 m, coll. J. Poupin-SMCB, 28 Oct. 1990 (2 MNHN, 1 NZGS WM15563). — Maria Island, Actaeon Islands, 22°01' S, 136°12' W, coll. J. Poupin-SMCB, 30 May 1990 (1 MNHN). — Tuhiai, Rurutu I., Austral Islands, 22°29' S, 151°22' W 125 m, coll. J. Poupin-SMCB, 27 Nov. 1990 (6 MNHN, medium-sized; 1 NZGS WM157857). — Mururoa Island, 21°51' S, 138°58' W, coll. J. Poupin-SMCB, 15 May 1990 (1 MNHN). — Off Moorea I., Society Islands, 500 m, coll. Plessis, 1979 (1 MNHN; Fig. 51 e). — Off Baie Omoa, west coast of Fatu Hiva, Marquesas Islands, *"Pele"* sta. FH-1, 80 m, 27 Sept. 1967 (1 USNM 798692, incomplete). — Off Oeno Island, Pitcairn Group, 23°56.89' S, 130°44.78' W, 100 m, F.V. *"McLachlan"*, coll. P. Sharples (2 NMNZ M270533). — Ducie Island, east of Pitcairn Island, 24°40.7' S, 124°48.3' W, 130 m, F.V. *"McLachlan"*, coll. P. Sharples, 10 May 1994 (1 NMNZ M264618). — Off Ducie I., Pitcairn Group, crayfish pots, 130 m, 24°40.7' S, 124°48.3' W, F.V. *"McLachlan"*, coll. P. Sharples (17 large, NMNZ M264618; Fig. 51 a).
Marianas Islands. Guam, from University of Guam deep-water samples, photographs of 2 specimens sent by R. Salisbury.
Hawaiian Islands. Off French Frigate Shoals, northern Hawaii, crab trap, 150-200 m, 14 May 1987 (1 NZGS WM15000). — Off Oahu, crab trap, 150-200 m (3, Abbey Specimens Shells no. 87-036A).
In addition to these specimens, a reliable published record (as *"Bursa nigrita"*) should be listed: WELLS *et al.* (1990: 40, pl. 19, fig. 123) gave an excellent coloured figure of a specimen of *B. latitudo* from Christmas Island, in the eastern Indian Ocean.

DISTRIBUTION. — *Bursa latitudo* appears to range from Christmas Island in the northeastern Indian Ocean, and from eastern Australia and New Caledonia, throughout southern Melanesia and Polynesia to the Hawaiian Islands and Pitcairn, and northwards through the West Pacific to the Philippines. It presumably occurs uncommonly throughout the western Pacific province and the eastern Indian Ocean, mostly in more than 200 m of water.

DIMENSIONS. — Holotype: H 95, D 55 (GARRARD, 1961). - *Bursa latitudo wolfei* (largest paratype), off Nanakuli, Oahu, in Honolulu Aquarium Colln: H 104.4, D 58.3. - Off Caloundra, Queensland, AMS C66528: H 54.4, D 33.5. - Loyalty Ridge, MUSORSTOM 6: sta. DW422: H 72.6, D 46.8. - Norfolk Ridge, SMIB 4: sta. DW56: H 60.6, D 38.7. - Loyalty Ridge, CALSUB: dive 5: H 70.4, D 46.5. - New Caledonia, off Le Leizour: H 87.4, D 51.6.

REMARKS. — The second surprising aspect of the New Caledonian bursid fauna, after the rediscovery of *Bursa fijiensis*, is the great abundance of *Bursa latitudo* in deep water (mostly 200-660 m) throughout the sampled area. In view of the continuing paucity of records from the type area, eastern Australia (a total of five specimens known to me) the variation and limits of the species have been poorly known since it was described, and I earlier (BEU, 1981: 289) named a large, coarsely sculptured form, at that time known only from Hawaii, as the subspecies *B. latitudo wolfei.* The huge range of size and of sculptural variation in the New Caledonian material now makes it obvious, however, that the *wolfei* form is simply part of the variation of the single Western Pacific species, *B. latitudo;* this was also the conclusion of PARTH (1991c).

New Caledonian specimens range from ones resembling the type material of *B. latitudo wolfei* (Fig. 51 d; the shallowest record, from only 100 m), through ones with small peripheral nodules but relatively large nodules over most of the rest of the teleoconch surface (Figs 50 a, e; 58 g), and specimens with huge nodules all down the shell (Fig. 50 c), to specimens with very small peripheral nodules and little other than fine gemmae over the rest of the teleconch surface. Most are intermediate between the finely sculptured *latitudo* form and the coarsely sculptured *wolfei* form. All specimens from eastern Australia, including the holotype (Figs 49 h, j), and virtually all from New Caledonia are pale fawn in colour, whereas those from eastern French Polynesia and Hawaii tend to be a more salmon to pink colour with bright red-brown maculations, and the relatively common Philippine Islands specimens now available are almost all a bright, fairly uniform red-brown. However, a reasonable range of colour variation occurs in all areas; some New Caledonian shells are bright red-brown, and there is no evidence of any consistent geographic forms. This is one Western Pacific species, ranging at least to Christmas Island in the eastern Indian Ocean.

The protoconch of *B. latitudo* (Figs 47 a, c) and the similar but narrower, Western Atlantic species *B. natalensis* Coelho & Matthews, 1970 (Fig. 47 d) is large, rather tall and exert, with a weakly impressed suture, producing a three-whorled, rather tall mammillate shape, and characteristically bearing fine but obvious reticulate sculpture on the first whorl of protoconch II; protoconch I is rather small in diameter, producing a narrowly pointed apex. This protoconch is similar to that described above for *B. granularis*, but a little taller and more narrowly pointed; the protoconch is markedly different from that of *B. fijiensis*, which is much shorter, with lower, more inflated whorls and more deeply impressed sutures. Another form originally described as a further form in the

B. latitudo complex, *B. "latitudo" fosteri*, has the low-turbiniform protoconch type as in *B. fijiensis*, and is now clearly seen to be a distinct, smaller species, not closely related to either *B. latitudo* or *B. ranelloides* (as also was concluded by PARTH, 1991c). *B. fosteri* is recorded above from New Caledonia.

Bursa ranelloides differs from *B. latitudo* in its smaller maximum size (few specimens of *B. ranelloides* are over 50 mm high), in having fewer rows of gemmae or small nodules between the major peripheral rows - about three rows in the most finely sculptured *B. ranelloides* (none in coarse Japanese ones), 3 more widely spaced (with 4 to many rows of fine gemmae between) in *B. latitudo* - and in having an intritacalx, or calcified periostracum, rather than merely the very thin, obscure, conchiolin one of *B. latitudo*. Some very well preserved, live-collected specimens of *B. latitudo* have a periostracum with low, thin, reticulate axial and spiral ridges <1 mm apart, with short, erect bristles at their intersections. Otherwise, the overall appearance and red parietal area of *B. latitudo* are closely similar to those of *B. ranelloides*. The western Atlantic *B. natalensis* is, again, closely similar to *B. latitudo*, but still taller and narrower.

A comment on some aspects of *Bursa ranelloides* taxonomy is called for. I agree with PARTH (1991c) that Somalian specimens formerly identified by me as *B. ranelloides humilis* do not belong in *B. ranelloides*. Apart from shell differences (the Somalian specimens all lack any red parietal area, otherwise consistently present in all *B. ranelloides* populations; and they all have consistently even granulous sculpture, without the larger, rectangular peripheral nodules of *B. ranelloides humilis*), a newly discovered *B. ranelloides* population makes the occurrence of *B. ranelloides humilis* in both Western Australia and Somalia a genetic impossibility. Clearly, if *B. ranelloides tenuisculpta* Dautzenberg & Fischer, 1906 is living in the central Indian Ocean, specimens on both shores cannot belong in the same subspecies if it is different from the one in mid-ocean. MNHN samples from off Réunion Island, central Indian Ocean, taken during cruise MD32 REUNION (1982), include five samples containing 8 specimens of *Bursa ranelloides* (Fig. 49 g), ranging from small juveniles to 39.1 mm in height, collected in 80 to 340 m. Another specimen in MNHN, taken by Cruise BENTHEDI in 1977, is from off Mayotte, in the Comores Islands (Fig. 49 f; sta. 49, 300-450 m, 12°54'6" S, 44°56'8" E, West of Passe Boueni). These specimens are all the elongate, finely gemmate *B. ranelloides tenuisculpta* form, and most retain their finely reticulate, silky-looking intritacalx. PARTH (1991c) identified the Somalian specimens as *B. awatii*, and the many Somalian specimens illustrated by COSSIGNANI (1994: 64-67) confirm this identification.

Enough has now come to light on the variation of *B. ranelloides* to suggest that differences between the "subspecies" *B. r. ranelloides* and *B. r. tenuisculpta* are trivial, in any case. FINLAY (1978: 148) has recognised *B. ranelloides* among the western Atlantic population (*i.e.*, this population varies between the *B. r. ranelloides* and *B. r. tenuisculpta* extremes) and PENNA-NEME & LEME (1978) named as *Bursa benvegnuae* a Brazilian intermediate form with moderate-sized, rectangular, weakly bifid peripheral nodules, illustrated beautifully, in colour, as *Bursa ranelloides benvegnuae*, by COLTRO (1995: 52, fig. 4), and as *B. ranelloides* form *benvegnuae* by COSSIGNANI (1994: 87). NORDSIECK (1975: 4, pl. 3, fig. 16) proposed the further synonym *B. canarica* for intermediate specimens from the Canary Islands. Specimens from more offshore localities in the type population of *B. ranelloides*, in southern Japan, also vary through to forms sculptured almost as weakly as *B. r. tenuisculpta*, and part of the variation is due to the usual ranellid and bursid tendency to be more finely sculptured in deeper-water habitats. Certainly all these forms are very similar, and recognition of a separate Atlantic-South African subspecies of *B. ranelloides* serves little purpose. In this light, the distinctive, short and wide Western Australian form is probably a separate species, *B. humilis* Beu, 1981 (see also WILSON 1993: 227, pl. 43, figs 10 a-b, and COSSIGNANI, 1994: 79, repeating Wilson's figure).

Bursa lucaensis Parth, 1991

Figs 47 b, 48 f-j, 58 i

Bursa lucaensis Parth, 1991a: 20, 2 figs.

Bursa sp. - SPRINGSTEEN, 1981: 3, fig. on front cover.
Bursa lucaensis - COSSIGNANI, 1994: 52.

TYPE DATA. — Holotype "to be presented to a museum" (PARTH, 1991a), from Cebu, Philippine Islands.

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW67.
New Caledonia. LAGON: sta. 392, 836 (Fig. 58 i). — *"Vauban"*, south of Pointe Sud du Grand Récif, 200 m, 5 Nov. 1976 (Figs 48 h, j). New Caledonian specimens were taken in 57 to 200 m; the specimen collected alive is from 57 m.

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. DW1021, 17°43' S, 168°37' E, 124-130 m (1).
Philippine Islands. Punta Engaño, Mactan I., Cebu (4 NZGS WM15024, pres. F.J. Springsteen; Figs 47 b, 48 f). — Off Cebu, "deep water", pres. Fely Leobrera, Carfel Shell Museum (2 NZGS WM14525; including original specimen figured in colour by SPRINGSTEEN, 1981; Figs 58 g, i). — Punta Engaño, Mactan I., Cebu (1 NZGS WM14121). — Bohol Straits, native fishermen, Sept. 1985, pres. F.J. Springsteen (1 NZGS WM14457).

DISTRIBUTION. — Although *Bursa lucaensis* is recorded only from the Philippine Islands, Vanuatu and New Caledonia at present, it seems likely to occur throughout the western Pacific archipelagoes between these extremes.

DIMENSIONS. — Coral Sea, Chesterfield Plateau, CORAIL 2: sta. DW67: H 20.2, D 14.5. - New Caledonia, LAGON: sta. 836: H 17.6, D 12.2. - *"Vauban"*, Grand Récif Sud, 200 m: H 13.4, D 9.7.

REMARKS. — *Bursa lucaensis* is not as rare as the recentness of its description might suggest (8 specimens from the Philippine Islands, one from Vanuatu, one from the Coral Sea and 6 from New Caledonia are before me); my own reluctance to name it earlier resulted from uncertainty of the range of variation and protoconch characters of the similar, highly variable *B. rhodostoma* (see below) and, consequently, whether this apparently distinct species was really just part of the variation of *B. rhodostoma*. Specimens of *B. rhodostoma* with a clean protoconch have now been seen, and I can confirm that, as stated by PARTH (1991a: 21), the protoconch of *B. rhodostoma* is markedly taller and narrower than the wide and relatively low one of *B. lucaensis*. The most distinctive character of *B. lucaensis* is its small size; mature, solid shells range in height from 13.4 mm to 22.3 mm (holotype); one specimen referred here with some hesitation is 37.3 mm high. Presumably because of their offshore habitat, all shells of *B. lucaensis* are clean and not encrusted, whereas almost all specimens of the shallow-water to intertidal *B. rhodostoma* are heavily encrusted with calcareous algae. The surface of specimens of *B. lucaensis* bears a cream, chalky, finely reticulate intritacalx. The four main, low spiral cords each bear 3 or 4 low, rounded nodules in each intervariceal interval, and a similar low nodule on each varix, with two or three narrow, well raised spiral threads in each interspace; the peripheral row of nodules is subdivided around its crest by a shallow groove in all specimens I have seen. The aperture is equally distinctive, having five pairs of narrow, short transverse ridges inside the outer lip and unique long, deeply entering, weakly anastomosing, transverse ridges on the inner lip; the aperture is cream to pale pink, with a large, markedly darker (dark pink to deep brownish maroon) parietal colour area. The outer lip bears a thin, upstanding, widely flared flange in front of the terminal varix, and the left margin of the inner lip is raised and free of the previous whorl for most of its height on all specimens. The exterior varies from cream and pale yellowish pink to a dull maroon (New Caledonia, LAGON sta. 836); on the darker specimens the varices, the outer edge of the parietal colour area, and the peripheral nodules are a dull yellow, whereas in most paler specimens the spiral cords and anterior fasciole are flecked with red-brown and a narrow red-brown line runs around the groove on the peripheral nodules.

There is some doubt whether the specific name *lucaensis* conforms to the requirements of ICZN Article 31(a). Indeed, it is formed exactly in the way recommended in ICZN Recommendation D iv (ICZN, 1958: 197) for names formed from **geographical** names, *i.e.* it conveys the meaning "**from** (the place called) luca". However, as *lucaensis* is an adjective, it appears admissible under Article 31(a), even though PARTH (1991a) expressly stated that he was dedicating the new species "to my son Luca".

Bursa quirihorai Beu, 1987

Figs 47 e, 52 a-g, 58 b

Bursa (Colubrellina) quirihorai Beu, 1987: 321, figs 182-192.

Bursa (Colubrellina) quirihorai - COSSIGNANI, 1994: 85.

TYPE DATA. — Holotype USNM 849004 and 12 paratypes: 6 NZGS WM14093 (Figs 52 e-f), 3 Abbey Specimen Shells, 1 Santa Barbara Museum of Natural History, SBNHM 33909, tangle nets in 275-460 m, off Balicasag Island, a few km south of Panglao Peninsula, Bohol, Philippines, 1 paratype NZGS WM14442, off Punta Engaño, Mactan I., Cebu, 1 paratype MNHN, *"Vauban"* 1978-79: sta. 7, off New Caledonia, 22°19' S, 167°11' E, 300-315 m (Fig. 52 d).

NEW CALEDONIA RECORDS. — **Coral Sea.** MUSORSTOM 5: sta. 299.
New Caledonia. LAGON: sta. 490. BATHUS 1: sta. CP669, DE694.
North of New Caledonia. SMIB 6: sta. DW119, DW120, DW121, DW123. BATHUS 4: sta. DW924, DW925, DW926, CP939.
Norfolk Ridge. BIOCAL: sta. DW64, DW65. — MUSORSTOM 4: sta. DW227. — CHALCAL 2: sta. DW69, DW71, DW79, DW82. — SMIB 1: sta. DW2. — SMIB 2: sta. DW8, DW15. — SMIB 3: sta. DW8, DW10, DW14, DW17, DW18 (Fig. 47 e), DW20. — SMIB 4: sta. DW40, DW41, DW43, DW48, DW49, DW50, DW53, DW56. — SMIB 5: sta. DW70, DW71, DW72, DW73, DW74, DW75, DW76, DW78, DW80, DW85, DW87, DW88, DW89, DW90, DW91, DW92, DW93, DW94, DW98, DW103. — SMIB 8: sta. DW154, DW159, DW160, DW162 (Fig. 58 b), DW163, DW165, DW170-172 (Figs 52 b-c, g), DW177, DW182, DW183, DW184, DW195. — SMIB 10: sta. DW208, DW209. — BERYX11: sta. DW18, CP25, DW40, CP45. — BATHUS 3: sta. CP805, CP806, DW830.
Loyalty Ridge. MUSORSTOM 6: sta. DW397, DW398, DW399, DW418, DW444, DW472, DW473, DW479.
New Hebrides Arc. VOLSMAR: sta. DW7, DW17 (Fig. 52 a).
These 87 samples were taken in 230-660 m; specimens were collected alive throughout this depth range.

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. CP1018, 17°53' S, 168°25' E, 300-301 m (1, large with narrow nodules as in New Caledonian specimens).

DISTRIBUTION. — *B. quirihorai* is recorded only from the Philippine Islands and New Caledonia, with the exception of a single specimen from off the Kai Islands in eastern Indonesia and a single specimen from Vanuatu. It likely occurs throughout the western Pacific archipelagoes between these extremes.

DIMENSIONS. — New Caledonia: SMIB 1: sta. DW2: H 56.8, D 36.5. - SMIB 4: sta. DW56: H 50.1, D 30.6; H 46.7, D 28.8. - VOLSMAR: sta. DW17: H 57.7, D 36.3.

REMARKS. — At the time of description of *Bursa quirihorai*, I knew of a single New Caledonian specimen (BEU, 1987: 324, figs 189, 192) whereas the remaining type material is from the Philippine Islands. Subsequent MNHN-ORSTOM collections from New Caledonia have brought to light a further 86 samples of *B. quirihorai* (and one specimen from Vanuatu), all totally consistent in differing from Philippines specimens in their much longer, sharper and more antero-posteriorly compressed peripheral nodules, their narrower and more prominent spiral cords, their markedly coarser interstitial gemmate sculpture, their much more deeply digitate outer margin of the outer lip, and their more sharply twisted and more strongly angled fasciolar bulge at the base of the anterior siphonal canal. However, the two populations share all other significant characters, such as overall size and appearance, the low-turbiniform protoconch of 2.75 whorls with fine reticulate sculpture on the first whorl of protoconch II, the varices of succeeding whorls not being aligned (separated by 20°-30°), the thin, flange-like columellar base, the widely flared apertural lips, and the pale, fawn to tan teleoconch exterior coloration with bright red-brown splashes on the spiral cords and an axially aligned, diffuse red-brown zone after each varix. However, the red-brown splashes or streaks on the cords, between nodules, are much narrower on New Caledonian than on Philippines specimens. A single specimen seen from Indonesia (MNHN, from N.O. *"Baruna Jaya 1"* cruise KARUBAR, off the Kai Islands, sta. DW18, 05°18' S, 133°01' E, 205-212 m, coll. Bouchet, Kastoro & Métivier, 24 Oct. 1991) has rounded nodules like those of Philippines specimens.

Therefore, the New Caledonian-Vanuatu population may be a taxon distinct from the Philippines to Indonesian one. However, in the present knowledge of only a single specimen from the huge region between these populations, it is impossible to say whether these are in fact distinct subspecies (or even species) or (as seems more likely at present) the end-members of a cline. The status of the New Caledonian-Vanuatu specimens will remain unclear until intensive deep-water sampling has been carried out throughout the western Pacific.

Bursa rhodostoma (Beck *in* G.B. Sowerby II, 1835)

Figs 47 g, 52 h, k, 58 e

Ranella rhodostoma Beck *in* G.B. Sowerby II, 1835: pl. 88, fig. 10.
Ranella paulucciana Tapparone-Canefri, 1876: 244.
Ranella rhodostoma var. *xantostoma* Tapparone-Canefri, 1878: 249.
Ranella bergeri G.B. Sowerby II *in* Tapparone-Canefri, 1881: 50, pl. 2, figs 1-2.

Ranella rhodostoma - G.B. SOWERBY II, 1841: 52. — DESHAYES, 1843: 552. — REEVE, 1844b: pl. 7, fig. 32. — KÜSTER & KOBELT, 1871: 155, pl. 34 a, fig. 11. — KOBELT, 1876b: 330. — SCHMELTZ, 1877: 81.
Bursa (Lampas) rhodostoma - SCHEPMAN, 1909: 118.
Lampadopsis rhodostoma - HABE, 1961: 47, pl. 24, fig. 1. — OYAMA & TAKEMURA, 1963: *Lampadopsis* figs 1-2. — HABE, 1964: 75, pl. 24, fig. 1. — OKUTANI, 1986: 116-117, top centre fig.
Bursa rhodostoma - SALVAT & RIVES, 1975: 307, fig. 181. — HINTON, 1978: 32, figs 5-5a. — KAY, 1979: 229, figs 80 C-D. — SHORT & POTTER, 1987: 44, pl. 21, fig. 8. — DRIVAS & JAY, 1988: 60, pl. 15, fig. 9. — LAI, 1989: 21, fig. 4. — WILSON, 1993: 227, pl. 43, fig. 5.
Bursa (Bursa) rhodostoma rhodostoma - BEU, 1985: 63. — COSSIGNANI, 1994: 56.
Bursa (Bursa) rhodostoma - SPRINGSTEEN & LEOBRERA, 1986: 124, pl. 34, fig. 9.

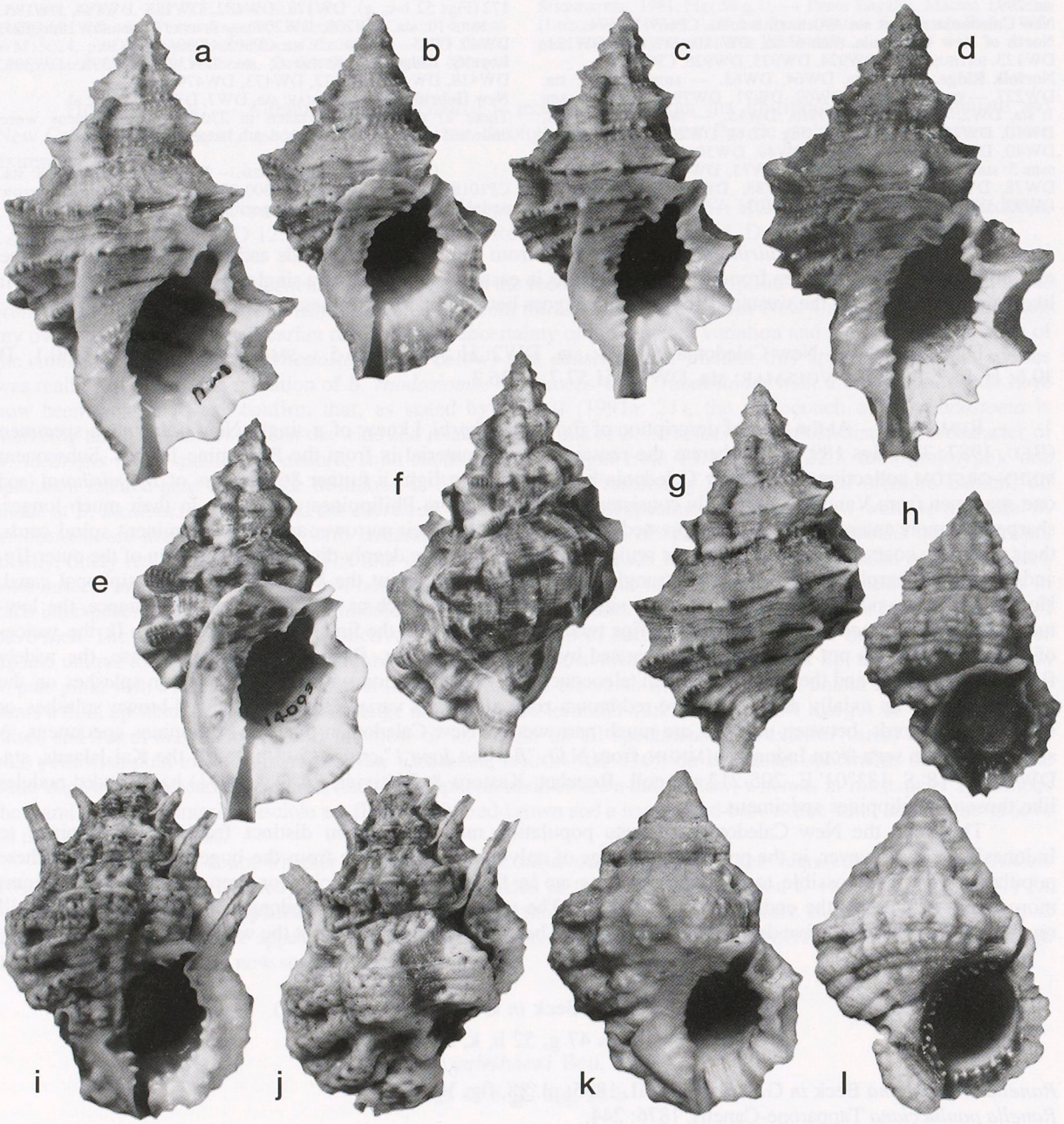

FIG. 52. — *Bursa* species. — **a-g**, *Bursa quirihorai* Beu. **a**, VOLSMAR: sta. DW17, New Caledonia, 260-300 m, x1.25. **b-c**, **g**, SMIB 8: sta. DW170-172, Norfolk Ridge, New Caledonia, 233-290 m, x1.5. **d**, *"Vauban"*: sta. 7, southern New Caledonia, 300-315 m, x1.5. **e-f**, paratype, NZGS WM14093, off Balicasag I., Philippines, 300-500 m, x1 (example of typical Philippines form). — **h**, **k**, *Bursa rhodostoma* (Beck *in* G.B. Sowerby II). **h**, unusually clean shell, protoconch in Fig. 47 g, x2. **k**, MNHN, specimen identified as "*Ranella bergeri*" by Jousseaume; "Japan", x2. — **i-j**, *Bursa rosa* (Perry), unusually clean specimen, EXPÉDITION MONTROUZIER: sta. 1252, 1-4 m, Baie de Touho, New Caledonia, x1.5. — **l**, *Bursa venustula* (Reeve), BMNH 1966541/1, Reeve's figured syntype, one of 3 syntypes, x1.25 (limited to eastern Polynesia).

Ranella (Lampas) cruentata var. *rhodostoma* - TRYON, 1880: 40, pl. 21, fig. 25.
Ranella paulucciana - TAPPARONE-CANEFRI, 1881: 51, pl. 2, figs 16-17.
Ranella venustula - ANGAS, 1877: 180.
Bursa venustula - DRIVAS & JAY, 1988: 60, pl. 15, fig. 10.
Bursa mammata - HEDLEY, 1915: 28. — ?OLIVER, 1915: 528. — IREDALE, 1931: 212. — IREDALE & MCMICHAEL, 1962: 55.
Bursa bergeri - DRIVAS & JAY, 1988: 60, pl. 15, fig. 8.

TYPE DATA. — *Ranella rhodostoma*: 3 syntypes BMNH 1966542/1-3; from "Isl. Masbate, of the Philippines", *ex* Cuming Colln. Of these three, BMNH 1966542/1 appears likely to be G.B. Sowerby II's figured syntype, but either its colour has faded or he overemphasised the red spots on the exterior. This, the smallest of the three (H 22.0) is here designated the lectotype of *Ranella rhodostoma*. The larger paralectotype, BMNH 1966542/3, H 28.7, is the specimen illustrated by REEVE (1844b), but again the colour is overemphasised in Reeve's illustration as the specimen has a dull, brownish flesh-pink aperture. The second paralectotype (H 28.3) has a dark red aperture. — I have not seen type material of *Ranella bergeri*, *Ranella paulucciana* or *Ranella rhodostoma* var. *xantostoma*. COSSIGNANI (1994: 57) reported that 15 specimens (presumably syntypes) of *Bursa bergeri* are present in Tapparone-Canefri's Colln in Museo Civico di Storia Naturale "Giacomo Doria", in Genoa, and the type material of Tapparone-Canefri's other two nominal taxa are presumably in this same museum.

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. D12. — CORAIL 2: sta. DW28.
New Caledonia. LAGON: sta. 52, 67, 79, 84, 99, 545, 546, 580, 645, 1006, 1017, 1182. — EXPÉDITION MONTROUZIER: sta. 1245 (Fig. 58 e), 1259, 1285, 1300, 1308, 1310, 1312, 1315, 1318, 1319, 1323, 1331. — LAGON DE NOUMÉA: sta. 1352. In addition, M J.C. Martin (Réunion) has sent me a photograph of a specimen of *B. rhodostoma* (with dark red aperture) he collected alive inside a dead *Trachycardium* shell among algae in 3-4 m at Kuendu Beach, near Nouméa, in Jan. 1994.
North of New Caledonia. LAGON: sta. 472.
Norfolk Ridge. CHALCAL 2: sta. CP18.
These 30 samples were collected from the intertidal zone to 274 m, but living specimens were collected in only 0 to 80 m.

DISTRIBUTION. — *Bursa rhodostoma* is distributed throughout the Indo-West Pacific province, from Madagascar and East Africa (possibly to eastern South Africa, although I know of no records), to the northern Indian Ocean and throughout the Red Sea (Eilat, 3 NZGS WM13332), in the western Pacific from southern Honshu, Japan (Izu Peninsula, HABE, 1964: 76; Tanabe, Wakayama Pref.: NZGS WM13943) southwards to Sydney Harbour, New South Wales, Australia (AMS C36472, collected alive, Bottle and Glass Rocks, Vaucluse, Port Jackson, "found by Mr Thomas Rossiter", the original specimen recorded by ANGAS (1877: 180) as *B. venustula*, and by HEDLEY (1915: 28), IREDALE (1931: 213) and IREDALE & MCMICHAEL (1962: 55) as *B. mammata*; Bradley's Head, Sydney Harbour, coll. Lee Woolacott, Jan. 1943, 1 abraded beach shell AMS C81607), and possibly to the Kermadec Islands (material recorded by OLIVER (1915: 528) as *Bursa mammata*), and eastwards throughout Melanesia and Polynesia to Hawaii (KAY, 1979). The subspecies (or synonym) *B. rhodostoma thomae* (d'Orbigny, 1842) ranges from South Carolina to Brazil in the Western Atlantic (ABBOTT, 1974: 166), and in the Eastern Atlantic is recorded from Madeira, the Canary Islands and the Cape Verde Islands (NORDSIECK & GARCIA-TALAVERA, 1979: 126).

DIMENSIONS. — *Ranella rhodostoma* (lectotype): H 22.0, D 16.1; paralectotypes: H 28.7, D 20.8 (REEVE's (1844b) figured specimen); H 28.3, D 19.6. - *Ranella paulucciana*: H 30, D 23 (TAPPARONE-CANEFRI, 1876: 244). - New Caledonia, LAGON: sta. 79: H 25.4, D 17.8; sta. 99: H 33.0; D 24.2 (unusually large, and much the largest of New Caledonian specimens).

REMARKS. — *Bursa rhodostoma* is interpreted here as an extremely variable species of small size, with a variable spire height and, in low-spired specimens (much more common than tall-spired ones) a rounded, almost subspherical shape; with three predominant spiral cords each of which bears on its crest a median groove, which is deep and relatively wide on the peripheral cord of many specimens; with a protoconch of similar size to that of *B. lucaensis* but significantly taller and narrower; and with a uniformly coloured, pale cream to deep purple aperture bearing a row of paler nodules on each lip. The most variable character is the aperture colour; whereas most specimens have a pale mauve to bright, pale red aperture, in some specimens it is violet or dark maroon to deep purple, and in others it varies through pink and yellow to almost white. The relatively few unencrusted specimens (most are heavily encrusted with calcareous algae) also have a variable exterior coloration; on most specimens it is pale yellow or grey to pale golden tan, with scattered darker flecks and, in particular, a row of dark brown flecks around the groove on each row of nodules, but the colour can be a little darker overall, or almost white, and the flecks can be missing over much or only part of the surface. TAPPARONE-CANEFRI (1881: pl. 2, figs 1-2) illustrated as *Ranella bergeri* "Sowerby" (a name never published by any of the Sowerby family) a rather tall-spired specimen with narrow, widely spaced spiral cords that had not finished secreting the current aperture, which

therefore is white, thin, with narrow lips and a digitate outer edge of the outer lip. This form (which occurs throughout the Indo-West Pacific, and in the Atlantic population) has persistently been known as *Bursa bergeri* from Mauritius and Réunion, and was recently illustrated excellently in colour by DRIVAS & JAY (1988: pl. 15, fig. 8) but intergrades completely with *B. rhodostoma*. A specimen in Jousseaume's collection in MHNH, identified as "*Ranella bergeri* Sowerby", from "Japon", is illustrated for comparison (Fig. 52 k). TAPPARONE-CANEFRI's (1876) *Ranella paulucciana* was later illustrated by TAPPARONE-CANEFRI (1881: pl. 2, figs 16-17) and is based on the most common form of *B. rhodostoma* with a deep, rich, maroon aperture and a heavier overall appearance than the *bergeri* form. DRIVAS & JAY (1988: pl. 15, fig. 10) illustrated as yet another species, *Bursa venustula* "Reeve", an immature specimen with a pale red aperture; this has nothing to do with Reeve's *Ranella venustula*, which is a very distinctive species occurring only in eastern Polynesia (illustrated by SPRINGSTEEN & LEOBRERA, 1986: 124, and by COSSIGNANI, 1994: 62; see also Fig. 52 l).

Claude Berthault (ORSTOM, Nouméa) recently sent me colour photographs of a specimen of *Bursa rhodostoma* collected at between 7 and 9 m in a sea-grass bed in New Caledonia. The head-foot of this specimen is brightly and heavily maculated white and deep crimson red, with a particularly large, uniform red area on the dorsum in front of the operculum, and the mantle is translucent white with a row of alternating bright red and opaque white spots around the margin.

Considerable debate over many years has centred on the relationship to *Bursa rhodostoma* of the very similar Atlantic form *Bursa thomae*. In earlier days intemperate statements such as WATSON's (1881: 400) that "any one capable of recognising differences will not fail to see when once his attention has been directed to the subject" were lavished on the question, whereas in more recent times even such "splitters" as NORDSIECK (in NORDSIECK & GARCIA-TALAVERA, 1979: 126, pl. 28, fig. 2) have identified Atlantic specimens as *B. rhodostoma*. I have now had the opportunity to compare many clean specimens from Indo-West Pacific, western Atlantic and eastern Atlantic localities, and failed to discover any morphological differences. However, there does seem to be a consistent difference in aperture colour: all Atlantic shells I have seen have a white to pale mauve aperture; the only evidence I know of that darker aperture colours occur in the Atlantic population is Nordsieck's painting (in NORDSIECK & GARCIA-TALAVERA, 1979: pl. 28, fig. 2) showing a specimen with a rather dark red aperture. This suggests that the Atlantic form is at best a weakly differentiated geographic subspecies, *B. rhodostoma thomae*.

Bursa rosa (Perry, 1811)

Figs 52 i-j

Biplex rosa Perry, 1811: pl. 4, fig. 1.
Ranella siphonata Reeve, 1844b: pl. 7, fig. 38 (excluding variety b).

Bursa rosa - WILSON & GILLETT, 1971: 80, pl. 54, figs 4-4 a. — HINTON, 1972: 12, pl. 6, fig. 26; 1978: 32, fig. 4. — KAY, 1979: 229, figs 80 E-F. — BEU, 1985: 63. — SPRINGSTEEN & LEOBRERA, 1986: 123, pl. 34, fig. 5. — SHORT & POTTER, 1987: 44, pl. 21, fig. 7. — DRIVAS & JAY, 1988: 60, pl. 15, fig. 6. — LAI, 1987: 19, figs 3-4. — WILSON, 1993: 227, pl. 43, figs 6 a-b. — COSSIGNANI, 1994: 58-59.
Bursa rosea (sic) - OKUTANI, 1986: 116; 117, top right fig.
Ranella siphonata - REEVE, 1844d: 138. — KOBELT, 1876b: 328.
Bursa siphonata - EDMONDSON, 1946: 143, fig. 61 j.
NOT *Bursa siphonata* - OLIVER, 1915: 528 [= *Tutufa bufo*].
NOT *Argobuccinum siphonatum* - IREDALE, 1910: 73 [= *Tutufa bufo*].
Ranella (Lampas) bufonia var. *venustula* - TRYON, 1880: 39, pl. 19, fig. 11.
Bursa mammata - HABE, 1961: 47, pl. 24, fig. 2. — OYAMA & TAKEMURA, 1963: *Bursa* fig. 1-3. — HABE, 1964: 76, pl. 24, fig. 2. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 13.
Bursa bufonia dunkeri - LADD, 1982: 41, pl. 8, figs 6-7 (only; not pl. 33, figs 15-16 [= *Bufonaria nobilis*]).

TYPE DATA. — *Ranella siphonata*: 3 syntypes of typical variety, BMNH 1967658; all three are typical *B. rosa* of authors; from Philippine Islands, *ex* Cuming Colln. The largest of these three syntypes (H 49.7) is the specimen illustrated by REEVE (1844b: pl. 7, fig. 38) and is here designated both the lectotype of *Ranella siphonata* and the neotype of *Biplex rosa*. PERRY (1811: caption to pl.4) stated that the locality for *Biplex rosa* is New Caledonia, but this is superseded by the present neotype designation. — *Ranella siphonata* var. b: 2 (of an original three?) specimens, H 45.3, D 30.9; H 41.6, D 28.4, BMNH 1967659; from Philippine Islands, *ex* Cuming Colln; these are specimens of the *leo* (Shikama, 1964) form of *Bursa tuberosissima*, as is shown by their white aperture with sparse plicae on the inner lip, and their grey-brown spiral cords on a paler background.

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. D2. — CORAIL 2: sta. DW1, DW10, DW18, DW48. — W. Ilôt Reynart, dived 6 m.
New Caledonia. LAGON: sta. 49, 82, 83, 172, 342, 391, 942, 954, 985, 1159. In addition, Claude Berthault (ORSTOM, Nouméa) sent colour photographs of two living specimens collected at 9 m on the Grand Récif, Nouméa, on 3 July 1996. The head-foot exterior of living specimens is irregularly streaked and spotted with pale to medium pink on a cream ground, with a few dark red maculations. — EXPÉDITION MONTROUZIER: sta. 1241, 1242, 1245, 1252 (Figs 52 i-j), 1287, 1301, 1304, 1308, 1310, 1318, 1319, 1330.
North of New Caledonia. LAGON: sta. 443, 445.
Loyalty Ridge. MUSORSTOM 6: sta. DW430, DW432.
These 32 samples were collected from the intertidal zone to 69 m, except for the Coral Sea specimens (80-120 m).

DISTRIBUTION. — *Bursa rosa* occurs throughout the Indo-West Pacific province, from South Africa to Hawaii, including the Red Sea, and from the southern Great Barrier Reef, eastern Australia, north to Kii Peninsula, Honshu, in southern Japan (HABE, 1964: 76).

DIMENSIONS. — *Biplex rosa* (neotype), and *Ranella siphonata* (lectotype): H 49.7, D 36.5; paralectotypes: H 47.6, D 35.5; H 42.5, F 31.9. - New Caledonia, LAGON: sta. 82: H 40.1, D 30.2 (largest New Caledonian specimen); sta. 954: H 40.0, D 29.1.

REMARKS. — *Bursa rosa* is one of the most common of the short-spired, very heavy-shelled, coarsely nodulous "typical" *Bursa* species in the Indo-West Pacific, and is easily recognised by its long, spine-like, semitubular posterior canals and its purplish rose apertural colour, particularly developed on the inner part of the inner lip of most specimens, from a height of only about 10 mm up to the maximum adult size of about 58 mm. The species has been known as *B. mammata* (Röding, 1798) in many earlier works (by no means all listed in the synonymy) but BEU (1987: 316) selected the specimen figured by FAVANNE & FAVANNE (1780: pl. 32, fig. B1) as the lectotype of *B. mammata*, making this a synonym of *B. bufonia*.

Genus *BUFONARIA* Schumacher, 1817

Bufonaria Schumacher, 1817: 251. Type species (SD by HERRMANNSEN, 1846: 135): *Bufonaria spinosa* Schumacher, 1817 [= *Gyrineum echinatum* Link, 1807], Miocene to Recent, central-northern Indo-West Pacific and Red Sea.
Chasmotheca Dall, 1904: 118. Type species (OD): *Ranella foliata* Broderip, 1825, Recent, Indian Ocean.
Bursina Oyama, 1964: 333. Type species (OD): *Ranella nobilis* Reeve, 1844, Pleistocene and Recent, Indo-West Pacific.

REMARKS. — *Bufonaria* differs from *Bursa* by its more dorsoventrally compressed shape, its evenly granulous teleoconch sculpture (between rows of small to large nodules - three nodule rows on almost all species), and its fan-shaped to oval operculum with its nucleus near the centre of the columellar margin, similar to the operculum of phaliine cassids. Species of the nominate subgenus are confined the Indo-West Pacific, whereas the single species, *B. marginata* (Gmelin, 1791), of subgenus *Bufonaria (Aspa)* H. & A. Adams, 1853 is limited to the Mediterranean Sea and West Africa. I formerly (BEU, 1981) treated *Marsupina* Dall, 1904 (type species: *Murex bufo* Bruguière, 1792, Western Atlantic) as another subgenus of *Bufonaria*, but the anterior opercular nucleus indicates that this is better treated as a distinct genus.

Bufonaria ignobilis Beu, 1987

Fig. 53 g

Bufonaria (Bufonaria) ignobilis Beu, 1987: 344, figs 221, 257-263.

Bufonaria (Bufonaria) ignobilis - COSSIGNANI, 1994: 27.
Bufonaria nobilis - BEU, 1977: fig. 5.
Bursa (Colubrellina) nobilis - LADD, 1977: 35, pl. 12, figs 1-3.

TYPE DATA. — Holotype USNM 849010 and 4 paratypes NZGS WM14037, off Punta Engaño, Mactan I., Cebu, Philippines. 5 paratypes NZGS WM13075, Bohol, Philippines, 1 paratype NZGS WM13890, Balicasag I., off Bohol; 1 paratype NZGS WM14141, Balut I., Philippines; 3 paratypes NZGS WM13198, Samar, Philippines; 2 paratypes NZGS WM13130, Visayan Sea, Philippines; 3 paratypes NZGS WM14135, Panglao Peninsula, Bohol; 1

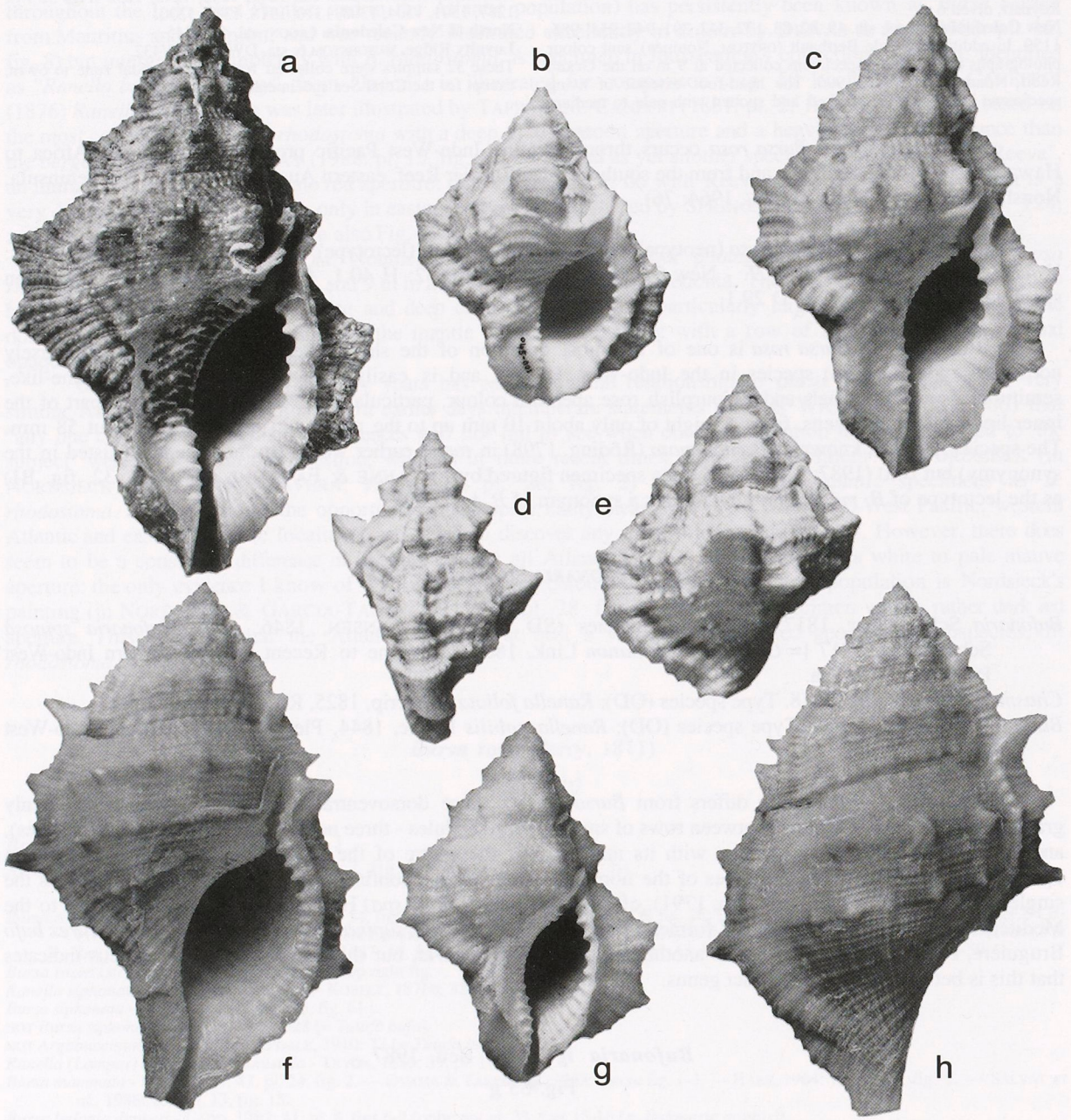

FIG. 53. — *Bufonaria* species. — **a**, **c**, *Bufonaria nobilis* (Reeve), New Caledonia, both x1. **a**, off Hienghène, NE coast, 100 m, 1978. **c**, MUSORSTOM 6: sta. DW399, Loyalty Ridge, 282 m. — **b**, **d-e**, *Bufonaria thersites* (Redfield), NZGS WM13523, Vanua Levu, Fiji, x1. — **f**, **h**, *Bufonaria perelegans* Beu, LAGON: sta. 833, Secteur de Poindimié, New Caledonia, 52-70 m, x1 (largest New Caledonian specimen). — **g**, *Bufonaria ignobilis* Beu, MUSORSTOM 6: sta. DW461, Loyalty Ridge, New Caledonia, 240 m, x1.25.

paratype NZGS WM13174, near Lombok, Indonesia; 1 paratype WAM 616-74, Mariel King Memorial Expedition sta. AHI/5, Haruku I., Ambon, Indonesia; 1 paratype MNHN, off Madagascar, 15°21.0' S, 46°12.5' E, 150 m; 1 paratype MNHN, off Madagascar, 15°24.5' S, 46°02.0' E, 250-265 m.

NEW CALEDONIA RECORDS. — **Loyalty Ridge.** MUSORSTOM 6: sta. DW391, DW392, DW421, DW461 (Fig. 53 g). Local depth range 240-390 m.

DISTRIBUTION. — In the western Pacific, *Bufonaria ignobilis* occurs from Taiwan to New Caledonia (so far taken only at the Loyalty Islands); I am not aware of either it or *B. nobilis* occurring in Australia. In the Indian Ocean, I have still seen material only from Madagascar, and one specimen from lobster traps in 150-175 m, between Cabo das Correntes and Zavora Pt., Mozambique, East Africa, presented by Sr C. Fernandes (NZGS WM15172).

DIMENSIONS. — Holotype: H 49.7, D 32.5; largest paratype: H 57.1, D 37.6. - New Caledonia, Loyalty Ridge, MUSORSTOM 6: sta. DW391: H 41.4, D 30.5; sta. DW461: H 44.1, D 32.0.

REMARKS. — Both *Bufonaria ignobilis* and *B. nobilis* (see below) are present in very small numbers in the MNHN collections reported here and, curiously, all four specimens of *B. ignobilis* are from off the Loyalty Islands, whereas two of the three *B. nobilis* are from off the main island of New Caledonia, and only one is from the Loyalty Islands. This near-complete exclusion is presumably a sampling artifact. *B. ignobilis* is similar to *B. nobilis* in its strongly compressed shape, its tall spire, its two moderately prominent peripheral rows of nodules that form two narrowly pointed nodules on each varix, its thin, widely expanded, strictly aligned varices, and its flared and strongly ridged apertural lips. *B. ignobilis* is much smaller than *B. nobilis* (few specimens exceed 60 mm in height, whereas *B. nobilis* attains at least 100 mm). Other consistent differences are the paler colour (white to cream, with weak fawn marbling, compared with fawn marbled with red-brown, through to intensely marbled dark brown in *B. nobilis*), the finer and more widely spaced sculptural gemmae, and the more narrowly flared lips in *B. ignobilis* than in *B. nobilis*. Both have proved to be widespread, throughout the western Pacific and to Madagascar and Mauritius in the Indian Ocean, since *B. ignobilis* was named, and they occur together as Pleistocene fossils in the amazing deep-water fauna of the Kere River, southern Espiritu Santo I., Vanuatu (LADD, 1977: pl. 12, figs 1-3; 1982: pl. 33, figs 15-16; and examined in USNM).

Bufonaria nobilis (Reeve, 1844)

Figs 53 a, c

Ranella nobilis Reeve, 1844b: pl. 4, fig. 16.

Ranella nobilis - REEVE, 1844d: 137. — KOBELT, 1876b: 332.
Bursa (Bursa) nobilis - ALTENA, 1942: 111 (in part other spp.?).
"Gyrineum" nobile - OYAMA & TAKEMURA, 1960: *Gyrineum* figs 1-2.
Bursa (Gyrineum) nobile - SHIKAMA, 1963: pl. 49, fig. 8.
Bursina nobilis - OYAMA, 1964: 330, 332.
Gyrineum nobilis - HABE & KOSUGE, 1966a: 46, pl. 16, fig. 7.
Bufonaria (Bufonaria) nobilis - BEU, 1985: 65. — COSSIGNANI, 1994: 29-30.
Bufonaria nobilis - LAI, 1987: 25, figs 1-2.
NOT *Bufonaria nobilis* - BEU, 1977: fig. 5 [= *B. ignobilis*].
Bursa nobilis - DRIVAS & JAY, 1988: 62, pl. 16, fig. 5.
NOT *Bursa nobilis* - CERNOHORSKY, 1967a: 314, pl. 42, fig. 5; 1967b: 46, pl. 2, fig. 6. — HINTON, 1978: 32, fig. 1 [= *B. thersites*].
NOT *Bursa (Colubrellina) nobilis* - LADD, 1977: 35, pl. 12, figs 1-3 [= *B. ignobilis*].
Bursa bufonia dunkeri - LADD, 1982: 41, pl. 33, figs 15-16 (only; not pl. 8, figs 6-7 [= *Bursa rosa*]).

TYPE DATA. — Holotype BMNH 1967655, an unlocalised specimen *ex* Cuming Colln. The type locality is here designated as Taiwan.

NEW CALEDONIA RECORDS. — **New Caledonia.** Off Hienghène, NE coast of New Caledonia, 100 m, traps (BEU, 1987: fig. 253 and Fig. 53 a).
Norfolk Ridge. BIOCAL: sta. CP84.
Loyalty Ridge. MUSORSTOM 6: sta. DW399 (Fig. 53 c).

DISTRIBUTION. — *Bufonaria nobilis* is uncommon throughout the western Pacific from Taiwan to New Caledonia; I am not aware of records from further east, or from Australia. In the Indian Ocean, I know of specimens

from Réunion and/or Mauritius (DRIVAS & JAY, 1988: pl. 16, fig. 5; and material in MNHN) and from Mozambique (NZGS WM15177, pres. Sr C.P. Fernandes).

DIMENSIONS. — Holotype: H 83.4, D 53.9. - Taiwan, NZGS WM15560, *ex* Penniket Colln: H 99.3, D 59.8. - Off Hienghène, New Caledonia: H 86.7, D 55.5. - Loyalty Ridge, MUSORSTOM 6: sta. DW399: H 72.0, D 46.9.

REMARKS. — Differences between *Bufonaria nobilis* and *B. ignobilis* are pointed out above.

Bufonaria perelegans Beu, 1987

Figs 53 f, h, 54

Bufonaria perelegans Beu, 1987: 328, figs 211-217.

Gyrineum elegans - OYAMA & TAKEMURA, 1960: *Gyrineum* figs 11-12. — HABE & KOSUGE, 1966a: 46, pl. 16, fig. 6.
Bursa (Gyrineum) elegans - SHIKAMA, 1964: pl. 62, fig. 9.
Bufonaria sp. - SPRINGSTEEN & LEOBRERA, 1986: 123, pl. 34, figs 1 a-b.
Bufonaria perelegans - COSSIGNANI, 1994: 31-32.
Bursa rana - SALVAT *et al.*, 1988: 103, pl. 13, fig. 15.
Bufonaria albivaricosa - LAI, 1987: 24, figs 1-3.

TYPE DATA. — Holotype USNM 849005, trawled off southwestern Taiwan; 5 paratypes from Taiwan, 1 from Thailand, and 14 from the Philippine Islands, all in NZGS, listed by BEU (1987: 333).

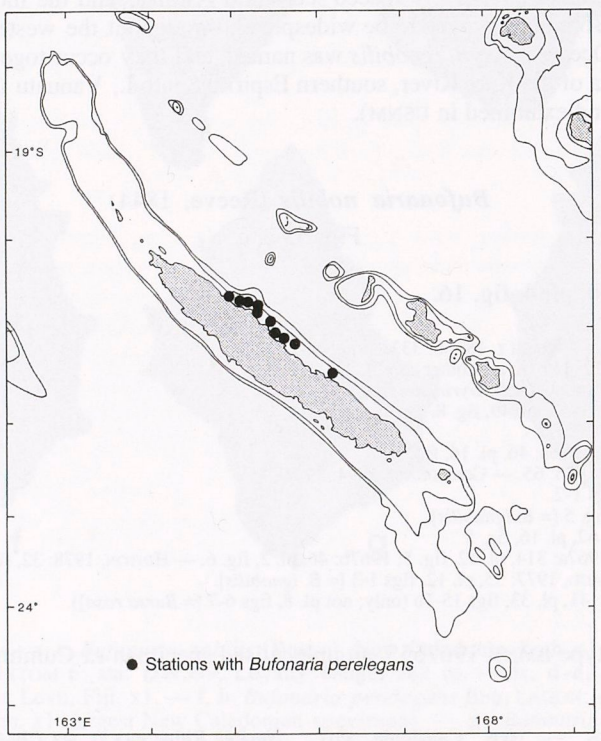

FIG. 54. — Distribution of *Bufonaria perelegans* Beu in the New Caledonian region.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 691, 758, 775, 783, 786, 790, 805, 813, 826, 827, 832, 833 (Figs 53 f, h), 849, 869. — EXPÉDITION MONTROUZIER: sta. 1268.
These 15 samples were collected in 9-70 m, but living specimens were taken only at LAGON: sta. 827 and 833, in 52-70 m.

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. CP1117, 15°10' S, 166°53' E, 170-220 m (1, lv?). — Sta. CP1122, 15°08' S, 166°56' E, 168-234 m (1, lv?). Clearly, these two Vanuatu specimens were collected in considerably deeper water than the New Caledonian ones.
Fiji, Pliocene fossils. New road off Prince's Road, behind Dilkusha, Nausori, Fiji; Nakasi Sandstone, Late Pliocene, coll. K.J. Gilchrist, 1988 (2 mod. large, AMS C302624, closely resembling New Caledonian Recent specimens, and 2 small). — All data as last (3 small, AMS C302625).

DISTRIBUTION. — I am aware of Recent specimens of *Bufonaria perelegans* only from the northwestern Pacific (Taiwan, Philippines, Thailand) and the present specimens from the mid-northern coast of New Caledonia and from Vanuatu. The specimens from Vanuatu are from significantly deeper water than the New Caledonian ones, so it is possible that *B. perelegans* occurs uncommonly throughout the western Pacific archipelagoes in depths greater than 150 m. The specimens from the Pliocene of Fiji suggest that this species formerly was more widespread than it is now, so that the apparantly disjunct range is possibly a remnant of a wider range.

DIMENSIONS. — Holotype: H 104.5, D 68.4. - New Caledonia, LAGON: sta. 833, largest: H 80.6, D 54.2; second largest: H 69.8, D 46.2; sta. 869: H 65.6, D 44.6.

REMARKS. — Typical *Bufonaria perelegans* from the Philippine Islands and Taiwan is a very large shell (reaching at least 110 mm in height) with an elongate-oval, inflated shape, a finely and evenly gemmate surface, and two rows of small, sharp nodules and a third, peribasal, elevated cord around the last whorl, forming three narrow, sharp spines where these three cords cross the varices. The anal siphonal canal protrudes laterally as a further narrow, semitubular spine similar in size and shape to the three lower ones. The colour is an overall golden fawn on most specimens, varying to a pale red-brown that highlights the main spiral cords slightly on many specimens. It is thus similar to both *B. echinata*, which differs in its more compressed shape, more finely sculptured surface, and much longer variceal and anal spines, and *B. elegans*, a species limited to the Andaman Islands and western Indonesia, differing in its markedly smaller size, smoother surface, and very bright red-brown spiral cords (BEU, 1987, figs 207-210; COSSIGNANI, 1994: 21-22).

The occurrence of relatively few specimens of a species closely approaching *B. perelegans* from two stations in Vanuatu and from several stations along the mid-northern coast of New Caledonia (Fig. 54) is a surprise, and adds to the growing evidence that *Bufonaria* species have curiously patchy, unpredictable distributions (*e.g.*, specimens indistinguishable from *B. subgranosa*, a common Philippines species but virtually unknown outside that area in the northwestern Pacific, are common also off Cape Moreton in southern Queensland, Australia). The New Caledonian and Vanuatu specimens are nearly all much smaller than Philippines-Taiwan ones, although the largest is 80.5 mm high, but as they are scarcely distinguishable from northern shells in any other characters they seem best referred to *B. perelegans*. Even within mid-northern New Caledonia its distribution appears to be patchy, as not only is it apparently limited to the mid-northern coast of the main island, but also most samples consist of only a few juvenile to moderate-sized specimens, whereas the sample from LAGON sta. 833 contains 18 medium to large shells, seven of which were collected alive.

Bufonaria thersites (Redfield, 1846)

Figs 53 b, d-e, 58 a

Ranella thersites Redfield, 1846: 166, pl. 10, figs 6 a-b.

Bufonaria (Bufonaria) thersites - BEU, 1987: 342, figs 254-256. — COSSIGNANI, 1994: 38.
Bursa thersites - SHORT & POTTER, 1987: 44, pl. 21, fig. 1.
Bufonaria thersites - WILSON, 1993: 226.
Gyrineum (Chasmotheca) cavitense - OYAMA & TAKEMURA, 1960: *Gyrineum* figs 3-4.
Bursa nobilis - CERNOHORSKY, 1967a: 314, pl. 42, fig. 5; 1967b: 46, pl. 2, fig. 6. — HINTON, 1978: 32, fig. 1
Bursa crumena - SALVAT *et al.*, 1988: 103, pl. 13, fig. 17.

TYPE DATA. — REDFIELD's (1846: pl. 10, figs 6 a-b) coloured drawing of the presumed holotype of *Ranella thersites* leaves no doubt of its identity, despite its confusion with *Crossata californica* (Hinds, 1844) by TRYON (1880: 40), but I have not seen the type specimen (presumably in State Museum of New York, Albany; pers. comm. H.A. Rehder, USNM). Redfield's material (he cited specimens in the collections of Dr Budd and Messrs.

Wheatley and Wilbur, as well as his own) was without locality; I here designate the type locality as New Caledonia.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 63, 80, 522, 523, 535, 542, 555 (Fig. 58 a), 596, 747, 895, 937, 1129, 1182, 1197. — GLASS & FOSTER (1993) illustrated 2 specimens collected "live in 40 metres off Belep Islands north of New Caledonia in 1987". In addition, Claude Berthault (ORSTOM, Nouméa) sent colour photographs of a beach specimen found near Voh, on the west coast of northern New Caledonia. — EXPÉDITION MONTROUZIER: sta. 1287, 1301, 1303, 1304, 1305, 1322.
North of New Caledonia. LAGON: sta. 452, 454.
These 22 samples (32 specimens) were collected in 0 to 71 m; specimens were collected alive throughout this range.

OTHER MATERIAL EXAMINED. — **Queensland, Australia.** Off Sandy Cape, southern Queensland, 40-60 m (2, Whitehead Colln). — Upolu Cay, off Cairns, Queensland, collected intertidally by Mrs T. Whitehead (2, Whitehead Colln).
Fiji, Pliocene fossils. New road off Prince's Road, behind Dilkusha, Nausori, Fiji; Nakasi Sandstone, Late Pliocene; coll. K.J.Gilchrist, 1988 (2 AMS C302629).

DISTRIBUTION. — *Bufonaria thersites* presumably occurs uncommonly throughout the western Pacific archipelagoes, from at least the Philippine Islands southwards to northeastern Australia, New Caledonia and Fiji. Its range is poorly known at present.

DIMENSIONS. — REDFIELD (1846: 167) gave the dimensions of his specimen as H 1.9 inches (48 mm), D 1.4 inches (35 mm). - Off Sandy Cape, Queensland, Whitehead Colln, largest seen: H 70.8, D 50.9. - New Caledonia, LAGON: sta. 555: H 54.5, D 40.2; sta. 937: H 57.7, D 38.6.

REMARKS. — *Bufonaria thersites* is easily recognised by its short spire and overall extremely wide, squat shape, by most specimens bearing one or two enormous, antero-posteriorly compressed nodules on the dorsum of the last whorl, by its pale, cream exterior with small red-brown maculations on the spiral cords, and in particular, by its cream to bright yellow or pale orange aperture with widely flared, prominently ridged lips. At the time of the earlier comments (BEU, 1987) I knew of few specimens, from Fiji, New Caledonia, New Guinea and northern Australia, although poorly localised old specimens reputed to be from the Philippine Islands, as well as other western Pacific localities, are present in many museums. It is now clear, however, that *B. thersites* is an uncommon but widespread species throughout the central western Pacific archipelagoes, as reliable northeastern Australian records, 32 further specimens from New Caledonia, reliable Philippines records in MCZ, and an illustrated record from the Philippines (OYAMA & TAKEMURA, 1960: *Gyrineum* figs 3-4) have now been seen. It appears that this species is uncommon because of its shallow offshore rocky habitat (New Caledonian specimens were collected alive in 0 to 71 m) and, in part, because it has been confused with the very similar *B. margaritula* in some samples. *B. thersites* differs from *B. margaritula* in its much less dorsoventrally compressed shape, in its consistently short spire, in its much larger dorsal nodules on the last whorl of large shells, in its consistently pale cream to fawn coloration, and in its yellow to pale orange (rather than white) aperture with much more widely flared lips than in *B. margaritula*. The two species also seem to have incomplete sympatry, as *B. margaritula* is not recorded from New Caledonia.

Genus *TUTUFA* Jousseaume, 1881
Subgenus *TUTUFA*, *s. s.*

Tutufa Jousseaume, 1881: 175. Type species (ICZN Opinion 1074): *Murex rana bubo* Linné, 1758, Pliocene to Recent, Indo-West Pacific.

Tutufa (Tutufa) bubo (Linné, 1758)
Fig. 55 c

Murex rana bubo Linné, 1758: 748.
Murex lampas Linné, 1758: 748 (in part; RONDELET, 1555: 81 [=*Charonia lampas*] designated lectotype above).
Bursa (Tutufa) rubeta var. *gigantea* E.A. Smith, 1914: 230, pl. 4, fig. 4 (only).

Murex lampas - HANLEY, 1855: 286 (in part).
Triton lampas - LAMARCK, 1822: 180 (in part). — REEVE, 1844a: pl. 9, fig. 30 a (only). — LISCHKE, 1869: 47 (in part); 1871: 34; 1874: 29.
Bursa lampas - SCHEPMAN, 1909: 118.

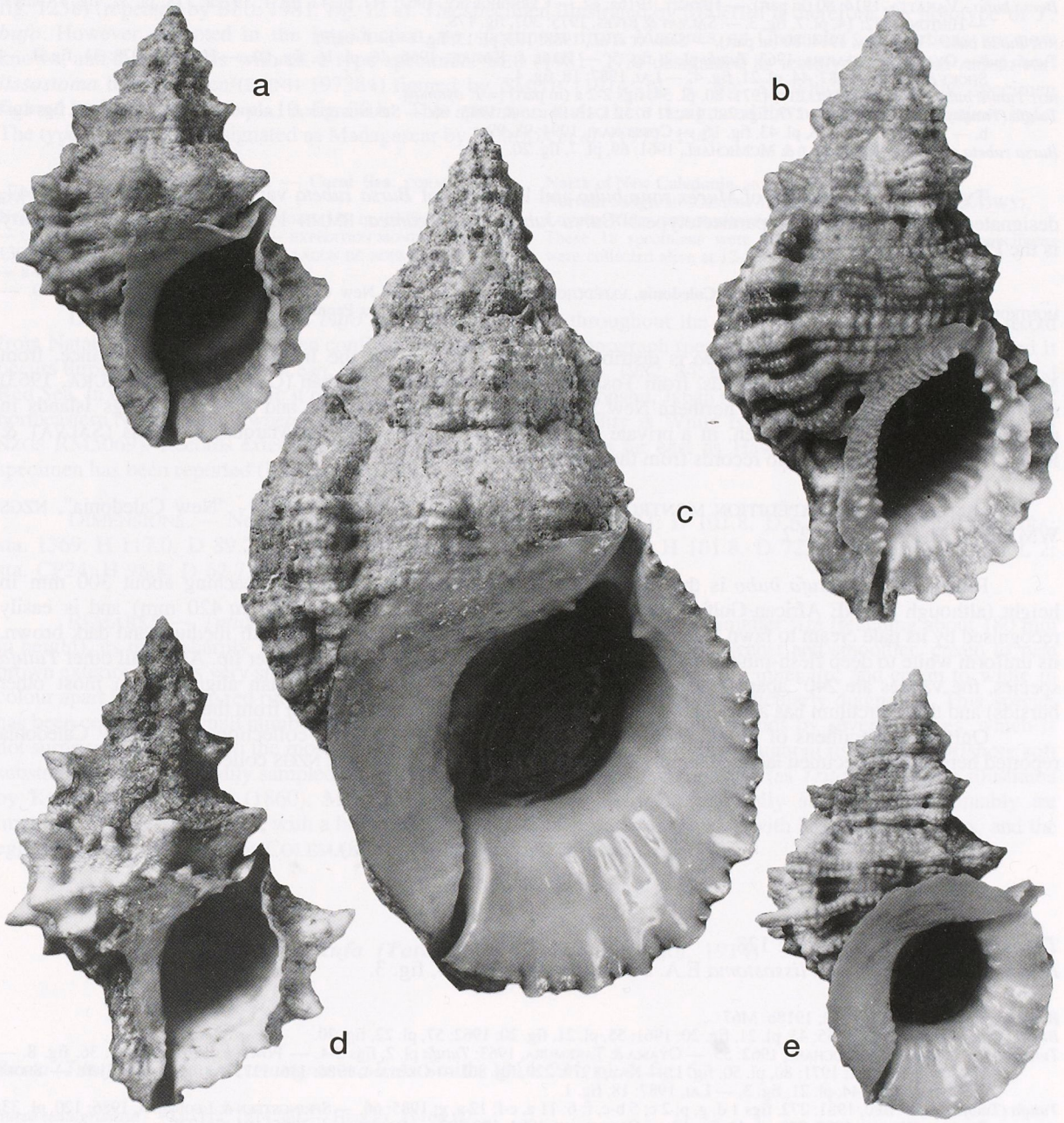

FIG. 55. — *Tutufa* species, all from New Caledonia. — **a**, **d.** *Tutufa (Tutufa) bufo* (Röding). **a**, EXPÉDITION MONTROUZIER: sta. 1303, Plateau de Karembé, 0-8 m, x0.67. **d**, MNHN, off Hienghène, NE coast, 100 m, 1978, x1. — **b**, *Tutufa (Tutufella) rubeta* (Linné), EXPÉDITION MONTROUZIER: sta. 1274, Récif de Koé, 3-30 m, x1. — **c**, *Tutufa (Tutufa) bubo* (Linné), EXPÉDITION MONTROUZIER: sta. 1271, Haut Fond de Tié, 5-25 m, alive on sand and coral slabs, x0.5. — **e**, *Tutufa (Tutufella) oyamai* Habe, LAGON: sta. 1014, Secteur de Poum, 22-23 m, x1.

Murex lampas bubo - LINNÉ, 1767: 1216. — GMELIN, 1791: 3532.
Bursa bubo - VANATTA, 1914: 80 (in part). — HEDLEY, 1916a: 42. — CERNOHORSKY, 1967: 311, pl. 42, fig. 1; 1972a: 118, pl. 32, fig. 7 (only). — HINTON, 1972: 14, pl. 7, fig. 3. — SALVAT & RIVES, 1975: 307, fig. 178.
NOT *Bursa bubo* - VANATTA, 1914: 80 (in part). — SALVAT *et al.*, 1988: 103, pl. 13, fig. 14 [= *T. bufo*].
Tutufa bubo - OYAMA & TAKEMURA, 1963: *Tutufa* pl. 2, fig. 5. — HABE & KOSUGE, 1966: 46, pl. 16, fig. 10. — HINTON, 1978: 31, fig. 1. — SHORT & POTTER, 1987: 44, pl. 21, fig. 4. — LAI, 1987: 18, fig. 4.
NOT *Tutufa bubo* - WILSON & GILLETT, 1971: 80, pl. 54, figs 2-2 a (in part) [= *T. oyamai*].
Tutufa (Tutufa) bubo - BEU, 1981: 277, figs 2 d, 4 a, 11 b, 12 f, 13-14 a, c-d; 1985: 66. — SPRINGSTEEN & LEOBRERA, 1986: 122, pl. 33, figs 8 a-b. — WILSON, 1993: 228, pl. 43, fig. 16. — COSSIGNANI, 1994: 98, 99.
Bursa rubeta gigantea - RIPPINGALE & MCMICHAEL, 1961: 69, pl. 7, fig. 20.

TYPE DATA. — Neotype of *Murex rana bubo* and lectotype of *Bursa rubeta* var. *gigantea*, BMNH 1974147, designated by BEU (1981: 278); paralectotype of *Bursa rubeta* var. *gigantea*, BMNH 1914.6.29.1. The type locality is the Philippine Islands.

NEW CALEDONIA RECORDS. — **New Caledonia.** EXPÉDITION MONTROUZIER: sta. 1271 (Fig. 55 c). Kouaré, southern New Caledonia, coll. P. Bouchet, May 1979. — "New Caledonia", *ex* Penniket Colln (1 nzgs WM15376).

DISTRIBUTION. — *Tutufa bubo* is distributed throughout most of the Indo-West Pacific province, from Mozambique to the Seychelles Islands, from Tosa Bay, Shikoku, southern Japan (OYAMA & TAKEMURA, 1963) southwards to off Minnie Waters, northern New South Wales (BEU, 1981: 280) and the Three Kings Islands in northern New Zealand (1 specimen, in a private collection), and eastwards to the Marquesas Islands (SALVAT & RIVES, 1975: 307). There are no records from the Red Sea or from Hawaii.

DIMENSIONS. — EXPÉDITION MONTROUZIER: sta. 1271: H 267.5, D 160.8. - "New Caledonia", NZGS WM15376: H 166.2, D 102.2.

REMARKS. — *Tutufa bubo* is the largest of the Indo-West Pacific bursids, reaching about 300 mm in height (although the NE African-Gulf of Arabian *T. bardeyi* is much larger, reaching *ca* 420 mm) and is easily recognised by its pale cream to fawn, coarsely nodulous exterior marbled irregularly with medium and dark brown, its uniform white to deep flesh-pink or pale orange aperture, and its closely plicate inner lip. As for all other *Tutufa* species, the varices are 240° apart (situated at each two-thirds of a whorl, rather than aligned as in most other bursids) and the operculum has a subcentral nucleus, a little to the right and abapical from the centre.

Only two specimens of *Tutufa bubo* are present in the MNHN/ORSTOM collections from New Caledonia reported here, and a specimen labelled simply "New Caledonia" is present in the NZGS collection.

Tutufa (Tutufa) bufo (Röding, 1798)

Figs 55 a, d

Tritonium bufo Röding, 1798: 128.
Bursa (Tutufa) rubeta var. *lissostoma* E.A. Smith, 1914: 230, pl. 4, fig. 3.

Bursa bufo - HEDLEY, 1916a: 42; 1918b: M67.
Bursa (Tutufa) bufo - KIRA, 1955: 43, pl. 21, fig. 20; 1961: 55, pl. 21, fig. 20; 1962: 57, pl. 22, fig. 20.
Tutufa bufo - IREDALE & MCMICHAEL, 1962: 55. — OYAMA & TAKEMURA, 1963: *Tutufa* pl. 2, figs 2-4. — POWELL, 1967: 189, pl. 36, fig. 8. — WILSON & GILLETT, 1971: 80, pl. 50, fig. 1. — KAY, 1979: 229, fig. 80I. — OKUTANI, 1986: 116; 117, 3rd fig. from top left. — SHORT & POTTER, 1987: 44, pl. 21, fig. 3. — LAI, 1987: 18, fig. 1.
Tutufa (Tutufa) bufo - BEU, 1981: 272, figs 1 d, g, p; 2 c; 5 b-c, f; 6; 11 a, c-f; 12 a, g; 1985: 66. — SPRINGSTEEN & LEOBRERA, 1986: 120, pl. 33, fig. 1. — WILSON, 1993: 228, pl. 43, fig. 17. — COSSIGNANI, 1994: 100-102. — BOSCH *et al.*, 1995: 104, fig. 376.
Bursa rubeta - BOSCH *et al.*, 1982: 84.
Tutufa lissostoma - IREDALE, 1931: 214, pl. 23, fig. 5. — OKUTANI, 1970: 124, pl. 8, fig. 1. — KURODA *et al.*, 1971: 134, pl. 34.
Bursa bubo forma *lissostoma* - CERNOHORSKY, 1972a: 118, pl. 32, fig. 7 a.
Bursa bubo lissostoma - POWELL, 1974: 205; 1976: 152; 1979: 168, pl. 33, fig. 12.
Triton lampas - LAMARCK, 1822: 180. — KIENER, 1842: pl. 5, fig. 1. — REEVE, 1844a: pl. 10, fig. 30 b (only). — LISCHKE, 1869: 47; 1871: 34. — KÜSTER & KOBELT, 1871: 175, pl. 37, figs 3-4. — LISCHKE, 1874: 29. — KOBELT, 1876 [in 1876-78]: pl. 9, fig. 2.
Ranella lampas - TRYON, 1880: pl. 19, fig. 12.
Bursa (Lampas) hians - ANGAS, 1877: 179.
Tutufa (Crossata) californica - SUTER, 1906: 328.
Argobuccinum siphonatum - IREDALE, 1910: 73.
Bursa bubo - VANATTA, 1914: 80 (in part). — SALVAT *et al.*, 1988: 103, pl. 13, fig. 14.
Bursa siphonata - OLIVER, 1915: 528.

TYPE DATA. — *Tritonium bufo* depends for its interpretation on the cited figure, MARTINI (1780: pl. 129, fig. 1238) (repeated by BEU, 1981: fig. 12 a). The specimen illustrated by MARTINI is therefore the holotype of *T. bufo*. However, as noted in the Introduction, no specimens from Martini's or Chemnitz's collections are now known, and this name is without a type specimen. BEU (1981: 273) designated as lectotype of *Bursa rubeta* var. *lissostoma* the specimen (BMNH 197384) figured by SMITH (1914: pl. 4, fig. 3), which is also the specimen figured by REEVE (1844a: pl. 10, fig. 30 b). This specimen is also here designated the neotype of *Tritonium bufo*. The type locality was designated as Madagascar by KURODA *et al.* (1971: 134).

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW9, CP24.
New Caledonia. Off Hienghène, NE coast, 100 m, 1978 (Fig. 55 d). — LAGON: sta. 100, 328, 836, 933. — EXPÉDITION MONTROUZIER: sta. 1303 (Fig. 55 a), 1305, 1314, 1321. — LAGON DE NOUMÉA: sta. 1369. — BATHUS 1: sta. DW640, DW678.
North of New Caledonia. MUSORSTOM 4: sta. DW187.
Norfolk Ridge. MUSORSTOM 4: sta. DW231. — SMIB 4: sta. DW57.
Loyalty Ridge. MUSORSTOM 6: sta. DW442.
These 18 specimens were collected in 0-260 m, and specimens were collected alive at 12-260 m.

DISTRIBUTION. — *Tutufa bufo* is very wide-ranging throughout the Indo-West Pacific province; a record from Natal, South Africa, has been confirmed since my 1981 monograph (pers. comm. R.N. Kilburn, NMP) and it occurs throughout the Indian Ocean, Gulf of Arabia (BOSCH *et al.*, 1982: 84; BOSCH *et al.*, 1995: 104, fig. 376) and Red Sea. In the western Pacific it ranges as far north as central Honshu, Japan (KIRA, 1962: 57) and as far south as northeastern New Zealand, where the southernmost recorded locality is White Island, Bay of Plenty (5 specimens NZGS RM5069). Records extend throughout the central Pacific as far east as Hawaii where, however, only one specimen has been reported (KAY, 1979: 229).

DIMENSIONS. — New Caledonia, MUSTORSTOM 4: sta. DW 231: H 101.8, D 62.5. - LAGON DE NOUMÉA: sta. 1369: H 117.0, D 89.2. - EXPÉDITION MONTROUZIER: sta. 1303: H 101.8, D 72.4. - Coral Sea, CORAIL 2: sta. CP24: H 98.8, D 62.7.

REMARKS. — *Tutufa bufo* is easily distinguished from *T. bubo* by its smaller size (reaching about 180 mm in height), its more sharply nodulous, less rugose, and (on most specimens) cleaner and smoother, cream to pale brown exterior, and its very smooth, widely flared aperture, lacking ridges on the inner lip, and cream to white in colour apart from a deep red ring around the "throat". The red apertural ring is particularly diagnostic. This species has been collected in small numbers all around New Caledonia and the Loyalty Islands by several cruises, which is not surprising as it is much the most widespread species of *Tutufa*, and occurs throughout its range on offshore soft substrates where it is readily sampled by trawling and dredging. It was recorded also (as *Triton lampas* as illustrated by KIENER) by FISCHER (1860). Most New Caledonian specimens are unusually small, and presumably are immature. The living animal, with a brownish pink head-foot strongly maculated with large dark red areas, and the egg-mass were illustrated by COLEMAN (1981: 12; 54).

Tutufa (Tutufa) tenuigranosa (Smith, 1914)

Figs 56 b-c

Bursa (Tutufa) rubeta var. *tenuigranosa* E.A. Smith, 1914: 231, pl. 4, fig. 6.

Bursa tenuigranosa - VANATTA, 1914: 80. — HEDLEY, 1916a: 42.
Tutufa tenuigranosa - HABE, 1973: 139, text-fig. 1.
NOT *Tutufa tenuigranosa* - HABE, 1961: 47, pl. 24, fig. 4. — OYAMA & TAKEMURA, 1963: *Tutufa* pl. 1, figs 6-7. — HABE, 1964: 76, pl. 24, fig. 4 [= *T. oyamai*].
Tutufa (Tutufella) tenuigranosa - BEU, 1981: 285, figs 15 a-c.
Tutufa (Tutufa) tenuigranosa - BEU, 1985: 66, fig. 53; 1987: 346. — WILSON, 1993: 228, pl. 43, fig. 15. — COSSIGNANI, 1994: 103.
Tutufa (Tutufa) bubo form *tenuigranosa* - SPRINGSTEEN & LEOBRERA, 1986: 122, pl. 33, fig. 13.

TYPE DATA. — Lectotype (designated by BEU, 1981: 286) BMNH 1914.6.29.4, an unlocalised specimen. The type locality is here designated as Taiwan. Several paralectotypes are also present in BMNH.

NEW CALEDONIA RECORDS. — **New Caledonia.** I doubtfully localised specimen in Staadt Colln, MNHN (see below).

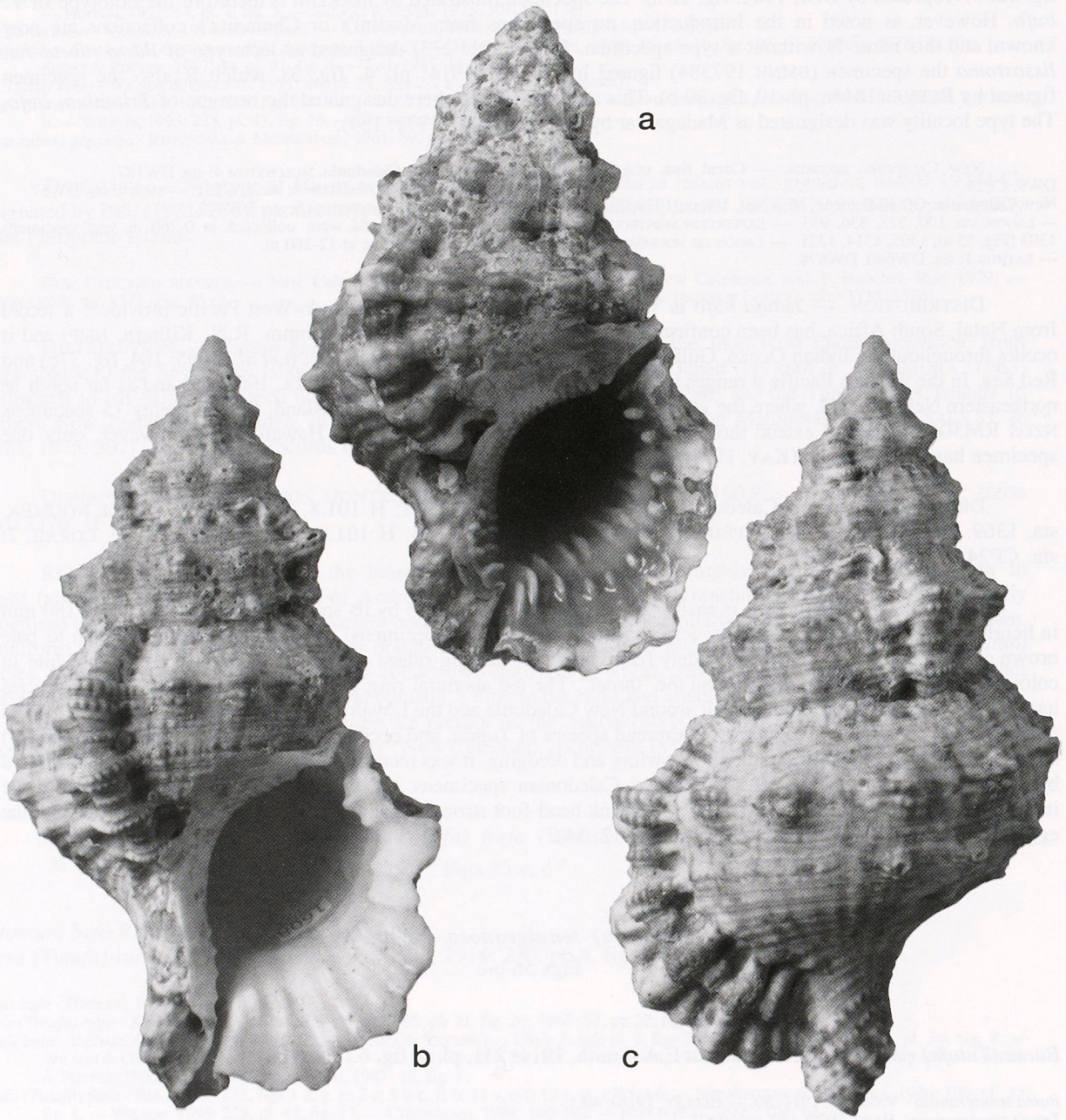

FIG. 56. — *Tutufa* species, both x1. — **a**, *Tutufa (Tutufella) rubeta* (Linné), MNHN, off Hienghène, NE coast of New Caledonia, 100 m, 1978. — **b-c**, *Tutufa (Tutufa) tenuigranosa* (E.A. Smith), MNHN, Staadt Colln, "New Caledonia", but probably from the Philippine Islands.

DISTRIBUTION. — Authentically localised specimens of *T. tenuigranosa* have been seen from Taiwan, the Philippine Islands and Indonesia. Similar but paler and more weakly sculptured specimens, with a particularly weakly sculptured spire apex as in *T. boholica*, have been seen from off Somalia and from the northwestern shelf of Western Australia. Typical *T. tenuigranosa* seems to be limited to the central western Pacific, and is unlikely to range as far south as New Caledonia.

DIMENSIONS. — "Nouvelle-Calédonie", Staadt Colln: H 119.0, D 69.6. - Bohol Straits, Philippines, pres. F.J. Springsteen, NZGS WM14021: H 176.4, D 98.1.

REMARKS. — At the time of the 1981 monograph of *Tutufa* (BEU, 1981) I had seen very little material of *Tutufa tenuigranosa*, but I have since seen many specimens from the Philippine Islands and Taiwan, and a large range of material from Indonesia in RMNH. A Philippines specimen was illustrated in colour by COSSIGNANI (1994: 103). It is now clear that *T. tenuigranosa* is an uncommon species that is distributed widely throughout the western Pacific from Taiwan to Indonesia, and perhaps as far south as New Caledonia. It is easily recognised by its large size (to about 280 mm in height), its tall, narrow shape, its relatively long, strongly twisted anterior canal, its consistent sculpture of finely beaded, low, narrow spiral threads and four slightly more prominent primary cords on the last whorl, the whole surface crossed by microscopic axial threads, its relatively small, narrow, widely spaced peripheral nodules, its plain white aperture with thin, widely flared lips, the outer one deeply digitate and coarsely nodulous inside, the inner one closely ridged with long, narrow, transverse ridges for its whole height, and its very characteristic medium red-brown exterior with markedly darker major spiral cords. The earliest three spire whorls are a little more weakly sculptured than the remainder of the teleoconch and are consistently coloured a pale pinkish brown. Specimens collected relatively recently in the Indian Ocean (off Somalia, and from the far northwestern shelf of Western Australia) appear to represent an unnamed, closely related species differing from *T. tenuigranosa* in its consistently paler coloration and in the weakly sculptured, pinkish early teleoconch stage extending for at least five whorls (closely resembling, in the latter character, *T. boholica*).

Tutufa tenuigranosa is not present in any of the Coral Sea or New Caledonian collections reported here, and I have seen no specimens from eastern Australia or New Guinea. It is included in this report because a lot of four specimens of *Tutufa* in the Staadt Colln, MNHN, labelled "Nouvelle-Calédonie", consists of three *T. bufo* and one *T. tenuigranosa*. However, two of the specimens of *T. bufo* in this lot bear paper labels, stuck into their apertures with adhesive tape, reading "Philippines", throwing great suspicion on the entire sample. The Staadt Colln contains many other wrongly localised specimens and mixed lots (P. Bouchet, com. pers.) and, as *T. tenuigranosa* is now a well-known Philippines species, but is otherwise unknown from New Caledonia, it seems likely the Staadt Colln specimen (Figs 56 b-c) actually originated from the Philippines, but it is illustrated here because of its possible New Caledonian provenance.

Subgenus *TUTUFELLA* Beu, 1981

Lampas Schumacher, 1817: 252. Type species (by monotypy): *Lampas hians* Schumacher, 1817 [= *Murex rana rubeta* Linné, 1758], Recent, Indo-West Pacific. Not *Lampas* Montfort, 1808 [Foraminifera].
Tutufella Beu, 1981: 260. Replacement name for *Lampas* Schumacher, 1817, preoccupied.

REMARKS. — *Tutufa (Tutufella)* is distinguished from *T. (Tutufa)* by the smaller shell size, by the cephalic tentacles bearing two dark colour rings that are absent in *T. (Tutufa)*, and by having a closed seminal groove rather than the open one of *T. (Tutufa)*.

Tutufa (Tutufella) oyamai Habe, 1973

Fig. 55 e

Tutufa oyamai Habe, 1973: 140, fig. 2.

Tutufa oyamai - HINTON, 1978: 31, fig. 3. — OKUTANI, 1986: 116; 117, central fig. — LAI, 1987: 18, fig. 5. — WILSON, 1993: 228, pl. 43, figs 14 a-b.
Tutufa (Tutufella) oyamai - BEU, 1981: 283, figs 1 f, i, l, q, 2 e, 4 b-f, 15 d-i; 1985: 66, fig. 54. — SPRINGSTEEN & LEOBRERA, 1986: 120, pl. 33, fig. 4. — COSSIGNANI, 1994: 106-108. — BOSCH *et al.*, 1995: 104, fig. 378.

Gyrineum (Lampas) ranelloides - MELVILL & STANDEN, 1899: 163.
Tutufa tenuigranosa - HABE, 1961: 47, pl. 24, fig. 4. — OYAMA & TAKEMURA, 1963: *Tutufa* pl. 1, figs 6-7. — HABE, 1964: 76, pl. 24, fig. 4.
Tutufa bubo - WILSON & GILLETT, 1971: 80, pl. 54, figs 2-2 a (in part).

TYPE DATA. — Holotype NSMT 42372, 1 figured paratype NSMT 42373, 1 paratype (presented by Dr T. Habe) NZGS WM11274; all from prawn boats, off Taiwan, South China Sea.

NEW CALEDONIA RECORDS. — **New Caledonia.** LAGON: sta. 905, 1014 (Fig. 55 e).

DISTRIBUTION. — *Tutufa oyamai* occurs throughout the Indian Ocean and the western Pacific archipelagoes, from at least as far southwest as Inhaca Island, southern Mozambique (alive on intertidal coral; NZGS WM15178, pres. Sr C.P. Fernandes) northwards to Muscat, Oman (NZGS WM13355, pres. D.T. Bosch), and in the western Pacific from southern Japan southwards to Queensland and New South Wales, Australia (BEU, 1981: 285). However, I am not aware of records from further eastward than New Caledonia, and it is not recorded from Hawaii (KAY, 1979). A range through at least part of Polynesia seems likely but needs confirmation.

DIMENSIONS. — LAGON: sta. 1014: H 67.8, D 46.7.

REMARKS. — *Tutufa oyamai* is similar to the more common *T. rubeta* in size range (mature shells range in height from *ca* 65 to 100 mm), in shape, in the closely and finely plicate inner lip, and in the inner lip being widely flared over the previous whorl. Also, while most specimens have a strongly digitate thin, flared margin to the outer lip (the digitations corresponding to the spiral cords on the exterior), some specimens of both species are found with a much wider and more heavily calcified outer lip, without digitations, the complete apertural outline then being almost circular; these appear likely to be egg-laying females, the apertural margin conforming to the exterior of the egg-mass as it is being secreted (as observed in living *Crossata californica*; B. Foster & C. Glass, Abbey Specimen Shells, pers. comm.). *T. oyamai* is easily distinguished from *T. rubeta* by its white rather than orange to brick-red aperture (lip margins cream to pale brown on some specimens of *T. oyamai*), by having longer, semitubular anterior and posterior siphonal canals, by its pale peach to yellow-brown exterior with narrow red-brown spiral lines around the nodule rows, rather than strongly maculated in dark red-brown and white to deep maroon as in *T. rubeta*, and by its more subdued external sculpture of narrower nodule rows, with markedly finer interstitial rows of gemmae than the coarse, closely spaced small nodules of *T. rubeta*. Only two specimens of *T. oyamai* are present in the MNHN/ORSTOM collections reported here; one (LAGON: sta. 1014) is a moderately large, live-collected specimen with a widely flared, circular aperture (*i.e.* an egg-laying female?) whereas the other (LAGON: sta. 905) is a broken, long-dead juvenile specimen, distinguished from the slightly more common juveniles of *T. bufo* in these collections by its markedly coarser peripheral nodules and interstitial gemmae.

Tutufa (Tutufella) rubeta (Linné, 1758)

Figs 55 b, 56 a, 57 b, d-e

Murex rana rubeta Linné, 1758: 748.
Tritonium tuberosum Röding, 1798: 127.
Biplex tuberculus Perry, 1811: pl. 4, fig. 3.
Lampas hians Schumacher, 1817: 252.
Lampas caledonensis Jousseaume, 1881: 177.

Murex lampas rubeta - LINNÉ, 1767: 1216. — GMELIN, 1791: 3532.
Tritonium rubeta - RÖDING, 1798: 128.
Triton lampas - LAMARCK, 1816: pl. 420, figs 3 a-b; "Liste des objets", p. 5; LAMARCK, 1822: 180 (in part) (not *Murex lampas* Linné, 1758).
Murex lampas - WOOD, 1828: pl. 25, *Murex* fig. 28 d.
Tritonium lampas - ANTON, 1838: 83.
Triton lampas var. - KÜSTER & KOBELT, 1871: 175, pl. 40, figs 7-8.
Bursa (Tutufa) rubeta, typical var. - SMITH, 1914: 228, pl. 4, figs 1-2.
Bursa rubeta - VANATTA, 1914: 80. — HEDLEY, 1916a: 41. — HINTON, 1972: 14, pl. 6, fig. 23; pl. 7, fig. 2. — CERNOHORSKY, 1972a: 118, pl. 1, fig. 5. — DRIVAS & JAY, 1988: 62, pl. 16, fig. 2. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 16.
NOT *Bursa rubeta* - BOSCH *et al.*, 1982: 84 [= *T. bufo*].

Bursa (Bufonaria) rubeta - COOKE, 1916: 9.
Tutufa rubeta - OYAMA & TAKEMURA, 1963: *Tutufa* pl. 2, fig. 1. — HABE & KOSUGE, 1966a: 46, pl. 16, fig. 8. — HINTON, 1978: 31, fig. 2. — OKUTANI, 1986: 116; 117, top row, 5th fig. from left. — SHORT & POTTER, 1987: 44, pl. 21, fig. 5. — LAI, 1987: 18, fig. 2.
Tutufa (Tutufella) rubeta - BEU, 1981: 280, figs 1 b-c, e, j-k; 3; 4 g-i; 5 d-e; 7; 9 c; 12 b-c; 14 d. — SPRINGSTEEN & LEOBRERA, 1986: 120, pl. 33, figs 6 a-b. — WILSON, 1993: 228, pl. 43, fig. 18. — COSSIGNANI, 1994: 109-110.
NOT *Bursa (Lampas) hians* - ANGAS, 1877: 179 [= *T. bufo*].

TYPE DATA. — Following the review by BEU (1981), most names regarded as synonyms of *Murex rana rubeta* remained without type specimens, as the figures cited by early authors are reasonably clearly identifiable, so there were thought to be no complications about the synonymy. However, MÜHLHÄUSSER & BLÖCHER (1979) described the very similar Indian Ocean species *T. nigrita* while that review was in press and, as it is impossible to distinguish whether any of the early illustrations were intended to represent either *T. rubeta* or *T. nigrita*, it is now desirable to select a neotype for *T. rubeta*. The main character distinguishing *T. nigrita* is its yellow aperture with a dark brown to black inner lip, rather than the uniform orange to red aperture of *T. rubeta*. It is therefore particularly unfortunate that the figure (RUMPHIUS, 1705: pl. 28, fig. D) cited for *Murex rana rubeta* Linné, 1758 is an undiagnostic dorsal view. The selection of an appropriate neotype turns out, however, not to be a simple matter.

The case of *Triton lampas* Lamarck, 1816 is unusually complex. According to Rosalie de Lamarck's annotation on Lamarck's copy of LAMARCK (1822), the Lamarck Colln originally contained four specimens assigned to *Triton lampas*; five specimens are now present (Dr Y. FINET, MHNG, letter Jan. 1993). The figure in LAMARCK (1816: pl. 420, figs 3 a-b) is, as usual, poorly drawn, but nevertheless the relatively tall spire, the relatively small nodules on the shoulder of the last whorl (in particular, without a large nodule on the terminal varix), the short anterior canal, and the coarsely and closely plicate inner lip show clearly that the illustrated specimen is *T. rubeta*. The outer lip is narrow, with moderately long digitations around its lower (abapical or anterior) half, and the hollow furrow inside the lip shows it is incompletely secreted. None of the five specimens now recognised in Lamarck's Colln agrees in detail with this specimen. The five are: (1) a large (H 230) specimen of *T. bubo*, with a large shoulder nodule on the terminal varix (MHNG 1099/7b); (2) a relatively small (H 90) specimen of *T. bufo*, illustrated by KIENER (1842: pl. 5, fig. 1) as *Triton lampas* (MHNG 1099/75); (3) a fairly large (H 105.5) specimen of *T. rubeta*, differing from LAMARCK's (1816: pl. 420, figs 3 a-b) figured specimen in its slightly shorter spire, its completely secreted outer lip interior, its more widely flared inner lip shield, and its widely flared outer lip margin with an only weakly digitate edge (MHNG 1099/74); (4 and 5) MHNG 1099/73, two small, immature specimens, one a coarsely sculptured *T. bubo*, and the other apparently *T. rubeta* (not identifiable with certainty). It therefore appears that LAMARCK's (1816) figured syntype is not now among Lamarck's specimens, and therefore, that at least **two** of the specimens currently identified as syntypes have been added to the collection since it was owned by Lamarck. It seems preferable not to choose one of Lamarck's specimens as the neotype.

REEVE (1844a), in his monograph of *Triton*, illustrated *Tutufa bubo* (pl. 9, fig. 30 a) and *T. bufo* (pl. 10, fig. 30 b) as "*Triton lampas*", but did not include a figure of *T. rubeta*.

The earliest nominal taxon with clearly identifiable type specimen(s) that belong in the species here called *Tutufa rubeta* is therefore *Lampas caledonensis*. Five syntypes of *L. caledonensis* remain in MNHN, and another presented by Jousseaume to BMNH was illustrated by SMITH (1914: pl. 4, fig. 2). Of Jousseaume's five syntypes in MNHN, three specimens are *Tutufa rubeta* of this monograph, and two specimens (Figs 57 a, c) are *Tutufa nigrita*. As *T. nigrita* occurs only in the central and western Indian Ocean (Réunion, Mauritius, Madagascar (Grand Récif de Tuléar, type locality), East Africa and Oman; BOSCH *et al*, 1995: 104), there is no doubt that these specimens are wrongly localised, throwing some doubt on the reliability of Jousseaume's other specimens. However, although few specimens of *T. rubeta* are present among the ORSTOM/MNHN collections reported on here, specimens from New Caledonia are common in museums and private collections, and there is no reason to doubt Jousseaume's locality. The cleanest and most complete of Jousseaume's two adult, large syntypes of *Lampas caledonensis* (Figs 57 d-e) is here designated the lectotype of *Lampas caledonensis* Jousseaume, 1881. This specimen (H 114.6, D 70.7, labelled simply "N^{el}. Calédonie, Jouss.") is here designated also the neotype of *Murex rana rubeta*, of *Tritonium tuberosum*, of *Biplex tuberculus*, and of *Lampas hians*. The type locality of all five nominal taxa is therefore New Caledonia. The paralectotypes of *Lampas caledonensis* are (1) one immature specimen of *T. rubeta*, "N^{el}. Calédonie, Jouss.", H 85.4, D 52.8 (Fig. 57 b); (2) another large, mature, adult specimen of *T. rubeta*, H 119.3, D 71.4, "Nouvelle-Calédonie, don. de M. l'abbé Lambert, no. 12, 1876", *ex* Jousseaume Colln; and (3), the two specimens of *T. nigrita* mentioned above, "N^{el}. Calédonie, Jouss." (**wrong**, probably from Mauritius or Madagascar); H 64.6, D 37.5; H 56.7, D 33.0.

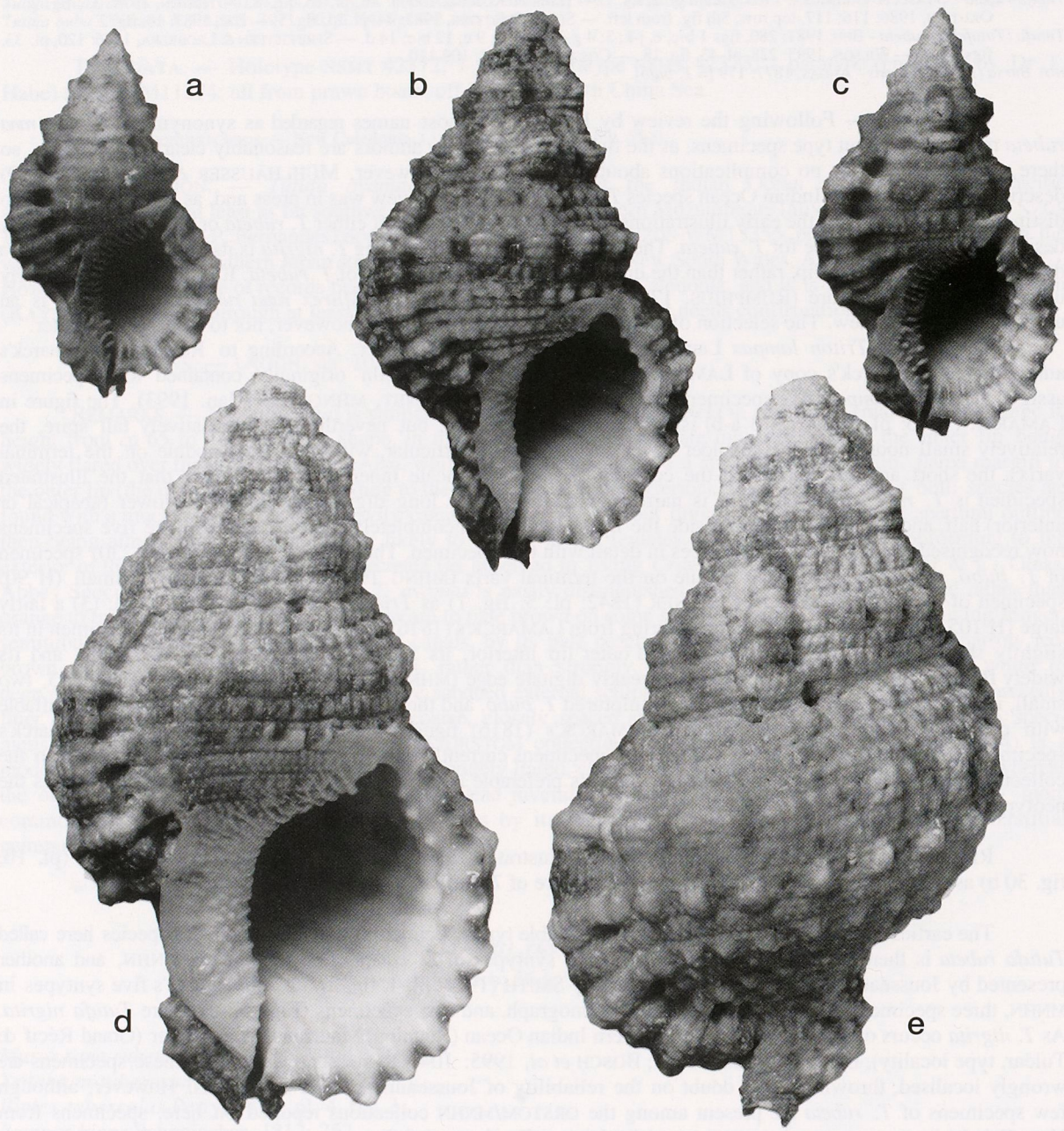

FIG. 57. — Four of the syntypes of *Lampas caledonensis* Jousseaume, in MNHN; all x1. — **a**, **c**, *Tutufa (Tutufella) nigrita* Mühlhäusser & Blöcher, paralectotypes of *Lampas caledonensis*, "New Caledonia" (wrong; Mauritius?). — **b**, *Tutufa (Tutufella) rubeta* (Linné), small paralectotype, "New Caledonia". — **d-e**, *Tutufa (Tutufella) rubeta* (Linné), neotype of *Murex rana rubeta* Linné, 1758, of *Tritonium tuberosum* Röding, 1798, and of *Biplex tuberculus* Perry, 1811, and lectotype of *Lampas caledonensis* Jousseaume, 1881; "New Caledonia".

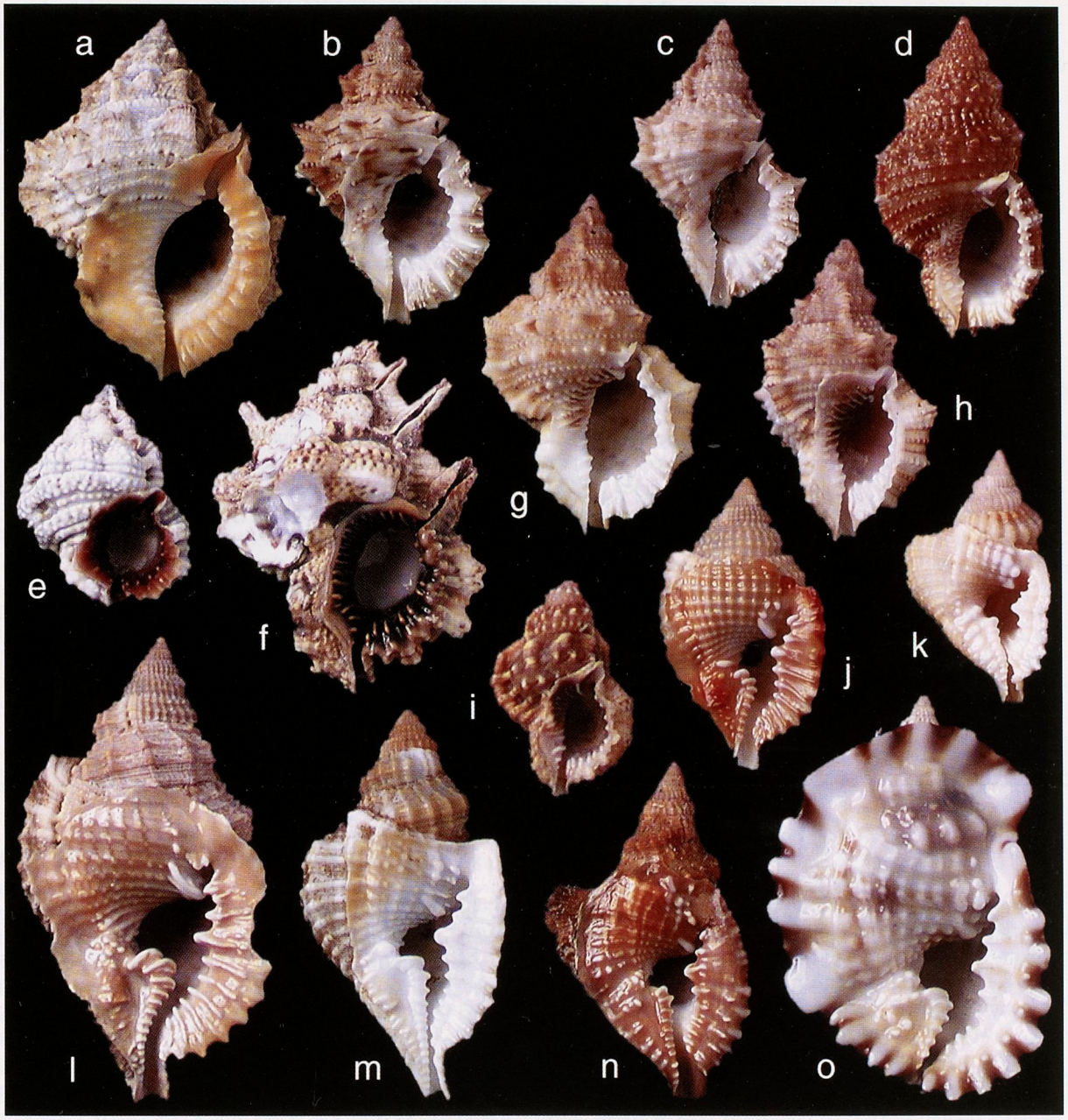

FIG. 58. — *Bufonaria, Bursa* and *Distorsio* species, all from New Caledonia. — **a**, *Bufonaria thersites* (Redfield), LAGON: sta. 555, Grand Récif Sud, 32 m, x1. — **b**, *Bursa quirihorai* Beu, SMIB 8: sta. CP162, Norfolk Ridge, 254-264 m, x1. — **c**, *Bursa fijiensis* (Watson), SMIB 8: sta. DW189, Norfolk Ridge, 400-402 m, x1. — **d**, *Bursa granularis* (Röding), EXPÉDITION MONTROUZIER: sta. 1303, 0-8 m, Plateau Karembé, x1. — **e**, *Bursa rhodostoma* (Beck *in* G.B. Sowerby II), EXPÉDITION MONTROUZIER: sta. 1245, intertidal, Grand Récif Mengalia, x1.25. — **f**, *Bursa lamarckii* (Deshayes), EXPÉDITION MONTROUZIER: sta. 1270, 10-35 m, Grand Récif Mengalia, x1.— **g**, *Bursa latitudo* Garrard, VOLSMAR: sta. DW41, Loyalty Ridge, 195-250 m, x1. — **h**, *Bursa fosteri* Beu, SMIB 6: sta. DW130, north of New Caledonia, 225-230 m, x1.25. — **i**, *Bursa lucaensis* Parth, dark specimen, LAGON: sta. 836, Poindimié, 57 m; x2. — **j**, *Distorsio parvimpedita* sp. nov., holotype, EXPÉDITION MONTROUZIER: sta. 1260, channel NE of Touho Bank, 49-59 m, x1.25. — **k**, *Distorsio euconstricta* Beu, southern New Caledonia, 200-350 m, coll. P. Tirard, x1.25. — **l**, *Distorsio reticularis* (Linné), LAGON: sta. 55, Nouméa, 23 m, x1. — **m**, *Distorsio decipiens* (Reeve), SMIB 6: sta. DW128, north of New Caledonia, 205-215 m, x1. — **n**, *Distorsio kurzi* Petuch & Harasewych, LAGON: sta. 374, Grand Récif Sud, 70-72 m, x1.25. — **o**, *Distorsio anus* (Linné), EXPÉDITION MONTROUZIER: sta. 1268, 9-11 m, La Thiem, x1.

NEW CALEDONIA RECORDS. — **New Caledonia.** Off Hienghène, 100 m, 6 Sept. 1978 (Fig. 56 a). — Passe Le Leizour, 100 m, 5 Sept. 1978. — Amédée Lighthouse, Nouméa, coll. P. Bouchet, 25 April 1979. — EXPÉDITION MONTROUZIER: sta. 1245, 1270, 1272, 1274 (Fig. 55 b), 1318, 1332.
These 9 specimens were collected in 0-100 m, but most living specimens were collected in 0-35 m on coral reefs.

DISTRIBUTION. — *Tutufa rubeta* has a very similar distribution to that of *T. bufo*, but does not quite reach the same limits. Although it occurs from southeastern Africa (possibly as far west at Natal, South Africa) to Eilat in the Red Sea, there are no records from Oman. In southern Japan, it probably does not occur north of the Ryukyu Islands, as it was not recorded from the main islands by either KIRA (1962) or HABE (1964). In Australia, it is recorded as far south as Fremantle, in Western Australia, and Coff's Harbour in northern New South Wales; it does not occur in New Zealand. Empty shells are abundant at some quite southern localities (*e.g.* One Tree Island, Capricorn Group) on the Great Barrier Reef. Although it occurs through much of the central Pacific, it is not recorded from Hawaii (KAY, 1979).

DIMENSIONS. — *Lampas caledonensis* (lectotype) and *Murex rana rubeta* (neotype): H 114.6, D 70.7. - New Caledonia, off Hienghène: H 113.2, D 69.5. - Eilat, Red Sea, dived, coll. M. Blom, 1964-65, in University Zoological Museum, Copenhagen (largest seen): H 132.3, D 82.0.

REMARKS. — *Tutufa rubeta* is a highly distinctive species because of its marbled cream and red-brown to uniform deep maroon exterior, its orange to bright red aperture with two clearly separated rows of nodules inside the outer lip, its closely and intricately ridged inner lip, and its low varices and nodules that give most specimens a rather evenly oval appearance, lacking the prominent nodules (particularly where the varices cross the shoulder angle) of other *Tutufa* species. Whereas most specimens have only moderately flared lips and a strongly digitate outer lip, many of the largest specimens have strongly flared, raised collars on both the inner and outer lips (these are probably egg-laying females). *T. rubeta* is much smaller than the *Tutufa (Tutufa)* species known to occur in New Caledonia.

Family PERSONIDAE Gray, 1854

Genus *DISTORSIO* Röding, 1798

Distorsio Röding, 1798: 133. Type species (SD by PILSBRY, 1922: 347): *Murex anus* Linné, 1758, Pliocene to Recent, Indo-West Pacific.
Distortrix Link, 1807: 122. Type species (SD by DALL, 1904: 133): *Murex anus* Linné, 1758.
Persona Montfort, 1810: 603. Type species (by monotypy): *Murex anus* Linné, 1758.
Distorta Perry, 1811: Caption to pl. 2. Type species (SD by EMERSON & PUFFER, 1953: 96): *Distorta rotunda* Perry, 1811 [= *Murex anus* Linné, 1758].
Rhysema Clench & Turner, 1957: 236. Type species (OD): *Triton clathratum* Lamarck, 1816, Pliocene to Recent, western Atlantic Ocean.

Distorsio anus (Linné, 1758)

Figs 58 o, 59 a-b

Murex anus Linné, 1758: 750.
Distorta rotunda Perry, 1811: pl. 10, fig. 2.
Distorta rugosa Schumacher, 1817: 249.

Murex anus - LINNÉ, 1767: 1218. — GMELIN, 1791: 3536. — DILLWYN, 1817: 703. — HANLEY, 1855: 292.
Distorsio anus - RÖDING, 1798: 133. — TRYON, 1880: 35, pl. 15, fig. 153; pl. 17, figs 173-174. — OOSTINGH, 1925: 134. — IREDALE, 1929b: 280. — HIRASE, 1936: 66, pl. 96, fig. 4. — EDMONDSON, 1946: 143, fig. 61 k. — WISSEMA, 1947: 152. — EMERSON & PUFFER, 1953: 96. — KIRA, 1955: 43, pl. 21, fig. 16. — OYAMA & TAKEMURA, 1959: *Distorsio* pl. 2, figs 5-8. — RIPPINGALE & MCMICHAEL, 1961: 68, pl. 7, fig. 14. — KIRA, 1962: 57, pl. 22, fig. 16. — HABE & KOSUGE, 1966a: 44, pl. 15, fig. 18. — WILSON & GILLETT, 1971: 78 j, pl. 53, figs

7-7 a. — HINTON, 1972: 12, pl. 6, fig. 1. — LEWIS, 1972: fig. 42. — CERNOHORSKY, 1967a: 323, pl. 45, fig. 23, text-fig. 13. — SALVAT & RIVES, 1975: 306, fig. 176. — HINTON, 1978: 30, figs 1-1 a. — KAY, 1979: 223, fig. 79 K. — BEU, 1985: 62. — SPRINGSTEEN & LEOBRERA, 1986: 117, pl. 32, fig. 2. — OKUTANI, 1986: 114-115, second fig. second row. — SHORT & POTTER, 1987: 48, pl. 23, fig. 11. — DRIVAS & JAY, 1988: 62, pl. 16, fig. 8. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 8. — LAI, 1989: 127, fig. 55. — HENNING & HEMMEN, 1993: 135, pl. 27, fig. 1. — WILSON, 1993: 239, pl. 40, figs 21 a-b. — KRONENBERG, 1994: 63, fig. 5; pl. 1, fig. 1; pl. 2, fig. 4.

Distortrix anus - LINK, 1807: 123. — TAPPARONE-CANEFRI, 1881: 44. — HEDLEY, 1899: 456. — SCHEPMAN, 1909: 113.

Persona anus - MONTFORT, 1810: 603. — KOBELT, 1876a: 49; 1876 [in 1876-78]: pl. 10, fig. 3; 1878b: 370.

Triton anus - LAMARCK, 1816: pl. 413, figs 3 a-b; "Liste des objets", p. 4; 1822: 186. — J. SOWERBY & G.B. SOWERBY I, 1826: pl. 227, fig. 2. — QUOY & GAIMARD, 1833: 544, pl. 40, figs 6-10. — KIENER, 1842: 22, pl. 15, fig. 1. — REEVE, 1842: 198, pl. 244, fig. 2. — DESHAYES, 1843: 366. — REEVE, 1844a: pl. 12, fig. 44. — KÜSTER & KOBELT, 1872: 198, pl. 57, figs 1-2.

TYPE DATA. — Linné's collection housed by the Linnean Society of London contains two specimens of *Distorsio anus*, as interpreted by all post-Linnean authors, identified as syntypes of *Murex anus*. One specimen is encrusted, and bears no markings. The other is a fresh, clean shell, with "539" written clearly in the aperture (539 is the species number of *Murex anus* in LINNÉ, 1767: 1218). There is therefore no doubt that this specimen is an authentic Linnean syntype, and it is here designated the lectotype of *Murex anus*. The same specimen is also here designated the neotype of *Distorta rotunda* and of *Distorta rugosa*. The type locality is here designated as Ambon Island (Amboina), eastern Indonesia. Two additional paralectotypes of *Murex anus* are present in the Linné Colln of the Uppsala University Zoological Museum (WALLIN, 1993: 74).

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW60, DW91 (Fig. 59 b), DW147.
New Caledonia. LAGON: sta. 230, 1181. — EXPÉDITION MONTROUZIER: sta. 1246, 1268 (Fig. 58 o), 1272, 1318.
North of New Caledonia. LAGON: sta. 455.
Norfolk Ridge. SMIB 4: sta. DW55.
Loyalty Ridge. MUSORSTOM 6: sta. DW430 (Fig. 59 a).
These specimens collected alive were taken from the intertidal zone to 45 m.

DISTRIBUTION. — *Distorsio anus* is very widespread in shallow water throughout the Indo-West Pacific province, from Natal, South Africa, throughout the Indian Ocean to Somalia and southern India, and in the Red Sea (although I have seen no records from the Gulf of Arabia); in the western Pacific it occurs as far north as the Kii Peninsula, Honshu, Japan (OYAMA & TAKEMURA, 1959: *Distorsio* pl. 2, fig. 5) and as far south as Queensland, Australia, and New Caledonia; and as far east as Hawaii (KAY, 1979) and Pitcairn (1, NMNZ M270993, coll. P. Sharples, 1994).

DIMENSIONS. — *Murex anus* (lectotype): H 51.0, D 36.7. - New Caledonia, SMIB 4: sta. DW55: H 65.8, D 50.3. Maximum size recorded in New Caledonia 80.1 mm (PRIGENT, 1993).

REMARKS. — *Distorsio anus* is one of the most distinctive of all molluscs and being reasonably common, has been listed and illustrated in so many papers, monographs and popular books it would be pointless to list them all. The synonymy above includes the synonyms, most of the early, well-known iconographies, some modern papers (*e.g.* CERNOHORSKY, 1967a: 323; radula described and illustrated) and several popular books where it has been illustrated in colour. The most distinctive characters are its extremely distorted coiling, the dark red-brown and white spiral banding of the teleoconch exterior, the anterior canal being bent towards the dorsum at right angles to the plane of the aperture, and the extraordinarily developed apertural shield, highly polished but bearing numerous, irregular nodules and hollows (as the previous whorls show through), hiding much of the rest of the shell (apart from the spire apex) in ventral view in large specimens. The interior of the outer lip bears the usual *Distorsio* row of large nodules, the third from the adapical end much the largest, and the columellar base bears the usual *Distorsio* prominent ridge protruding to the right into the aperture, bearing prominent, thin, transverse ridges - in this species, five or, less commonly, six ridges. Many specimens have alternate white and red-brown radiating colour splashes around the outer margin of the apertural shield. Juvenile specimens have a narrowly conical, undistorted spire.

As *Distorsio anus* is the sole species of the genus occurring commonly in shallow water (even occasionally found intertidally on sand flats) throughout the Indo-West Pacific province, it is not surprising that several specimens are present in the LAGON and EXPÉDITION MONTROUZIER samples and in samples from the Coral Sea. However, *D. anus* appears to be relatively uncommon in New Caledonia.

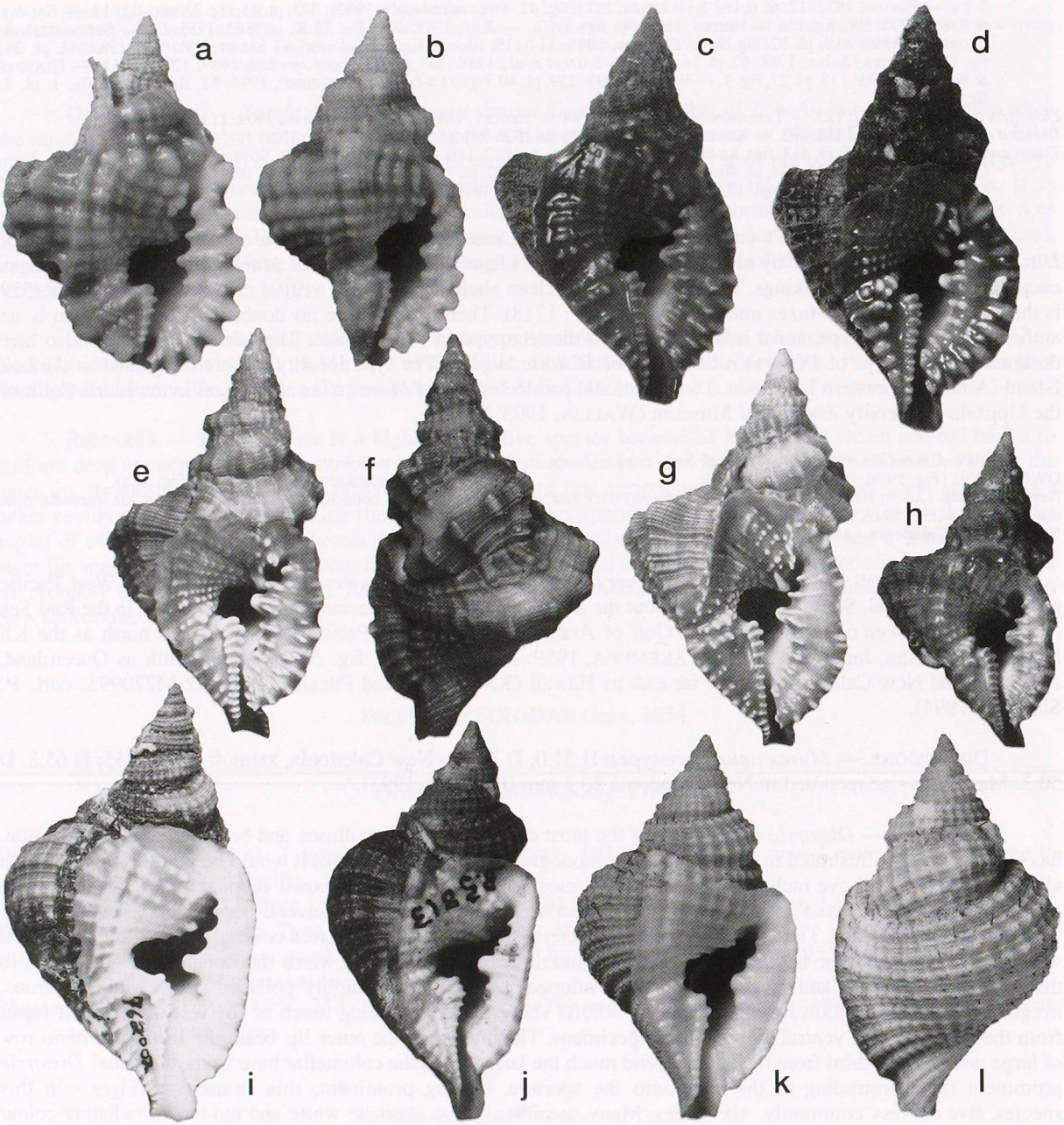

FIG. 59. — *Distorsio* species. — **a-b**, *Distorsio anus* (Linné), immature specimens. **a**, MUSORSTOM 6: sta. DW430, Loyalty Ridge, 30 m, x1. **b**, CORAIL 2: sta. DW91, Chesterfield Plateau, Coral Sea, 43 m, x1.5. — **c-h**, *Distorsio kurzi* Petuch & Harasewych. **c**, LAGON: sta. 374, Grand Récif Sud, New Caledonia, 70-72 m, x1.5. **d**, NMP, dredged off Park Rynie, Natal, South Africa, 100 m, x1. **e-f**, typical large Philippines specimen, NZGS WM15615, 100-200 m, off Cebu, x1.5. **g**, largest specimen seen, off Punta Engãno, Mactan I., Cebu, Philippines, F.J. Springsteen Colln, x1. **h**, NMP H7529, Maldive Islands, x1. — **i-l**, *Distorsio perdistorta* Fulton. **i**, USNM 762002, Gulf of Guinea, West Africa, 100 m, x1. **j**, NMP B3813, dredged off Park Rynie, Natal, South Africa, 120 m, x1. **k-l**, MUSORSTOM 6: sta. DW428, Loyalty Ridge, New Caledonia, 420 m, x1.25.

Distorsio decipiens (Reeve, 1844)

Figs 58 m, 61 g-k, 63 a-e

Triton decipiens Reeve, 1844a: pl. 20, fig. 102.

Triton decipiens - Reeve, 1844c: 121.
Distorsio decipiens - Brazier, 1877: 174. — Oyama & Takemura, 1959: *Distorsio* pl. 1, figs 5-6. — Beu, 1985: 62. — Springsteen & Leobrera, 1986: 118, pl. 32, fig. 6. — Henning & Hemmen, 1993: 138, pl. 27, fig. 5. — Wilson, 1993: 239. — Kronenberg, 1994: 72, fig. 11; pl. 3, fig. 3.
Persona decipiens - Kobelt, 1878b: 370.
Distorsio (Rhysema) decipiens - Habe, 1961: 4b, pl. 23, fig. 2; 1964: 74, pl. 23, fig. 2. — Okutani, 1986: 115, 2nd fig. from right, central row.
Distorsio (Distorsio) reticulatus decipiens - Shuto, 1969: 89, pl. 7, figs 9-10.
Distorsio cancellinus - Tryon, 1880: 35, pl. 17, fig. 178 (only).
Distorsio ridens - Oyama & Takemura, 1959: *Distorsio* pl. 1, figs 7-8.

Type data. — Three specimens assumed to be syntypes of *Triton decipiens* (as they are the only Cuming Colln specimens present in BMNH), BMNH 1984162, from "Island of Mindanao", Philippines. The medium-sized specimen most closely matches Reeve's (1844a: pl. 20, fig. 102) figure, but differs in having a less brightly striped outer lip, and in having a V-shaped, enlarged third tooth inside the outer lip, rather than the clearly single one of the drawing. This specimen (Figs 63 c-d; H 51.0, D 28.3) is here designated the lectotype. Another apparent paralectotype, MCZ 188158, "Mindanao, Philippines", *ex* Cuming Colln and C.B. Adams Colln.

New Caledonia records. — **Coral Sea.** MUSORSTOM 5: sta. 301.
New Caledonia. LAGON: sta. 386, 580, 745 (Fig. 63 e). — EXPÉDITION MONTROUZIER: sta. 1314, 1321. — BATHUS 1: sta. DW640, DW645, DW659, DW665, CP667, CP668, DW674, CP680, DW688, DW689, DW690, DW691, DE700, CP702, CP710, CP712, DW713. — HALIPRO 1: sta. CP851, CP853, CP855, CP863.
North of New Caledonia. MUSORSTOM 4: sta. CC173. — SMIB 6: sta. DW115, DW128 (Fig. 58 m), DW134. — BATHUS 4: sta. DW901, CP905, DW943, CP953.
Norfolk Ridge. BIOCAL: sta. DW77. — MUSORSTOM 4: sta. DW203, DW204 (Figs 61 h-i). — BATHUS 2: sta. DW717.
Loyalty Ridge. MUSORSTOM 6: sta. DW391, DW397, DW398, DW417, DW422, DW439, DW442, DW451, DW452.
These 49 lots were collected in 30-660 m, but only 3 specimens were collected in less than 100 m. *D. decipiens* is most common in 100-350 m.

Other material examined. — **Vanuatu.** MUSORSTOM 8: sta. CP971, 20°19' S, 169°53' E, 250-315 m (2). — Sta. CP1031, 17°53' S, 168°33' E, 310 m (1 lv). — Sta. CP1039, 16°50' S, 168°30' E, 464-472 m (1). — Sta. DW1097, 15°05' S, 167°11' E, 281-288 m (3; 1 lv). — Sta. CP1103, 15°04' S, 167°08' E, 163-165 m (1). — Sta. DW1105, 15°03' S, 167°07' E, 154-179 m (1). — Sta. CP1137, 15°42' S, 167°03' E, 360-371 m (1).
Eastern Australia. Off the Bunker Group, Great Barrier Reef, Queensland, trawled 200-260 m (3, Whitehead Colln). — SE of Hixson Cay, Swain Reefs, trawled 188-192 m (2 NZGS, pres. Allan Limpus).
Fiji, Pliocene fossils. Around Waila, Nausori, Fiji; Nakasi Sandstone, Late Pliocene; coll. K.J. Gilchrist, 1988 (13 AMS C301897).

Distribution. — The distribution of *Distorsio decipiens* is poorly known at present, as it has been recognised by so few previous workers. Although most material in museums comes from the area between southern Japan and the Philippine Islands, I have seen specimens from off Natal, South Africa (NMP), off Madagascar (MNHN), off the Seychelles Islands (1 MNHN), in numerous MUSORSTOM 2 samples off the Philippines in 122 to 490 m (MNHN), from Queensland, Australia, from Taiwan and southern Japan, as well as the above New Caledonia and Vanuatu material. The species therefore presumably ranges throughout the Indo-West Pacific province, although its eastern limit is unclear. The northernmost Japanese locality is listed as Kii Peninsula, Honshu by Habe (1964: 74).

Dimensions. — Lectotype: H 51.0, D 28.3; paralectotypes: H 57.8, D 29.3; H 46.4, D 25.0. - Mactan Island, Cebu, Philippines, largest seen, NZGS WM13119: H 70.0, D 38.77. - New Caledonia, SMIB 6: sta. DW128: H 58.3, D 33.1; sta. DW134: H 55.5, D 31.0.

Remarks. — As *Distorsio decipiens* has been recognised by few workers outside Japan, following the disparaging remarks by Tryon (1880: 35) that "*D. constrictus* ... *D. ridens* ... *and D. decipiens* have no claim to rank even as varieties", the synonymy is briefer than its wide Indo-West Pacific distribution and commonness in several areas would indicate. It is difficult to know whether Brazier (1877: 174) had *D. decipiens* or the more common *D. reticularis* before him, but as *D. decipiens* occurs in Queensland and Brazier presumably had access to Reeve's (1844a) figures, it is feasible that his identification was correct.

The name *Distorsio decipiens* has been applied consistently in Japan to a species occurring sympatrically with *D. reticularis*, as well as in deeper water than *D. reticularis*, and differing from *D. reticularis* in its pale brown

FIG. 60. — *Distorsio* species. — **a-b**, *Distorsio djunggranganensis* Martin, holotype, RMNH 9818, Upper Miocene, "G. Spelong", West Progo Mountains, Java, x2. — **c-h**, *Distorsio habei* Lewis. **c.** holotype of *Distorsio kotakai* Ogasawara & Morita, IGPS 100052, Middle Miocene, Yanagawa, NE Honshu, Japan, x1.5. **d**, SMIB 8: sta. DW182, Norfolk Ridge, New Caledonia, 314-330 m, x1.5. **e**, SMIB 4: sta. DW49, S. New Caledonia, 240-300 m, x1.5. **f-g**, largest New Caledonian specimen, SMIB 1: sta. DW6, southern New Caledonia, 300 m, x1. **h**, unusually large Philippines specimen, Mactan I., Cebu, F.J. Springsteen Colln, x1. — **i-j**, **l-n**, *Distorsio euconstricta* Beu. **i**, CHALCAL 1: sta. D2, Lansdowne-Fairway Bank, Coral Sea, 80-120 m, x2. **j**, SMIB 5: sta. DW94, Norfolk Ridge, New Caledonia, 275 m, x1.5. **l-m**, specimen in Fig. 58 k, x1.5. **n**, paratype, NZOI.T682, NZOI Sta. P82, off Lord Howe I., 78-84 m, x1.5. — **k**, **o-p**, *Distorsio graceiellae* Parth. **k**, BATHUS 1: sta. DW692, off east coast of New Caledonia, 140-150 m, x2. **o-p**, VOLSMAR: sta. DW41, Loyalty Ridge, New Caledonia, 195-250 m, x2.5 (**p**. unwhitened specimen, to show characteristic pale brown band in subperipheral constriction).

aperture (uniform on some specimens, radially banded brown and white on others), by its long and very straight anterior canal (deviated to the left, in conventional apertural view, in most *D. reticularis*), by its closely spaced two peripheral cords, separated from the cord anterior to them by a wider interspace than other spaces, by its concave sutural ramp, by its prominent subsutural cord, which bends strongly adapically at the end of each intervariceal interval to extend up to the strongly adapically flared apertural shield, forming a marked, almost square, right adapical extremity to the outer lip that is not present on *D. reticularis*, and by its very uniform white to pale yellow-brown exterior. The consistent, long, anteriorly decreasing row of 9-10 basal columellar nodules is matched by a row of short, transverse ridges along the lower left edge of the columellar shield, margining the edge of the neck, which is more gently contracted than in *D. reticularis*. Examination with F.J. Springsteen during preparation of SPRINGSTEEN & LEOBRERA (1986) of large Philippine Islands collections of *Distorsio* showed that *D. decipiens* is a reasonably common and consistent species there, but most specimens have a white aperture, at most tinged with golden brown on the apertural shield. Subsequent examination of large *Distorsio* collections from South Africa and New Caledonia has shown that *D. decipiens* is distinguishable in these areas also, and is almost as common as *D. reticularis*, but in general occurs in deeper water. It now appears that a large number of quite similar *Distorsio* species occur sympatrically in the Philippine Islands, in New Caledonia, and in South Africa (*i.e.* almost certainly throughout the Indo-West Pacific) (see also KRONENBERG, 1994) and care is necessary to distinguish them; some juvenile and aberrant specimens are not identifiable with certainty.

The Philippines Pliocene (?) fossil, from the Dingle Formation on Panay Island, Philippines, illustrated by SHUTO (1969) is typical *D. decipiens*.

Distorsio euconstricta Beu, 1987

Figs 58 k, 60 i-j, l-n

Distorsio (Distorsio) euconstricta Beu, 1987: 310, figs 131-143, 145.

Distorsio euconstricta - HENNING & HEMMEN, 1993: 140, pl. 28, fig. 7. — WILSON, 1993: 239. — KRONENBERG, 1994: 74, fig. 13; pl. 2, fig. 10.

TYPE DATA (listed with full data by BEU, 1987: 314). — Holotype USNM 718952, from International Indian Ocean Expedition sta. 437, 90 m, 09°25' N, 50°54' E, off northern Somalia, 16 Dec. 1964, 16 paratypes NMP, off Natal, South Africa, 4 paratypes NZGS, off Somalia, 1 paratype AMS C127393, off Zanzibar, 2 paratypes USNM 718966, off Somalia, 3 paratypes AMS, off eastern Australia, 1 paratype NMNZ M242428, Wanganella Bank, Norfolk Ridge, 1 paratype NZOI T682 (Fig. 60 n), NZOI sta. P82, off Lord Howe I.

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: sta. D2 (Fig. 60 i).
Norfolk Ridge. BIOCAL: sta. DW65. — SMIB 3: sta. DW8. — SMIB 4: sta. DW43. — SMIB 5: sta. DW94 (Fig. 60 j). — From 22°40' S to 22°50' S, from 167°10' E to 167°30' E, 200-350 m, coll. P. Tirard, 7-10 Oct. 1986 (Fig. 58 k).
Loyalty Ridge. VOLSMAR: sta. DW41.
These eight specimens (in seven samples) were taken in 80-350 m, but only one in less than 195 m.

DISTRIBUTION. — *Distorsio euconstricta* occurs throughout most of the Indo-West Pacific province, from Natal, South Africa, to Somalia, and from southern Japan to the southern Norfolk Ridge (not far north of New Zealand) and New Caledonia. I have not seen specimens from east of New Caledonia, but the eastern limit is obscure as yet because of inadequate sampling. Most material in museums is from the Philippine Islands.

DIMENSIONS. — New Caledonia, coll. P. Tirard, largest seen: H 31.8, D 20.3. - BIOCAL: sta. DW65: H 29.3, D 18.2. SMIB 5: sta. DW94: H 30.5, D 19.2.

REMARKS. — The Western Pacific specimens referred to *Distorsio euconstricta*, including all those recorded here from New Caledonia, differ from northeastern Indian Ocean topotypes in having an evenly rounded and slightly narrower peripheral bulge, lacking the upper and lower protruding cords that render the outline angled in Somalian and Zanzibar specimens. However, specimens from off Natal, South Africa (BEU, 1987: fig. 135; listed p. 314) seem to have the same evenly rounded peripheral bulge as Pacific specimens. Until more material is available from the northeastern Indian Ocean it seems best to treat all Indian Ocean and Pacific specimens as conspecific.

The New Caledonian material is valuable for the opportunity it provides to compare *Distorsio euconstricta* (nine specimens) with 66 lots (*ca* 130 specimens) of *D. habei* in all growth stages, and with *D. graceiellae* (three specimens). The specimens of *D. euconstricta* can be separated immediately from these other similar species by

their uniform golden orange to salmon colour, including the aperture, by their small maximum size (largest 32 mm high), by their shorter and wider form, with a particularly widely protruding, strongly convex bulge to the left of the aperture (in conventional apertural view) and, of course, by the most distinctive of all characters, the narrowly and sharply keeled ridge at the base of the outer lip, extending well into the aperture, separated from the columellar base by 1 mm (or less) at the aperture, but by up to 2 mm further inside the shell. The abundant small specimens of *D. habei* are easily distinguished by their white aperture, by their narrower shape, by the weakly calloused appearance of most specimens of the size of *D. euconstricta*, and by lacking the ridge inside the outer lip, separated from the inner lip by a narrow slit. *D. graceiellae* is considered below.

Distorsio graceiellae Parth, 1989

Figs 60 k, o-p

Distorsio graceiellae Parth, 1989a: 55, figs p. 55-57.

Distorsio graceiellae - HENNING & HEMMEN, 1993: 140, pl. 28, fig. 6. — WILSON, 1993: 239. — KRONENBERG, 1994: 76, fig. 14; pl. 2, fig. 11.

TYPE DATA. — Holotype originally in Colln M. Parth, München; from Balicasag Island, Philippines; 2 paratypes in Parth Colln. The holotype has since been presented to BMNH.

NEW CALEDONIA RECORDS — **New Caledonia.** BATHUS 1: sta. DW692 (Fig. 60 k).
Loyalty Ridge. MUSORSTOM 6: sta. DW399. — VOLSMAR: sta. DW41 (Figs 60 o-p).

OTHER MATERIAL EXAMINED. — **Indonesia.** N/O *"Baruna Jaya 1"* KARUBAR: sta. DW30, 05°39' S, 132°56' E, 111-118 m, 26OCT91 (2 MNHN).

Vanuatu. MUSORSTOM 8: sta. DW964, 20°20' S, 169°49' E, 360-408 m (1 large, faded to white). — Sta. DW1021, 17°43' S, 168°37' E, 124-130 m (1, juv.).
Marquesas Islands, French Polynesia. Eiao I., 07°59.8' S, 140°45' W, 155 m, coll. J. Poupin-SMCB, 19 Jan. 1991 (2, 1 large and 1 juv.). — Eiao I., 07°59' S, 140°44' W, 101 m, coll. J. Poupin-SMCB, 19 Jan. 1991 (1 large).

DISTRIBUTION. — *Distorsio graceiellae* is recorded to date from the Philippine Islands, eastern Indonesia, Vanuatu, New Caledonia and the Marquesas Islands, and at both the Philippines and New Caledonia it is sympatric with *D. euconstricta*. Clearly, it can be expected throughout the western Pacific between these extremes, in about 100-400 m.

DIMENSIONS. — Holotype: H 30.7, D 18.8. - Loyalty Ridge, VOLSMAR: sta. DW41: H 17.7, D 10.5. Marquesas Islands, Eiao I.: H 27.7, D 17.1.

REMARKS. — Three specimens among the New Caledonian material, two from Vanuatu and three from the Marquesas Islands agree with *Distorsio graceiellae*, previously recorded from the Philippine Islands only. These specimens share with *D. euconstricta* the distinctive characters of very small maximum size (holotype of *D. graceiellae* H 30.7, but rarely over 25 mm high) and the sharp ridge on the base of the inner lip, separated from the columellar base by a slit only about 1 mm wide. *D. graceiellae* differs from *D. euconstricta* in its horizontal sutural ramp (on the inflated area to the left of the aperture, in conventional apertural view) and much more sharply angled periphery, formed by a narrow, elevated group of four of five narrow, closely spaced spiral cords, followed below by a narrow, weakly contracted zone without prominent spiral sculpture, followed again by a single protruding cord. The most obvious difference, though, on initial examination, is in coloration: *D. graceiellae* is generally whitish (*i.e.* paler than the uniform salmon orange *D. euconstricta*), with the aperture and columellar shield a pale, translucent yellow to pale yellowish brown, and diffuse pale brown to medium red-brown zones around the suture, around the narrow peripheral contracted zone, and over the neck of the last whorl. These differences seem consistent in the material I have examined, particularly in a large lot of both species from the Philippine Islands in AMS.

Distorsio habei Lewis, 1972

Figs 60 a-h

Distorsio constricta habei Lewis, 1972: 38, figs 4, 10, 38, 49.
?*Persona djunggranganensis* Martin, 1916: 242, pl. 2, fig. 41.

Distorsio (Rhysema) yagenaensis Noda, 1980: 16, pl. 7, figs 14 a-b.
Distorsio (Rhysema) kotakai Ogasawara & Morita, 1990: 26, pl. 1, figs 1 a-d, 2 a-d.

Distorsio constricta habei - BEU, 1978: 38, figs 28-29. — BEU, 1985: 62, fig. 32. — SPRINGSTEEN& LEOBRERA, 1986: 117, pl. 32, fig. 4.
Distorsio habei - HENNING & HEMMEN, 1993: 141, pl. 28, fig. 2. — WILSON, 1993: 239, fig. in text [not pl. 40, figs 20 a-b, which show *D. reticularis*]. — KRONENBERG, 1994: 77, fig. 15; pl. 3, fig. 1.
?*Distorsio djunggranganensis* - EMERSON & PUFFER, 1953: 99.
Distorsio perdistorta - OYAMA & TAKEMURA, 1959: *Distorsio* pl. 1, figs 9-10.

TYPE DATA. — *Distorsio habei*: holotype ANSP 325380, from Tosa Bay, Shikoku, Japan (LEWIS, 1972: 44); 1 paratype, DMNH 50943. — *Persona djunggranganensis*: holotype RMNH 9818 (Figs 60 a-b), from "G. Spelong, Java", Late Miocene, West Progo Mountains. — *Distorsio yagenaensis*: holotype in Institute of Geoscience, University of Tsukuba, Japan, no. IGUT 10470, from locality 33411, cliff about 1 km northeast of Ihara, Sashiki-mura, Shimajiri-gun, southeastern Okinawa, from the Pliocene Shinzato Formation (NODA, 1980: 4). — *Distorsio kotakai*: holotype IGPS 100052 (Fig. 60 c), largest paratype IGPS 100053, from Hirose River bed 150 m upstream from railway bridge, Yanagawa, Fukushima Pref., N.E. Honshu, Japan, from the Middle Miocene Yanagawa Formation.

NEW CALEDONIA RECORDS. — **Coral Sea.** MUSORSTOM 5: sta. 329, 335.
New Caledonia. BATHUS 1: sta. CP669. — HALIPRO 1: sta. CP852.
North of New Caledonia. MUSORSTOM 4: sta. DW163. — BATHUS 4: sta. CP907. — HALICAL 1: sta. DW04.
Norfolk Ridge. BIOCAL: sta. DW64, DW65. — MUSORSTOM 4: sta. DW227. — CHALCAL 2: sta. DW69, DW70, DW71. — SMIB 1: sta. DW6 (Figs 60 f-g). — SMIB 3: sta. DW8, DW14, DW20. — SMIB 4: sta. DW40, DW41, DW44, DW49 (Fig. 60 e), DW51, DW53, DW57. — SMIB 5: sta. DW73, DW74, DW75, DW76, DW85, DW87, DW90, DW91, DW92, DW93, DW94, DW95, DW101, DW103. — SMIB 8: sta. DW154, DW157, DW158, DW159, DW160, DW163, DW165, DW170-172, DW182 (Fig. 60 d), DW185, DW187, DW190. — SMIB10: sta. DW208. — BERYX 11: sta. DW11, CP16, DW18, CP23, DW40, CP44. — BATHUS 2: sta. DW749.
Loyalty Ridge. MUSORSTOM 6: sta. DW399, DW444, DW451, DW452, CP455, DW480. — CALSUB: dive 9.
New Hebrides Arc. VOLSMAR: sta. DW7, DW9, DW39. — SMIB 9: sta. DW16.
Confirmed local depth range 200-380 m.

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. CP1031, 17°53' S, 168°33' E, 310 m (1). — Sta. CP1084, 15°50' S, 167°17' E, 207-280 m (1).
Eastern Australia. Off Cape Moreton, southern Queensland (2, Whitehead Colln).

DISTRIBUTION. — *Distorsio habei* occurs uncommonly throughout the western Pacific, from Boso Peninsula, Honshu, Japan, south to New Caledonia and Vanuatu, and to southern Queensland, Australia, and eastwards to Hawaii (BEU, 1987: figs 146, 150). Most material seen is from the Philippine Islands.

DIMENSIONS. — *Persona djunggranganensis* (holotype): H 21.7, D 14.9. - *Distorsio yagenaensis* (holotype): H 39.5, D 24.4. - *Distorsio kotakai* (holotype): H 32.9, D 19.5. - SMIB 1: sta. DW6, largest New Caledonian specimen: H 58.9, D 35.1.

REMARKS. — *Distorsio habei* is the most common *Distorsio* species in the MNHN/ORSTOM collections reported here, which reflects the intensity of deep-water sampling around New Caledonia and the Loyalty Islands, as *D. habei* is among the least common of *Distorsio* species in collections from the Philippine Islands. This abundance of material allows a better appreciation of the characters and variation of *D. habei* than previously has been possible, as well as more satisfactory comparison with *D. euconstricta* and *D. graceiellae*.

An important character is that **no** specimens of *D. habei*, of whatever size or degree of apertural secretion, have the basal constricting ridge inside the outer lip, separated from the columellar base by only a narrow slit, that characterises *D. euconstricta* and *D. graceiellae*. Apart from this difference, small specimens of *D. habei* resemble adult *D. graceiellae* in a number of characters: (1) the very marked coiling distortion is brought about by the very enlarged, excentric bulge to the left of the aperture (in conventional apertural view), a raised zone of four narrow, closely spaced cords producing a particularly elevated, wide peripheral protrusion; (2) a narrow constricted zone without prominent spiral sculpture follows below the peripheral raised zone; (3) five narrow, finely nodulous, relatively closely spaced spiral cords occupy the rest of the base, and are separated from the cords on the anterior canal by another narrow constricted zone lacking obvious sculpture. *D. habei* differs from *D. graceiellae* in its less horizontal and less markedly concave sutural ramp, in its very straight, narrow, elevated basal columellar ridge bearing unusually short transverse nodules, separated from the columellar by a much more strongly concave smooth area than in all other *Distorsio* species, in its wide, flattened lower area of the outer lip, bearing long, narrow transverse ridges, and in the more prominent, more obviously nodulous spiral ridge in the centre of the mid-columellar embayment.

MARTIN's (1916) Javanese Miocene fossil *Persona djunggrananensis* shares almost all these characters with *D. habei*. Unfortunately, the holotype (Figs 60 a-b) is a calcite neomorph of a juvenile shell lacking the tip of the anterior canal and the outer margin of the outer lip, and so is difficult to compare with modern specimens identified as *D. habei*. However, it clearly has an elevated peripheral zone of four narrow, closely spaced spiral cords, followed below by a narrow constricted zone, followed below by five spiral cords, separated in turn from the canal by a further constricted zone. It also lacks the constricting ridge of the basal interior of the outer lip seen in *D. euconstricta* and *D. graceiellae*. The single character distinguishing it from *D. habei* is the anterior canal deviating to the left, rather than rigidly straight, and the corresponding difference in shape of the base of the outer lip. Until more material from the Miocene of Java can be compared with modern specimens, it seems better to regard *D. djunggranganensis* as potentially an extinct but closely related Miocene species, rather than an earlier name for *D. habei*.

Distorsio yagenaensis was based on a single incomplete specimen from the Pliocene Shinzato Formation of Okinawa. Casts of the holotype kindly sent by Dr H. Noda show that most of its distinctive characters result from the lack of the basal columellar elevated, nodulous ridge, which has been broken off in this specimen. It shares with *D. habei* almost all the characters listed above, the only difference being that the spiral cords are more evenly spaced around the periphery than in modern *D. habei* specimens I have seen. Again, examination of a greater range of more complete, large specimens will help to confirm or deny the apparent synonymy of *D. yagenaensis* with *D. habei*.

Distorsio kotakai was based on a complete, small specimen (holotype; Fig. 60 c) and 4 incomplete or juvenile specimens, all from the Middle Miocene Yanagawa Formation at the Hirose River, Yanagawa, northeastern Honshu, Japan. Photographs kindly sent by Dr Ogasawara and the illustrations by OGASAWARA & MORITA (1990: pl. 1, figs 1-2) show conclusively that this material agrees in all characters with immature *D. habei*.

LEWIS (1972) and most subsequent authors (including me, previously) regarded *D. habei* as a geographic subspecies of the Panamic western American *D. constricta* (Broderip, 1833). The western Atlantic *D. macgintyi* Emerson & Puffer, 1952 has been regarded as a further subspecies in this complex by many authors. The recognition by PARTH (1989b) that both *D. constricta*, with a chequerboard-patterned columellar shield, and *D. minoruohnishii* Parth, 1989, with a plain columellar shield, inhabit the Panamic province has forced a reassessment of relationships in this group of species. It seems preferable to me (as it did to PARTH, 1989b) to treat forms in this complex as distinct species, at least until something more definite is known of their phylogenetic relationships.

Another useful aspect of the large New Caledonian-Loyalty Islands collections of *Distorsio habei* is their demonstration that the moderately large, inflated specimens normally seen from the Philippine Islands, with a strongly curved outline of the outer lip margin, do in fact grow into the markedly larger and somewhat narrower form recorded under this name from the southwest Pacific by BEU (1978: 38, figs 28-29; 1987: fig. 149). While Philippines material rarely seems to reach the larger maximum size of more southerly large shells (largest from New Caledonia: H 58.9) I have no doubt that all western Pacific specimens belong in one species.

Distorsio kurzi Petuch & Harasewych, 1980

Figs 58 n, 59 c-h

Distorsio (Rhysema) kurzi Petuch & Harasewych, 1980: 7, figs 1-2.

Distorsio kurzi - HABE, 1983: 82, fig. — BEU, 1985: 62. — SPRINGSTEEN & LEOBRERA, 1986: 117, pl. 31, fig. 3. — HENNING & HEMMEN, 1993: 143, pl. 28, fig. 1. — KRONENBERG, 1994: 84, fig. 17; pl. 1, figs 4, 9; pl. 2, fig. 12.

TYPE DATA. — Holotype USNM 783780, from off Balicasag Island, Bohol, Philippines; paratypes USNM 783931, same locality.

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW109.
New Caledonia. LAGON: sta. 374 (Figs 58 n, 59 c), 983.
Confirmed local depth range 64-70 m.

OTHER MATERIAL EXAMINED. — I list here the Recent specimens I have seen from localities outside the Philippine Islands. In addition, a Pleistocene fossil specimen of *Distorsio kurzi* is present in USNM collections from the Kere River, southern Espiritu Santo, Vanuatu; and a Late Pliocene fossil from Fiji, new road of Prince's Road, behind Dilkusha, Nausori; Nakasi Sandstone, coll. K.J. Gilchrist, 1988, is present in AMS (C301896).

Maldive Islands. Coll. Dov Peled, Dec. 1978 (1 NMP H7529, Fig. 59 h).
South Africa. Off Durban, Natal, 29°50.2' S, 31°12.3' E, 95 m, dredged R.V. *"Meiring Naudé"*, sta. XX113, 9 July 1986 (1 lv adult, NMP D4048). — Natal, dredged off Park Rynie, 100 m, coll. R. Kilburn, 5 March 1981 (1 lv adult, NMP unreg., Fig. 59 d).
South China Sea. South China Sea near Nha Trang, Vietnam, pres. L. Neth, 1968-1970 (1 LACM 110125).
Papua-New Guinea. New Guinea, pres. E. Albi (1 LACM 90916).

DISTRIBUTION. — *Distorsio kurzi* is recorded in the living fauna only from the Philippine Islands, from Natal, South Africa, from the Maldive Islands, from the South China Sea off Vietnam, from New Guinea, from New Caledonia and the Coral Sea, and from southern Japan (HABE, 1983) but presumably occurs rarely throughout the Indo-West Pacific province between these extremes. Fossils are recorded here from Fiji and Vanuatu.

DIMENSIONS. — Off Punta Engãno, Mactan I., Cebu, Philippines, F.J. Springsteen Colln, largest seen (Fig. 59 g): H 60.3, D 35.0. - New Caledonia, LAGON: sta. 374: H 41.2, D 25.8. - South Africa, off Park Rynie: H 44.3, D 26.1.

REMARKS. — *Distorsio kurzi* is immediately recognisable by its uniform mid-brown to dark brown colour, including the aperture, and by its extreme distortion. In shape, sculpture and distortion it might be described as "ultra-*habei*", as it has the same protruding peripheral group of spiral cords, followed below by a narrow constriction, followed below by five spiral cords, separated from the canal by another constriction, seen in *D. habei* and closely related species, but differs in having up to seven narrow cords on the peripheral band (the number increases as the shell grows), in having a markedly taller and narrower spire, and in the distorted, excentric bulge to the left of the aperture (in conventional apertural view) being even larger and more prominent and so inducing a more marked eccentricity of coiling than in any other species.

Distorsio kurzi has become relatively common in museum collections from the Philippine Islands (40 specimens in NZGS) but specimens from any other localities are exceedingly rare. Nine specimens listed above from localities other than the Philippine Islands show that the species is more widespread than was at first supposed, and that living specimens have long, pale brown periostracal bristles on the nodules around the peripheral band.

Distorsio parvimpedita sp. nov.

Figs 58 j, 61 a-f, 62

TYPE DATA. — Holotype (Figs 58 j, 61 a-b) MNHN. Northeastern New Caledonia, channel northeast of Banc de Touho, EXPÉDITION MONTROUZIER: sta. 1260, 20°44' S, 165°14' E, 49-59 m, collected alive (only specimen at this station).

NEW CALEDONIA RECORDS (all paratypes). — **New Caledonia.** LAGON: sta. 139 (2), 143 (4), 144 (1), 414 (1), 570 (1), 637 (1), 679 (1), 699 (1), 711 (2), 788 (1), 813 (1), 814 (1), 824 (1), 833 (22; 19 MNHN (Figs 61 c-f), 3 NZGS WM15623), 850 (1).

These 16 lots (42 specimens) were collected in 25 to 70 m, but only the holotype seems to have been collected alive. *D. parvimpedita* was collected with *D. reticularis* at two stations, but is potentially widely sympatric with *D. reticularis* in New Caledonia.

DISTRIBUTION. — *Distorsio parvimpedita* is apparently restricted to New Caledonia, where available samples suggest it ranges from the mid-northern coast near Touho south to the Nouméa area and Ile des Pins (Fig. 62). All material has been dredged on offshore soft substrates in 25 to 70 m.

DESCRIPTION. — Shell small for genus (adults 35-38 mm high), short and wide, with moderately short spire, strongly and evenly inflated whorls (*i.e.*, lacking a clearly defined shoulder angle), relatively rapidly contracted base, and moderately short, almost straight anterior siphonal canal, inclined slightly to left for most of its length but opening to right at extremity in most specimens. Teleoconch coiling moderately eccentric; with more marked, evenly rounded inflated region following each varix and weakly inflated area before succeeding varix. Varices present at each 0.66 whorls, low and indistinct on early whorls, last 2 each raised into prominent thin flange to form widened outer lip. Sculpture of relatively low, narrow but clearly raised and sharply defined, widely spaced spiral cords, 3 on early spire whorls, 4 on more inflated areas of penultimate whorl, and 14-15 on last whorl, base and canal; evenly and regularly spaced over most of surface, progressively lower and more closely spaced over base and canal than higher up, with one wider interspace between uppermost 2 cords, defining a weak sutural ramp, with narrow, secondary median cord in uppermost interspace on most specimens; crossed by narrow axial costae of similar prominence and spacing to spiral cords, 21 on each of last 2 intervarical intervals on

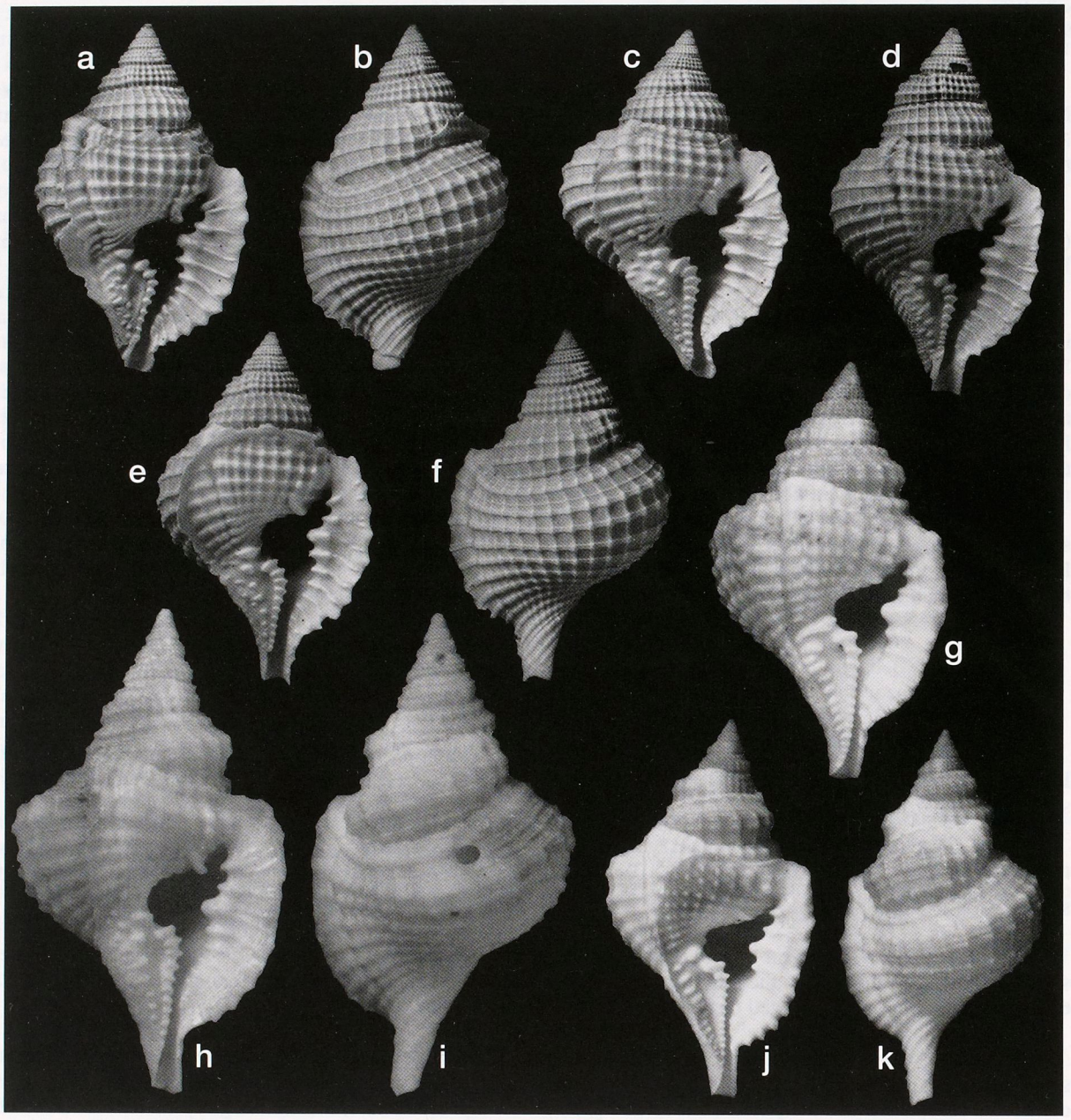

FIG. 61. — *Distorsio* species. — **a-f**, *Distorsio parvimpedita* sp. nov., New Caledonia, all x1.5. **a-b**, holotype, EXPÉDITION MONTROUZIER: sta. 1260, channel northeast of Touho Bank, 49-59 m. **c-f**, 3 paratypes, LAGON: sta. 833, near Poindimié, 52-70 m. — **g-k**, *Distorsio decipiens* (Reeve). **g**, NZGS WM13085, Samar, Philippines, x1.5. **h-i**, MUSORSTOM 4: sta. DW204, Norfolk Ridge, 120 m, x1.5. **j-k**, NZGS WM15616, Balicasag I., Philippines, x1.

holotype, forming low nodules at intersections with spiral cords and forming overall evenly cancellate appearance. Interspaces crossed by many very weak spiral and axial lirae. Aperture widely flared into nearly flat shield; outer lip extended into flat flange, with 10-11 prominent narrow nodules on inner edge, third from adapical end largest, most or all extended into low, narrow, radial ridge across ventral face of lip flange. Inner lip extended into wide, very thin shield over previous whorl, up to and across suture on most specimens and covering penultimate varix on all adults, raised into wide, indented collar over neck; lower columella raised into very prominent, toothed ridge descending left edge of siphonal canal, bearing 8-10 prominent, narrowly rounded, transverse ridges decreasing in size anteriorly; single prominent transverse ridge in centre of columellar embayment; single very prominent parietal ridge extending towards most prominent tooth of outer lip, to constrict narrow posterior apertural sinus; inner lip plate extremely thin, prominently cancellated by sculpture of previous whorl, thickened only over 1-3 nodules in row above parietal ridge. Colour uniform pale cream to pale golden brown, exterior of terminal varix pale reddish brown crossed by markedly paler spiral cords; aperture pale orange, darkening gradually to bright orange-brown on outer part of outer lip face and opposite lower columellar toothed ridge, all apertural ridges and teeth prominent white. Protoconch small, turbiniform, of *ca* 2.5 strongly inflated whorls, smooth and polished, closely similar to those of *D. reticularis* and *D. decipiens* but a little shorter.

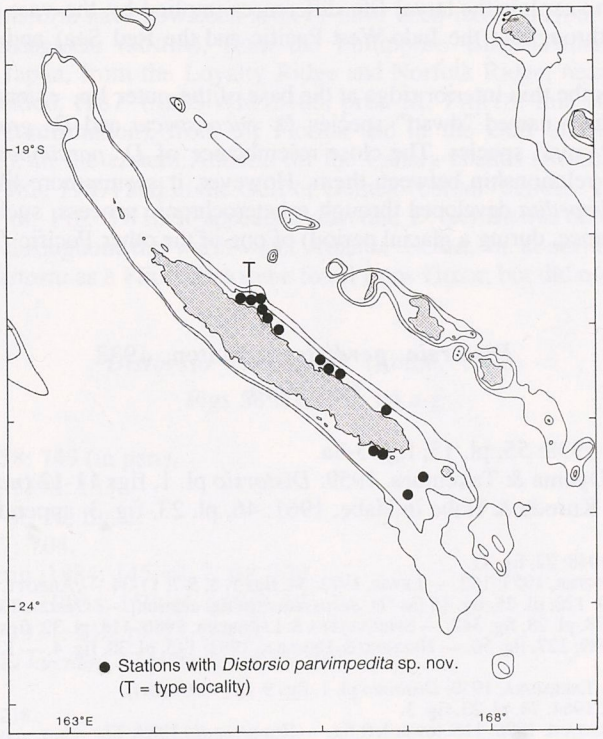

FIG. 62. — Distribution of *Distorsio parvimpedita* sp. nov.

DIMENSIONS. — Holotype: H 35.5, D 22.2; paratype, LAGON: sta. 824, H 34.9, D 22.7; paratypes, sta. 833: H 38.5, D 23.5; H 35.8, D 24.1; H 35.9, D 22.8.

REMARKS. — It is astonishing that an apparently endemic New Caledonian *Distorsio* species was recognised at a late stage of this project; the bright orange aperture of the holotype brought it to my attention and led to its recognition among other material previously confused with immature *D. reticularis*. The astonishing aspect is its apparent restriction to New Caledonia; almost all other *Distorsio* species are wide-ranging, at least from New Caledonia to the Philippines, but *D. parvimpedita* presumably would have been recognised long ago in

the Philippines if it occurred there (*D. ventricosa* seems to be limited to the Philippine Islands and at least two species, *D. muehlhaeusseri* and *D. somalica*, are recorded only from the western Indian Ocean, but the other New Caledonian *Distorsio* species are wide-ranging).

The most distinctive characters of *Distorsio parvimpedita* sp. nov. are its unusually small maximum size (rarely exceeding 35 mm in height), its short, wide shape, its evenly cancellate sculpture and evenly rounded whorls, and its coarsely cancellate apertural shield. It perhaps most closely resembles a dwarf *D. clathrata* (Lamarck, 1816), from the Western Atlantic. The evenly rounded whorls, evenly cancellate sculpture, and thin, cancellate apertural shield raised into a thin, irregularly flexed collar over the neck are characters shared with *D. clathrata*, and are precisely those that distinguish it from the most nearly similar Pacific species, *D. decipiens* and *D. reticularis*. The bright orange-brown aperture of the holotype might well be another distinctive character of *D. parvimpedita*, but needs to be verified from more live-collected specimens. The empty shells in LAGON samples have presumably faded, but all seem to have been paler than the holotype. Brightly coloured individuals, with a more colourful apertural shield than the usual pale form, occur in several *Distorsio* species, particularly *D. clathrata* and Japanese specimens of *D. decipiens*, so this is conceivably an individual character of the holotype of *D. parvimpedita*.

The protoconch of *D. parvimpedita* is only slightly shorter than those of *D. decipiens* and *D. reticularis*. That of *D. clathrata*, in contrast, is significantly larger and markedly taller than in all three of these Pacific species, although essentially similar. The protoconchs of all *Distorsio* species are remarkably similar, and the subtle differences seem insufficient to explain the larval life differences implied by the vast differences in range between, for example, *D. reticularis* (throughout the Indo-West Pacific and the Red Sea) and *D. parvimpedita* (apparently limited to New Caledonia).

D. parvimpedita lacks the thin interior ridge at the base of the outer lip, extending almost to the inner lip, that characterises the previously named "dwarf" species *D. euconstricta* and *D. graceiellae*. It seems not to be closely related to these other small species. The close resemblance of *D. parvimpedita* to *D. clathrata* possibly implies a close phylogenetic relationship between them. However, it seems more likely that this resemblance is superficial, and that *D. parvimpedita* developed through a heterochronic process, such as paedomorphosis, from a restricted population (for instance, during a glacial period) of one of the other Pacific *Distorsio* species, perhaps *D. reticularis*.

Distorsio perdistorta Fulton, 1938

Figs 59 i-l

Distorsio perdistorta Fulton, 1938: 55, pl. 13, figs 3-3a.
Distorsio horrida Kuroda *in* Oyama & Takemura, 1959: *Distorsio* pl. 1, figs 11-12 (*nomen nudum*).
Distorsio (Rhysema) horrida Kuroda & Habe *in* Habe, 1961: 46, pl. 23, fig. 3, append. p. 17.

Distorsio peridistorta (*sic*) - SMITH, 1948: 22, fig. 11.
Distorsio perdistorta - EMERSON & PUFFER, 1953: 102. — LEWIS, 1972: 34, figs 1, 3, 5-7, 11-34. — ABBOTT, 1974: 166, fig. 1774. — NORDSIECK & GARCIA-TALAVERA, 1979: 120, pl. 25, fig. 15 [as "*D. decussatus*" in fig. caption]. — GARCIA-TALAVERA, 1983: 117. — BEU, 1985: 62, fig. 33. — RIOS, 1985: 78, pl. 28, fig. 342. — SPRINGSTEEN & LEOBRERA, 1986: 118, pl. 32, figs 5 a-b. — GARCIA-TALAVERA, 1987: 253, pl. 2, fig. 8. — LAI, 1989: 127, fig. 56. — HENNING & HEMMEN, 1993: 145, pl. 30, fig. 4. — KRONENBERG, 1994: 88, fig. 20; pl. 3, fig. 2.
NOT *Distorsio perdistorta* - OYAMA & TAKEMURA, 1959: *Distorsio* pl. 1, figs 9-10 [= *D. habei*].
Distorsio (Rhysema) horrida - HABE, 1964: 74, pl. 23, fig. 3.
Distorsio (Rhysema) perdistorta - OKUTANI, 1986: 115, lower left fig. — ROBBA *et al.*, 1989: 77.

TYPE DATA. — *Distorsio perdistorta*: holotype BMNH 1938.7.13.13, from "Kii, Japan". — *Distorsio (Rhysema) horrida*: holotype and 1 paratype NSMT 39788, from Tosa Bay, Shikoku, Japan (HABE, 1964: 74).

NEW CALEDONIA RECORDS. — **New Caledonia.** HALIPRO 1: sta. CP850.
North of New Caledonia. BATHUS 4: sta. DW902, CP906.
Norfolk Ridge. SMIB 8: sta. DW187. — BATHUS 2: sta. DW729. — BATHUS 3: sta. DW838.
Loyalty Ridge. MUSORSTOM 6: sta. DW428 (Figs 59 k-l), DW487.
These 8 lots were collected in 260-540 m, alive in 350-420 m.

DISTRIBUTION. — As noted below, *Distorsio perdistorta* appears likely to occur throughout the Indo-West Pacific between Natal, South Africa, Tosa Bay, Japan and New Caledonia, although there are as yet no records from further east in the Pacific. The single western American record (see below) needs confirmation. In the Atlantic, it is recorded from Florida to southern Brazil, off the Canary Islands, and in the Gulf of Guinea.

DIMENSIONS. — *Distorsio perdistorta* (holotype): H 59.8, D 35.9. - *D. horrida* (holotype): H 58.9, D 35.0. - Loyalty Ridge, MUSORSTOM 6: sta. DW428: H 47.1, D 28.5. - HALIPRO 1: sta. CP850: H 69.7, D 40.4.

REMARKS. — *Distorsio perdistorta* has turned out to be an almost circum-tropical species, so it is not surprising that it was collected at 9 localities around New Caledonia. However, it is one of the least common *Distorsio* species in this area. LEWIS (1972) clarified the confusion in Japanese literature between *D. perdistorta* and *D. habei*, providing the name *D. habei* for the species previously known incorrectly as *D. perdistorta*. *Distorsio perdistorta* is recognisable by its reasonably consistent white aperture (the parietal shield is partly pale to medium red-brown in some specimens in most populations), consistent stark white exterior, strongly excentric coiling with a large but evenly rounded bulge to the left of the aperture (in conventional apertural view), regularly cancellate teleoconch sculpture without the four grouped peripheral spiral cords of *D. kurzi, D. habei, D. euconstricta* and *D. graceiellae*, or the more closely spaced peripheral pair of cords of *D. decipiens*, its very straight anterior canal with a long, anteriorly decreasing row of nodules on the basal columellar ridge (similar to the ridges of *D. kurzi, D. decipiens* and *D. habei*) and its wide outer lip bearing narrow, long transverse ridges as in *D. habei*, but more consistently having a strongly out-curved right margin than in *D. habei*. The whole effect is of a humped but rather roundly oval, evenly reticulate shell, most specimens of which are plain white. The very long, black periostracal bristles of some specimens were illustrated by LEWIS (1972) and ABBOTT (1974).

Specimens of *D. perdistorta* have now been seen or have been recorded from off Natal, South Africa (NMP B3813; Fig. 59 j), off Madagascar (MNHN), from the Philippine Islands (many in museums and private collections), from southern Japan, from the Loyalty Ridge and Norfolk Ridge, near New Caledonia (see above), from "near Oaxaca, West Mexico, 1987" (NZGS WM15105, pres. M. PARTH; this single western American record cannot be accepted without confirmation), from off Florida and in the Gulf of Mexico (LEWIS, 1972) and off southern Brazil (RIOS, 1985), in the eastern Atlantic off the Canary Islands (NORDSIECK & GARCIA-TALAVERA, 1979; GARCIA-TALAVERA 1983, 1987) and in the Gulf of Guinea (USNM 762002, *"La Rafale"* transect 12, sta. 6, 6°56' N, 12°05'30" W, 100 m; Fig. 59 i). It appears likely that *D. perdistorta* occurs throughout the Indo-West Pacific province as well as throughout the warm-water Atlantic Ocean, in about 100 to 500 m. ROBBA *et al.* (1989: 77) recorded *D. perdistorta* as a Plio-Pleistocene fossil from Timor, but did not illustrate their material.

Distorsio reticularis (Linné, 1758)

Figs 58 l, 63 f-k, 64 a-g

Murex reticularis Linné, 1758: 749 (in part).
Distorsio reticulata Röding, 1798: 133.
Distorta acuta Perry, 1811: pl. 10, fig. 1.
Murex mulus Dillwyn, 1817: 704.
Nassa(?) *lamonganana* Martin, 1884: 145, pl. 7, fig. 128.
Persona metableta Cossmann, 1903a: 159, pl. 6, figs 4-5.
Distorsio francesae Iredale, 1931: 213, pl. 23, fig. 2.
Persona (Distorsio) reticulata kueneni Koperberg, 1931: 118.

Murex reticularis - LINNÉ, 1767: 1218.
Distorsio (Distorsio) reticularis - BEU, 1987: 314, figs 151-152.
Distorsio reticularis - HENNING & HEMMEN, 1993: 146, pl. 27, figs 3-4, 6. — KRONENBERG, 1994: 90, fig. 21; pl. 1, figs 8, 12 a-b; pl. 3, figs 7-9; pl. 4, fig. 3. — BOSCH *et al.*, 1995: 101, fig. 367.
Persona reticulata - MARTIN, 1899: 145, pl. 23, fig. 336. — TESCH, 1915: 69, pl. 82, fig. 151. — MARTIN, 1919: 122, 130, 141, 145.
Distorsio reticulata - EMERSON & PUFFER, 1953: 102. — RIPPINGALE & MCMICHAEL, 1961: 68, pl. 7, fig. 13. — KIRA, 1962: 55, pl. 22, fig. 10. — CERNOHORSKY, 1967a: 324, pl. 45, fig. 24; 1967b: 56, pl. 6, fig. 24. — HINTON, 1972: 12, pl. 13, fig. 2; 1978: 30, figs 2-2a. — BOSCH *et al.*, 1982: 81, lowest fig. — BEU, 1985: 62. — SPRINGSTEEN & LEOBRERA, 1986: 117, pl. 32, figs 1a-e. — SHORT & POTTER, 1987: 48, pl. 23, fig. 8. — SALVAT *et al.*, 1988: 103, pl. 13, fig. 9. — LAI, 1989: 127, figs 57-59. — WILSON, 1993: 239, pl. 40, figs 22 a-b [and figs 20 a-b].
Distorsio (Distorsio) reticulatus reticulatus - SHUTO, 1969: 90, pl. 4, fig. 8.
Distorsio (Rhysema) reticulata - KURODA *et al.*, 1971: 128, pl. 28, fig. 3. — OKUTANI, 1986: 114-115, central fig.
Persona reticulata var. *subclathrata* - VREDENBURG, 1922: 332.
Distorsio reticulata var. *subelethrata* (*sic*) - COTTER, 1938: 90.
Murex cancellinus - DE ROISSY, 1805: 56 (not of Lamarck, 1803).
Triton cancellinus - REEVE, 1844a: pl. 12, fig. 45. — DEY, 1962: 74 (not of Lamarck, 1803).
Persona cancellina - KOBELT, 1876a: 49; 1878b: 370 (not of Lamarck, 1803).
Distorsio cancellinus - TRYON, 1880: 35, pl. 17, figs 175-178 (in part; not of Lamarck, 1803).
Distorsio cancellina - ALTENA, 1942: 105 (not of Lamarck, 1803).

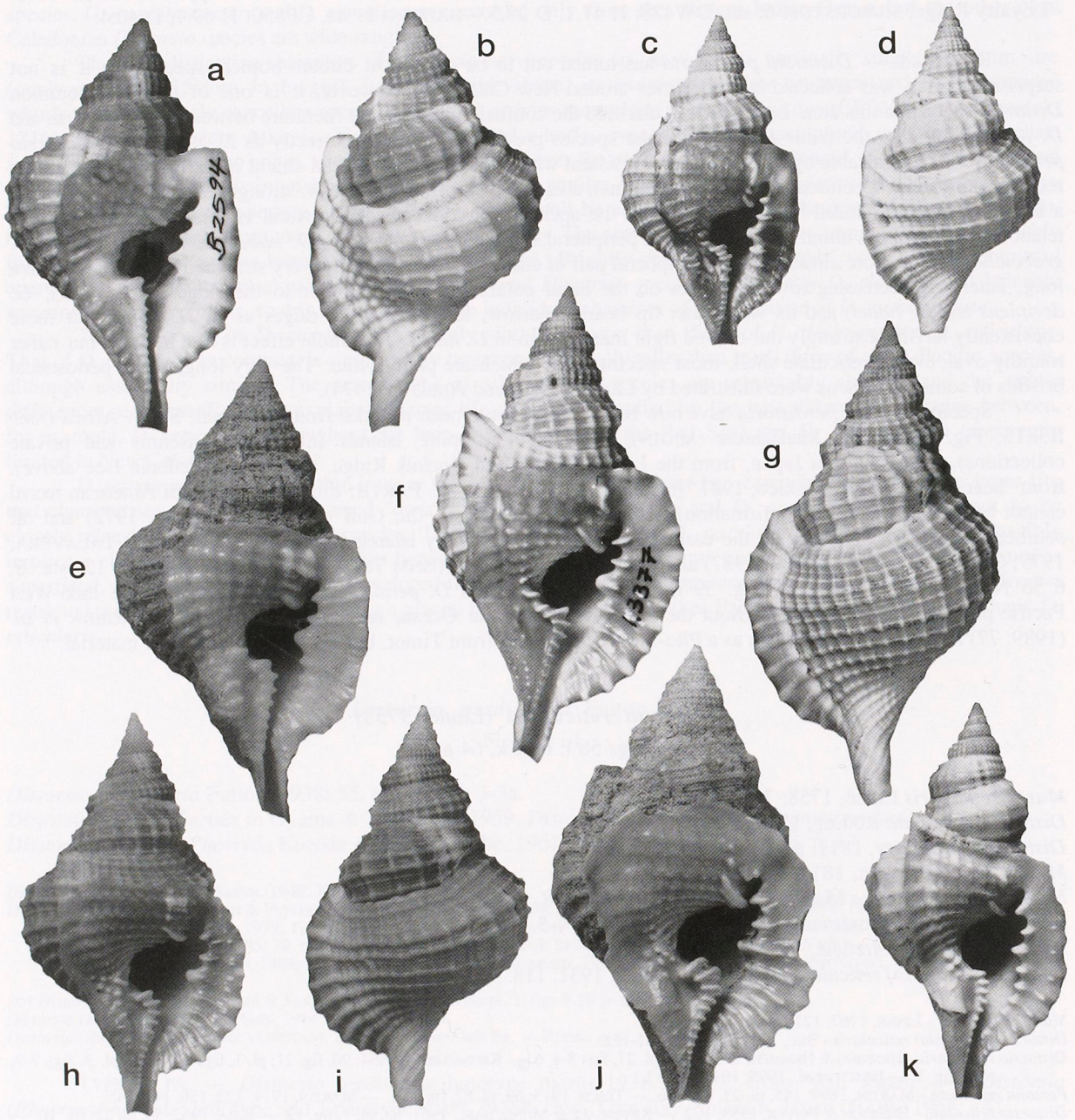

FIG. 63. — *Distorsio* species. — **a-e**, *Distorsio decipiens* (Reeve). **a-b**, NMP B2594, trawled off Durban, South Africa, 220 m, x1.5. **c-d**, lectotype of *Triton decipiens* Reeve, 1844, BMNH 1984162/1, "Island of Mindanao", Philippines, x1. **e**, LAGON: sta. 745, New Caledonia, 78-80 m, x1.5. — **f-k**, *Distorsio reticularis* (Linné), all x1. **f-g**, NMP H3377, Conducia Bay, Mozambique. **h-i**, MNHN, Ilôt Bampton, Chesterfield-Bellona Plateau, Coral Sea, 18 m. **j**, specimen in Fig. 58 l. **k**, Dahlak I., Red Sea, 80 m, Dov Peled Colln.

Distorsio francesae - IREDALE & MCMICHAEL, 1962: 54.
Distorsio habei - WILSON, 1993: pl. 40, figs 20 a-b (only).

TYPE DATA. — *Murex reticularis*: lectotype (designated by BEU, 1987: figs 151-152) in Linnean Society of London. This specimen is here also designated the neotype of *Distorsio reticulata*, and the neotype of *Distorta acuta*. The type locality was designated by KRONENBERG (1994: 90) as Ambon Island (Amboina), eastern Indonesia. Five additional paralectotypes of *Murex reticularis* are present in the Linné Colln of the Uppsala University Zoological Museum (nos. 698 a-b, 1621, and 1624 a-b; WALLIN, 1993: 78). — *Murex mulus*: lectotype designated by DEAN (1936: 231) in National Museum of Wales, Cardiff (A. Trew, letter 7 Jan. 1997; accession no. NMW.1928.82.15); according to DEAN (1936: 231) this is a specimen of *Distorsio "cancellinus* Roissy", *i.e.*, *D. reticularis*. — *Nassa*(?) *lamonganana*: type not seen, presumably in RMNH, from the Miocene of Java. — *Persona metableta*: type not seen; from the Pliocene of Karikal, India (whereabouts not known to me, not in Laboratoire de Paléontologie, MNHN; not in Centre des Sciences de la Terre, Université Claude Bernard, Lyon). — *Distorsio francesae*: holotype AMS C57795, from *"Triton"* dredgings in Sydney Harbour, New South Wales, Australia. — *Persona (Distorsio) reticulata kueneni*: type not seen, whereabouts not known to me; from the Pliocene of Timor.

NEW CALEDONIA RECORDS. — **Coral Sea.** CHALCAL 1: Ilôt Bampton (Figs 63 h-i). — CORAIL 2: sta. CP23.
New Caledonia. LAGON: sta. 55 (Fig. 58 l), 315, 316, 339, 488, 524, 526, 529, 534, 535, 541, 542, 598, 604, 633, 824, 833, 905, 936, 937, 941, 995, 1024, 1025, 1032, 1068, 1069, 1115, 1116, 1155, 1157, 1160, 1163, 1174, 1181, 1182, 1190, 1206, 1208. — EXPÉDITION MONTROUZIER: sta. 1319 (Figs 64 a-g), 1321.
These 42 lots were collected in 14 to 115 m, and specimens were taken alive throughout this range.

DISTRIBUTION. — *Distorsio reticularis* occurs commonly throughout most of the Indo-West Pacific province, although there are no records from Hawaii (KAY, 1979). It is recorded from Natal, South Africa (NMP 188, Durban Bluff, leg. H.C. Burnup), throughout the Indian Ocean and Red Sea (Fig. 63 k), and in the western Pacific archipelagoes as far north as Sagami Bay, Honshu, Japan, and as far south as Sydney Harbour, New South Wales, Australia. *Distorsio reticularis* is also a common Miocene to Pleistocene fossil throughout the western Pacific, from the Ryukyu Islands and Taiwan to Vanuatu (Espiritu Santo I.) and Indonesia.

DIMENSIONS. — New Caledonia, LAGON: sta. 55: H 70.4, D 42.1; sta. 529: H. 62.6 (anterior canal incomplete), D 38.6; sta. 1206: H 58.0, D 34.2. - Coral Sea, Ilôt Bampton: H 62.7, D 36.2.

REMARKS. — *Distorsio reticularis* is much the most abundant and widespread of Indo-West Pacific *Distorsio* species, occurring in about 20 to 100 m on soft substrates, *i.e.* in shallower water than all other species other than *D. anus*. It is very variable in size, shape, coloration and minor sculptural details, but is recognisable by its very generalised *Distorsio* characters, with a moderately long anterior siphonal canal directed to the left (in conventional apertural orientation), a rather steeply sloping sutural ramp, a moderately tall spire, and sculpture of narrow, relatively evenly reticulate spiral cords and axial costae, with two more closely grouped peripheral spiral cords but not the wide zone of grouped cords of most other New Caledonian *Distorsio* species. The only other species occurring in New Caledonia that have evenly reticulate sculpture are *D. perdistorta*, which is easily distinguished from *D. reticularis* by its much more distorted coiling, its more rounded whorls lacking the weak peripheral shoulder of most *D. reticularis*, and its marked, evenly convex bulge to the left of the aperture, and *D. parvimpedita* sp. nov., which is much smaller and has still more evenly spaced cords than *D. reticularis*. A juvenile specimen collected during EXPÉDITION MONTROUZIER is remarkable for its enormously elaborated periostracum on the teleoconch, and for displaying the type of protoconch periostracal bristles previously recorded only by LAURSEN (1981: figs 42-43, pl. 2, figs 6 a-b) from planktonic juveniles (Figs 64 a-g).

BEU (1987: 314, figs 151-156) illustrated LINNÉ's (1758) three syntypes of *Murex reticularis*, and selected as the lectotype a specimen of the common Indo-West Pacific species more usually known in recent years as *D. reticulata*. Linné's name *Murex reticularis* has been applied to a wide variety of species since its proposal, but one of its most common applications is to the present *Distorsio* species, and in ALTENA's (1942: 105) long synonymy of usages for Indo-West Pacific Neogene fossils, it is clear that one of the names most commonly applied to the species is *D. reticularis*.

The other name most consistently applied to this species last century and early this century was *D. cancellinus* "de Roissy", but DE ROISSY (1805: 56) wrongly adopted a name proposed by LAMARCK (1803) for a European fossil *Distorsio* specimen. Although Lamarck's illustration of *Murex cancellinus* (PALMER, 1977: pl. 4,

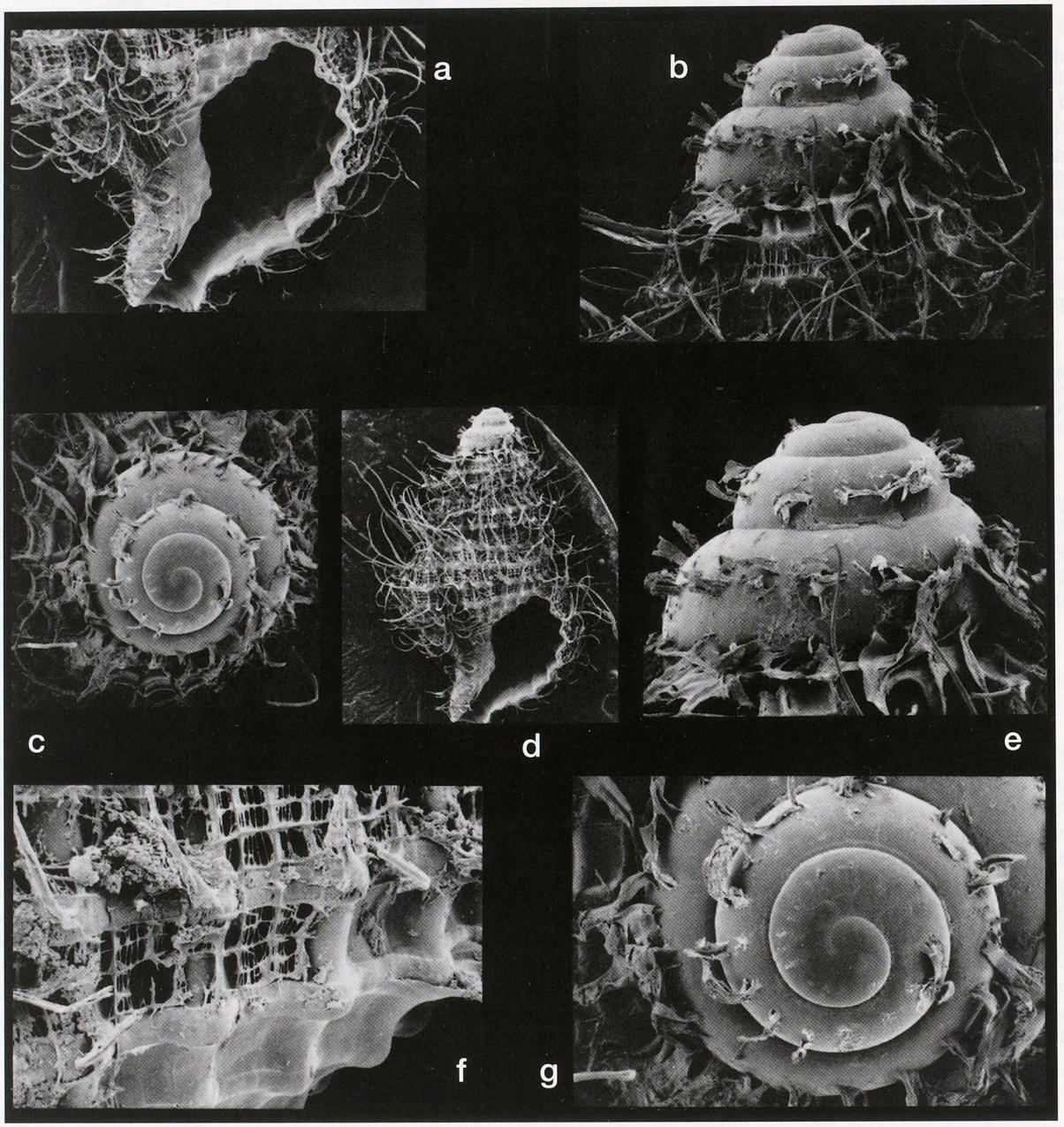

FIG. 64. — *Distorsio reticularis* (Linné), juvenile, SEM micrographs, EXPÉDITION MONTROUZIER: sta. 1319, Passe Deverd, New Caledonia, 15-20 m; a. x9; b-c. x17; d. x4.2; e. x24; f. x36; g. x34.

figs 11 a-b) appears to be based on a Recent specimen of *D. clathrata*, this was probably substituted as more complete (or larger, etc.) than the holotype. DESHAYES (1865: 302-303), discussing Paris Basin *Triton* species, said that "among them does not figure *Triton clathratum*, cited from Grignon [Calcaire Grossier, Lutetian, early Middle Eocene] by Lamarck. The late Professor Richard possessed in his collection a fossil shell exactly identical to that which lives now in the southern seas; this shell came from Grignon, according to its owner. Lamarck mentioned it in the *Annales*, under the name *Murex cancellinus*, and in his "Animaux sans vertèbres" under that of *clathratum*. This precious shell passed from the collection of Richard to that of our old and honorable friend M. Duchastel, it is now in our hands. Firstly we can affirm that it definitely did not come from Grignon, it has not the proper colour of fossils from that celebrated locality. For 40 years another individual has not been found of so remarkable a fossil ... nowhere in the Paris Basin has the least trace been found. It is then very probable that this species is another of those which definitively must be crossed out of the catalogue of our Parisian fossils. Perhaps this shell came from the yellow sands of Astezan", *i.e.*, the type Astian (Late Pliocene) of Asti, northern Italy. If this is so, *D. cancellina* (Lamarck, 1803) is probably an earlier name for the common European Neogene species usually known as *D. tortuosa* (Borson, 1821).

The other names listed in the synonymy all appear to be based on specimens differing in only trivial characters from the common *D. reticularis*. *Nassa*(?) *lamonganana* is apparently based on a juvenile *D. reticularis*, as MARTIN (1899: 45) himself later realised, but unfortunately I have not seen the holotype (which indicates that it had been recatalogued under *D. reticularis* when I examined the collection in RMNH). *Persona metableta* and *Distorsio francesae* were based on normal, if short and wide, specimen of *D. reticularis*. ALTENA (1942: 105, fig. 3) proposed a "variety" *D. cancellina denseplicata*, which is one of few really distinctive forms. The holotype (examined in RMNH), from the Pliocene Kendeng beds of Java, has very elevated, wide, closely spaced spiral cords unlike those of any Recent species I am aware of, and this appears to be a distinctive, extinct fossil species, an opinion echoed by KRONENBERG (1994: 100).

Genus ***DISTORSOMINA*** gen. nov.

Type species: *Distorsio pusilla* Pease, 1861, Recent, Indo-West Pacific.

DIAGNOSIS. — Teleoconch small (to about 12.5 mm high), tall and narrow for family, with long, narrow aperture. Coiling weakly but obviously excentric. Inner lip without expanded callus over previous whorl. Interior of outer lip with uppermost denticle the most prominent, apart from minute denticle in posterior notch of some specimens. Base of inner lip lacking expanded, hollow nodulous ridge, protruding to right into aperture, of *Distorsio*, but instead having a much higher-placed row of 4-5 short, well raised, transverse ridges, situated slightly obliquely on outer part of mid-columellar callus. Varices narrow, prominent, present down whole teleoconch.

REMARKS. — The generic position of *Distorsio pusilla* has long been in doubt. When proposing *Personopsis* gen. nov. for the species of Personidae previously placed in the ranellid subgenus *Sassia (Personella)*, I noted (BEU, 1988: 91) that another genus, distinct from *Personopsis*, "might prove necessary" for *D. pusilla*. This genus is now provided, because of the combination of several distinctive characters seen in *D. pusilla*. *Distorsomina pusilla* differs from all *Distorsio* species in its much smaller size, in its narrower form, in its narrow aperture, in lacking the expanded columellar shield, and in lacking the very prominent, nodulous basal columellar ridge that is seen in both *Distorsio* and the New Zealand Late Paleocene personid *Kotakaia simplex* Beu, 1988 (: 92, pl. 3, figs 14-17). The prominent, nodulous basal columellar ridge, built out rapidly in *Distorsio* by leaving a spiral hollow beneath it, is absent in the personid genera *Distorsionella, Distorsomina* and *Personopsis*, but low rows of nodules that appear to be homologous are present in all these genera: a uniform row low on the columellar base in *Distorsionella*, a basal columellar row decreasing anteriorly in size in *Personopsis* (and so more resembling that of *Distorsio* than in the other genera, but not elevated on a hollow ridge), and a mid-columellar row of relatively large, uniform, short, oblique, transverse ridges in *Distorsomina*. Varices before the terminal one are very indistinct in *Distorsionella, Personopsis* and *Kotakaia* Beu, 1988, but more prominent in *Distorsio* and *Distorsomina*. *Kotakaia* is rendered further distinctive by its very simple sculpture of low, wide, smooth spiral cords, and by having regular coiling and only four extremely prominent, narrow nodules inside the outer lip. *Personopsis* differs further from *Distorsomina* by its wide form, with a widely conical spire and wide last whorl, tapering unusually gradually to a short, widely open siphonal canal, by having the flared inner lip shield expanded over the previous whorl, as is also prominent in *Distorsio* and, again as in *Distorsio*, by having the second or, in

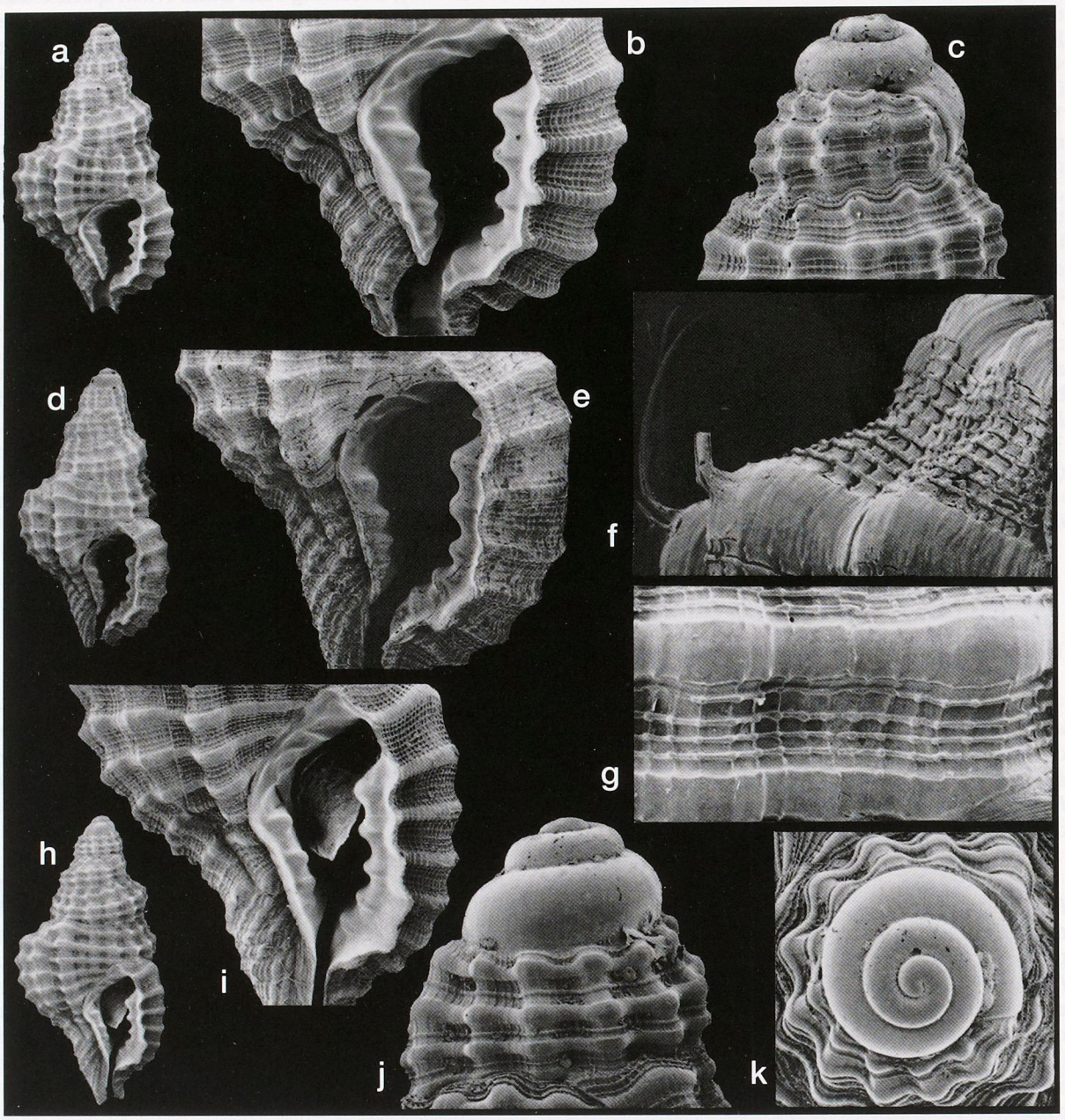

FIG. 65. — *Distorsomina* (gen. nov.) *pusilla* (Pease), SEM micrographs. — **a-c**, BENTHEDI: sta. 32, NE of Ile Pamanzi, Comores Islands, Indian Ocean, 15-20 m; a. x5.2; b. x15; c. x30. — **d-e**, LAGON: sta. 830, near Poindimié, New Caledonia, 105-110 m; d. x5.2; e. x15. — **f-k**, EXPÉDITION MONTROUZIER: sta. 1319, Passe Deverd, New Caledonia, 15-20 m; f. periostracal bristle at periphery, x68; g. x52; h. x5; i. aperture, with operculum, x15; j-k. x30.

most species, third nodule from the adapical end of the interior of the outer lip markedly enlarged compared with the others. The two new species named below in *Personopsis* closely resemble the Italian Pliocene type species, *P. grasi*, and these and records (listed below) of Recent Atlantic specimens closely resembling *P. grasi* demonstrate that *Personopsis* remains a distinctive genus in the modern fauna. The small size, narrow shape, and distinctive apertural characters of *Distorsomina pusilla* demonstrate that it is distinct phylogenetically from *Personopsis* and deserves its own genus.

Distorsomina pusilla (Pease, 1861)

Figs 65 a-k, 66 a-h

Distorsio pusilla Pease, 1861: 397.

Persona pusilla - KOBELT, 1878b: 370. — KÜSTER & KOBELT, 1878: 273.
Distorsio pusilla - TRYON, 1880: 35. — EDMONDSON, 1946: 123. — KURODA & HABE, 1952: 53. — EMERSON & PUFFER, 1953: 102. — OYAMA & TAKEMURA, 1959: *Distorsio* pl. 2, figs 1-4. — KAY, 1965: 37, pl. 3, figs 15-16. — CERNOHORSKY, 1978a: 44. — KAY, 1979: 225, fig. 79I. — SHASKY, 1992: 113, figs 1-4.
Distorsio (?Personella) pusilla - CERNOHORSKY, 1975: 215, figs 5-9.
Distorsio (Rhysema) pusilla - LADD, 1977: 35, pl. 11, figs 12-13.
Personella pusilla - BEU, 1985: 62, fig. 36.
Distorsio (Personella) pusilla - SPRINGSTEEN & LEOBRERA, 1986: 334, pl. 95, fig. 11.
Personopsis(?) pusilla - BEU, 1988: 91. — HENNING & HEMMEN, 1993: 150, pl. 30, fig. 6. — KRONENBERG, 1994: 98, fig. 27.

TYPE DATA. — Holotype, BMNH 1961155, from "Sandwich Islands" [Hawaiian Islands] (CERNOHORSKY, 1975: 217, fig. 5; JOHNSON, 1994: 21).

NEW CALEDONIA RECORDS. — **Coral Sea.** CORAIL 2: sta. DW69.
New Caledonia. LAGON: sta. 830 (Figs 65 d-e). — EXPÉDITION MONTROUZIER: sta. 1259, 1312, 1316, 1318, 1319 (Figs 65 f-k, 66 a-e, h), 1323, 1331. — LAGON DE NOUMÉA: sta. 1354.
Loyalty Ridge. "New Caledonia", possibly from Lifou, Melvill-Tomlin Colln, National Museum of Wales, Cardiff (2; Fig. 66 g). — Lifou, Loyalty Is, coll. J. Brazier (3 AMS).

OTHER MATERIAL EXAMINED AND PUBLISHED RECORDS. — **Southern Japan.** "Amami-Oshima", Melvill-Tomlin Colln, National Museum of Wales (5; Fig. 66 f). — Recorded also from "Amami-Oshima" by OYAMA & TAKEMURA (1959, *Distorsio* pl. 2). — Osumi, Ohshima Island, Kagoshima Prefecture, southern Kyushu (3 IGPS 10590). — Amami-Oshima (2 NSMT 40868). — Osumi, Ohshima I., pres. Hirase, *ex* T. Barbour Colln (2 MCZ 43243). — Osima, Ohsumi, pres. Hirase (5 USNM 343804). — 0. 5 km ESE of Zampa-misaki, 45 m, Okinawa, coll. R.F. Bolland, 24 Aug. 1978 (1 LACM). — 1 km west of Onna Village, 45 m, Okinawa, coll. R. F. Bolland, Sept. 1978 (1 LACM 78-99). — Nakijin, Motobu Peninsula, 30 m, Okinawa, coll. R.F. Bolland, 10 June 1978 (1 LACM 78-22). — Horseshoe Cliffs, 1 km WNW of Onna Village, 60 m, Okinawa, coll. R.F. Bolland, July-Aug. 1979 (1 LACM 79-76)
Philippine Islands. Zamboanga (1 NSMT 40867). — Cabra I., Lubang, pres. P. de Mesa (1 MCZ unregistered). — Mactan I., Cebu, pres. F.J. Springsteen (7 NZGS WM13358). — As above, Abbey Shells, 1984 (3 NZGS WM13627). — As above, *ex* J.R. Penniket Colln (1 NZGS WM15562). — Cebu, *ex* J.R. Penniket Colln (1 NZGS WM15561). — East end Santa Cruz I., off Zamboanga, Mindanao, 9-18 m, coll. J. H. McLean, 19 Jan. 1981 (2 LACM 81-7). — SW end Mactan I., tangle nets Cebu, pres. E. Svoboda, 1984 (1 LACM 85-158).
Marianas Islands. Guam, N. Tipilao Point, 11 m, under rocks, coll. R. Salisbury (CERNOHORSKY, 1975: 217, figs 6-8). — Orote Point, Guam, 17-23 m (AMNH 203676; SHASKY, 1992).
Marshall Islands. Ine I., Arno Atoll, 15-32 m, on coral, 9 May 1991 (2, Shasky Colln; SHASKY, 1992). — Eniwetok, Holocene fossil from 30-40 ft (9-12 m) in drillhole E-1, illustrated by LADD (1977: 35, pl. 11, figs 12-13) (2 USNM 650634).
Malaysia. N. side Sipidan I., Sabah, 8-33 m under coral, 11-16 June 1990, coll. D. Shasky (1; SHASKY, 1992: 114, figs 1-2).
Indonesia. Haarlem I., Bay of Batavia [now Jakarta], 1938 (1, ZMA; photo sent by G. Kronenberg).
Papua-New Guinea. Inlet N. end Kranket I., Madang, coll. W.F. Ponder & P.H. Colman, 26 May 1970 (1 AMS). — Nimoa, Calvados Chain, Louisiade Archipelago, beach, coll. E. Petuch, 1970 (1 AMS).
Eastern Australia. Yonge Reef, east of Lizard I., N. Queensland, 15-17 m, outer face at N end of island, coll. W.F. Ponder, 9 Dec. 1975 (1 AMS). — Euston Reef, outer Barrier Reef off Cairns, Queensland, 21 m, at bottom of sandy slope below steep coral walls, coll. P.H. Colman, 30 Nov. 1972 (1 AMS).
Fiji. Fiji (1 USNM 333612). — Nandi Bay, Fiji, coll. J. Laseron (1 AMS *ex* T. Garrard Colln). — Lakeba I., Lau Group (CERNOHORSKY, 1978a: 44).
Samoa. Ofu I., American Samoa (1 BPBM 196185).
French Polynesia. Coral reef off Pt. Teffao, N of Fare, Huahine I., Society Is, 0-1 m, coll. H.A. Rehder, 2 May 1957 (1 USNM 630349). — Sta. W-244, N. of Passe Avamoa, off Pt. Teffao, Huahine I., Society Is, coll. H.A. Rehder, 19 March 1971 (1 USNM 731500). — Baie Faaroa, Raiatea, Society Is, coll. D. Shasky, Aug. 1977 (1 LACM 77-116). — Tahiti (AMNH 237985; SHASKY, 1992). — Maiai I., Tuamotu Is, Tikahau, beach, coll. H.A. Rehder, 13 April 1957 (1 USNM 629477). — S end of Opakea I., Tuamotu Is, Raroia, 17 Aug. 1952 (1 USNM 722453). — Mataira I., Tuamotu Is, Raroia, beach, 16 July 1952 (1).
Hawaii. Honolulu, Oahu, dredged, pres. Thaanum (1 USNM 337878). — Sandwich Is, pres. W.H. Pease (1 USNM 16977). — Honolulu Harbour, Oahu (1 BPBM 63192). — Fort Armstrong Reef, Oahu, Thaanum Colln no. 11260 (1 BPBM). — Off Ewa Beach Park, Oahu, 14 m, under dead coral, coll. D. Shasky, 2 Nov. 1989 (1, Shasky Colln). — Puako Bay, Hawaii, 11-26 m, under dead coral, coll. D. Shasky, 30 Sept. 1986 (1, Shasky Colln). — Lanai I., near lighthouse, 12-22 m, coll. T. Bratcher, Sept. 1974 (1 LACM 74-66). — Maui (AMNH 214713; SHASKY, 1992). — Sand I., Oahu (AMNH 241909; SHASKY, 1992).
Comores. Mayotte I., northeast of Ile Pamanzi, BENTHEDI: sta. 32, 15-20 m, 12°45'1" S, 45°17'9" E (1 MNHN; Figs 65 a-c).

DISTRIBUTION. — Although *Distorsomina pusilla* is uncommon in collections, and its range has been poorly known until recently, the locality data collected above indicate that it ranges throughout the Indo-West

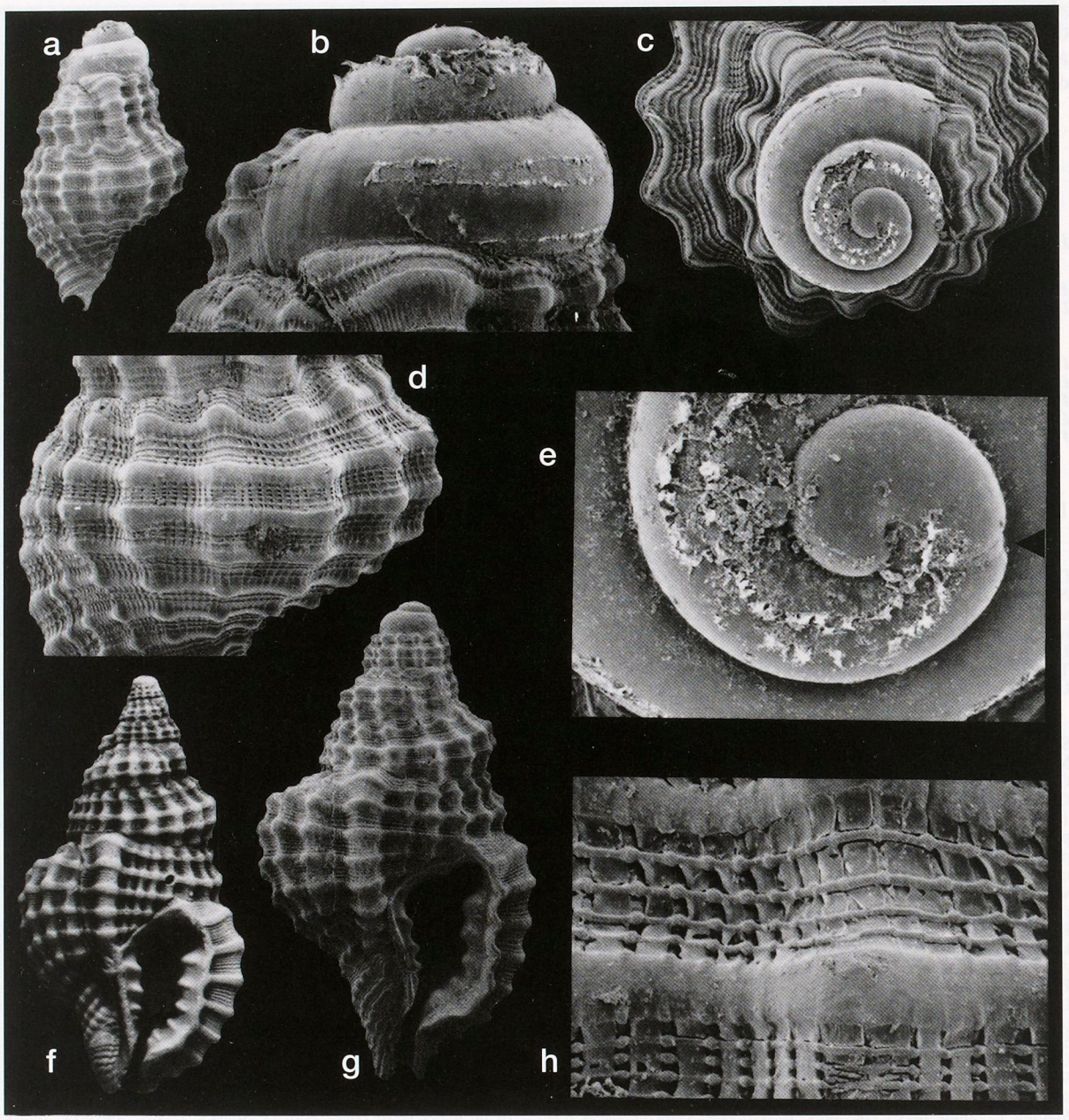

FIG. 66. — *Distorsomina* (gen. nov.) *pusilla* (Pease). — **a-e**, **h**, smallest specimen in same sample as Figs 65 f-k; a. x14; b. x60; c. x36; d. x34; e. protoconch apex, showing constriction ending protoconch I (arrowed), x124; h. periostracum, x133. — **f**, largest specimen seen (H 12.5 mm), "Amami-Oshima", Japan, Melvill-Tomlin Colln, Nat. Museum of Wales, x5. — **g**, "New Caledonia", possibly from Lifou, Melvill-Tomlin Colln, Nat. Museum of Wales, x8.

Pacific Province, from the western Indian Ocean (Comores Islands) and from southern Kyushu, Japan, south to Queensland, New Caledonia and the Coral Sea, and eastwards throughout Micronesia, Melanesia and Polynesia to Hawaii. The first Indian Ocean record is listed above, but others confidently can be expected. Living specimens have been collected in New Caledonia in 12-57 m.

DIMENSIONS. — Holotype: H 9.9, D 5.3. - Amami-Oshima Islands, southern Japan, Melvill-Tomlin Colln, National Museum of Wales, largest specimen seen: H 12.5, D 6.9.

REMARKS. — As noted under the generic discussion, the most distinctive characters of *Distorsomina pusilla* are its small size (up to 12.5 mm high - the smallest species of tonnoidean I am aware of), its very narrow shape compared with species of *Personopsis*, in particular, and its small, very narrow aperture in which the typical personid row of enlarged basal columellar nodules is located obliquely and relatively adapically, occupying the mid-columellar area of the inner lip of the very small aperture. Part of the unusual appearance of the aperture of *D. pusilla* results from the relatively large size of this row of nodules compared with the rest of the aperture; the relatively high, adapical position of this nodule row could result largely from the small maximum shell size. The base of the inner part of the columellar lip (*i.e.*, just visible well inside the aperture) is expanded to form a distinctive, thin, sharp-edged ridge, margining the columella and sharply demarcating the narrow channel curving around into the anterior siphonal canal. The protoconch (Figs 65 c, j-k) consists of 2.3-2.5 evenly convex whorls, forming a typical "primitive ranellid" (*i.e.*, plesiomorphic) low-turbiniform protoconch with an apparently smooth surface; a juvenile collected alive by EXPÉDITION MONTROUZIER bears two rows of low periostracal flanges on the protoconch, and is only the second personid protoconch I have seen with an obvious constriction between protoconchs I and II (Figs 66 b-c, e) (one was figured earlier, in *Distorsio euconstricta*, by BEU (1987: fig. 139) but it has not been seen on other *Distorsio* protoconchs). The single Indian Ocean specimen I have seen (off Mayotte, in 15-20 m, MNHN; see above; Figs 65 a-c) is expanded a little more widely between varices than most western Pacific specimens, but is matched by the most extreme western Pacific specimens.

Genus ***DISTORSIONELLA*** Beu, 1978

Distorsionella Beu, 1978: 38. Type species (OD): *Distorsio (Distorsionella) lewisi* Beu, 1978, Recent, southwest Pacific.

REMARKS. — *Distorsionella* was proposed, as a subgenus of *Distorsio*, for a single relatively large species of Personidae (reaching 40 mm in height, *i.e.*, larger than all personids other than *Distorsio*) of most atypical fusiform shape, with a drawn-out and only gradually contracted base merging into a poorly defined siphonal canal, with the basal columellar nodules situated directly on the columella rather than on the larger, elevated, hollow ridge characteristic of *Distorsio*, with an only narrowly flared inner-lip shield over the previous whorl, and with only weakly distorted coiling. In view of the diversity of smaller personids recorded here from New Caledonia and nearby areas and the distinctive shell shape of *Distorsionella*, *Distorsionella* seems better treated as a genus rather than as a subgenus of *Distorsio*. This rank was used also by WARÉN & BOUCHET (1990), HENNING & HEMMEN (1993) and KRONENBERG (1994).

Distorsionella lewisi (Beu, 1978)

Figs 67 a-h

Distorsio (Distorsionella) lewisi Beu, 1978: 39, figs 5, 8, 19-24, 30 A.

Distorsio (Distorsionella) lewisi - BEU, 1985: 62, fig. 35.
Distorsionella lewisi - WARÉN & BOUCHET, 1990: 102, fig. 121. — HENNING & HEMMEN, 1993: 149, pl. 30, fig. 5. — KRONENBERG, 1994: 96, fig. 26.

TYPE DATA. — Holotype NZOI 230 (Fig. 66 d), from NZOI sta. P57, 33°15.0' S, 169°59.0' E, central Reinga Ridge, between northern New Zealand and Norfolk I., 563-614 m, 2 paratypes NZOI P323-324, from NZOI sta. I97, 32°22.9' S, 167°28.2' E, Wanganella Bank, southern Norfolk Ridge, 540-544 m, 1 paratype NZOI P325 from NZOI sta. K870, 31°21.2' S, 178°44.5' W, off l'Esperance Rock, Kermadec Is, 510-610 m.

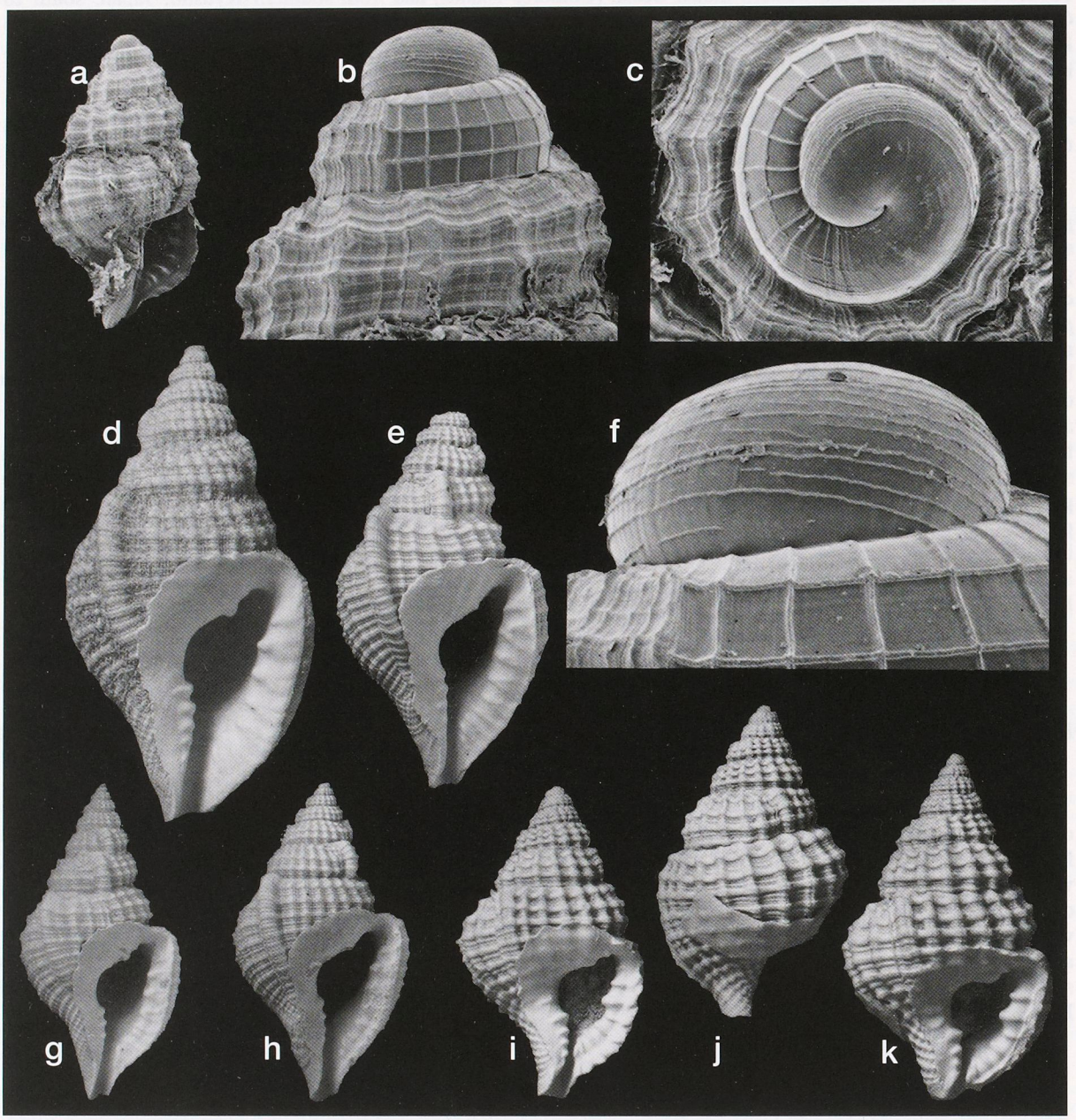

FIG. 67. — *Distorsionella* and *Personopsis* species. — **a-h**, *Distorsionella lewisi* (Beu). **a-c**, **f**, BIOCAL: sta. DW66, New Caledonia, 505-515 m; a. x6.8; b. x33; c. x47; f. x96. **d**, holotype, NZOI 230, NZOI Sta. P57, central Reinga Ridge, north of northern New Zealand, 563-614 m, x2. **e**, largest specimen seen, CHALCAL 2: sta. DW74, S. New Caledonia, 650 m, x1.5. **g-h**, SMIB 8: sta. DW146, Norfolk Ridge, New Caledonia, 514-522 m, x1.5. — **i-k**. *Personopsis grasi* (Bellardi *in* D'Ancona), type species of *Personopsis* Beu, 1988; Pliocene of Italy, in Mayer-Eymar Colln, Naturhistorisches Museum Basel, both x2. **i-j**, H.17139, Savona. **k**, H.17140, Bacedasco, near Piacenza.

NEW CALEDONIA RECORDS. — **Coral Sea.** MUSORSTOM 5: sta 361, 362, 372.
North of New Caledonia. HALICAL 1: sta DW01-04, DW03.
Norfolk Ridge. BIOCAL: sta DW66 (Figs 67 a-c, f). — MUSORSTOM 4: sta DW223. — CHALCAL 2: sta CC2, DW74 (Fig. 67 e). — SMIB 3: sta DW1, DW2, DW3, DW5, DW6, DW7, DW13. — SMIB 4: sta DW37. — SMIB 8: sta DW146 (Figs 67 g-h), DW147, DW149, DW150, DW152. — SMIB 10: sta DW203, 215. — BERYX 11: sta CP08. — BATHUS 2: sta CP735. — BATHUS 3: sta DW781, DW785, DW800.
Loyalty Ridge. VOLSMAR: sta DW37.
These 35 lots were collected in 163 to 650 m, but only one lot (Vanuatu, MUSORSTOM 8: sta. CP1103) was collected in less than 400 m, and *D. lewisi* seems most common in more than 500 m.

OTHER MATERIAL EXAMINED. — **Vanuatu.** MUSORSTOM 8: sta. CP983, 19°22' S, 169°28' E, 475-480 m (1 large). — Sta. CP984, 19°20' S, 169°26' E, 480-544 m (1). — Sta. DW1011, 17°50' S, 168°12' E, 547-585 m (1). — Sta. DW1014, 17°55' S, 168°19' E, 495-498 m (2; 1 NZGS WM15822). — Sta. CP1103, 15°04' S, 167°08' E, 163-165 m (1).

DISTRIBUTION. — From a southern limit on the Reinga Ridge and Norfolk Ridge, a short distance north of northern New Zealand, *Distorsionella lewisi* has been collected as far north as the Chesterfield Plateau, in the Coral Sea, around New Caledonia, and from four stations around Vanuatu. Some specimens are also known from near the Kermadec Islands and on the Loyalty Ridge. More deep-water sampling further to the north is needed to be sure whether these samples define its entire range. Specimens have not as yet been collected off eastern Australia.

DIMENSIONS. — Holotype: H 37.5, D 19.8. - BATHUS 2: sta. CP735, largest specimen seen: H 40.1, D 21.2. - CHALCAL 2: sta. DW74: H 37.7 (incomplete, spire tip missing, estimated originally 39-40 mm), D 21.5 (Fig. 67 e).

REMARKS. — *Distorsionella lewisi* is readily identified among the numerous New Caledonian deep-water tonnoideans reviewed here because of its relatively large size (adult specimens are about 25 to 40 mm high), its fusiform shape, its finely cancellate sculpture, and its pale yellow-brown, finely bristled periostracum. Fresh shells, and the apertures of all specimens, are plain bright white. The varices are relatively prominent, and the terminal varix and its thickened interior are wide and obvious on large specimens, with up to nine prominent, transverse ridges on the interior face. Unlike most other Personidae, the ridges inside the outer lip are uniform in size, with no obviously enlarged second or third "tooth" from the adapical end, as occurs in *Distorsio* and *Personopsis*. The short, transverse ridges on the base of the columella range from four to six in number and, although they are clearly defined and moderately prominent in some specimens (*e.g.*, the holotype, Fig. 67 d; BEU, 1978: fig. 24) they are low and poorly defined in both weakly calcified, small specimens and heavily calcified, large specimens. The protoconch (Figs 67 b-c, f; figured also by WARÉN & BOUCHET, 1990: fig. 121) is distinctive in having only 1.2 whorls, an inclined, partly immersed initiation of large diameter, and initial sculpture of numerous thin, irregular, closely spaced spiral ridges that pass gradually into the regular, reticulate, spiral and axial sculpture of the last 0.3-0.4 whorl. WARÉN & BOUCHET (1990: 94) suggested that the few protoconch whorls indicate that this species does not have planktotrophic development. This and the apparently restricted southwest Pacific distribution, from north of New Zealand to the Coral Sea and Vanuatu, and commonly in deep water (400-650 m) throughout New Caledonia, indicate a short planktonic larval life. The present material demonstrates that *Distorsionella lewisi* is moderately common in the New Caledonian region, in the deep-water fauna along with abundant *Sassia remensa, Bursa latitudo* and *B. quirihorai*, common *Distorsio habei* and *Bursa fijiensis*, and other less common *Personopsis* and *Distorsio* species.

Distorsionella pseudaphera sp. nov.

Figs 68 a-l

TYPE DATA. — Holotype (Figs 68 g-h, j, l) and 3 paratypes MNHN, north of New Caledonia, MUSORSTOM 4: sta. DW159, 18°46' S, 163°16' E, 585 m.

NEW CALEDONIA RECORDS (all paratypes). — **North of New Caledonia.** MUSORSTOM 4: sta. DW156 (2, large), DW162 (3; 1 NZGS WM15621), DW164 (2, small), DW181 (3; Figs 68 a-d, f), DW184 (6, narrow form; Figs 68 e, i), DW196 (1), DW197 (4; 1 NZGS WM15622). — LAGON: sta. 1152 (2, narrow form; 1 NZGS WM15620). — BATHUS 4: sta. DW919 (2), DW923 (3), DW926 (1). — SMIB 5: sta. DW87 (1), DW91 (1).
Loyalty Ridge. MUSORSTOM 6: sta. DW458 (2), DW464 (1), DW478 (2).
These 16 lots were collected in 255 to 660 m.

DISTRIBUTION. — *Distorsionella pseudaphera* sp. nov. has been collected so far only north of New Caledonia and on the Loyalty Ridge.

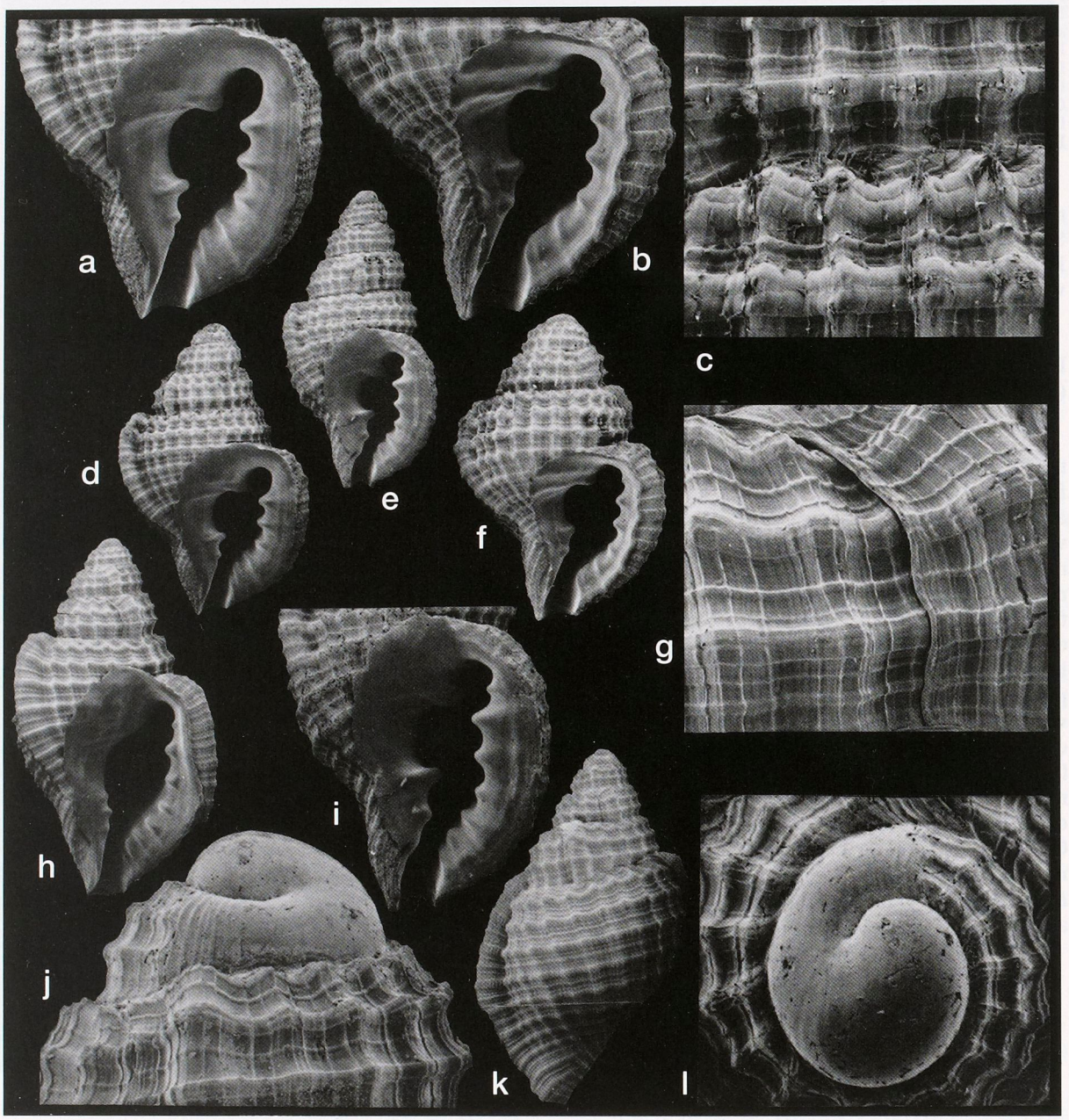

FIG. 68. — *Distorsionella pseudaphera* sp. nov., New Caledonia; SEM micrographs. — **a-d**, **f**, 2 paratypes, MUSORSTOM 4: sta. DW181, 350 m; a. x8.5; b. x13; c. x30; d. x5; f. x7.4. — **e**, **i**, paratype, MUSORSTOM 4: sta. DW184, 260 m; e. x4.6; c. x8.5. — **g-h**, **j-l**, holotype, MUSORSTOM 4: sta. DW159, 585 m; g. x35; h, k. x3.9; j, l. x30.

DESCRIPTION. — Shell small (largest seen 16.5 mm high, rarely over 14 mm high, *i.e.* less than half height of *D. lewisi*), short and wide in most specimens but highly variable in shape, some specimens relatively narrow. Protoconch small, low, of 0.75 whorls, with bulbous, inclined initiation of large diameter, followed by slightly irregular, markedly narrower quarter-whorl, flaring slightly at end to pass abruptly into teleoconch; initial half-whorl apparently smooth and polished on most specimens, bearing faint, irregular, spiral and axial threads in a few unabraded specimens; last quarter-whorl gradually developing weakly rugose, low, closely spaced axial costae; 5-6 well developed costae present on last 0.1 whorl of most specimens. Teleoconch of 4-4.5 regularly convex whorls, almost completely regularly coiled, without defined sutural ramp or shoulder angle; last whorl very gradually contracted to a short, straight, widely open, weakly defined anterior siphonal canal, with unnotched tip and no fasciole. External sculpture of regular, reticulate, low axial costae and spiral cords; three cords and, in places, adapical edge of fourth visible on spire whorls and 10 evenly spaced over last whorl, base and anterior canal, with single large median secondary cord and several narrow, widely spaced tertiary threads in each spiral interspace; crossed by many low, rounded, widely spaced axial cords, 12 in both last and penultimate intervariceal intervals on holotype, forming low nodules at intersections with spiral cords; all crossed by many low, narrow, widely spaced axial costellae, equal in size and spacing to tertiary spiral threads. Varices prominent, high and wide with strongly convex surface, the first after one teleoconch whorl, thereafter slightly irregular in position but situated at about each two-thirds of a whorl (5 in 4.3 whorls on holotype). Outer lip polished, reflected over half to two-thirds of width of terminal varix for adapical two-thirds of lip height, and over up to whole width of varix over abapical third, bearing 5-7 short, low, rounded, widely and evenly spaced nodules along its inner margin; uppermost nodules (in posterior canal, demarcated by single prominent parietal ridge) prominent in some specimens, weak in most, absent from a few; second adapical nodule slightly more prominent than all others on most specimens. Inner lip smooth and polished, weakly flared into narrow shield over previous whorl, particularly over parietal area; bearing 3-5 basal columellar ridges. Most specimens with 3 low, similarly prominent columellar ridges, but adapical or median one slightly more prominent than others in some specimens; a few specimens (all with unusually narrow teleoconchs) with 3 nodules of abapically decreasing prominence, uppermost (adapical) much the largest; one specimen with 5 low, abapically decreasing nodules (MUSORSTOM 4: sta. DW196). Periostracum present on almost all specimens, pale straw-yellow to olive-yellow, thin, bearing many short, widely spaced bristles.

DIMENSIONS. — Holotype: H 14.3, D 8.7; short paratype, same station as holotype: H 13.0, D 8.0; large, elongate paratype, same station as holotype: H 16.5, D 10.6.

REMARKS. — *Distorsionella pseudaphera* sp. nov. closely resembles *D. lewisi* in shape, sculpture and apertural characters. It is distinguished from *D. lewisi* by reaching less than half the maximum size of *D. lewisi*, by its smaller, lower protoconch of 0.75 rather than 1.2 whorls, lacking the cancellate sculpture of the last stage of the *D. lewisi* protoconch, and by having fewer nodules inside both lips of the aperture. Also, the much more protruding protoconch is pale golden brown in live-collected *D. lewisi*, whereas it is translucent white in all specimens of *D. pseudaphera* sp. nov.

There is some evidence that what is interpreted here as one could really be two species. Relatively few specimens (LAGON: sta. 1152, 2 specimens; MUSORSTOM 4: sta. DW184, 6 specimens; SMIB 5: sta. DW91, 1 specimen; possibly including 1 large paratype in the same lot as the holotype, with elongate shape but with apertural characters obliterated by a polychaete that formerly inhabited the shell) are much narrower in shape than all the others, and have larger basal columellar nodules, decreasing regularly in size abapically in all specimens; these conceivably represent a species distinct from *D. pseudaphera*. However, a scatter diagram comparing H:D of all available specimens showed that the shapes intergrade completely, and several specimens are exceptions to these two combinations of characters (*e.g.*, MUSORSTOM 4: sta. DW181, 1 small juv., 1 moderately narrow adult and 1 short, wide adult, but all 3 have the columellar nodules prominent, and decreasing in size abapically). It is likely that all the material belongs in a single, highly variable species.

Distorsionella pseudaphera sp. nov. is placed a little tentatively in *Distorsionella*, because the close overall resemblance to *D. lewisi* does not necessarily reflect a close phylogenetic relationship. Much more study of the anatomy and radulae of more material is needed to confirm the relationship. The specific epithet reflects the almost equally close resemblance of the new species to some Cancellariidae such as *Fusiaphera* Habe, 1961 which, however, is shown to be superficial by the columellar ridges being short nodules that do not enter the aperture, rather than the continuous, spiral columellar ridges of Cancellariidae.

Genus *PERSONOPSIS* Beu, 1988

Personopsis Beu, 1988: 90. Type species (OD): *Triton grasi* Bellardi *in* d'Ancona, 1873, Pliocene, Italy; Recent, Atlantic seamounts.

REMARKS. — BEU (1988: 90) proposed *Personopsis* to replace in Personidae the incorrect usage of the name *Personella* Conrad, 1865; *Sassia (Personella)* proved to be a subgenus of the ranellid *Sassia* (BEU, 1988: 85). "*Personopsis*" *pusilla* is referred above to the new genus *Distorsomina*, and all other species previously referred to *Personopsis* by BEU (1988: 90-91) are Cenozoic fossils, ranging in age from Paleocene to Pliocene. It is therefore of great interest to record here two species of *Personopsis* living in the waters of the New Caledonia-Coral Sea region. Both are rare, small species occurring in more than 300 m depth, so it is not surprising that only the intensive MNHN/ORSTOM deep-sea sampling programme has brought them to light. Specimens of an Atlantic deep-water species closely resembling *P. grasi* are also reported below.

Personopsis differs from the other genera of Personidae in its small size (to about 25 mm high, but most species reach less than 20 mm); its only slightly irregular coiling; its biconic shape with a moderately tall spire with straight-sided outlines, the last whorl weakly expanded to the left of the aperture (in conventional spire-upward orientation) to form a weakly defined, slightly concave sutural ramp and an evenly rounded periphery, and the base gradually contracting to a weakly defined neck and short, open, anterior siphonal canal directed weakly to the left and dorsally; its moderately expanded inner lip forming a thin parietal shield over part of the previous whorl, but much narrower than the shield of *Distorsio*; and its weakly trigonal aperture with a prominent, deep posterior notch margined by a sharply rounded adapical expansion of the outer lip, and with a markedly enlarged third nodule (from the adapical end) inside the outer lip, one or two prominent parietal ridges demarcating the posterior notch, and a row of abapically decreasing transverse ridges on the base of the columella. *Personopsis* is the most nearly similar to *Distorsio* of the smaller personid genera, and differs from *Distorsio* in its smaller size, its much less distorted coiling, its narrower parietal shield, its relatively tall spire and more gradually contracted base, and its basal columellar nodule row being situated directly on the columella rather than on the strongly elevated, hollow ridge protruding into the aperture in *Distorsio*.

BEU (1988: 90-91) listed the species referred to *Personopsis*, but this needs modification now, as a further fossil species can be added and, of course, *Distorsomina pusilla* deleted.

Species now included in *Personopsis*:

(?)*Distorsio alvaradoi* Villalta, 1956 (: 182, pl. 7, figs 4 a-b), Middle-Late Eocene, blue marls at Isún, Spanish Pyrenees [although the coiling is weakly excentric, the tall spire suggests a position in *Sassia*; apertural characters unknown].

Distorsio (Personella) beui Maxwell, 1968 (: 135; MAXWELL, 1992: 107, pl. 13 e), Late Eocene, New Zealand.

Triton grasi Bellardi *in* d'Ancona, 1873 (: 262, pl. 14, fig. 18), Pliocene, Italy (Figs 67 i-k; figured also recently by SPADINI, 1994: 283, fig. 8). S. Gofas (MNHN; pers. comm.) reports that Recent *Personopsis* specimens "hardly separable from *Personopsis grasi*" have been collected from the Meteor, Hyères and Irving seamounts, in the Atlantic Ocean, during the SEAMOUNT 2 cruise, 1993.

(?) *Distorsio interposita* Tate, 1894 (: 172, pl. 10, fig. 3), Late Oligocene, Torquay, near Melbourne, Victoria, Australia [the small size and weak sculpture suggest a position in *Personopsis*, but the strongly excentric coiling and the position of the transverse columellar ridges on a raised, if low, basal columellar ridge suggest this species might better be regarded as a small species of *Distorsio*, perhaps related to *D. euconstricta*].

Triton minae de Gregorio, 1880 (: 101, pl. 7, fig. 64), Eocene, San Giovanni Ilarione, Italy [a small, weakly distorted species resembling *P. beui*].

Personopsis purpurata sp. nov., Recent, described below.

Eutritonium (Sassia) rutoti (Vincent, 1930), Paleocene, Belgium and Poland [see KRACH (1963: 102, pl. 23, fig. 6) for reference and apertural characters].

Personopsis trigonaperta sp. nov., Recent, described below.

Personopsis purpurata sp. nov.

Figs 69 a-d, g-h

TYPE DATA. — Holotype MNHN (Figs 69 a-d, g-h), northern Norfolk Ridge, south of New Caledonia, SMIB 5: sta. DW97, 23°01' S, 168°18' E, 300 m.

NEW CALEDONIA RECORDS (all paratypes). — **Coral Sea.** MUSORSTOM 5: sta. 300 (1), 301 (3), 304 (1). **Norfolk Ridge.** SMIB 5: sta. DW87 (1). — SMIB 8: sta. DW160 (1 NZGS WM15619), DW189 (2 lv, with long periostracal bristles). — BATHUS 2: sta. DW730 (1). — BATHUS 3: sta. DW827 (1). **Loyalty Ridge.** MUSORSTOM 6: sta. DW457 (1). These 10 lots (12 specimens) were taken in 280 to 610 m.

DISTRIBUTION. — *Personopsis purpurata* sp. nov. has been collected to date only on the northern Norfolk Ridge, on the Loyalty Ridge, and on the Argo and Nova Banks in the eastern Coral Sea.

DESCRIPTION. — Shell small for genus (most specimens to 16 mm high; largest 18.5 mm high), relatively broadly biconic, with moderately tall spire, widely expanded last whorl, and moderately contracted base and short anterior canal. Protoconch of 2.75 strongly convex whorls, low-turbiniform, slightly taller than wide, with narrow initiation, apparently entirely smooth and polished, ending abruptly at low, narrow ridge. Teleoconch of 6 whorls, with weakly distorted coiling, slight, concave sutural ramp developed over expanded areas of last 2 whorls, whorl surface weakly but evenly convex abapertural to varices but more strongly convex adapertural to varices (in direction of coiling) over last 2 whorls. Varices low, except for nodule-like expansion over posterior apertural notch over last 2 whorls, weakly defined on early spire whorls; initial varix after 0.5 teleoconch whorl; varices little more than each 0.5 whorls apart on early spire but becoming progressively further apart down spire, situated at each 0.66 whorl over last 2 whorls. Sculpture of low, narrow, reticulate axial costae and spiral threads; axial costae numerous, rounded, moderately prominent, with interspaces each twice width of one costa, 12 in last and 13 in penultimate intervariceal intervals on holotype; spiral cords low, flat-topped, sharply defined, each less than half width of one axial costa, riding over axial costae, forming low, rounded nodules at intersections; 3 cords and, over expanded areas of penultimate whorl, fourth cord showing on spire whorls, 8 primary cords on last whorl (passing onto terminal varix) and further 7 lower, wider and more closely spaced cords on canal. Primary cords with wide, concave interspaces bearing several orders of low, narrow, widely spaced interstitial threads; entire surface crossed by low, narrow, widely and evenly spaced axial costellae. Aperture weakly trigonal, with outer lip flared over inner half of terminal varix for adapical two-thirds of its height, and over most or all of width over basal third; bearing 7 or 8 nodules along inner edge, uppermost nodule (in centre of posterior notch) minute, second nodule moderate, third nodule strongly enlarged, fourth nodule smaller than most others, fifth to seventh moderate-sized and similar to each other, small anterior eighth present on some specimens. Inner lip expanded into narrow, smooth shield over parietal area, bearing single prominent parietal ridge, small second ridge adapical to prominent one, low but obvious transverse ridge in apex of marked mid-columellar excavation, and abaperturally decreasing row of 6 or 7 basal columellar ridges; uppermost basal columellar ridge much the most prominent, adapically concave ("hooked"-looking), strongly protruding towards enlarged third nodule inside outer lip, directed more adapically than more abapical, simple ridges and forming markedly concave groove margining adapical end of nodulous ridge. Entire shell translucent white, except for prominent bright brownish purple area at extremity of anterior siphonal canal (most obvious on dorsum of cleaned live-collected specimens), and less obvious one in centre of mid-columellar excavation, marking position of penultimate canal tip visible through translucent inner lip. Periostracum present on most specimens, very thin, pale straw-yellow to pale olive-yellow, bearing numerous bristles that are long, thick and closely spaced over axial costae but short, thin and widely spaced over axial interspaces.

DIMENSIONS. — Holotype: H 15.6, D 9.2; paratype, SMIB 5: sta. DW87: H 16.4, D 9.6. MUSORSTOM 5: sta. 301, largest paratype: H 18.6, D 11.2.

REMARKS. — *Personopsis purpurata* sp. nov. is very easily recognised among the New Caledonia-Coral Sea material by its small size, its biconic shape with a short anterior canal, its very prominent, slightly "hooked"-looking (adapically concave) uppermost basal columellar tooth, and the purple anterior canal tip on an otherwise uniform white shell. The type species of *Personopsis*, the Italian Pliocene and Atlantic living *P. grasi*, is very similar in almost all characters and makes a plausible direct ancestor for *P. purpurata*, but differs from *P. purpurata* in its markedly larger size (to *ca* 25 mm high), its slightly shorter and wider form, and its lower and less prominent uppermost basal columellar tooth (BEU, 1988: pl. 3, fig. 11; Figs 67 i-k).

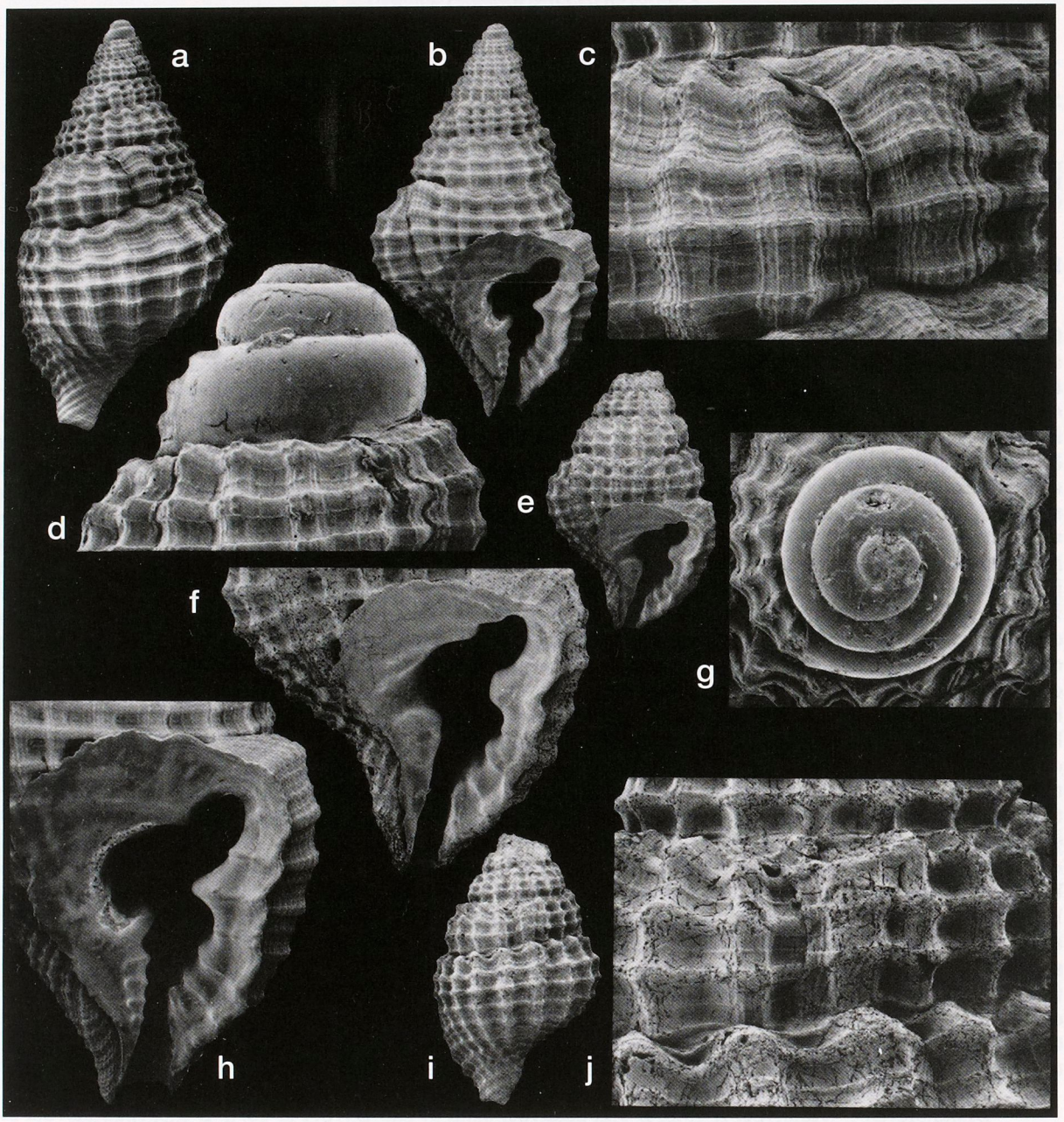

FIG. 69. — *Personopsis* species, New Caledonia, SEM micrographs. — **a-d**, **g-h**, *Personopsis purpurata* sp. nov., holotype, SMIB 5: sta. DW97, Norfolk Ridge, 300 m; a-b. x4; c. x16; d. x34; g. x32; h. x8. — **e-f**, **i-j**, *Personopsis trigonaperta* sp. nov., paratype juvenile specimen, MUSORSTOM 6: sta. DW485, Loyalty Ridge, 350 m; e, i. x3.9; f. x9; j. x16.

Personopsis trigonaperta sp. nov.

Figs 69 e-f, i-j, 70 a-h

TYPE DATA. — Holotype (Figs 70 f-g) from Gemini Seamounts, southern Vanuatu, VOLSMAR: sta. DW51, 20°59' S, 170°3' E, 450 m; immature paratype (Figs 70 a-e, h), off New Caledonia, BIOCAL: sta. DW83, 20°35' S, 166°54' E, 460 m; immature paratype, northern Norfolk Ridge off southern New Caledonia, BATHUS 2: sta. DW730, 23°03' S, 166°58' E, 397-400 m ; small juvenile specimen (Figs 69 e-f, i-j) referred here tentatively, Loyalty Ridge, MUSORSTOM 6: sta. DW485, 21°23' S, 167°59' E, 350 m. All four specimens in MNHN.

DISTRIBUTION. — The four known specimens of *Personopsis trigonaperta* sp. nov., all collected empty, were taken on the Gemini Seamounts, southern Vanuatu (holotype) and south of New Caledonia, in 350-460 m.

DESCRIPTION. — Shell relatively large (to 26 mm high) but very elongate for genus, with moderately tall spire of straight outlines, whorls evenly convex except for weak, concave sutural ramp developed over more inflated parts of last three whorls, coiling weakly distorted because of low whorl inflation abapertural to varices but marked expansion adapertural to varices (in direction of coilng), and long, drawn-out, gradually contracted base passing gradually into moderately long, open, well defined siphonal canal. Protoconch of 2.5 strongly convex whorls, low-turbiniform, height about equal to width, with narrow initiation, apparently smooth and polished. Teleoconch of 7 whorls. Varices moderately low, except for adapical expansion over posterior notch of aperture; first varix after 0.5 whorl, second after 0.3 whorl, thereafter at each 0.66 whorl. Sculpture of reticulate axial costae and spiral cords, closely resembling that of *Personopsis purpurata* sp. nov. in all details, except that 16 major cords on last whorl are all similar, without distinctly lower and wider basal ones of *P. purpurata*, and axial costae and spiral cords are more nearly similar in proportions than in *P. purpurata*; 17 costae in last and 16 in penultimate intervariceal intervals of holotype. Aperture narrowly trigonal, with prominently protruding and constricted posterior notch margined by protrusion of adapical end of outer lip; outer and inner lips angled to almost meet at columellar base, leaving only a narrow slit, 0.3 mm wide, between narrow, sharp-edged ridges on bases of both lips. Outer lip flared over inner two-thirds to entire width of terminal varix, with 8 prominent short, transverse ridges and 3 very short, partly fused basal ones on its inner margin, uppermost (in centre of posterior notch) much smaller than others and third adapical one much larger than others but nevertheless rounded and relatively small, much less elevated than in *P. purpurata* sp. nov.; eighth (abapical) major ridge and basal 3 short ridges partially fused and elongated into thin-edged ridge extending short distance into aperture at base of lip. Inner lip weakly expanded into thin, smooth shield over parietal area, bearing single prominent parietal ridge and second very small ridge adapical to prominent one, very weak, low ridge in centre of mid-columellar excavation, and basal columellar row of 7 (on immature paratypes) or 8 (on holotype) abapically decreasing nodules. Uppermost (adapical) basal columellar nodule largest, but similar in shape and orientation to nodules below, not greatly enlarged and inclined as in *P. purpurata* sp. nov.; lowermost 4-5 nodules similar in size, nodule row ceasing abruptly below lowermost nodule, allowing siphonal canal margin to open markedly, matching corresponding widening at base of outer lip to produce unique, abruptly widened, spout-like canal below constricted lip bases; interior margin of columellar base, interior to basal columellar nodule row, expanded into thin, sharp, smooth margining ridge. Exterior of holotype uniform pale cream, aperture white; exterior of smaller paratype pale mauvish brown with cream varices and anterior canal, aperture white; paratypes bearing remains of thin, pale straw-yellow periostracum, with many short, thick, closely spaced bristles on axial costae of smaller paratype.

DIMENSIONS. — Holotype: H 26.2, D 15.2; larger paratype: H 17.1, D 10.6; smaller paratype: H 16.1, D 10.2.

REMARKS. — *Personopsis trigonaperta* sp. nov. is readily distinguished from *P. purpurata* sp. nov. by its larger maximum size, by its slightly shorter spire, but much more gradually tapered, longer last whorl and longer siphonal canal, by its straighter canal and, in particular, its sharply constricted lip bases followed by a unique, spout-like canal expansion, by having much less strongly differentiated enlarged teeth on both lips, and by lacking the purple canal tip of *P. purpurata*. *P. trigonaperta* is therefore more like *P. grasi* than *P. purpurata* in the proportions of the teeth on the inner and outer lips, but differs strongly from *P. grasi* in its longer and narrower shape and in the longer, much straighter siphonal canal, in its strongly constricted lip bases, and in the spout-like canal expansion below the constriction. Although a radula from a live-collected specimen is needed to confirm the

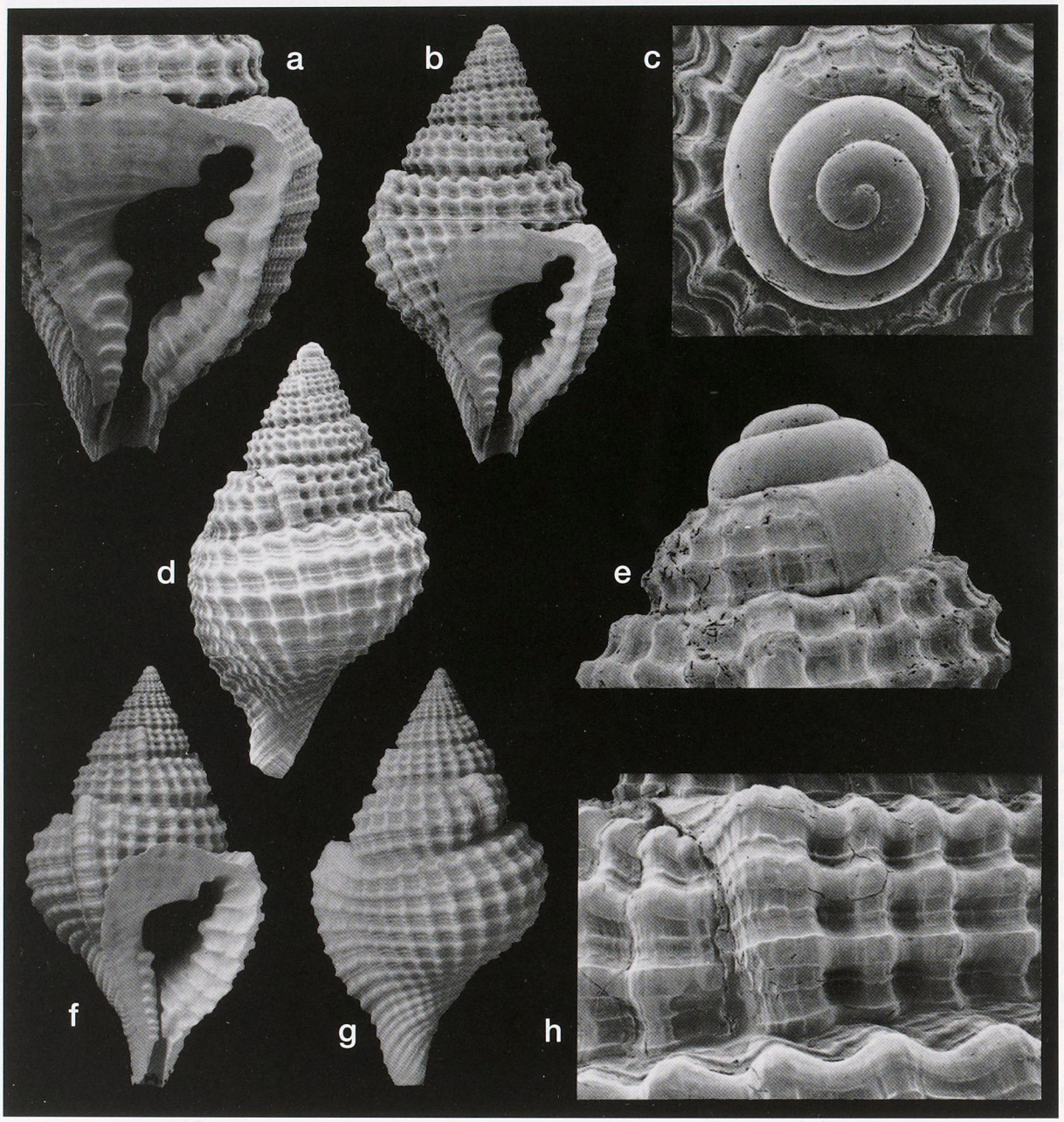

FIG. 70. — *Personopsis trigonaperta* sp. nov., New Caledonia - southern Vanuatu. — **a-e**, **h**, paratype, BIOCAL: sta. DW83, New Caledonia, 460 m, SEM micrographs; a. x5.5; b, d. x4; c, e. x33; h. x16. — **f-g**, holotype, VOLSMAR: sta. DW51, Gemini Seamounts, southern Vanuatu, 450 m, x2.5.

generic position, there is little doubt this species belongs in *Personopsis*. The smaller paratype differs from the holotype and the larger paratype in its shorter, more rapidly contracted base and in its pale mauvish brown coloration, but appears merely to be a younger and fresher shell than the two larger specimens. The very small, immature, pale mauvish brown specimen from MUSORSTOM 6 sta. DW485 was initially thought to represent a third species of *Personopsis*, but appears to be a very young specimen (Figs 69 e-f, i-j) and the subsequent recognition of the third, smallest paratype of *P. trigonaperta*, with similar coloration and aperture to the small juvenile, indicates that the juvenile specimen probably belongs in *P. trigonaperta*. The two smallest specimens of *P. trigonaperta* are interesting in having the enlarged second tooth inside the outer lip well developed at a small size.

ACKNOWLEDGEMENTS

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STATION LIST

The following list gives the location, depth and species identifications for the more than 1000 stations used in this report. A few further localities around New Caledonia or in the Coral Sea, not assigned Station numbers, are listed in full in the text. Station number prefixes (where they have been assigned) indicate the sampling gear used: CC = chalut à panneaux (crevettes) [prawn trawl]; CH = chalut à panneaux (poissons) [otter trawl for fish]; CP = chalut à perche [beam trawl]; D = drague [dredge]; DC = drague Charcot [Charcot dredge]; DW = drague Warén [Warén rock dredge]; P = plongée sous-marine [SCUBA diving]. The location of most samples is shown on maps by RICHER DE FORGES (1990; 1991; 1993) and RICHER DE FORGES & CHEVILLON (1996).

CORAL SEA

Cruise CHALCAL 1, N.O. *"Coriolis"*, coll. B. Richer de Forges-ORSTOM, July 1984. Station list and narrative: RICHER DE FORGES (1990, 1991).

Lansdowne -Fairway Banks

Sta. D2.-80-120 m, 21°14' S, 162°16'27 E: *Gyrineum roseum* (1), *Cymatium dunkeri* (1), *Bursa rosa* (1), *Distorsio euconstricta* (1).
Sta. D6.-45 m, 20°57'00 S, 161°43'00' E: *Gyrineum roseum* (3).
Sta. D7.-62 m, 20°50'86 S, 161°36'99' E: *Gyrineum roseum* (1).
Sta. D8.-40 m, 20°47'30 S, 161°01'40' E: *Gyrineum roseum* (1).
Sta. D9.-75 m, 20°44'50 S, 161°06'60' E: *Gyrineum longicaudatum* (1).
Sta. D10.-87 m, 20°36'09 S, 161°05'82' E: *Cymatium labiosum* (1).
Sta. D11.-83 m, 20°31'52 S, 161°06'60' E: *Gyrineum longicaudatum* (1).
Sta. D12.-80 m, 20°31'33 S, 161°06'51' E: *Bursa rhodostoma* (1).

Chesterfield-Bellona Plateau

Sta. CP14.-66 m, 21°13'50 S, 158°50'20 E: *Cymatium dunkeri* (1).
Sta. P15.-50 m, 21°24'80 S, 158°51'20 E: *Cymatium occidentale* (1 fresh dd), *C. rubeculum* (1), *Bursa granularis* (1).
Sta. D15.-65 m, 19°23'30 S, 158°38'60 E: *Gyrineum roseum* (2).
Sta. D18.-60 m, 19°07'80 S, 158°48'10 E: *Gyrineum roseum* (1).
Sta. D24.-38 m, 19°10'78 S, 158°37'10 E: *Gyrineum roseum* (2).
Sta. D26.-48 m, 19°10'72 S, 158°34'99 E: *Gyrineum roseum* (3), *Cymatium gemmatum* (1).
Sta. D29.-100 m, 19°30'60 S, 158°31'10 E: *Gyrineum roseum* (1).
Sta. D35.-210 m, 19°44'84 S, 158°25'83 E: *Gyrineum lacunatum* (1).
Sta. D37.-50 m, 19°54'00 S, 158°46'30 E: *Cymatium dunkeri* (1).
Sta. D41.-67 m, 20°34'80 S, 158°47' 30 E: *Gyrineum longicaudatum* (1).
Sta. D44.-79 m, 20°46'03 S, 158°33'73 E: *Cymatium muricinum* (1, large dd).
Sta. D45.-50 m, 20°48'93 S, 158°30'21 E: *Gyrineum roseum* (2), *Cymatium dunkeri* (1).
Sta. D47.-70 m, 20°50'85 S, 158°36'03 E: *Gyrineum longicaudatum* (1), *G. roseum* (1).
Sta. D50.-70 m, 20°04'40 S, 158°40'70 E: *Gyrineum roseum* (1).
Sta. D51.-55 m, 21°13'21 S, 158°42'50 E: *Gyrineum roseum* (3), *Cymatium dunkeri* (1), *C. labiosum* (1).
Sta. D52.-69 m, 21°13'40 S, 158°49'20 E: *Gyrineum longicaudatum* (3; 1 NZGS WM15658), *Cymatium exaratum* (1), *C. dunkeri* (1).
Sta. D53.-60 m, 21°19'50 S, 158°55'30 E: *Cymatium dunkeri* (1).
Sta. D55.-55 m, 21°23'90 S, 158°59'60 E: *Cymatium dunkeri* (2).
Sta. D57.-62 m, 21°29'50 S, 159°16'40 E: *Gyrineum roseum* (1).
Sta. D58.-56 m, 21°34'60 S, 159°18'90 E: *Cymatium exaratum* (1).
unnumbered, Ilot Bampton, 18 m: *Distorsio reticularis* (1, large lv).
no further data: *Cymatium dunkeri* (1), *Gyrineum roseum* (2).

Cruise MUSORSTOM 5, N.O. *"Coriolis"*, coll. P. Bouchet, B. Métivier & B. Richer de Forges, October 1986. Station list and narrative: RICHER DE FORGES (1990).

Capel Bank

Sta. 255.-280-295 m, 25°15' S, 159°55' E: *Charonia lampas* (1 dd juv.), *Sassia remensa* (9R; 7S, 2med).
Sta. 256.-290-300 m, 25°18' S, 159°53' E: *Sassia remensa* (1SR).

Argo Bank

Sta. 294.-272 m, 23°11' S, 159°30' E: *Bursa latitudo* (1).
Sta. 299.-360-390 m, 22°48' S, 159°24' E: *Sassia remensa* (4SR), *Bursa latitudo* (2; 1 lv), *B. quirihorai* (1 lv).
Sta. 300.-450 m, 22°48' S, 159°24' E: *Sassia remensa* (3R; 2S, 1 med), *Personopsis purpurata* (1).

Nova Bank

Sta. 301.-487-610 m, 22°07' S, 159°25' E: *Sassia remensa* (26; 17SR, 3medR, 1medI, 2medM, 3LM; 5 NZGS WM15836), *Distorsio decipiens* (2 juv.), *Personopsis purpurata* (3).
Sta. 302.-345-360 m, 22°10' S, 159°23' E: *Sassia remensa* (1medM, 3LR).

Sta. 304.-385-420 m, 22°10' S, 159°26' E: *Sassia remensa* (10; 3SR, 5medR, 1medI, 1LI), *Personopsis purpurata* (1).
Sta. 306.-375-415 m, 22°08' S, 159°21' E: *Sassia remensa* (2SR; 1medI, 1medM), *Bursa fijiensis* (1 lv).
Sta. 307.-350-345 m, 22°11' S, 159°24' E: *Sassia remensa* (1medR).

Chesterfield Plateau

Sta. 329.-320 m, 20°23' S, 158°47' E: *Distorsio habei* (1).
Sta. 335.-315 m, 20°03' S, 158°45' E: *Distorsio habei* (1).
Sta. 336.-350 m, 19°56' S, 158°39' E: *Sassia remensa* (1LM).
Sta. 337.-412-430 m, 19°54' S, 158°38' E: *Bursa fijiensis* (3; 1 lv).
Sta. 338.-540-580 m, 19°52' S, 158°40' E: *Bursa fijiensis* (4; 1 lv).
Sta. 361.-400 m, 19°53' S, 158°38' E: *Sassia remensa* (5medR), *Bursa fijiensis* (7; 2 lv), *Distorsionella lewisi* (1).
Sta. 362.-410 m, 19°53' S, 158°40' E: *Sassia remensa* (1SR, 2medI), *Bursa fijiensis* (1 lv), *Distorsionella lewisi* (1).
Sta. 372.-400 m, 19°53' S, 158°39' E: *Sassia remensa* (1SR), *Distorsionella lewisi* (1).
Sta. 375.-300 m, 19°52' S, 158°30' E: *Gyrineum longicaudatum* (1), *Sassia remensa* (1medI).
Sta. 378.-355 m, 19°54' S, 158°38' E: *Sassia remensa* (2medI).
Sta. 379.-370-400 m, 19°53' S, 158°40' E: *Sassia remensa* (2medR), *Bursa fijiensis* (2; 1 lv).

Cruise CORAIL 2, N.O. *"Coriolis"*, coll. B. Richer de Forges-ORSTOM, July-August 1988. Station list and narrative: RICHER DE FORGES (1991).

Lansdowne -Fairway Banks

Sta. DW1.-59 m, 20°56' S, 161°41' E: *Gyrineum longicaudatum* (1), *G. roseum* (1), *Cymatium pyrum* (1, excellent large, fresh adult shell), *Bursa rosa* (1).
Sta. DW2.-62 m, 20°50' S, 161°37' E: *Cymatium dunkeri* (2; 1 lv), *C. labiosum* (1).
Sta. DW4.-64 m, 20°52' S, 161°37' E: *Gyrineum lacunatum* (1), *G. longicaudatum* (1).
Sta. DW8.-63 m, 20°52' S, 161°38' E: *Gyrineum roseum* (3), *Cymatium dunkeri* (1), *Bursa granularis* (1).
Sta. DW9.-62 m, 20°53' S, 161°35' E: *Gyrineum lacunatum* (2), *G. roseum* (2), *G. longicaudatum* (2), *Cymatium labiosum* (1), *Tutufa bufo* (1 juv.).
Sta. DW10.-60 m, 20°52' S, 161°41' E: *Gyrineum roseum* (2), *Cymatium dunkeri* (1), *Bursa rosa* (1).
Sta. DW11.-58 m, 20°50' S, 161°41' E: *Gyrineum roseum* (1).
Sta. DW18.-69 m, 20°44' S, 161°00' E: *Gyrineum roseum* (2), *Cymatium dunkeri* (3), *C. labiosum* (1), *Bursa rosa* (1).
Sta. DW19.-77 m, 20°42' S, 161°00' E: *Gyrineum longicaudatum* (1), *G. roseum* (1), *Cymatium comptum* (1), *C. dunkeri* (1).
Sta. DW21.-86 m, 20°36' S, 161°02' E: *Gyrineum longicaudatum* (1).
Sta. CP23.-80-83 m, 20°31' S, 161°04' E: *Distorsio reticularis* (1).
Sta. CP24.-74-75 m, 20°27' S, 161°05' E: *Gyrineum longicaudatum* (4), *Tutufa bufo* (1 lv adult).
Sta. CP25.-67-70 m, 20°25' S, 161°05' E: *Cymatium comptum* (2 lv).
Sta. DW28.-78 m, 20°28' S, 160°56' E: *Bursa rhodostoma* (1).

Chesterfield Plateau

Sta. DW31.-57 m, 19°25' S, 158°45' E: *Cymatium dunkeri* (1).
Sta. DW32.-55 m, 19°25' S, 158°49' E: *Cymatium dunkeri* (1).
Sta. DW38.-61 m, 19°22' S, 158°43' E: *Gyrineum roseum* (2).
Sta. DW41.-52 m, 19°22' S, 158°32' E: *Cymatium comptum* (1).
Sta. DW46.-21 m, 19°19' S, 158°20' E: *Cymatium aquatile* (1).
Sta. DW48.-44 m, 19°18' S, 158°27' E: *Cymatium comptum* (1), *Bursa rosa* (1).
Sta. DW56.-66 m, 19°18' S, 158°47' E: *Gyrineum roseum* (2; 1 NZGS WM15833).
Sta. DW60.-45 m, 19°15' S, 158°57' E: *Gyrineum longicaudatum* (1), *Distorsio anus* (1).
Sta. DW65.-62 m, 19°15' S, 158°41' E: *Gyrineum roseum* (1).
Sta. DW67.-66 m, 19°15' S, 158°37' E: *Bursa lucaensis* (1).
Sta. DW69.-30-52 m, 19°15' S, 158°30' E: *Distorsomina pusilla* (1).
Sta. DW70.-54 m, 19°15' S, 158°27' E: *Bursa cruentata* (1 dd).
Sta. DW73.-41 m, 19°12' S, 158°23' E: *Cymatium comptum* (1).
Sta. DW77.-60 m, 19°12' S, 158°36' E: *Cymatium dunkeri* (1).
Sta. DW79.-58 m, 19°12' S, 158°43' E: *Cymatium comptum* (1), *C. dunkeri* (1), *Gyrineum lacunatum* (1).
Sta. DW80.-66 m, 19°12' S, 158°47' E: *Gyrineum roseum* (2).
Sta. DW82.-62 m, 19°12' S, 158°50' E: *Gyrineum roseum* (1).
Sta. DW83.-59 m, 19°12' S, 158°54' E: *Gyrineum roseum* (1).
Sta. DW84.-16-26 m, 19°12' S, 158°57' E: *Gyrineum roseum* (2; 1 NZGS WM15834).
Sta. DW88.-32 m, 19°06' S, 158°56' E: *Gyrineum roseum* (1).
Sta. DW89.-40 m, 19°03' S, 158°58' E: *Gyrineum roseum* (1).
Sta. DW91.-43 m, 19°03' S, 158°55' E: *Gyrineum roseum* (1), *Cymatium dunkeri* (1), *Distorsio anus* (1 lv, small adult).
Sta. DW92.-8m, 19°03' S, 158°54' E: *Cymatium occidentale* (1 faded dd), *Bursa cruentata* (1, lv adult).
Sta. DW93.-58-60 m, 19°06' S, 158°53' E: *Gyrineum roseum* (1).
Sta. DW94.-36-53 m, 19°06' S, 158°50' E: *Gyrineum roseum* (1).
Sta. DW95.-41 m, 19°06' S, 158°47' E: *Gyrineum roseum* (1).
Sta. DW99.-52 m, 19°06' S, 158°31' E: *Cymatium comptum* (1).
Sta. DW100.-40 m, 19°06' S, 158°27' E: *Cymatium vespaceum* (2).
Sta. DW102.-58 m, 19°09' S, 158°30' E: *Gyrineum roseum* (1).
Sta. DW105.-35 m, 19°09' S, 158°39' E: *Gyrineum roseum* (1).
Sta. DW109.-47-64 m, 19°09' S, 158°53' E: *Distorsio kurzi* (1 juv.).
Sta. DW110.-40 m, 19°09' S, 158°56' E: *Gyrineum roseum* (1), *Cymatium dunkeri* (2), *C. rubeculum* (1 lv).
Sta. DW115.-44 m, 19°22' S, 158°38' E: *Gyrineum roseum* (2), *Cymatium comptum* (1).
Sta. DW116.-52 m, 19°23' S, 158°35' E: *Cymatium labiosum* (1).
Sta. DW117.-52 m, 19°25' S, 158°32' E: *Gyrineum roseum* (1).
Sta. DW118.-52 m, 19°25' S, 158°28' E: *Gyrineum roseum* (1), *Cymatium labiosum (2).*
Sta. DW120.-56 m, 19°25' S, 158°22' E: *Cymatium exaratum* (1).
Sta. DW121.-34 m, 19°25' S, 158°18' E: *Cymatium muricinum* (1).
Sta. CP124.-53-56 m, 19°29' S, 158°20' E: *Gyrineum roseum* (1).

Sta. DW125.-54 m, 19°28' S, 158°24' E: *Cymatium exaratum* (1), *C. dunkeri* (1).
Sta. DW128.-38 m, 19°28' S, 158°30' E: *Gyrineum roseum* (4).
Sta. DW133.-45 m, 19°31' S, 158°25' E: *Gyrineum roseum* (1), *Cymatium rubeculum* (1).
Sta. DW135.-46 m, 19°31' S, 158°19' E: *Cymatium dunkeri* (1 NZGS WM15813).
Sta. DW136.-37 m, 19°31' S, 158°16' E: *Gyrineum roseum* (2), *Cymatium dunkeri* (1), *C. rubeculum* (1, lv adult).
Sta. DW138.-31 m, 19°34' S, 158°18' E: *Cymatium dunkeri* (1).
Sta. DW139.-57 m, 19°34' S, 158°20' E: *Cymatium dunkeri* (1).
Sta. DW141.-95 m, 19°34' S, 158°27' E: *Gyrineum roseum* (1).
Sta. DW143.-45 m, 19°37' S, 158°25' E: *Gyrineum roseum* (1).
Sta. DW144.-50 m, 19°28' S, 158°23' E: *Gyrineum roseum* (5; 2 NZGS WM15832), *Cymatium labiosum* (1).
Sta. DW147.-25 m, 19°37' S, 158°14' E: *Distorsio anus* (1 lv, small adult).
Sta. DW148.-34 m, 19°54' S, 158°27' E: *Gyrineum roseum* (2).
Sta. DW150.-39 m, 19°54' S, 158°25' E: *Cymatium muricinum* (1), *C. vespaceum* (1).
Sta. DW153.-45 m, 19°52' S, 158°23' E: *Gyrineum roseum* (1).
Sta. DW154.-35 m, 19°52' S, 158°27' E: *Cymatium exaratum* (1), *C. gutturnium* (1).
Sta. DW156.-42 m, 19°49' S, 158°21' E: *Gyrineum roseum* (7), *Cymatium comptum* (2), *C. dunkeri* (1).
Sta. DW157.-51 m, 19°49' S, 158°18' E: *Gyrineum roseum* (1), *Cymatium dunkeri* (1).
Sta. DW160.-35-41 m, 19°46' S, 158°23' E: *Gyrineum roseum* (2), *Cymatium comptum* (1).
Sta. DW164.-58 m, 19°41' S, 158°19' E: *Cymatium labiosum* (1).
W. Ilôt Reynart, dived 6 m: *Gyrineum roseum* (1), *Bursa rosa* (1).

NEW CALEDONIA proper

Programme LAGON, coll. B. Richer de Forges-ORSTOM, 1984-1989. Station list and narrative: RICHER DE FORGES (1991).

Secteur de Nouméa

Sta. 3.-15 m, 22°21' S, 166°22' E: *Gyrineum gyrinum* (2), *Cymatium vespaceum* (1).
Sta. 5.-10 m, 22°24' S, 166°22' E: *Cymatium vespaceum* (1).
Sta. 9.-10 m, 22°22' S, 166°19' E: *Cymatium labiosum* (2; 1 NZGS WM15817).
Sta. 10.-15 m, 22°20' S, 166°20' E: *Gyrineum lacunatum* (1).
Sta. 16.-30 m, 22°21' S, 166°38' E: *Gyrineum gyrinum* (1), *Cymatium pyrum* (1 juv.), *Bursa granularis* (1).
Sta. 17.-24 m, 22°19' S, 166°39' E: *Gyrineum lacunatum* (1).
Sta. 20.-23 m, 22°21' S, 166°25' E: *Gyrineum gyrinum* (1).
Sta. 21.-10 m, 22°23' S, 166°23' E: *Cymatium vespaceum* (1).
Sta. 23.-10-18 m, 22°24' S, 166°25' E: *Cymatium vespaceum* (1).
Sta. 25.-28 m, 22°21' S, 166°27' E: *Gyrineum gyrinum* (3).
Sta. 28.-9 m, 22°15' S, 166°33' E: *Gyrineum gyrinum* (1).
Sta. 29.-12 m, 22°17' S, 166°34' E: *Cymatium dunkeri* (1).
Sta. 30.-24 m, 22°18' S, 166°33' E: *Gyrineum gyrinum* (1), *Cymatium vespaceum* (1).
Sta. 32.-30 m, 22°23' S, 166°29' E: *Gyrineum gyrinum* (1).
Sta. 46.-25 m, 22°13' S, 166°18' E: *Gyrineum lacunatum* (1).
Sta. 49.-10 m, 22°19' S, 166°14' E: *Bursa rosa* (1).
Sta. 51.-10 m, 22°15' S, 166°11' E: *Cymatium vespaceum* (1).
Sta. 52.-13 m, 22°14' S, 166°14' E: *Bursa rhodostoma* (1).
Sta. 53.-12 m, 22°13' S, 166°13' E: *Cymatium vespaceum* (1).
Sta. 55.-23 m, 22°11' S, 166°17' E: *Cymatium vespaceum* (1), *C. gutturnium* (1), *Distorsio reticularis* (1).
Sta. 56.-11 m, 22°10' S, 166°15' E: *Cymatium vespaceum* (1).
Sta. 57.-10 m, 22°12' S, 166°14' E: *Gyrineum gyrinum* (1), *Cymatium vespaceum* (1).
Sta. 58.-22 m, 22°09' S, 166°13' E: *Gyrineum gyrinum* (1).

Ile Ouen-Baie du Prony

Sta. 63.-20 m, 22°26' S, 166°26' E: *Gyrineum lacunatum* (1), *Cymatium vespaceum* (1), *Bufonaria thersites* (1).
Sta. 66.-15 m, 22°28' S, 166°27' E: *Cymatium muricinum* (1).
Sta. 67.-21 m, 22°26' S, 166°29' E: *Bursa rhodostoma* (1).
Sta. 68.-22-40 m, 22°24' S, 166°30' E: *Gyrineum gyrinum* (1), *G. lacunatum* (1), *Cymatium vespaceum* (1).
Sta. 69.-13 m, 22°23' S, 166°32' E: *Gyrineum gyrinum* (1), *G. lacunatum* (3).
Sta. 71.-22 m, 22°20' S, 166°34' E: *Cymatium pyrum* (1 good lv half-grown shell, with periostracum and part of protoconch).
Sta. 72.-15 m, 22°19' S, 166°35' E: *Gyrineum lacunatum* (1).
Sta. 73.-15 m, 22°18' S, 166°39' E: *Gyrineum gyrinum* (1).
Sta. 79.-16 m, 22°29' S, 166°29' E: *Gyrineum lacunatum* (1), *Cymatium comptum* (2), *C. labiosum* (1), *Bursa granularis* (3; 2 NZGS WM15785), *B. rhodostoma* (3; 2 NZGS WM15796).
Sta. 80.-33 m, 22°311' S, 166°28' E: *Cymatium labiosum* (3), *Bufonaria thersites* (1).
Sta. 82.-10 m, 22°33' S, 166°29' E: *Cymatium labiosum* (1), *Bursa granularis* (1), *B. rosa* (1).
Sta. 83.-22 m, 22°32' S, 166°30' E: *Bursa rosa* (3; 1 NZGS WM15798).
Sta. 84.-17 m, 22°30' S, 166°31' E: *Gyrineum lacunatum* (1), *Bursa rhodostoma* (1).
Sta. 85.-21 m, 22°29' S, 166°32' E: *Gyrineum gyrinum* (2).
Sta. 89.-32 m, 22°22' S, 166°38' E: *Gyrineum gyrinum* (3).
Sta. 92.-24 m, 22°27' S, 166°37' E: *Gyrineum gyrinum* (3), *G. lacunatum* (2).
Sta. 97.-20 m, 22°35' S, 166°30' E: *Cymatium rubeculum* (1 lv adult).
Sta. 98.-15 m, 22°36' S, 166°32' E: *Cymatium labiosum* (1).
Sta. 99.-14 m, 22°33' S, 166°35' E: *Cymatium vespaceum* (1), *Bursa rhodostoma* (2).
Sta. 100.-15 m, 22°33' S, 166°35' E: *Tutufa bufo* (1).
Sta. 101.-18 m, 22°31' S, 166°36' E: *Cymatium vespaceum* (1 lv).
Sta. 101 bis.-18 m, 22°31' S, 166°36' E: *Bursa granularis* (1).

Sta. 107.-33 m, 22°22' S, 166°42' E: *Gyrineum gyrinum* (1).
Sta. 110 bis.-40 m, 22°24' S, 166°47' E: *Gyrineum lacunatum* (19; 4 NZGS WM15829).
Sta. 111.-25 m, 22°24' S, 166°48' E: *Gyrineum lacunatum* (2), *Cymatium vespaceum* (1).
Sta. 112.-42 m, 22°24' S, 166°48' E: *Gyrineum gyrinum* (2), *G. lacunatum* (3), *Cymatium comptum* (2).
Sta. 113.-32 m, 22°23' S, 166°48' E: *Gyrineum gyrinum* (1 lv), *Cymatium vespaceum* (1).
Sta. 116.-43 m, 22°25' S, 166°44' E: *Gyrineum lacunatum* (4).
Sta. 119.-20 m, 22°28' S, 166°46' E: *Gyrineum gyrinum* (1).
Sta. 120.-46 m, 22°28' S, 166°44' E: *Gyrineum lacunatum* (1).
Sta. 121.-12 m, 22°28' S, 166°43' E: *Cymatium vespaceum* (1).
Sta. 123.-21 m, 22°30' S, 166°40' E: *Gyrineum lacunatum* (2).
Sta. 124.-18 m, 22°31' S, 166°41' E: *Bursa granularis* (1).
Sta. 127.-55 m, 22°31' S, 166°46' E: *Gyrineum lacunatum* (5; 3 NZGS WM15828).
Sta. 129.-44-55 m, 22°31' S, 166°47' E: *Gyrineum lacunatum* (1).
Sta. 131.-38 m, 22°28' S, 166°50' E: *Gyrineum gyrinum* (7), *Cymatium pileare* (1), *C. vespaceum* (1).
Sta. 133.-59-62 m, 22°24' S, 166°52' E: *Gyrineum lacunatum* (6).
Sta. 139.-45 m, 22°23' S, 166°51' E: *Distorsio parvimpedita* (2).
Sta. 143.-32 m, 22°20' S, 166°49' E: *Gyrineum gyrinum* (1), *Distorsio parvimpedita* (4).
Sta. 144.-25 m, 22°19' S, 166°51' E: *Distorsio parvimpedita* (1).
Sta. 146.-40-52 m, 22°24' S 166°55' E: *Gyrineum gyrinum* (2), *G. lacunatum* (7), *Cymatium dunkeri* (1 NZGS WM15814).
Sta. 147.-50-60 m, 22°26' S, 166°54' E: *Gyrineum gyrinum* (2), *G. lacunatum* (1).
Sta. 150.-62-68 m, 22°30' S, 166°50' E: *Gyrineum gyrinum* (4).
Sta. 151.-31-33 m, 22°32' S, 166°48' E: *Gyrineum lacunatum* (1).
Sta. 152.-23 m, 22°32' S, 166°43' E: *Gyrineum lacunatum* (1), *Cymatium vespaceum* (1).
Sta. 154.-29 m, 22°33' S, 166°40' E: *Cymatium vespaceum* (1).
Sta. 155.-23 m, 22°32' S, 166°38' E: *Gyrineum gyrinum* (1).
Sta. 159.-17 m, 22°38' S, 166°36' E: *Cymatium labiosum* (1).
Sta. 160.-10 m, 22°36' S, 166°37' E: *Cymatium rubeculum* (1 lv adult).
Sta. 161.-20 m, 22°34' S, 166°38' E: *Gyrineum gyrinum* (1 lv), *Bursa granularis* (1).

Baie de St Vincent

Sta. 169.-22 m, 22°08' S, 166°08' E: *Cymatium vespaceum* (2).
Sta. 171.-32 m, 22°11' S, 166°06' E: *Bursa granularis* (1).
Sta. 172.-30-60 m, 22°10' S, 166°06' E: *Bursa rosa* (1).
Sta. 180.-10 m, 21°60' S, 166°05' E: *Gyrineum lacunatum* (1).
Sta. 181.-10 m, 22°01' S, 166°05' E: *Gyrineum lacunatum* (1), *Cymatium vespaceum* (1).
Sta. 182.-8 m, 22°00' S, 166°06' E: *Cymatium vespaceum* (2).
Sta. 193.-20 m, 21°60' S, 166°00' E: *Cymatium vespaceum* (1).
Sta. 198.-14 m, 21°59' S, 166°04' E: *Cymatium vespaceum* (1).
Sta. 200.-18 m, 22°01' S, 165°59' E: *Bursa granularis* (1).
Sta. 201.-17 m, 21°60' S, 165°59' E: *Gyrineum gyrinum* (1), *Cymatium vespaceum* (1).
Sta. 203.-13 m, 21°58' S, 165°57' E: *Cymatium vespaceum* (2).
Sta. 215.-14 m, 21°53' S, 166°50' E: *Cymatium muricinum* (1).
Sta. 216.-14 m, 21°53' S, 166°49' E: *Cymatium muricinum* (1).
Sta. 217.-16 m, 21°53' S, 165°47' E: *Bursa granularis* (1).

Ile Ouen-Baie du Prony

Sta. 225.-15 m, 22°36' S, 166°40' E: *Cymatium muricinum* (1).
Sta. 226.-28 m, 22°38' S, 166°39' E: *Gyrineum gyrinum* (1).
Sta. 229.-41 m, 22°39' S, 166°40' E: *Gyrineum lacunatum* (2).
Sta. 230.-35 m, 22°38' S, 166°41' E: *Distorsio anus* (1 lv small).
Sta. 232.-28 m, 22°35' S, 166°43' E: *Gyrineum gyrinum* (3).
Sta. 233.-30 m, 22°35' S, 166°46' E: *Gyrineum gyrinum* (3), *Cymatium vespaceum* (1).
Sta. 234bis.-60 m, 22°32' S, 166°51' E: *Cymatium exaratum* (1).
Sta. 240.-42 m, 22°23' S, 166°59' E: *Cymatium springsteeni* (1 adult).
Sta. 243.-29 m, 22°24' S, 167°01' E: *Gyrineum lacunatum* (1), *Cymatium comptum* (1).
Sta. 244.-37 m, 22°25' S, 166°60' E: *Gyrineum lacunatum* (1).
Sta. 247.-43 m, 22°24' S, 166°51' E: *Gyrineum gyrinum* (1), *G. lacunatum* (1).
Sta. 248.-47 m, 22°24' S, 166°47' E: *Gyrineum lacunatum* (1).
Sta. 249.-11 m, 22°25' S, 166°42' E: *Gyrineum gyrinum* (1), *G. lacunatum* (2).

Secteur de Nouméa

Sta. 250.-10 m, 27°19' S, 166°26' E: *Gyrineum gyrinum* (1).
Sta. 251.-20 m, 22°19' S, 166°25' E: *Gyrineum gyrinum* (1), *G. lacunatum* (2), *Cymatium vespaceum* (1 lv).
Sta. 259.-18 m, 22°20' S, 166°22' E: *Gyrineum lacunatum* (1).
Sta. 260.-23 m, 22°18' S, 166°23' E: *Gyrineum lacunatum* (1).
Sta. 261.-19 m, 22°17' S, 166°24' E: *Cymatium vespaceum* (1).
Sta. 262.-21 m, 22°15' S, 166°23' E: *Cymatium vespaceum* (1).
Sta. 264.-19 m, 22°19' S, 166°20' E: *Gyrineum lacunatum* (1), *Cymatium vespaceum* (1 NZGS WM15810).
Sta. 265.-15 m, 22°20' S, 166°19' E: *Cymatium nicobaricum* (1 lv adult).
Sta. 270.-25 m, 22°16' S, 166°19' E: *Gyrineum gyrinum* (1).
Sta. 271.-22 m, 22°15' S, 166°21' E: *Cymatium dunkeri* (1).
Sta. 272.-20 m, 22°13' S, 166°22' E: *Gyrineum gyrinum* (5), *Bursa granularis* (2).
Sta. 275.-19 m, 22°14' S, 166°18' E: *Gyrineum gyrinum* (3).
Sta. 276.-26 m, 22°16' S, 166°17' E: *Gyrineum gyrinum* (1).
Sta. 277.-30 m, 22°17' S, 166°16' E: *Bursa granularis* (1).
Sta. 279.-29 m, 22°21' S, 166°27' E: *Gyrineum gyrinum* (1).

Sta. 283.-13 m, 22°27' S, 166°24' E: *Bursa granularis* (1).
Sta. 284.-6 m, 22°26' S, 166°25' E: *Cymatium muricinum* (1).
Sta. 285.-19 m, 22°24' S, 166°26' E: *Gyrineum gyrinum* (1).
Sta. 286.-28 m, 22°23' S, 166°27' E: *Gyrineum gyrinum* (1).
Sta. 287.-29 m, 22°21' S, 166°29' E: *Cymatium vespaceum* (1).
Sta. 289.-23 m, 22°17' S, 166°31' E: *Gyrineum gyrinum* (6).

Grand Récif Sud

Sta. 296.-26 m, 22°41' S, 166°44' E: *Cymatium vespaceum* (1), *C. dunkeri* (1), *C. labiosum* (1).
Sta. 297.-30 m, 22°39' S, 166°46' E: *Cymatium vespaceum* (1).
Sta. 301.-46 m, 22°35' S, 166°52' E: *Gyrineum gyrinum* (2), *G. lacunatum* (2), *Cymatium exaratum* (1 NZGS WM15807) .
Sta. 312.-26 m, 22°42' S, 166°49' E: *Gyrineum lacunatum* (1).
Sta. 313.-30 m, 22°40' S, 166°50' E: *Cymatium labiosum* (1).
Sta. 315.-50 m, 22°37' S, 166°53' E: *Distorsio reticularis* (1).
Sta. 316.-68 m, 22°35' S, 166°54' E: *Distorsio reticularis* (1).
Sta. 317.-66 m, 22°33' S, 166°53' E: *Gyrineum longicaudatum* (1).
Sta. 319.-75 m, 22°32' S, 166°57' E: *Gyrineum lacunatum* (1), *G. longicaudatum* (1).
Sta. 320.-70 m, 22°32' S, 166°54' E: *Gyrineum lacunatum* (2).
Sta. 322.-71 m, 22°30' S, 166°58' E: *Gyrineum lacunatum* (4).
Sta. 324.-39 m, 22°24' S, 167°03' E: *Gyrineum lacunatum* (3), *Cymatium exaratum* (1), *C. gutturnium* (1 small juv.).
Sta. 326.-67 m, 22°26' S, 167°02' E: *G. longicaudatum* (3), *Cymatium exaratum* (1).
Sta. 327.-60 m, 22°26' S, 167°04' E: *Gyrineum lacunatum* (1).
Sta. 328.-72 m, 22°27' S, 167°03' E: *Gyrineum lacunatum* (1), *Cymatium comptum* (1), *Tutufa bufo* (1 juv.).
Sta. 331.-79 m, 22°33' S, 166°59' E: *Gyrineum longicaudatum* (1).
Sta. 332.-80 m, 22°34' S, 166°57' E: *Gyrineum longicaudatum* (1).
Sta. 334.-47 m, 22°38' S, 166°54' E: *Cymatium comptum* (2), *C. exaratum* (1).
Sta. 339.-26 m, 22°46' S, 166°48' E: *Bursa granularis* (1), *Distorsio reticularis* (1).
Sta. 342.-55 m, 22°51' S, 166°47' E: *Bursa granularis* (1), *B. rosa* (1).
Sta. 345.-39 m, 22°46' S, 166°50' E: *Cymatium vespaceum* (1).
Sta. 346.-40 m, 22°45' S, 166°52' E: *Cymatium exaratum* (1).
Sta. 350.-67 m, 22°39' S, 166°57' E: *Gyrineum longicaudatum* (1).
Sta. 352.-82 m, 22°35' S, 166°60' E: *Gyrineum longicaudatum* (3).
Sta. 356.-78 m, 22°29' S, 167°05' E: *Gyrineum lacunatum* (1).
Sta. 357.-77 m, 22°30' S, 167°07' E: *Gyrineum lacunatum* (11), *G. longicaudatum* (1), *Cymatium exaratum* (2).
Sta. 358.-50 m, 22°31' S, 167°05' E: *Cymatium comptum* (2).
Sta. 359.-74 m, 22°23' S, 167°04' E: *Gyrineum lacunatum* (1).
Sta. 368.-70 m, 22°35' S, 167°05' E: *Gyrineum lacunatum* (1).
Sta. 370.-127 m, 22°38' S, 167°06' E: *Gyrineum longicaudatum* (3).
Sta. 374.-70-72 m, 22°30' S, 167°09' E: *Gyrineum lacunatum* (3), *G. longicaudatum* (5; 1 NZGS WM 15656), *Distorsio kurzi* (1 lv, adult).
Sta. 375.-70-74 m, 22°30' S, 167°09' E: *Gyrineum lacunatum* (1), *Cymatium sarcostoma* (1 juv.).
Sta. 377.-56 m, 22°35' S, 167°08' E: *Cymatium dunkeri* (1).
Sta. 378.-70-72 m, 22°40' S, 167°11' E: *Gyrineum longicaudatum* (1).
Sta. 381.-65 m, 22°28' S, 167°13' E: *Cymatium exaratum* (1 lv).
Sta. 382.-57 m, 22°30' S, 167°14' E: *Gyrineum longicaudatum* (1).
Sta. 384.-70 m, 22°34' S, 167°11' E: *Gyrineum lacunatum* (2), *G. longicaudatum* (2).
Sta. 384bis.- 72 m, 22°34' S, 167°11' E: *Gyrineum lacunatum* (1), *G. longicaudatum* (1).
Sta. 386.-128 m, 22°37' S, 167°09' E: *Gyrineum longicaudatum* (1), *Distorsio decipiens* (1).
Sta. 387.-225 m, 22°39' S, 167°07' E: *Gyrineum longicaudatum* (2).
Sta. 391.-65 m, 22°46' S, 167°01' E: *Bursa granularis* (1), *B. rosa* (1).
Sta. 392.-80 m, 22°48' S, 167°02' E: *Bursa lucaensis* (2).
Sta. 397.-125 m, 22°39' S, 167°11' E: *Gyrineum longicaudatum* (1).
Sta. 398.-71 m, 22°37' S, 167°12' E: *Gyrineum lacunatum* (1).
Sta. 400.-64 m, 22°34' S, 167°14' E: *Gyrineum lacunatum* (1).
Sta. 403.-45 m, 22°35' S, 167°18' E: *Gyrineum lacunatum* (4; 1 NZGS WM15831).
Sta. 405.-27 m, 22°38' S, 167°20' E: *Gyrineum lacunatum* (1), *Cymatium dunkeri* (1).
Sta. 409.-18 m, 22°42' S, 167°24' E: *Gyrineum lacunatum* (1).
Sta. 414.-60 m, 22°37' S, 167°16' E: *Distorsio parvimpedita* (1).
Sta. 429.-95 m, 22°40' S, 167°15' E: *Cymatium caudatum* (1).

Lagon Nord

Sta. 477.-50 m, 18°51' S, 163°27' E: *Gyrineum lacunatum* (2).
Sta. 478.-35 m, 18°53' S, 163°27' E: *Gyrineum lacunatum* (1), *Cymatium comptum* (1).
Sta. 480.-31 m, 18°56' S, 163°29' E: *Cymatium comptum* (2; 1 NZGS WM15805), *Bursa granularis* (1).
Sta. 481.-33 m, 18°57' S, 163°32' E: *Gyrineum lacunatum* (2), *Cymatium vespaceum* (1).
Sta. 483.-33 m, 19°01' S, 163°32' E: *Gyrineum lacunatum* (1), *Cymatium vespaceum* (1), *Bursa granularis* (1).
Sta. 484.-35 m, 19°00' S, 163°35' E: *Gyrineum lacunatum* (1).
Sta. 488.-38 m, 18°53' S, 163°30' E: *Distorsio reticularis* (2).
Sta. 489.-43 m, 18°51' S, 163°29' E: *Gyrineum lacunatum* (1), *Cymatium aquatile* (1), *C. gemmatum* (1).
Sta. 490.-230 m, 18°55' S, 163°24' E: *Bursa quirihorai* (1).
Sta. 495.-80 m, 19°04' S, 163°06' E: *Cymatium dunkeri* (1).
Sta. 496.-215 m, 19°04' S, 163°10' E: *Biplex pulchra* (1).
Sta. 497.-255 m, 18°57' S, 163°28' E: *Bursa latitudo* (1).
Sta. 517.-42 m, 19°09' S, 163°35' E: *Cymatium pileare* (6 juv.; 2 NZGS WM15808), *C. vespaceum* (1), *C. labiosum* (1).
Sta. 518.-38 m, 19°05' S, 163°35' E: *Cymatium vespaceum* (1).
Sta. 521.-39 m, 19°05' S, 163°38' E: *Bursa granularis* (2).
Sta. 522.-42 m, 19°08' S, 163°38' E: *Gyrineum lacunatum* (1), *Cymatium labiosum* (1), *Bufonaria thersites* (1).

Sta. 523.-47 m, 19°11' S, 163°39' E: *Bufonaria thersites* (1).
Sta. 524.-50 m, 19°14' S, 163°40' E: *Distorsio reticularis* (1).
Sta. 526.-54 m, 19°20' S, 163°40' E: *Distorsio reticularis* (1).
Sta. 529.-50 m, 19°29' S, 163°28' E: *Gyrineum lacunatum* (1), *Distorsio reticularis* (1).
Sta. 532.-56 m, 19°20' S, 163°27' E: *Cymatium vespaceum* (1).
Sta. 534.-48 m, 19°14' S, 163°26' E: *Cymatium labiosum* (1), *Distorsio reticularis* (1).
Sta. 535.-46 m, 19°11' S, 163°25' E: *Gyrineum lacunatum* (1), *Cymatium vespaceum* (1), *Bufonaria thersites* (1), *Distorsio reticularis* (1).
Sta. 536.-61 m, 19°09' S, 163°23' E: *Cymatium rubeculum* (1).
Sta. 539.-240 m, 19°05' S, 163°17' E: *Biplex pulchra* (1).
Sta. 541.-45 m, 19°06' S, 163°13' E: *Distorsio reticularis* (1).
Sta. 542.-50 m, 19°06' S, 163°10' E: *Gyrineum gyrinum* (1), *G. lacunatum* (8), *C. exaratum* (3), *C. gutturnium* (2 small juv.), *C. dunkeri* (2; 1 lv), *C. testudinarium* (1 excellent adult), *C. labiosum* (1), *Bufonaria thersites* (1), *Distorsio reticularis* (6).

Grand Récif Sud

Sta. 545.-37 m, 22°52' S, 166°50' E: *Gyrineum lacunatum* (1), *Cymatium comptum* (1), *C. dunkeri* (1 lv), *Bursa rhodostoma* (1).
Sta. 546.-33 m, 22°53' S, 166°52' E: *Bursa granularis* (1), *B. rhodostoma* (1).
Sta. 549.-26 m, 22°58' S, 166°56' E: *Cymatium vespaceum* (1).
Sta. 550.-24 m, 22°59' S, 166°58' E: *Bursa granularis* (1).
Sta. 551.-9 m, 23°00' S, 166°59' E: *Cymatium aquatile* (1), *Bursa granularis* (1).
Sta. 552.-38 m, 22°54' S, 166°55' E: *Cymatium dunkeri* (1).
Sta. 553.-39 m, 22°51' S, 166°55' E: *Cymatium exaratum* (1).
Sta. 555.-32 m, 22°50' S, 166°51' E: *Bufonaria thersites* (1).
Sta. 558.-43 m, 22°46' S, 166°54' E: *Gyrineum lacunatum* (1), *Cymatium sarcostoma* (1 adult).
Sta. 560.-48 m, 22°43' S, 166°57' E: *Gyrineum lacunatum* (2), *Cymatium vespaceum* (1).
Sta. 561.-48 m, 22°42' S, 166°59' E: *Bursa granularis* (1).
Sta. 564.-35 m, 22°47' S, 166°56' E: *Cymatium pileare* (1).
Sta. 565.-52 m, 22°49' S, 166°55' E: *Cymatium pileare* (1).
Sta. 569.-62 m, 22°49' S, 166°59' E: *Gyrineum lacunatum* (2).
Sta. 570.-53 m, 22°50' S, 167°01' E: *Gyrineum lacunatum* (1), *Distorsio parvimpedita* (1).
Sta. 571.-40 m, 22°52' S, 167°02' E: *Cymatium aquatile* (1).
Sta. 572.-65 m, 22°52' S, 167°00' E: *Cymatium succinctum* (1 half grown spm), *C. exaratum* (1).
Sta. 580.-95-100 m, 22°44' S, 167°19' E: *Gyrineum longicaudatum* (1), *Bursa rhodostoma* (1), *Distorsio decipiens* (1).

Ile des Pins

Sta. 581.-23 m, 22°42' S, 167°26' E: *Gyrineum lacunatum* (1), *Cymatium muricinum* (1).
Sta. 588.-32 m, 22°32' S, 167°26' E: *Cymatium aquatile* (1).
Sta. 592.-22 m, 22°34' S, 167°22' E: *Bursa granularis* (1).
Sta. 596.-35 m, 22°31' S, 167°21' E: *Cymatium nicobaricum* (1 juv.), *Bufonaria thersites* (1).

Secteur de Yaté

Sta. 597B.-50-70 m, 22°20' S, 167°04' E: *Gyrineum lacunatum* (2), *Cymatium comptum* (1).
Sta. 598.-73-75 m, 22°19' S, 167°06' E: *Gyrineum lacunatum* (7), *G. longicaudatum* (3), *Cymatium dunkeri* (1), *Distorsio reticularis* (2).
Sta. 599.-50 m, 22°17' S, 167°06' E: *Gyrineum lacunatum* (1).
Sta. 600.-62-65 m, 22°18' S, 167°04' E: *Gyrineum lacunatum* (1).
Sta. 601.-47-48 m, 22°18' S, 167°03' E: *Gyrineum lacunatum* (2).
Sta. 602.-43-48 m, 22°16' S, 167°03' E: *Gyrineum lacunatum* (1).
Sta. 603.-78-80 m, 22°16' S, 167°05' E: *Gyrineum lacunatum* (6), *G. longicaudatum* (4; 1 NZGS WM15657), *Cymatium exaratum* (1 lv), *C. labiosum* (1).
Sta. 604.-80 m, 22°14' S, 167°04' E: *Gyrineum lacunatum* (2), *G. longicaudatum* (1), *Distorsio reticularis* (1).
Sta. 606.-46-48 m, 22°13' S, 167°01' E: *Gyrineum lacunatum* (1), *Bursa granularis* (1).
Sta. 607.-48-54 m, 22°12' S, 167°03' E: *Bursa granularis* (1).
Sta. 614.-48-50 m, 22°08' S, 166°58' E: *Gyrineum gyrinum* (1).
Sta. 619.-27-42 m, 22°03' S, 166°54' E: *Gyrineum lacunatum* (1), *Bursa granularis* (1).
Sta. 623.-32-40 m, 22°01' S, 166°51' E: *Gyrineum lacunatum* (1), *Bursa granularis* (1).
Sta. 625.-34-40 m, 21°59' S, 166°54' E: *Gyrineum gyrinum* (1).
Sta. 633.-50 m, 21°56' S, 166°48' E: *Gyrineum lacunatum* (2), *Distorsio reticularis* (1).
Sta. 636.-34-40 m, 21°59' S, 166°43' E: *Gyrineum gyrinum* (5).
Sta. 637.-60-65 m, 21°57' S, 166°42' E: *Distorsio parvimpedita* (1).
Sta. 641.-50-52 m, 21°53' S, 166°43' E: *Gyrineum gyrinum* (1), *Bursa granularis* (1).
Sta. 645.-51 m, 21°50' S, 166°40' E: *Bursa rhodostoma* (1).

Secteur de Thio

Sta. 648.-22-25 m, 21°53' S, 166°35' E: *Gyrineum lacunatum* (1).
Sta. 649.-64-65 m, 21°51' S, 166°37' E: *Cymatium sinense* (1, a half grown shell).
Sta. 656.-30-40 m, 21°49' S, 166°33' E: *Gyrineum gyrinum* (1), *Cymatium caudatum* (1).
Sta. 657.-40-42 m, 21°48' S, 166°34' E: *Gyrineum gyrinum* (2).
Sta. 662.-50 m, 21°44' S, 166°32' E: *Gyrineum gyrinum* (3), *Cymatium rubeculum* (1), *Bursa granularis* (1).
Sta. 663.-38-40 m, 21°42' S, 166°31' E: *Bursa granularis* (1).
Sta. 669.-30-40 m, 21°41' S, 166°26' E: *Gyrineum gyrinum* (1).
Sta. 672.-15-20 m, 21°41' S, 166°23' E: *Cymatium vespaceum* (1).
Sta. 675.-43 m, 21°36' S, 166°24' E: *Gyrineum lacunatum* (1).
Sta. 676.-41 m, 21°35' S, 166°23' E: *Gyrineum lacunatum* (2).
Sta. 679.-29-30 m, 21°38' S, 166°18' E: *Distorsio parvimpedita* (1).
Sta. 682.-36-37 m, 21°34' S, 166°19' E: *Gyrineum lacunatum* (1), *Cymatium rubeculum* (1).
Sta. 686.-33-35 m, 21°34' S, 166°16' E: *Gyrineum gyrinum* (1).
Sta. 688.-36-40 m, 22°31' S, 166°15' E: *Cymatium labiosum* (1).

Sta. 691.-33-34 m, 21°34' S, 166°11' E: *Bufonaria perelegans* (1 juv.).
Sta. 692.-44-48 m, 21°32' S, 166°12' E: *Bursa granularis* (1).
Sta. 695.-54-55 m, 21°31' S, 166°11' E: *Cymatium vespaceum* (1), *C. caudatum* (1).

Secteur de Canala

Sta. 696.-41-57 m, 21°29' S, 166°12' E: *Cymatium dunkeri* (1).
Sta. 698.-40-43 m, 21°29' S, 166°09' E: *Gyrineum lacunatum* (1).
Sta. 699.-50-52 m, 21°31' S, 166°08' E: *Distorsio parvimpedita* (1).
Sta. 701.-36-39 m, 21°28' S, 166°07' E: *Cymatium labiosum* (1).
Sta. 702.-37 m, 21°27' E, 166°08' E: *Cymatium aquatile* (1).
Sta. 710.-30-31 m, 21°24' E, 166°03' E: *Gyrineum lacunatum* (1), *Cymatium vespaceum* (1).
Sta. 711.-55-56 m, 21°26' E, 166°02' E: *Distorsio parvimpedita* (2).
Sta. 712.-47-49 m, 21°25' E, 166°00' E: *Gyrineum lacunatum* (1), *Bursa granularis* (1).
Sta. 713.-34-35 m, 21°23' E, 166°01' E: *Gyrineum lacunatum* (2), *Cymatium comptum* (1).
Sta. 714.-37-38 m, 21°21' S, 166°02' E: *Cymatium labiosum* (1).
Sta. 716.-30 m, 21°22' S, 165°59' E: *Cymatium dunkeri* (1).
Sta. 723.-45 m, 21°22' S, 165°57' E: *Gyrineum gyrinum* (1), *G. lacunatum* (1).
Sta. 726.-50-51 m, 21°20' S, 165°55' E: *Gyrineum gyrinum* (1), *G. lacunatum* (1).
Sta. 728.-43-47 m, 21°21' S, 165°52' E: *Gyrineum gyrinum* (4).
Sta. 731.-37-42 m, 21°17' S. 165°52' E: *Gyrineum gyrinum* (3), *Cymatium vespaceum* (1).

Secteur de Yaté

Sta. 735.-15-34 m, 22°05' S, 166°57' E: *Bursa granularis* (1).
Sta. 737.-49-50 m, 22°08' S, 166°59' E: *Gyrineum gyrinum* (4), *Cymatium dunkeri* (1 NZGS WM15815).

Secteur de Canala

Sta. 742.-77-78 m, 22°14' S, 167°03' E: *Cymatium exaratum* (1).

Secteur de Yaté

Sta. 744.-76-81 m, 22°14' S, 167°03' E: *Cymatium gutturnium* (1 small juv.).
Sta. 745.-78-80 m, 22°14' S, 167°03' E: *Distorsio decipiens* (1).

Secteur de Canala

Sta. 747.-31-33 m, 21°15' S, 165°51' E: *Gyrineum lacunatum* (1), *Cymatium gutturnium* (1 lv), *Bufonaria thersites* (1).
Sta. 749.-49 m, 21°18' S, 165°18' E: *Gyrineum lacunatum* (2), *Cymatium vespaceum* (1), *C. caudatum* (1).
Sta. 754.-36 m, 21°13' S, 165°49' E: *Cymatium rubeculum* (1).
Sta. 757.-44 m, 21°15' S, 165°46' E: *Cymatium aquatile* (1), *C. vespaceum* (1),
Sta. 758.-37-42 m, 21°17' S, 165°44' E: *Bufonaria perelegans* (1 small).
Sta. 759.-32 m, 21°17' S, 165°42' E: *Gyrineum gyrinum* (1).
Sta. 760.-43 m, 21°15' S, 165°43' E: *Bursa granularis* (1).

Secteur de Poindimié

Sta. 765.-35 m, 21°14' S, 165°42' E: *Gyrineum lacunatum* (2).
Sta. 766.-26 m, 21°16' S, 166°41' E: *Bursa granularis* (2).
Sta. 769.-39 m, 21°12' S, 165°40' E: *Gyrineum lacunatum* (1).
Sta. 771.-34 m, 21°09' S, 165°42' E: *Gyrineum gyrinum* (1), *G. lacunatum* (1), *Cymatium gutturnium* (1 small juv.).
Sta. 772.-30 m, 21°08' S, 165°41' E: *Bursa granularis* (1).
Sta. 775.-28 m, 21°13' S, 165°37' E: *Bufonaria perelegans* (1 small).
Sta. 781.-36 m, 21°05' S, 165°38' E: *Gyrineum lacunatum* (1).
Sta. 783.-47 m, 21°08' S, 165°36' E: *Bufonaria perelegans* (1 large).
Sta. 786.-40-52 m, 21°05' S, 165°35' E: *Bufonaria perelegans* (1 juv.).
Sta. 788.-33 m, 21°02' S, 165°35' E: *Gyrineum gyrinum* (1), *Cymatium labiosum* (1), *Distorsio parvimpedita* (1).
Sta. 790.-51 m, 21°05' S, 165°33' E: *Bufonaria perelegans* (1 small).
Sta. 791.-33 m, 21°07' S, 165°31' E: *Cymatium muricinum* (1).
Sta. 797.-92 m, 20°58' S, 165°33' E: *Cymatium pfeifferianum* (1).
Sta. 801.-29 m, 21°02' S, 165°29' E: *Gyrineum gyrinum* (1), *Cymatium labiosum* (2; 1 NZGS WM15816), *Bursa granularis* (1).
Sta. 805.-38 m, 21°03' S, 165°28' E: *Bufonaria perelegans* (1 small).
Sta. 807.-55 m, 20°59' S, 165°29' E: *Gyrineum lacunatum* (1), *Cymatium vespaceum* (1).
Sta. 808.-30 m, 20°57' S, 165°30' E: *Gyrineum gyrinum* (1), *G. lacunatum* (1).
Sta. 809.-34 m, 20°56' S, 165°28' E: *Cymatium labiosum* (1).
Sta. 813.-47 m, 21°06' S, 165°25' E: *Bufonaria perelegans* (2 juv.), *Distorsio parvimpedita* (1).
Sta. 814.-38-50 m, 21°56' S, 165°26' E: *Gyrineum gyrinum* (1), *G. lacunatum* (1), *Cymatium pileare* (1), *C. vespaceum* (1), *Distorsio parvimpedita* (1).
Sta. 815.-32 m, 21°54' S, 165°27' E: *Gyrineum lacunatum* (1), *Cymatium vespaceum* (1).
Sta. 816.-31 m, 21°53' S, 165°25' E: *Cymatium vespaceum* (1).
Sta. 820.-44 m, 20°54' S, 165°22' E: *Gyrineum lacunatum* (1), *Cymatium aquatile* (1), *C. gutturnium* (2 small juv.).
Sta. 821.-32 m, 20°52' S, 165°23' E: *Cymatium comptum* (1).
Sta. 824.-30 m, 20°55' S, 165°20' E: *Distorsio parvimpedita* (1), *D. reticularis* (1).
Sta. 826.-28 m, 20°53' S, 165°17' E: *Bufonaria perelegans* (1 med).
Sta. 827.-53 m, 20°52' S, 165°18' E: *Bufonaria perelegans* (2; 1 juv., 1 med).
Sta. 828.-28 m, 20°50' S, 165°20' E: *Gyrineum gyrinum*. (1)
Sta. 830.-105-110 m, 20°49' S, 165°19' E: *Gyrineum lacunatum* (3), *Cymatium rubeculum* (1), *Distorsomina pusilla* (2).
Sta. 832.-32 m, 20°51' S, 165°15' E: *Bufonaria perelegans* (1 juv.).
Sta. 833.-52-70 m, 20°50' S, 165°18' E: *Cymatium caudatum* (2), *Bufonaria perelegans* (18med to large of which 7 lv; 3 NZGS WM15802), *Distorsio parvimpedita* (22; 3 NZGS WM15623), *D. reticularis* (1).
Sta. 834.-58 m, 20°48' S, 165°16' E: *Gyrineum gyrinum* (12).
Sta. 836.-57 m, 20°46' S, 165°16' E: *Gyrineum lacunatum* (12; 3 NZGS WM15830), *Bursa lucaensis* (1, maroon lv), *Tutufa bufo* (1 juv.).

Grand Récif Mengalia

Sta. 837.-28-36 m, 20°46' S, 165°14' E: *Gyrineum gyrinum* (1).
Sta. 840.-44 m, 20°43' S, 165°13' E: *Gyrineum gyrinum* (1), *G. lacunatum* (1).
Sta. 843.-33 m, 20°44' S, 165°10' E: *Cymatium pileare* (1).
Sta. 849.-41 m, 20°41' S, 165°11' E: *Bufonaria perelegans* (2 juv.).
Sta. 850.-38 m, 20°42' S, 165°10' E: *Bursa granularis* (1), *Distorsio parvimpedita* (1).
Sta. 851.-31 m, 20°44' S, 165°08' E: *Gyrineum gyrinum* (2), *Cymatium vespaceum* (1).
Sta. 852.-34 m, 20°43' S, 165°06' E: *Cymatium pileare* (1).
Sta. 855.-22 m, 20°38' S, 165°09' E: *Gyrineum lacunatum* (1), *Cymatium muricinum* (1).
Sta. 856.-30 m, 20°37' S, 165°11' E: *Cymatium labiosum* (1).
Sta. 858.-220 m, 20°37' S, 165°07' E: *Biplex pulchra* (1).
Sta. 862.-32 m, 20°41' S, 165°05' E: *Cymatium vespaceum* (1 lv).
Sta. 864.-26 m, 20°38' S, 165°08' E: *Gyrineum lacunatum* (2).
Sta. 867.-25 m, 20°39' S, 165°01' E: *Gyrineum lacunatum* (1), *Cymatium muricinum* (1), *C. labiosum* (1).
Sta. 869.-44 m, 20°39' S, 164°58' E: *Bufonaria perelegans* (1 juv., 1 med).

Secteur de Pouébo

Sta. 876.-30-70 m, 20°35' S, 164°51' E: *Gyrineum gyrinum* (1), *Bursa granularis* (1).
Sta. 885.-32 m, 20°26' S, 164°42' E: *Gyrineum lacunatum* (1).
Sta. 886.-20 m, 20°24' S, 164°41' E: *Gyrineum lacunatum* (1).
Sta. 893.-17 m, 20°17' S, 164°30' E: *Cymatium gemmatum* (1 lv juv.).
Sta. 895.-16 m, 20°16' S, 164°27' E: *Cymatium vespaceum* (2), *Bufonaria thersites* (1).
Sta. 898.-22 m, 20°14' S, 164°27' E: *Cymatium labiosum* (1).
Sta. 899.-16 m, 20°14' S, 164°25' E: *Gyrineum lacunatum* (1).
Sta. 900.-40 m, 20°15' S, 164°23' E: *Gyrineum lacunatum* (1), *Cymatium aquatile* (1).

Secteur de Koumac

Sta. 905.-56-57 m, 20°59' S, 164°37' E: *Gyrineum gyrinum* (5), *Cymatium vespaceum* (2), *Distorsio reticularis* (1), *Tutufa oyamai* (1 broken juv.).
Sta. 910.-15-26 m, 20°58' S, 164°36' E: *Gyrineum gyrinum* (1 lv).
Sta. 911.-13-19 m, 20°57' S, 164°35' E: *Gyrineum lacunatum* (1).
Sta. 912.-8-12 m, 20°57' S, 164°33' E: *Bursa granularis* (1).
Sta. 915.-12-13 m, 20°54' S, 164°29' E: *Gyrineum gyrinum* (1).
Sta. 921.-10-11 m, 20°51' S, 164°27' E: *Gyrineum gyrinum* (1 lv).
Sta. 923.-9 m, 20°49' S, 164°24' E: *Gyrineum gyrinum* (1), *Cymatium mundum* (1), *Bursa granularis* (1).
Sta. 928.-7-10 m, 20°45' S, 164°23' E: *Cymatium vespaceum* (2).
Sta. 932.-23 m, 20°46' S, 164°17' E: *Cymatium muricinum* (1).
Sta. 933.-90-100 m, 20°45' S, 164°15' E: *Tutufa bufo* (1 juv.).
Sta. 936.-14-15 m, 20°41' S, 164°16' E: *Distorsio reticularis* (1).
Sta. 937.-50-55 m, 20°40' S, 164°15' E: *Cymatium pileare* (1), *Gyrineum gyrinum* (1), *Bufonaria thersites* (1), *Distorsio reticularis* (1).
Sta. 939.-12 m, 20°37' S, 164°16' E: *Cymatium vespaceum* (2).
Sta. 940.-10 m, 20°38' S, 164°16' E: *Gyrineum gyrinum* (3; 2 lv), *Cymatium vespaceum* (1).
Sta. 941.-15-16 m, 20°39' S, 164°13' E: *Distorsio reticularis* (1).
Sta. 942.-15 m, 20°37' S, 164°13' E: *Cymatium muricinum* (1), *Bursa rosa* (1).
Sta. 948.-16 m, 20°32' S, 164°09' E: *Cymatium muricinum* (1).
Sta. 951.-12 m, 20°30' S, 164°12' E: *Gyrineum gyrinum* (1), *Cymatium vespaceum* (1 NZGS WM15811).
Sta. 954.-15-17 m, 20°31' S, 164°03' E: *Bursa rosa* (1).
Sta. 955.-19 m, 20°30' S, 164°05' E: *Cymatium mundum* (1).
Sta. 957.-17-18 m, 20°28' S, 164°09' E: *Gyrineum gyrinum* (3).
Sta. 958.-18-19 m, 20°26' S, 164°07' E: *Gyrineum gyrinum* (1), *Cymatium vespaceum* (2 lv; 1 NZGS WM15809).

Secteur de Poum

Sta. 962.-25-26 m, 20°37' S, 164°01' E: *Cymatium muricinum* (1 juv.), *C. vespaceum* (1).
Sta. 965.-17-18 m, 20°24' S, 164°07' E: *Cymatium vespaceum* (1).
Sta. 966.-13-14 m, 20°22' S, 164°07' E: *Gyrineum gyrinum* (6), *Cymatium vespaceum* (2).
Sta. 967.-12-16 m, 20°22' S, 164°07' E: *Gyrineum gyrinum* (6).
Sta. 975.-23-24 m, 20°22' S, 164°03' E: *Gyrineum gyrinum* (2).
Sta. 977.-12-15 m, 20°19' S, 164°07' E: *Gyrineum gyrinum* (1).
Sta. 978.-19 m, 20°20' S, 164°03' E: *Gyrineum gyrinum* (4).
Sta. 979.-15-18 m, 20°18' S, 164°03' E: *Gyrineum gyrinum* (2), *Cymatium vespaceum* (1), *C. sarcostoma* (1 adult).
Sta. 980.-18 m, 20°18' S, 164°02' E: *Gyrineum gyrinum* (1), *G. lacunatum* (3), *Cymatium vespaceum* (1).
Sta. 983.-38-68 m, 20°23' S, 163°57' E: *Gyrineum gyrinum* (2), *G. lacunatum* (13), *Cymatium comptum* (2), *Distorsio kurzi* (1 juv., with brown aperture).
Sta. 985.-15-17 m, 20°20' S, 163°58' E: *Cymatium nicobaricum* (1 lv, half grown), *Bursa rosa* (1).
Sta. 994.-70 m, 20°16' S, 163°53' E: *Gyrineum lacunatum* (2).
Sta. 995.-35-36 m, 20°15' S, 163°55' E: *Distorsio reticularis* (1).
Sta. 1001.-8-9 m, 20°10' S, 164°03' E: *Gyrineum gyrinum* (2).
Sta. 1002.-7-8 m, 20°09' S, 164°02' E: *Cymatium pileare* (1).
Sta. 1006.-18-25 m, 20°13' S, 163°57' E: *Cymatium comptum* (1), *Bursa rhodostoma* (1 NZGS WM15797).
Sta. 1011.-14 m, 20°08' S, 163°59' E: *Gyrineum lacunatum* (1).
Sta. 1014.-22-23 m, 20°09' S, 163°53' E: *Tutufa oyamai* (1 lv adult).
Sta. 1017.-21 m, 20°08' S, 163°51' E: *Bursa rhodostoma* (2; 1 NZGS WM15795).
Sta. 1020.-17 m, 20°04' S, 163°57' E: *Gyrineum gyrinum* (1).
Sta. 1023.-27 m, 20°04' S, 163°52' E: *Gyrineum gyrinum* (1).
Sta. 1024.-26 m, 20°06' S, 163°50' E: *Distorsio reticularis* (1).
Sta. 1025.-25-28 m, 20°07' S, 163°49' E: *Cymatium vespaceum* (1), *Distorsio reticularis* (1).

Sta. 1026.-29 m, 20°05' S, 163°48' E: *Gyrineum lacunatum* (1).
Sta. 1027.-29 m, 20°03' S, 163°51' E: *Gyrineum lacunatum* (1).
Sta. 1029.-26-27 m, 20°02' S, 163°53' E: *Cymatium muricinum* (1).
Sta. 1030.-23-26 m, 20°01' S, 163°53' E: *Gyrineum lacunatum* (1).
Sta. 1032.-20-21 m, 19°59' S, 163°54' E: *Distorsio reticularis* (2; 1 NZGS WM15826).

Secteur de Balabio

Sta. 1040.-16-17 m, 20°01' S, 164°00' E: *Gyrineum lacunatum* (1).
Sta. 1046.-6-7 m, 20°05' S, 164°07' E: *Gyrineum gyrinum* (3; 2 lv; 1 NZGS WM15827), *Cymatium vespaceum* (1).
Sta. 1047.-11-12 m, 20°03' S, 164°08' E: *Cymatium comptum* (1 lv).

Secteur des Belep

Sta. 1068.-26 m, 19°57' S, 163°53' E: *Cymatium vespaceum* (1), *Distorsio reticularis* (1).
Sta. 1069.-30 m, 19°59' S, 163°53' E: *Gyrineum gyrinum* (1), *G. lacunatum* (1), *Cymatium vespaceum* (2; 1 lv), *Distorsio reticularis* (1).
Sta. 1088.-23 m, 19°46' S, 163°58' E: *Bursa granularis* (3; 2 NZGS WM15784).
Sta. 1100.-39 m, 19°45' S, 163°48' E: *Cymatium mundum* (1).
Sta. 1105.-25 m, 19°40' S, 163°57' E: *Gyrineum lacunatum* (1), *Cymatium dunkeri* (1), *C. labiosum* (1).
Sta. 1115.-42 m, 19°38' S, 163°51' E: *Distorsio reticularis* (1).
Sta. 1116.-38 m, 19°37' S, 163°53' E: *Distorsio reticularis* (1).
Sta. 1123.-36 m, 19°37' S, 163°37' E: *Gyrineum lacunatum* (1).
Sta. 1126.-41 m, 19°33' S, 163°46' E: *Gyrineum lacunatum* (2).
Sta. 1128.-26 m, 19°31' S, 163°52' E: *Cymatium aquatile* (1).
Sta. 1129.-40 m, 19°29' S, 163°49' E: *Cymatium exile* (1 small juv.), *C. labiosum* (1), *C. pileare* (1), *Bufonaria thersites* (2; 1 NZGS WM15801).
Sta. 1134.-40 m, 19°31' S, 163°35' E: *Gyrineum lacunatum* (2).
Sta. 1139.-39 m, 19°24' S, 163°47' E: *Gyrineum lacunatum* (1), *Cymatium comptum* (1).
Sta. 1140.-44 m, 19°24' S, 163°44' E: *Gyrineum lacunatum* (2).
Sta. 1143.-54 m, 19°23' S, 163°38' E: *Cymatium vespaceum* (1), *C. labiosum* (1).
Sta. 1145.-38 m, 19°21' S, 163°45' E: *Gyrineum gyrinum* (1).
Sta. 1147.-210 m, 19°08' S, 163°30' E: *Biplex pulchra* (1).
Sta. 1148.-220 m, 19°07' S, 163°30' E: *Biplex pulchra* (1), *Cymatium tenuiliratum* (1 small juv.).
Sta. 1152.-335 m, 18°58' S, 163°24' E: *Distorsionella pseudaphera* (2 narrow form; 1 NZGS WM15620).
Sta. 1154.-40 m, 19°09' S, 163°19' E: *Gyrineum lacunatum* (1).
Sta. 1155.-48 m, 19°09' S, 163°16' E: *Cymatium vespaceum* (5), *Distorsio reticularis* (1).
Sta. 1156.-55 m, 19°10' S, 163°13' E: *Gyrineum lacunatum* (3).
Sta. 1157.-48 m, 19°10' S, 163°10' E: *Distorsio reticularis* (1).
Sta. 1158.-48 m, 19°10' S, 163°07' E: *Gyrineum lacunatum* (1), *G. roseum* (1 white), *Cymatium rubeculum* (1).
Sta. 1159.-50 m, 19°13' S, 163°07' E: *Bursa rosa* (1).
Sta. 1160.-65 m, 19°13' S, 163°10' E: *Distorsio reticularis* (3).
Sta. 1163.-48 m, 19°11' S, 163°22' E: *Cymatium comptum* (1), *Distorsio reticularis* (1).
Sta. 1168.-50 m, 19°16' S, 163°09' E: *Gyrineum lacunatum* (2).
Sta. 1174.-53 m, 19°21' S, 163°14' E: *Gyrineum lacunatum* (4), *Cymatium vespaceum* (1), *Distorsio reticularis* (1).
Sta. 1181.-45 m, 19°24' S, 163°15' E: *Distorsio anus* (1 lv, adult), *D. reticularis* (1).
Sta. 1182.-48 m, 19°27' S, 163°16' E: *Cymatium vespaceum* (1), *C. labiosum* (1), *Bursa rhodostoma* (1), *Bufonaria thersites* (1), *Distorsio reticularis* (3).
Sta. 1190.-40 m, 19°34' S, 163°31' E: *Cymatium vespaceum (1)*, *Bursa granularis* (3), *Distorsio reticularis* (1).
Sta. 1193.-52 m, 19°33' S, 163°23' E: *Gyrineum lacunatum* (1).
Sta. 1196.-30 m, 19°33' S, 163°21' E: *Gyrineum lacunatum* (1).
Sta. 1197.-41 m, 19°36' S, 163°22' E: *Bufonaria thersites* (1).
Sta. 1206.-36 m, 19°44' S, 163°27' E: *Distorsio reticularis* (1).
Sta. 1208.-30 m, 19°43' S, 163°36' E: *Distorsio reticularis* (1).

EXPÉDITION MONTROUZIER, shallow-water collecting and dredging around northern New Caledonia, by P. Bouchet and colleagues, September-October 1993. Narrative and report: BOUCHET (1994).

Secteur de Touho

Sta. 1237.-20°46.9' S, 165°13.8' E, 0-1 m: *Gyrineum gyrinum* (1), *Cymatium mundum* (1), *C. muricinum* (4), *C. nicobaricum* (3), *C. rubeculum* (1 lv), *Bursa granularis* (1 large).
Sta. 1240.- 20°46.5' S, 165°14'-15' S, 0-2 m: *Charonia tritonis* (1 lv, H 385 mm), *Cymatium muricinum* (3), *Bursa granularis* (4).
Sta. 1241.-20°48' S, 165°15.7' E, 0-2 m: *Gyrineum gyrinum* (1), *Cymatium aquatile* (3; 2 lv), *C. mundum* (2 lv), *C. muricinum* (3 lv), *C. nicobaricum* (2), *C. vespaceum* (1 lv), *Bursa granularis* (47 most lv), *B. rosa* (1 lv).
Sta. 1242.- Flat alongside Touho wharf, 20°46.2' S, 165°14.5' E, intertidal: *Gyrineum gyrinum* (5 lv), *G. lacunatum* (2 lv), *Cymatium aquatile* (1 lv), *C. mundum* (15 lv), *C. muricinum* (22, many lv), *C. nicobaricum* (10, many lv), *C. pileare* (2 lv), *C. vespaceum* (1 lv), *Bursa granularis* (71, many lv), *B. rosa* (1).
Sta. 1245.-Grand Récif Mengalia, 20°45.2' S, 165°16.3' E, intertidal: *Gyrineum gyrinum* (1), *Cymatium aquatile* (12, most lv), *C. comptum* (1, large lv), *C. gemmatum* (1 lv), *C. hepaticum* (1 small lv), *C. mundum* (3 lv), *C. muricinum* (2 lv), *C. rubeculum* (4 lv), *Bursa cruentata* (6 lv), *B. granularis* (29, many lv), *B. rhodostoma* (2), *B. rosa* (2), *Tutufa rubeta* (2 lv).
Sta. 1246.-Ilot Ouao [= I. Camille], 20°42.8' S, 165°07.8' E, intertidal: *Cymatium nicobaricum* (1), *Distorsio anus* (1 lv), *Bursa granularis* (2).
Sta. 1252.-Baie de Touho and vicinity, 20°46.5' S, 164°14' E, 1-4 m: *Gyrineum gyrinum* (7; 6 lv), *Cymatium muricinum* (2), *C. nicobaricum* (1), *Bursa granularis* (5 lv), *B. rosa* (1 lv).
Sta. 1256.-Off Vieux-Touho, 20°45.0' S, 165°09.8' E, 15-20 m: *Gyrineum gyrinum* (1).
Sta. 1259.-Baie de Touho, 20°44.6' S, 165°13.7' E, 15-35 m: *Gyrineum gyrinum* (1), *G. lacunatum* (2; 1 lv), *Cymatium gemmatum* (1), *Bursa granularis* (1), *B. rhodostoma* (1), *Distorsomina pusilla* (1).
Sta. 1260.-Channel NE of Banc de Touho, 20°44' S, 165°14' E, 49-59 m: *Gyrineum gyrinum* (3), *G. lacunatum* (13, most lv), *Cymatium comptum* (2; 1 lv), *C. vespaceum* (5; 2 lv), *Distorsio parvimpedita* (1 lv).
Sta. 1261.-Touho Channel, 20°46.47' S, 165°15' - 165°16.5' E, 45-56 m: *Gyrineum lacunatum* (33, many lv), *Cymatium pfeifferianum* (2 dd), *C. comptum* (1).

Sta. 1266.-Inner side of Grand Récif Mengalia, 20°39.6' S, 165°14.7' E, 10-15 m: *Gyrineum gyrinum* (2 lv), *Cymatium vespaceum* (1), *Bursa granularis* (1 lv).
Sta. 1268.-Near estuary of Thiem R., 20°45.2' S, 165°08.0' E, 9-11 m: *Cymatium vespaceum* (1 lv), *Distorsio anus* (1 large, lv), *Bursa granularis* (1), *Bufonaria perelegans* (2).
Sta. 1270.-Grand Récif Mengalia, outer slope, 20°45' S, 165°16.5' E, 10-35 m: *Gyrineum gyrinum* (1), *Bursa condita* (1 lv), *B. granularis* (1 lv), *B. lamarckii* (1 mature empty shell, bearing several *Sabia* limpets), *Tutufa rubeta* (1 lv).
Sta. 1271.-Haut-Fond de Tié, 20°52.7' S, 165°19.5' E, 5-25 m: *Charonia tritonis* (1 lv, H 310 mm), *Tutufa bubo* (one large lv adult).
Sta. 1272.-Ilot de Sable, Passe de Touho, 20°49.5' S, 165°19.6' S, 10 m: *Tutufa rubeta* (1 lv), *Distorsio anus* (1 lv).
Sta. 1274.-Récif de Koé, 20°47.7' S, 165°15.7' E, 3-30 m: *Tutufa rubeta* (1).
Sta. 1276.-Hienghène, Mission d'Ouaré, 20°40.5' S, 164°56.0' E, intertidal: *Cymatium aquatile* (1 lv), *C. muricinum* (2 lv).

Secteur de Koumac

Sta. 1277.-Anse de Koumac (= Baie de Ouanap), 20°34' S, 164°16' E, 0-2 m: *Gyrineum gyrinum* (9; 8 lv), *Cymatium gutturnium* (2 dd nice adults, 1 lv; 1 NZGS WM15812), *C. labiosum* (2; 1 lv), *C. mundum* (2 lv), *C. vespaceum* (3 lv), *Bursa granularis* (2 lv).
Sta. 1278.-Anse de Koumac, 20°34' S, 164°16' E, 0-2 m: *Gyrineum gyrinum* (1), *Cymatium vespaceum* (1).
Sta. 1279.-Pointe de Pandop, 20°35' S, 164°15.5' E, intertidal: *Gyrineum gyrinum* (1), *Cymatium mundum* (1 lv), *Bursa granularis* (1 lv).
Sta. 1282.-Ilot Tangadiou, 20°33.5' S, 164°13' E, intertidal: *Gyrineum gyrinum* (12 lv), *Cymatium aquatile* (1), *Bursa granularis* (2; 1 lv).
Sta. 1283.-Ilot Magone, 20°33.5' S, 164°12.2' E, intertidal: *Gyrineum gyrinum* (1 lv).
Sta. 1284.-Ilot Rat (= Ilot de la Table), 20°33.7' S, 164°11' E: *Gyrineum gyrinum* (2 lv), *Cymatium nicobaricum* (1 lv), *C. vespaceum* (2 lv), *Bursa granularis* (3).
Sta. 1285.-Ilot Kendec, 20°40.5' S, 164°15.2' E, intertidal: *Cymatium muricinum* (1), *Bursa granularis* (2; 1 lv juv.), *B. rhodostoma* (1).
Sta. 1286.-Plateau Karembé, 20°38' - 20°39' S, 164°16' - 164°17' E, intertidal: *Gyrineum gyrinum* (1 lv), *Cymatium aquatile* (2 lv), *C. mundum* (2 lv), *C. muricinum* (3 lv), *C. nicobaricum* (2 lv), *Bursa granularis* (1).
Sta. 1287.-Récif de l'Infernet, 20°37' S, 164°14' E, intertidal: *Gyrineum gyrinum* (4 lv), *Cymatium exile* (1 adult lv), *C. nicobaricum* (1 lv), *Bursa granularis* (10 lv), *B. rosa* (1 lv), *Bufonaria thersites* (1 lv).
Sta. 1288.-Sand cay in front of Kaala-Gomen, 20°40' S, 164°19' E, intertidal: *Cymatium nicobaricum* (1 lv).
Sta. 1289.-Paagoumène, 20°29.2' S, 164°10.2' E, intertidal: *Gyrineum gyrinum* (12; 6 lv), *Cymatium mundum* (4; 2 lv), *Bursa granularis* (1 lv).
Sta. 1290.-Paagoumène, 20°29.2' S, 164°10.2' E, intertidal: *Gyrineum gyrinum* (2 lv), *Cymatium hepaticum* (1).
Sta. 1291.-Pointe de Babouillat, 20°22.4' S, 164°06.8' E, intertidal: *Gyrineum gyrinum* (10; 6 lv), *Cymatium mundum* (2 lv), *C. muricinum* (2 lv), *C. nicobaricum* (1 lv), *Bursa granularis* (2 lv).
Sta. 1292.-Pointe de Babouillat, 20°22.4' S, 164°06.8' E, intertidal: *Gyrineum gyrinum* (4; 3 lv), *Cymatium mundum* (1 lv), *C. muricinum* (1 lv), *C. vespaceum* (1).
Sta. 1296.-Baie Banaré, Ilot Mouac, 20°13.5' S, 164°00.5' E, intertidal: *Gyrineum gyrinum* (3 lv), *Cymatium aquatile* (1 lv).
Sta. 1297.-Baie de Koumac, 20°34.5' S, 164°15.5' S: *Gyrineum gyrinum* (6; 5 lv), *Cymatium vespaceum* (2 lv).
Sta. 1298.-Pointe de Pandop, 20°35.2' S, 164°16.6' E, 2-4 m: *Gyrineum gyrinum* (2).
Sta. 1299.-Between mainland and l'Infernet Rf, 20°34.4' S, 164°13.0' E, 12-14 m: *Gyrineum gyrinum* (39, most lv), *G. lacunatum* (1 lv), *Cymatium muricinum* (1), *C. succinctum* (1 half-grown spm, lv), *Bursa granularis* (1).
Sta. 1300.- Between mainland and l'Infernet Rf, 20°35.6' S, 164°15.2' S, 10-11 m: *Bursa rhodostoma* (1).
Sta. 1301.-Récif de l'Infernet, 20°37.1'-37.5' S, 164°14.7'-15.0' E, 1-5 m: *Gyrineum gyrinum* (1), *Cymatium muricinum* (1 lv), *C. nicobaricum* (1 lv), *Bursa granularis* (2 lv), *B. rosa* (1 lv), *Bufonaria thersites* (3 lv).
Sta. 1302.-Récif de l'Infernet, 20°35.8' S, 164°12.7' E, inner slope: *Gyrineum gyrinum* (4; 3 lv).
Sta.1303.-Around Plateau Karembé, 20°37.7' - 20°38.8' S, 164°15.9' - 164°17.1' E, 0.8 m: *Cymatium aquatile* (5), *C. muricinum* (1), *C. nicobaricum* (2 lv), *C. pileare* (1 dd), *Bursa granularis* (3), *Bufonaria thersites* (5; 3 lv), *Tutufa bufo* (1).
Sta. 1304.-Infernet channel, 20°38.6' S, 164°13.2' E, 12-15 m: *Cymatium muricinum* (1 lv), *C. vespaceum* (1 lv), *Bursa granularis* (4; 2 lv), *B. rosa* (2; 1 NZGS WM15799), *Bufonaria thersites* (3; 1 lv).
Sta. 1305.-Infernet channel, 20°36.2' S, 164°11.0' E, 12-15 m: *Cymatium gutturnium* (1 lv adult), *C. muricinum* (2 lv), *C. vespaceum* (1 lv), *Bufonaria thersites* (1 lv), *Tutufa bufo* (1 med. lv).
Sta. 1306.-Infernet channel, 20°39.1' S, 164°12.4' E, 11-13 m: *Gyrineum lacunatum* (1), *Cymatium gemmatum* (1).
Sta. 1307.-Passe du Baron, 20°33.7' S, 164°10.3' E, 12 m: *Bursa granularis* (1).
Sta. 1308.-Tombant de l'Ilot Kendec, 24°40' S, 164°15.2' E, 15-20 m: *Gyrineum gyrinum* (2; 1 lv), *G. lacunatum* (3), *Bursa rhodostoma* (2 lv), *B. rosa* (1 lv).
Sta. 1310.-Passe de Koumac, tombant Nord, 20°39.7' S, 164°14.9' E, 15 m: *Gyrineum gyrinum* (1), *G. lacunatum* (3 lv), *Cymatium comptum* (1), *Bursa granularis* (1), *B. rhodostoma* (2 lv), *B. rosa* (3 lv).
Sta. 1311.-Passe de Koumac, tombant Est, 20°40.4' S, 164°14.9' E, 10-16 m: *Gyrineum lacunatum* (6; 1 lv), *G. roseum* (1 lv juv., pale orange with deep pink protoconch), *Cymatium comptum* (1 lv juv.), *C. hepaticum* (1, juv.), *C. pileare* (1).
Sta. 1312.-Passe de Koumac, tombant Est, 20°40.4' S, 164°14.9' E, 26-40 m: *Gyrineum gyrinum* (4; 1 lv), *G. lacunatum* (9; 3 lv), *Cymatium comptum* (4; 1 lv), *C. dunkeri* (1 lv juv.), *C. labiosum* (2 lv), *Bursa granularis* (2 lv), *B. rhodostoma* (8; 7 lv), *Distorsomina pusilla* (1).
Sta. 1314. - Channel of the Passe de Koumac, 20° 39.8' E, 164° 15.3' E, 30-63 m: *Gyrineum gyrinum* (1 lv), *G. lacunatum* (7; 2 lv), *Cymatium comptum* (1 lv), *C. labiosum* (2 lv), *Tutufa bufo* (1 juv.), *Distorsio decipens* (3 small).
Sta. 1315.-Channel of the Passe de Koumac, 20°40.7' S, 164°14.7' E, 66-87 m: *Gyrineum gyrinum* (1), *G. lacunatum* (10; 1 lv), *Cymatium comptum* (2), *C. fittkaui* (1 small lv), *Bursa granularis* (2; 1 lv), *B. rhodostoma* (4).
Sta. 1316.-Grand Récif de Koumac, 20°40' S, 164°11.2' E, 12 m, outer slope: *Gyrineum lacunatum* (5), *G. roseum* (1 lv juv., deep pink), *Cymatium comptum* (1 lv, juv.), *C. hepaticum* (1 lv, juv.), *C. rubeculum* (1 dd), *Bursa cruentata* (3 lv; 1 NZGS WM15778), *B. granularis* (2 lv), *Distorsomina pusilla* (5; 3 lv).
Sta. 1318.-Grand Récif de Koumac, 20°40' S, 164°11.2' E, 20-30 m, outer slope: *Gyrineum gyrinum* (2; 1 lv), *G. lacunatum* (2 lv), *G. roseum* (1 lv juv., bright deep pink), *Cymatium comptum* (1, lv juv.), *C. gemmatum* (1), *C. hepaticum* (1), *Bursa cruentata* (1 small lv), *B. granularis* (3 lv), *B. rhodostoma* (5 lv), *B. rosa* (1 lv), *Tutufa rubeta* (1 lv), *Distorsio anus* (1 lv), *Distorsomina pusilla* (3 lv?).
Sta. 1319.-Passe Deverd, 20°44.7' S, 164°15.5' E, 15-20 m: *Gyrineum lacunatum* (10; 7 lv), *Cymatium aquatile* (2, lv juv.), *C. labiosum* (1), *C. pileare* (1 dd, juv.), *Bursa rhodostoma* (5 lv), *B. rosa* (2 lv), *Distorsio reticularis* (1 juv.), *Distorsomina pusilla* (5 lv!).
Sta. 1321.-Passe Deverd, 20°44.7' S, 164°14.9' E, 90-115 m: *Gyrineum lacunatum* (2 lv), *G. longicaudatum* (1 lv), *Cymatium comptum* (1 lv), *C. gemmatum* (1), *C. dunkeri* (1 lv, juv.), *C. labiosum* (2; 1 lv), *Tutufa bufo* (2 juv.), *Distorsio decipiens* (1), *D. reticularis* (2 lv).
Sta. 1322.-Passe Deverd, 20°45.2' S, 164°15.2' E, 53-71 m: *Gyrineum gyrinum* (1), *G. lacunatum* (3; 1 lv), *G. longicaudatum* (1), *Bufonaria thersites* (1 lv).
Sta. 1323.-Channel of the Passe de Koumac, 20°40.9' S, 164°14.8' E, 82-120 m: *Gyrineum lacunatum* (8; 1 lv), *Cymatium comptum* (2 lv), *C. gemmatum* (1), *C. labiosum* (1), *Bursa granularis* (1 lv juv.), *B. rhodostoma* (2 juv.), *Distorsomina pusilla* (1).

Sta. 1330.-Ilot Kendec, 20°40.5' S, 164°15.2' E, 0.5-1.5 m: *Cymatium aquatile* (1 lv), *Bursa granularis* (2 lv), *B. rosa* (2 lv).
Sta. 1331.-Grand Récif de Koumac, 20°40'-20°40.6' S, 164°11.2'-164°12.1' E, 55-57 m, outer slope: *Gyrineum roseum* (3, empty juv.), *Cymatium hepaticum* (1 lv, juv.), *Bursa rhodostoma* (1), *Distorsomina pusilla* (5; 4 lv).
Sta. 1332.-Grand Récif de Koumac, 20°40'-40.6' S, 164°11.2'-12.1' E, 5-10 m, outer slope: *Tutufa rubeta* (1 large, lv).
Sta. 1333.- Grand Récif de Koumac, 20°40' - 20°40.6' S, 164°11.2 '- 164°12.1' E, 30-60 m, outer slope: *Gyrineum lacunatum* (1).

LAGON DE NOUMÉA, Coll. P. Bouchet and B.A. Marshall, 1992.

Sta. 1350.-Récif Senez, 22°17.9' S, 166°19.6' E, 3-6 m, 23 Nov. 1992: *Gyrineum gyrinum* (2), *Cymatium hepaticum* (1).
Sta. 1351.-Platier de l'Ilot Maitre, 22°20.4' S, 166°25.7' E, intertidal, 25 Nov. 1992: *Bursa granularis* (1).
Sta. 1352.-Grand Récif Aboré, 22°22.2' S, 166°16.1' E, 27-35 m, outer slope of barrier reef, 27 Nov. 1992: *Gyrineum lacunatum* (2), *Cymatium hepaticum* (1 juv.), *C. rubeculum* (1 lv adult), *Bursa cruentata* (1 lv coll. adult), *B. granularis* (1), *B. rhodostoma* (1 juv.).
Sta. 1354.-Grand Récif Aboré, 22°22.2' S, 166°15.9' E, 27-37 m, outer slope of barrier reef, 30 Nov. 1992: *Gyrineum lacunatum* (5), *Bursa granularis* (2), *Distorsomina pusilla* (2).
Sta. 1355.-Pointe Magnin, 22°18.9' S, 166°26.6' E, 7-10 m, 3 Dec. 1992: *Gyrineum gyrinum* (9), *G. lacunatum* (8), *Cymatium comptum* (1, large lv adult), *C. nicobaricum* (1), *C. vespaceum* (2 juv.).
Sta. 1356.-Canyon de la Dumbéa, 22°19.7' S, 166°15.4' E, 20-23 m, 4 Dec. 1992: *Gyrineum gyrinum* (9), *G. lacunatum* (2), *Cymatium aquatile* (2), *C. gemmatum* (1 juv.), *C. labiosum* (1 juv.), *Bursa granularis* (6).
Sta. 1369.-Quatre Bancs de l'Ouest, 22°25.4' S, 166°27. 8' E, 12 m, 19 Apr. 1993: *Tutufa bufo* (1 large lv).

Unnumbered stations

SW de Nouméa, Banc Gail, 27 m, 9 Feb. 1987: *Gyrineum gyrinum* (1), *G. lacunatum* (1), *Cymatium dunkeri* (1).
SW Nouvelle-Calédonie, Canal Woodin, 37 m: *Cymatium vespaceum* (1).
SW Nouvelle-Calédonie, Passe de Boulari, 400 m, 20 March 1988: *Sassia remensa* (1LM).

Cruise BIOGEOCAL, N.O. *"Coriolis"*, coll. P. Lozouet, April-May 1987. Station list and narrative: RICHER DE FORGES (1990).

Sta. DW253.-310-315 m, 21°31' S, 166°29' E: *Sassia remensa* (5SR, 4medR).
Sta. DW291.-510-520 m, 20°34' S, 166°54' E: *Sassia remensa* (1SR).
Sta. DW307.-470-480 m, 20°35' S, 166°55' E: *Sassia remensa* (2SR).
Sta. DW308.-510-590 m, 20°40' S, 166°58' E: *Sassia remensa* (1medR).

Cruise BATHUS 1, East coast of New Caledonia, N.O. *"Alis"*, coll. P. Bouchet & B. Richer de Forges-ORSTOM, March 1993. Station list and narrative: RICHER DE FORGES & CHEVILLON (1996).

Sta. DW639.-120-180 m, 21°52' S, 166°47' E: *Gyrineum longicaudatum* (2).
Sta. DW640.-174 m, 21°52' S, 166°48' E: *Distorsio decipiens* (1), *Tutufa bufo* (1 lv).
Sta. CP645.-250-258 m, 21°52' S, 166°49' E. *Distorsio decipiens* (1).
Sta. DW653.-190-207 m, 21°17' S, 165°57' E: *Biplex pulchra* (2), *Gyrineum longicaudatum* (1).
Sta. DW654.-237-298 m, 21°17' S, 165°57' E: *Bursa latitudo* (1).
Sta. DW659.-275 m, 21°17' S, 165°57' E: *Biplex pulchra* (1), *Distorsio decipiens* (1).
Sta. DW665.-180-200 m, 20°57' S, 165°35' E: *Distorsio decipiens* (1).
Sta. CP667.-205-212 m, 20°57' S, 165°35' E: *Biplex pulchra* (2), *Distorsio decipiens* (12).
Sta. CP668.-205-219 m, 20°57' S, 165°35' E: *Biplex pulchra* (4), *Distorsio decipiens* (9).
Sta. CP669.-255-280 m, 20°57' S, 165°35' E: *Biplex pulchra* (1), *Distorsio decipiens* (2), *D. habei* (1), *Bursa latitudo* (1), *B. quirihorai* (1).
Sta. DW674.-105-110 m, 20° 49' S, 165° 19' E: *Distorsio decipiens* (1).
Sta. DW678.-94-100 m, 20°49' S, 165°19' E: *Gyrineum lacunatum* (4), *Tutufa bufo* (1 juv.).
Sta. CP680.-86-92 m, 20°48' S, 165°18' E: *Gyrineum lacunatum* (2), *Distorsio decipiens?* (1 juv.).
Sta. DW688.-270-282 m, 20°33' S, 165°00' E: *Sassia remensa* (4SR), *Distorsio decipiens* (1), *Bursa fijiensis* (2).
Sta. DW689.-260-265 m, 20°33' S, 165°00' E: *Distorsio decipiens* (2).
Sta. DW690.-352 m, 20°33' S, 165°01' E: *Sassia remensa* (1SR, 1medR, 2medI), *Distorsio decipiens* (1).
Sta. DW691.-227-250 m, 20°35' S 164°59' E: *Gyrineum gyrinum* (1), *G. lacunatum* (4), *Cymatium rubeculum* (1 dd juv.), *Distorsio decipiens?* (1 juv.).
Sta. DW692.-140-150 m, 20°35' S, 164°59' E: *Gyrineum lacunatum* (4), *Distorsio graceiellae* (1 lv?)
Sta. DE694.-400-500 m, 20°36' S, 164°58' E: *Bursa quirihorai* (1).
Sta. DE700.-160-222 m, 20°57' S, 165°35' E: *Distorsio decipiens* (1).
Sta. CP702.-591-660 m, 20°35' S, 165°35' E: *Sassia remensa* (1medR), *Distorsio decipiens* (2).
Sta. CP710.-320-386 m, 21°43' S, 166°36' E: *Distorsio decipiens* (1).
Sta. CP712.-210 m, 21°44' S, 166°35' E: *Biplex pulchra* (2 lv), *Distorsio decipiens* (11).
Sta. DW713.-250 m, 21°45.3' S, 166°36.8' E: *Distorsio decipiens* (5).
Sta. DW1233, Canal Woodin, 45-50 m, 22°23.5' S, 166°47.6' E: *Gyrineum lacunatum* (2).
Sta. DW 1234, Cap N'Doua, 47-52 m, 22°24' S, 166°55.1' E: *Gyrineum gyrinum* (2).
Sta. DW1235, Cap N'Doua, 51-52 m, 22°24.1' S, 166°55.5' E: *Gyrineum gyrinum* (25), *G. lacunatum* (23), *Cymatium exaratum* (3), *C. vespaceum* (1).
Sta. DW1236, Passe de Kouaoua, 60 m, 21°20' S, 165°54' E: *Gyrineum gyrinum* (1), *Cymatium aquatile* (1 lv).

Cruise HALIPRO 1, N.O *"Alis"*, coll. B. Richer de Forges-ORSTOM, March 1994. Station list and narrative: RICHER DE FORGES & CHEVILLON (1996).

Sta. CP850.-541-580 m, 21°43' S, 166°39' E: *Distorsio perdistorta* (1, large).
Sta. CP851.-314-364 m, 21°43' S, 166°37' E: *Distorsio decipiens* (2).
Sta. CP852.-253-266 m, 21°44' S, 166°36' E: *Distorsio habei* (1, large).
Sta. CP853.-241-250 m, 21°45' S, 166°37' E: *Distorsio decipiens* (4 small; 1 NZGS WM15818).
Sta. CC855.-204-220 m, 21°45' S, 166°37' E: *Distorsio decipiens* (1).
Sta. CP863.-190-227 m, 21°31' S, 166°20' E: *Distorsio decipiens* (3).
Sta. CP877.-464-480 m, 23°03' S, 166°59' E: *Sassia remensa* (1 SR).

NORTH OF NEW CALEDONIA

Programme LAGON, coll. B. Richer de Forges-ORSTOM, 1984-1989. Station list and narrative: RICHER DE FORGES (1991).

Atoll de Huon

Sta. 433.-40-67 m, 18°06' S, 162°52' E: *Gyrineum lacunatum* (2).
Sta. 436.-45 m, 18°06' S, 162°50' E: *Cymatium comptum* (1).
Sta. 439.-39 m, 18°07' S, 162°55' E: *Cymatium comptum* (1).
Sta. 440 bis.-39 m, 18°05' S, 162°55' E: *Gyrineum lacunatum* (1).
Sta. 443.-40 m, 18°00' S, 162°55' E: *Gyrineum lacunatum* (1), *Bursa rosa* (1).

Atoll de Surprise

Sta. 444.-300-350 m, 18°15' S, 162°59' E: *Sassia remensa* (2 med; 1R, 1M).
Sta. 445.-41 m, 18°18' S, 163°02' E: *Cymatium dunkeri* (2), *Bursa rosa* (1).
Sta. 449.-21 m, 18°22' S, 162°09' E: *Cymatium vespaceum* (1).
Sta. 452.-27 m, 18°27' S, 163°12E: *Gyrineum lacunatum* (1), *Bursa granularis* (1), *Bufonaria thersites* (1).
Sta. 454.-36 m, 18°30' S, 163°10' E: *Bufonaria thersites* (2; 1 NZGS WM15800).
Sta. 455.-40 m, 18°30' S, 163°08' E: *Gyrineum lacunatum* (1), *Distorsio anus* (1 small lv).
Sta. 457.-38 m, 18°28' S, 163°04' E: *Cymatium lotorium* (1 lv).
Sta. 458.-40 m, 18°27' S, 163°02' E: *Cymatium gemmatum* (1 lv adult).
Sta. 472.-48 m, 18°26' S, 163°05' E: *Bursa rhodostoma* (1).
Sta. 473.-50 m, 18°24' S, 163°03' E: *Gyrineum roseum* (1 white), *Cymatium vespaceum* (1).

Cruise MUSORSTOM 4, N.O. *"Vauban"*, coll. P. Bouchet & B. Richer de Forges-ORSTOM, September-October 1985. Station list and narrative: RICHER DE FORGES (1990).

Sta. CC146.-33 m, 19°53' S, 163°47' E: *Cymatium labiosum* (1).
Sta. CP148.-58 m, 19°23' S, 163°32' E: *Gyrineum lacunatum* (1), *Cymatium labiosum* (1).
Sta. DW149.-155 m, 19°08' S, 163°23' E: *Gyrineum lacunatum* (2).
Sta. DW156.-525 m, 18°54' S, 163°19' E: *Distorsionella pseudaphera* (2 large).
Sta. DW159.-585 m, 18°46' S, 163°16' E: *Sassia remensa* (1medR), *Distorsionella pseudaphera* (4).
Sta. DW162.-525 m, 18°35' S, 163°10' E: *Distorsionella pseudaphera* (3; 1 NZGS WM15621).
Sta. DW163.-350 m, 18°34' S, 163°11' E: *Distorsio habei* (1).
Sta. DW164.-255 m, 18°33' S, 163°13' E: *Bursa latitudo* (1 juv.), *Distorsionella pseudaphera* (2 small).
Sta. CP172.-275-330 m, 19°01' S, 163°16' E: *Biplex pulchra* (3).
Sta. CC173.-250-290 m, 19°02' S, 163°19' E: *Biplex pulchra* (1), *Distorsio decipiens* (3).
Sta. CC175.-335 m, 18°59' S, 163°17' E: *Biplex pulchra* (2), *Bursa latitudo* (1).
Sta. DW179.-475 m, 18°57' S, 163°14' E: *Sassia remensa* (1 LR).
Sta. DW181.-350 m, 18°57' S, 163°22' E: *Distorsionella pseudaphera* (3).
Sta. DW184.-260 m, 19°04' S, 163°27' E: *Distorsionella pseudaphera* (6, narrow form).
Sta. DW185.-230 m, 19°06' S, 163°29' E: *Biplex pulchra* (1 lv), *Cymatium dunkeri* (1).
Sta. DW186.-190 m, 19°07' S, 163°30' E: *Biplex pulchra* (3; 1 NZGS WM15803).
Sta. DW187.-65-120 m, 19°08' S, 163°29' E: *Gyrineum lacunatum* (3), *Cymatium comptum* (6; 2 NZGS WM15806), *C. exaratum* (1), *C. fittkaui* (1 lv), *Tutufa bufo* (1).
Sta. CP189.-210 m, 19°07' S, 163°29' E: *Biplex pulchra* (2).
Sta. DW196.-450 m, 18°55' S, 163°24' E: *Sassia remensa* (1SR), *Bursa fijiensis* (8; 5 lv), *Distorsionella pseudaphera* (1).
Sta. DW197.-550 m, 18°51' S, 163°21' E: *Distorsionella pseudaphera* (4; 1 NZGS WM15622).

Cruise SMIB 6, N.O. *"Alis"*, coll. ORSTOM, February-March 1990. Station list and narrative: RICHER DE FORGES (1993).

Sta. DW106.- 165-195 m, 19°08' S, 163°31' E: *Cymatium labiosum* (1).
Sta. DW110.-225-230 m, 19°05' S, 163°30' E: *Biplex pulchra* (3).
Sta. DW113.-250 m, 19°03' S, 163°30' E: *Biplex pulchra* (1).
Sta. DW115.-280-285 m, 19°00' S, 163°27' E: *Distorsio decipiens* (1).
Sta. DW119.-295-305 m, 18°59' S, 163°26' E: *Bursa quirihorai* (2).
Sta. DW120.-310-325 m, 18°59' S, 163°26' E: *Bursa fijiensis* (1), *B. quirihorai* (2).
Sta. DW121.-315 m, 18°58' S, 163°26' E: *Bursa quirihorai* (5).
Sta. DW123.-330-360 m, 18°57' S, 163°25' E: *Bursa quirihorai* (3).
Sta. DW126.-320-330 m, 18°59' S, 163°23' E: *Bursa fijiensis* (4).
Sta. DW127.-205 m, 19°07' S, 163°23' E: *Biplex pulchra* (1).
Sta. DW128.-205-215 m, 19°06' S, 163°22' E: *Distorsio decipiens* (1).
Sta. DW129.-220-225 m, 19°05' S, 163°22' E: *Biplex pulchra* (1).
Sta. DW130.-225-230 m, 19°05' S, 163°21' E: *Bursa fosteri* (1).
Sta. DW132.-235-240 m, 19°03' S, 163°19' E: *Biplex pulchra* (1).
Sta. DW133.-250-270 m, 19°03' S, 163°17' E: *Biplex pulchra* (2).
Sta. DW134.-260-280 m, 19°03' S, 163°17' E: *Biplex pulchra* (1), *Distorsio decipiens* (1).
Sta. DW135.-250-260 m, 19°01' S, 163°19' E: *Biplex pulchra* (1).
Sta. DW136.-300-320 m, 19°01' S, 163°18' E: *Biplex pulchra* (4).

Cruise HALICAL 1, N.O. *"Alis"*, coll. ORSTOM, 1994.

Sta. DW01.-380-400 m, 18°56' S, 163°24' E: *Bursa fijiensis* (3).
Sta. DW02.-352-397 m, 18°54' S, 163°24' E: *Bursa fijiensis* (3), *Distorsionella lewisi* (1).
Sta. DW03.-350-380 m, 18°53' S, 163°24' E: *Distorsionella lewisi* (1).
Sta. DW04.-350-365 m, 18°55' S, 163°24' E: *Bursa fijiensis* (1), *Distorsio habei* (1).
Sta. DW01-04.-350-400 m, 18°53'-56' S, 163°23'-24' E: *Bursa fijiensis* (3), *Distorsionella lewisi* (2; 1 NZGS WM15823).

Cruise BATHUS 4, N.O. *"Alis"*, coll. B. Métivier & B. Richer de Forges-ORSTOM, August 1994. Station list and narrative: RICHER DE FORGES & CHEVILLON (1996).

Sta. DW887.-320-344 m, 21°07' S, 164°28' E: *Sassia remensa* (3 SR), *Gyrineum roseum* (1, white with pink protoconch).
Sta. CP889.-416-433 m, 21°01' S, 164°27' E: *Sassia remensa* (4medR, 1medI).
Sta. DW896.-315-350 m, 20°16' S, 163°52' E: *Gyrineum roseum* (1, white).
Sta. DW901.-297 m, 19°03' S, 163°15' E: *Distorsio decipiens* (1, large).
Sta. DW902.-341-351 m, 19°01' S, 163°15' E: *Sassia remensa* (1medI), *Biplex pulchra* (3), *Distorsio perdistorta* (1).
Sta. CP905.-294-296 m, 19°02' S, 163°16' E: *Biplex pulchra* (6; 2 NZGS WM15804), *Distorsio decipiens* (1).
Sta. CP906.-339-350 m, 19°01' S, 163°15' E: *Bursa fijiensis* (4; 2 lv), *Distorsio perdistorta* (1 lv).
Sta. CP907.-370-394 m, 19°01' S, 163°13' E: *Sassia remensa* (2medR), *Distorsio habei* (1, large).
Sta. DW908.-502-527 m, 18°58' S, 163°11' E: *Bursa fijiensis* (1).
Sta. DW914.-600-616 m, 18°49' S, 163°15' E: *Bursa fijiensis* (1).
Sta. DW919.-610-660 m, 18°50' S, 163°17' E: *Distorsionella pseudaphera* (2).
Sta. DW923.-470-502 m, 18°52' S, 163°24' E: *Distorsionella pseudaphera* (3).
Sta. DW924.-344-360 m, 18°55' S, 163°24' E: *Sassia remensa* (1medI), *Bursa quirihorai* (3).
Sta. DW925.-370-405 m, 18°55' S, 163°24' E: *Sassia remensa* (1medI), *Bursa fijiensis* (1), *B. latitudo* (1), *B. quirihorai* (5).
Sta. DW926.-325-330 m, 18°57' S, 163°25' E: *Bursa quirihorai* (8; 4 lv; 1 NZGS WM15792), *Distorsionella pseudaphera* (1).
Sta. DW927.-444-452 m, 18°56' S, 163°22' E: *Sassia remensa* (4medR, 1medI), *Bursa fijiensis* (8; 2 lv).
Sta. CP928.-420-452 m, 18°55' S, 163°24' E: *Bursa fijiensis* (5; 2 lv).
Sta. DW929.-502-516 m, 18°52' S, 163°23' E: *Sassia remensa* (1 LR), *Bursa fijiensis* (10; 3 NZGS WM15781).
Sta. DW931.-360-377 m, 18°55' S, 163°24' E: *Sassia remensa* (1 SR), *Bursa fijiensis* (1).
Sta. DW932.-170-190 m, 19°08' S, 163°29' E: *Gyrineum longicaudatum* (1).
Sta. DW933.-212-220 m, 19°07' S, 163°29' E: *Biplex pulchra* (2; 1 lv).
Sta. DW934.-231-240 m, 19°05' S, 163°29' E: *Biplex pulchra* (3).
Sta. CP939.-304-320 m, 18°58' S, 163°25' E: *Bursa quirihorai* (1).
Sta. DW943.-316-347 m, 20°12' S, 164°31' E: *Sassia remensa* (4 SR, 1medI), *Distorsio decipiens* (2).
Sta. CP953.-220-234 m, 21°45' S, 166°37' E: *Biplex pulchra* (1), *Distorsio decipiens* (8; 3 lv).

NORFOLK RIDGE

Southern New Caledonia, N.O. *"Vauban"* 1978-79, coll. P. Bouchet. Station list and narrative: RICHER DE FORGES (1990).

Sta. 3.-390 m, 22°17' S, 167°12' E: *Sassia remensa* (4 med; 1R, 1M, 2I).
Sta. 7.-300-315 m, 22°19' S, 167°11' E: *Bursa quirihorai* (1).
Sta. 9.-175-200 m, 22°20' S, 167°10' E: *Biplex pulchra* (2), *Cymatium testudinarium* (1, excellent adult).
Sta. 10.-80 m, 22°17' S, 167°05' E: *Cymatium comptum* (1), *Gyrineum lacunatum* (2).
Sta. 15.-390-395 m, 22°49' S, 167°12' E: *Bursa latitudo* (1).
Sta. 40.- 250-350 m, 22°30' S, 166°24' E: *Gyrineum longicaudatum* (1)
Sta. 48.- 18-20 m, Lagon entre l'ile Ouen et ilot Redika, 22°33' S, 166°36' E: *Gyrineum lacunatum* (13).

Cruise BIOCAL, N.O. *"Jean-Charcot"*, coll. P. Bouchet, B. Métivier & B. Richer de Forges, August-September 1985. Station list and narrative: RICHER DE FORGES (1990).

Sta. DW38.-360 m, 23°00' S, 167°15' E: *Sassia remensa* (1SR).
Sta. DW64.-250 m, 24°48' S, 168°09' E: *Sassia remensa* (2SR, 1medI, 1LM), *Bursa latitudo* (1), *B. quirihorai* (4), *Distorsio habei* (1) .
Sta. DW65.-245-275 m, 24°48' S, 168°09' E: *Sassia remensa* (1medM), *Bursa latitudo* (2), *B. quirihorai* (2), *Distorsio eucontricta* (1), *D. habei* (1).
Sta. DW66.-505-515 m, 24°55' S, 168°22' E: *Distorsionella lewisi* (5, including juv. illustrated by BOUCHET & WARÉN, 1990).
Sta. DW77.-440 m, 22°15' S, 167°15' E: *Sassia remensa* (14SR), *Distorsio decipiens* (1).
Sta. DW83.-460 m, 20°35' S, 166°54' E: *Sassia remensa* (1SR, 1medR finely and evenly granulous), *Personopsis trigonaperta* (1 immature).
Sta. CP84.-150-210 m, 20°43' S, 167°01' E: *Bufonaria nobilis* (1 immature).
Sta. CP105.-330-335 m, 21°31' S, 166°22' E: *Sassia remensa* (2medR), *Bursa latitudo* (1).
Sta. CP108.-335 m, 22°03' S, 167°06' E: *Sassia remensa* (1medR, 1LR).

Cruise CHALCAL 2, N.O. *"Vauban"*, coll. P. Bouchet, B. Métivier & B. Richer de Forges, October 1986. Station list and narrative: RICHER DE FORGES (1990).

Sta. CC2.-500 m, 24°45' S, 168° 21' E: *Distorsionella lewisi* (1).
Sta. CH3.-257 m, 24°48' S, 168° 09' E: *Bursa latitudo* (1).
Sta. CH4.-253 m, 24°44' S, 168° 10' E: *Bursa latitudo* (1).
Sta. CH5.-223 m, 24°44' S, 168° 09' E: *Bursa latitudo* (1).
Sta. CP18.-274 m, 24°47' S, 168° 09' E: *Bursa rhodostoma* (1).
Sta. CP19.-271 m, 24°43' S, 168° 10' E: *Sassia remensa* (1LM), *Bursa latitudo* (2).
Sta. CP20.-230 m, 24°45' S, 168° 09' E: *Sassia remensa* (1LM, 1SI), *Bursa latitudo* (1).
Sta. CP27.-289 m, 23°15' S, 168° 05' E: *Bursa latitudo* (1).
Sta. DW69.-260 m, 24°44' S, 168° 08' E: *Sassia remensa* (6; 1SR, 1medR, 4medM), *Bursa fijiensis* (3), *B. latitudo* (1), *B. quirihorai* (4), *Distorsio habei* (3).
Sta. DW70.-232 m, 24°46' S, 168° 09' E: *Sassia remensa* (5; 3SR, 2medM), *Bursa latitudo* (1), *Distorsio habei* (4).
Sta. DW71.-230 m, 24°42' S, 168° 10' E: *Sassia remensa* (5LM, 4SR), *Bursa latitudo* (2), *Bursa quirihorai* (2), *Distorsio habei* (4).
Sta. DW74.-650 m, 24°40' S, 168° 38' E: *Distorsionella lewisi* (1).
Sta. DW79.-243 m, 23°41' S, 168° 00' E: *Sassia remensa* (1LR), *Bursa latitudo* (3), *Bursa quirihorai* (4).
Sta. DW80.-160 m, 23°27' S, 168°02' E: *Gyrineum lacunatum* (1), *Cymatium exaratum* (1 lv).
Sta. DW82.-304 m, 23°14' S, 168°04' E: *Bursa quirihorai* (2).

Cruise MUSORSTOM 4, N.O. *"Vauban"*, coll. P. Bouchet & B. Richer de Forges-ORSTOM, September-October 1985. Station list and narrative: RICHER DE FORGES (1990).

Sta. DW203.-105-110 m, 22°36' S, 167°05' E: *Gyrineum longicaudatum* (1), *Distorsio decipiens* (2).
Sta. DW204.-120 m, 22°37' S, 167°06' E: *Gyrineum lacunatum* (1), *Distorsio decipiens* (1).
Sta. DW212.-375-380 m, 22°47' S, 167°10' E: *Bursa latitudo* (1).
Sta. DW222.-410-440 m, 22°58' S, 167°33' E: *Sassia remensa* (2medI, 2medR), *Bursa fijiensis* (6; 3 lv; 2 NZGS WM15780), *B. latitudo* (1).
Sta. DW223.-545-560 m, 22°57' S, 167°30' E: *Bursa fijiensis* (1), *Distorsionella lewisi* (2).
Sta. DW226.-226-390 m, 22°47' S, 167°22' E: *Sassia remensa* (7S-med R).
Sta. DW227.-300 m, 22°46' S, 167°20' E: *Bursa quirihorai* (2 lv), *Distorsio habei* (2).
Sta. DW230.-390-420 m, 22°52' S, 167°12' E: *Sassia remensa* (1medR, 1medM), *Bursa fijiensis* (1 lv).
Sta. DW231.-75 m, 22°34' S, 167°10' E: *Tutufa bufo* (1).

Cruise SMIB 1, N.O. *"Vauban"*, coll. G. Bargibant & P. Tirard-ORSTOM, February 1986. Station list and narrative: RICHER DE FORGES (1990).

Sta. DW2.-415 m, 22°52' S, 167°13' E: *Sassia remensa* (1medR, 1LR), *Bursa quirihorai* (1).
Sta. DW6.-300 m, 22°43' S, 167°16' E: *Distorsio habei* (1, large).

Cruise SMIB 2, N.O. *"Vauban"*, coll. J.L. Menou & P. Tirard-ORSTOM, September 1986. Station list and narrative: RICHER DE FORGES (1990).

Sta. DW1.-438-444 m, 22°53' S, 167°13' E: *Sassia remensa* (5S-med R, 1LM).
Sta. DW4.-410-417 m, 23°53' S, 167°13' E: *Bursa fijiensis* (2 lv).
Sta. DW6.-442-460 m, 22°56' S, 167°16' E: *Cymatium dunkeri* (1, long dd, abraded with pagurid).
Sta. DW8.-435-447 m, 22°54' S, 167°13' E: *Sassia remensa* (1LM), *Bursa fijiensis* (1), *B. quirihorai* (1).
Sta. DW14.-405-444 m, 22°53' S, 167°13' E: *Sassia remensa* (2medR, 1LI), *Bursa fijiensis* (1).
Sta. DW15.-375-402 m, 22°167' S, 167°11' E: *Sassia remensa* (1SM, 1LI), *Bursa quirihorai* (1).
Sta. DW20.-415 470 m, 22°44' S, 167°42' E: *Sassia remensa* (1medI).
Sta. DW23.-410-420 m, 22°31' S, 167°37' E: *Sassia remensa* (8S-med R, 1medM).

Cruise SMIB 3, N.O. *"Vauban"*, coll. B. Richer de Forges-ORSTOM, May 1987. Station list and narrative: RICHER DE FORGES (1990).

Sta. DW1.-520 m, 24°56' S, 168°22' E: *Distorsionella lewisi* (2).
Sta. DW2.-530-537 m, 24°53' S, 168°22' E: *Distorsionella lewisi* (2).
Sta. DW3.-513 m, 24°55°S, 166°22' E: *Distorsionella lewisi* (4).
Sta. DW5.-502-512 m, 24°55°S, 166°22' E: *Distorsionella lewisi* (5).
Sta. DW6.-505 m, 24°56' S, 168°21' E: *Distorsonella lewisi* (1).
Sta. DW7.-505 m, 24°55' S, 168°21' E: *Distorsionella lewisi* (2).
Sta. DW8.-233 m, 24°45' S, 168°08' E: *Sassia remensa* (10 med; 5I, 5M), *Bursa latitudo* (3), *B. quirihorai* (2), *Distorsio euconstricta* (1), *D. habei* (3).
Sta. DW9.-265 m, 24°42' S, 168°08' E: *Sassia remensa* (1medI), *Bursa latitudo* (2).
Sta. DW10.-235 m, 24°42' S, 168°07' E: *Sassia remensa* (5 med; 1R, 2I, 2M), *Bursa latitudo* (2), *B.quirihorai* (5).
Sta. DW13.-448 m, 23°38' S, 167°42' E: *Distorsionella lewisi* (1).
Sta. DW14.-246 m, 24°30' S, 168°00' E: *Charonia lampas* (1 lv adult), *Sassia remensa* (2SR, 1medM, 2LI, 2LM), *Bursa latitudo* (10), *B. quirihorai* (5), *Distorsio habei* (1).
Sta. DW17.-238 m, 23°41' S, 167°59' E: *Sassia remensa* (1medI, 1medM), *Bursa quirihorai* (1).
Sta. DW18.-338 m, 23°42' S, 167°59' E: *Sassia remensa* (13; 5L&2medM, 1L&4SR, 1medI), *Bursa latitudo* (7), *B.quirihorai* (6).
Sta. DW20.-280 m, 23°40' S, 168°00' E: *Bursa latitudo* (3), *Distorsio habei* (2), *Bursa quirihorai* (2).
Sta. DW26.-450 m, 22°55' S, 167°16' E: *Sassia remensa* (1LR).
Sta. DW29.-405 m, 22°47' S, 167°12' E: *Bursa latitudo* (1).

Cruise SMIB 4, N.O. *"Alis"*, coll. G. Bargibant, P. Laboute & J.L. Menou-ORSTOM, March 1989. Station list and narrative: RICHER DE FORGES (1990).

Sta. DW37.-515-540 m, 24°55' S, 168°22' E: *Distorsionella lewisi* (1).
Sta. DW40.-240-260 m, 24°46' S, 168°09' E: *Sassia remensa* (5medI), *Bursa latitudo* (4), *B. quirihorai* (1), *Distorsio habei* (1).
Sta. DW41.-230-235 m, 24°44' S, 168°09' E: *Sassia remensa* (9; 1SR, 3med& 4LI, 1LM), *Bursa latitudo* (7), *B. quirihorai* (3), *Distorsio habei* (1).
Sta. DW42.-290-320 m, 24°46' S, 168°08' E: *Sassia remensa* (1medM), *Bursa latitudo* (1).
Sta. DW43.-235-245 m, 24°47' S, 168°09' E: *Sassia remensa* (1medI, 1LM), *Bursa latitudo* (12), *B. quirihorai* (1), *Distorsio euconstricta* (1).
Sta. DW44.-270-300 m, 24°46' S, 168°08' E: *Sassia remensa* (8 med; 1R, 6I, 1M), *Bursa latitudo* (18), *Distorsio habei* (1).
Sta. DW45.-245-260 m, 24°46' S, 168°09' E: *Sassia remensa* (2med I), *Bursa latitudo* (2).
Sta. DW46.-245-260 m, 24°47' S, 168°09' E: *Sassia remensa* (1medM), *Bursa latitudo* (2).
Sta. DW47.-250-280 m, 24°46' S, 168°08' E: *Bursa latitudo* (6).
Sta. DW48.-240-245 m, 24°46' S, 168°09' E: *Sassia remensa* (4 med; 3I, 1M), *Bursa quirihorai* (2).
Sta. DW49.-240-300 m, 24°46' S, 168°09' E: *Sassia remensa* (2medR), *Bursa latitudo* (2), *B. quirihorai* (1), *Distorsio habei* (1).
Sta. DW50.-260-295 m, 23°42' S, 168°01' E: *Sassia remensa* (1medI, 4medM), *Bursa latitudo* (3), *B. quirihorai* (1)
Sta. DW51.-245-260 m, 23°41' S, 168°01' E: *Sassia remensa* (1medM), *Distorsio habei* (1).
Sta. DW53.-250-270 m, 23°40' S, 168°00' E: *Charonia lampas* (1, fresh and colourful, but empty), *Cymatium tenuiliratum* (1), *Sassia remensa* (1LI, 1LM), *Bursa latitudo* (2), *B. quirihorai* (3), *Distorsio habei* (2).
Sta. DW54.-230-235 m, 23°40' S, 168°00' E: *Charonia lampas* (1 stained, bored and incomplete).
Sta. DW55.-215-260 m, 23°21' S, 168°05' E: *Distorsio anus* (1 large, but long-dead and faded).
Sta. DW56.-230-260 m, 23°21' S, 168°05' E: *Bursa latitudo* (2; 1 NZGS WM15788), *B. quirihorai* (2; 1 NZGS WM15791).
Sta. DW57.-210-260 m, 23°22' S, 168°05' E: *Tutufa bufo* (1 small), *Distorsio habei* (1).
Sta. DW66.-400-430 m, 23°56' S, 167°15' E: *Bursa fijiensis* (1).
Sta. DW69.-395-405 m, 23°56' S, 167°14' E: *Bursa fijiensis* (1).

Cruise SMIB 5, N.O. *"Alis"*, coll. B. Richer de Forges-ORSTOM, September 1989. Station list and narrative: RICHER DE FORGES (1993).

Sta. DW70.-270 m, 23°41' S, 168°01' E: *Sassia remensa* (1medR, 1LR, 1medI, 1LI, 2LM), *Bursa latitudo* (6), *B. quirihorai* (4).
Sta. DW71.-265 m, 23°41' S, 168°01' E: *Sassia remensa* (2medR, 4LM), *Bursa latitudo* (2), *B. quirihorai* (12).
Sta. DW72.-400 m, 23°42' S, 168°01' E: *Sassia remensa* (4medM), *Bursa latitudo* (1), *B. quirihorai* (4).
Sta. DW73.-240 m, 23°41' S, 168°01' E: *Sassia remensa* (1SR), *Bursa latitudo* (8), *B. quirihorai* (3), *Distorsio habei* (1).

Sta. DW74.-245 m, 23°40' S, 168°01' E: *Sassia remensa* (2LM), *Bursa latitudo* (4), *B. quirihorai* (2), *Distorsio habei* (1).
Sta. DW75.-270 m, 23°41' S, 168°01' E: *Sassia remensa* (2medR, 3medI), *Bursa latitudo* (12; 4 NZGS WM15789), *B. quirihorai* (6; 2 NZGS WM15791), *Distorsio habei* (4).
Sta. DW76.-280 m, 23°41' S, 168°01' E: *Sassia remensa* (1medR), *Bursa latitudo* (9), *B. quirihorai* (3), *Distorsio habei* (1).
Sta. DW77.-270 m, 23°41' S, 168°01' E: *Sassia remensa* (3medR), *Bursa latitudo* (3).
Sta. DW78.-245 m, 23°41' S, 168°00' E: *Bursa quirihorai* (6).
Sta. DW79.-285 m, 23°41' S, 168°01' E: *Bursa fijiensis* (2).
Sta. DW80.-300 m, 23°42' S, 168°00' E: *Sassia remensa* (1medM), *Bursa quirihorai* (1).
Sta. DW81.-110 m, 22°38' S, 167°35' E: *Gyrineum longicaudatum* (4), *Sassia remensa* (1SR).
Sta. DW82.-155 m, 22°32' S, 167°32' E: *Gyrineum longicaudatum* (1).
Sta. DW85.-260 m, 22°20' S, 168°43'E: *Bursa latitudo* (2), *B. quirihorai* (1), *Distorsio habei* (5).
Sta. DW87.-370 m, 22°19' S, 168°41' E: *Sassia remensa* (2medI) , *Bursa latitudo* (2), *B. quirihorai* (5), *Distorsio habei* (1), *Distorsionella pseudaphera* (1), *Personopsis purpurata* (1).
Sta. DW88.-350 m, 22°19' S, 168°40' E: *Sassia remensa* (1SR, 1medR, 1medI, 3medM), *Bursa latitudo* (4), *B. quirihorai* (5).
Sta. DW89.-295 m, 22°19' S, 168°41' E: *Sassia remensa* (1SR), *Bursa quirihorai* (2).
Sta. DW90.-340 m, 22°19' S, 168°42' E: *Sassia remensa* (4 med; 1R, 2I, 1M), *Bursa quirihorai* (1), *Distorsio habei* (1).
Sta. DW91.-340 m, 22°18' S, 168°41' E: *Sassia remensa* (2SR), *Bursa latitudo* (1), *B. quirihorai* (2 lv), *Distorsio habei* (1), *Distorsionella pseudaphera* (1).
Sta. DW92.-280 m, 22°20' S, 168°41' E: *Sassia remensa* (3SR, 2medM), *Bursa latitudo* (1), *B. quirihorai* (1), *Distorsio habei* (2).
Sta. DW93.-255 m, 22°20' S, 168°42' E: *Sassia remensa* (8; 1SR, 7medM; 3 NZGS WM15837), *Bursa latitudo* (4), *B. quirihorai* (7), *Distorsio habei* (1).
Sta. DW94.-275 m, 22°20' S, 168°43' E: *Sassia remensa* (1SR, 5medI), *Bursa latitudo* (4), *B. quirihorai* (4), *Distorsio euconstricta* (2), *D. habei* (5).
Sta. DW95.-200 m, 23°00' S, 168°20' E: *Distorsio habei* (1).
Sta. DW97.-300 m, 23°01' S, 168°18' E: *Sassia remensa* (2SR, 1medI), *Bursa latitudo* (1), *Personopsis purpurata* (1).
Sta. DW98.-335 m, 23°02' S, 168°16' E: *Sassia remensa* (3medM), *Bursa quirihorai* (1).
Sta. DW100.-120 m, 23°23' S, 168°05' E: *Cymatium exaratum* (1), *C. dunkeri* (1).
Sta. DW101.-270 m, 23°21' S, 168°05' E: *Bursa latitudo* (2), *Distorsio habei* (1).
Sta. DW103.-315 m, 23°17' S, 168°05' E: *Distorsio habei* (1), *Bursa quirihorai* (1).
Sta. DW104.-335 m, 23°16' S, 168°04' E: *Sassia remensa* (1LM).
Sta. DW105.-310 m, 23°14' S, 168°05' E: *Sassia remensa* (1medR, 3medM).

Cruise SMIB 8, N.O. *"Alis"*, coll. P. Bouchet & B. Richer de Forges-ORSTOM, January-February 1993. Station list and narrative: RICHER DE FORGES & CHEVILLON (1996).

Sta. DW146.-514-522 m, 24°55' S, 168°22' E: *Distorsionella lewisi* (2).
Sta. DW147.-508-532 m, 24°55' S, 168°22' E: *Distorsionella lewisi* (5), *Bursa latitudo* (1).
Sta. DW149.-508-510 m, 24°54' S, 168°22' E: *Distorsionella lewisi* (4).
Sta. DW150.-519-530 m, 24°54' S, 168°22' E: *Distorsionella lewisi* (7; 3 NZGS WM15825).
Sta. DW152.-514-530 m, 24°54' S, 168°22' E: *Distorsionella lewisi* (1).
Sta. DW154.-235-252 m, 24°46' S, 168°08' E: *Gyrineum longicaudatum* (1), *Cymatium tenuiliratum* (1), *Sassia remensa* (4SR, 4medI), *Distorsio habei* (5), *Bursa fijiensis* (1 juv.), *B. latitudo* (18), *B. quirihorai* (1).
Sta. DW155.-257-262 m, 24°46' S, 168°08' E: *Sassia remensa* (1medM), *Bursa latitudo* (18).
Sta. DW157.-251-255 m, 24°46' S, 168°08' E: *Cymatium tenuiliratum* (2), *Sassia remensa* (2SR, 6medI, 1medM), *Distorsio habei* (7), *Bursa latitudo* (20).
Sta. DW158.-262-290 m, 24°47' S, 168°08' E: *Cymatium dunkeri* (1, large and bright but empty), *C. tenuiliratum* (1 large lv), *Distorsio habei* (4), *Bursa latitudo* (32; 6 NZGS WM15790).
Sta. DW159.-241-245 m, 24°46' S, 168°08' E: *Gyrineum longicaudatum* (1), *Halgyrineum louisae* (1), *Sassia remensa* (3SR, 2medM, 2medI, 7medR), *Distorsio habei* (6), *Bursa latitudo* (19), *B. quirihorai* (5).
Sta. DW160.-280-282 m, 24°47' S, 168°08' E: *Sassia remensa* (1SR, 3medR, 7medI, 1LI), *Distorsio habei* (5), *Personopsis purpurata* (1 NZGS WM15619), *Bursa latitudo* (8), *B. quirihorai* (1).
Sta. DW161.-232-251 m, 24°47' S, 168°08' E: *Sassia remensa* (1SR, 1LI), *Bursa latitudo* (3).
Sta. DW162.-254-264 m, 24°48' S, 168°09' E: *Sassia remensa* (2medI), *Bursa latitudo* (3), *B. quirihorai* (1).
Sta. DW163.-310-460 m, 24°50' S, 168°09' E: *Halgyrineum louisae* (1), *Sassia remensa* (4medR, 2medM, 7medI; 3 NZGS WM15839), *Distorsio habei* (3), *Bursa latitudo* (8), *B. quirihorai* (1).
Sta. DW165.-372-660 m, 24°47' S, 168°10' E: *Cymatium tenuiliratum* (1 large lv), *Sassia remensa* (4SR, 1LR, 6medI), *Distorsio habei* (2), *Bursa latitudo* (6), *B. quirihorai* (3).
Sta. DW170-172.-233-290 m, 23°41' S, 168°01' E: *Gyrineum longicaudatum* (1), *Sassia remensa* (5medM, 2medR, 1medI, 1LI; 3 NZGS WM15840), *Distorsio habei* (8; 3 NZGS WM15820), *Bursa latitudo* (14), *B. quirihorai* (9; 3 NZGS WM15794).
Sta. DW173.-234-242 m, 23°41' S, 168°00' E: *Sassia remensa* (1medI), *Bursa latitudo* (5).
Sta. DW174.-235-240 m, 23°40' S, 168°01' E: *Sassia remensa* (4medLI), *Bursa latitudo* (3).
Sta. DW175.-235-240 m, 23°41' S, 168°01' E: *Sassia remensa* (1LI).
Sta. DW176.-283-290 m, 23°42' S, 168°01' E: *Sassia remensa* (1medI, 1LI).
Sta. DW177.-320-370 m, 23°39' S, 168°00' E: *Sassia remensa* (2SR, 3medI, 3 med-LM), *Bursa latitudo* (1), *B. quirihorai* (3).
Sta. DW178.-400 m, 23°46' S, 168°17' E: *Sassia remensa* (2medR).
Sta. DW181.-311-330 m, 23°18' S, 168°05' E: *Bursa latitudo* (2).
Sta. DW182.-314-330 m, 23°19' S, 168°05' E: *Sassia remensa* (2SR), *Distorsio habei* (2), *Bursa latitudo* (1), *B. quirihorai* (1).
Sta. DW183.-330-367 m, 23°18' S, 169°05' E: *Bursa latitudo* (1), *B. quirihorai* (1).
Sta. DW184.-305-320 m, 23°18' S, 168°05' E: *Bursa latitudo* (1), *B. quirihorai* (1).
Sta. DW185.-311-355 m, 23°15' S, 168°04' E: *Distorsio habei* (2; 1 NZGS WM15821), *Bursa latitudo* (1).
Sta. DW186.-57-59 m, 23°25' S, 168°06' E: *Gyrineum lacunatum* (1).
Sta. DW187.-390-540 m, 23°17' S, 168°06' E: *Sassia remensa* (1SR, 1medR), *Distorsio habei* (1), *D. perdistorta* (1, adult), *Bursa latitudo* (1), *B. fijiensis* (8; 4 NZGS WM15783).
Sta. DW189.- 400-402 m, 23°18' S, 168°06' E: *Sassia remensa* (5SR, 1medR), *Personopsis purpurata* (2 lv, with long periostracal bristles), *Bursa fijiensis* (13; 3 NZGS WM15782).
Sta. DW190.- 305-310 m, 23°18' S, 168°05' E: *Distorsio habei* (1).
Sta. DW195.-508-514 m, 22°59' S, 167°21' E: *Bursa quirihorai* (1).

Sta. DW199.-408-410 m, 23°52' S, 167°12' E: *Charonia lampas* (1 half-grown, bright and apparently collected alive).
Sta. DW197-199.-414-436 m, 22°52' S, 168°12' E: *Sassia remensa* (1SR), *Bursa fijiensis* (1 lv), *B. latitudo* (1 juv.).

Cruise SMIB 10, N.O. *"Alis"*, coll. ORSTOM, January1995.

Sta. DW203.-508-502 m, 24°56' S, 168°22' E: *Bursa latitudo* (1), *Distorsionella lewisi* (1).
Sta. DW207.-508-553 m, 24°57' S, 168°21' E: *Bursa latitudo* (1).
Sta. DW208.-270 m, 24°49' S, 168°09' E: *Sassia remensa* (5medI), *Bursa fijiensis* (1), *B. latitudo* (6), *B. quirihorai* (4), *Distorsio habei* (1).
Sta. DW209.-329-560 m, 24°49' S, 168°09' E: *Bursa quirihorai* (2).
Sta. DW210.-308-510 m, 24°49' S, 168°09' E: *Sassia remensa* (1medI), *Bursa latitudo* (10).
Sta. DW215.-508-553 m, 24°56' S, 168°21' E: *Distorsionella lewisi* (1).

Cruise BERYX 11, N.O. *"Alis"*, coll. B. Richer de Forges-ORSTOM, October 1992. Station list and narrative: LEHODEY *et al.* (1992).

Sta. CP08.- 540-570 m, 24°54' S, 168°21' E: *Distorsionella lewisi* (1).
Sta. DW11.-320-350 m, 24°44' S, 168°10' E: *Sassia remensa* (1SR, 8medI), *Bursa latitudo* (1), *Distorsio habei* (1).
Sta. CH15.- 225-250 m, 24°44' S, 168°08' E: *Bursa latitudo* (1).
Sta. CP16.-240-250 m, 24°47' S, 168°09' E: *Distorsio habei* (1), *Bursa latitudo* (2).
Sta. CP17.-250-270 m, 24°48' S, 168°09' E: *Sassia remensa* (1medI).
Sta. DW18.-250-270 m, 24°48' S, 168°09' E: *Sassia remensa* (4SmedR, 2medM, 11medI), *Distorsio habei* (6), *Bursa quirihorai* (2), *B. latitudo* (7; 2 lv).
Sta. CP21.-430-450 m, 24°44' S, 168°07' E: *Sassia remensa* (3SR, 4medR).
Sta. CP22.-490-510 m, 24°44' S, 168°07' E: *Sassia remensa* (1medI).
Sta. CP23.-270-290 m, 24°43' S, 168°08' E: *Sassia remensa* (5medI), *Distorsio habei* (2), *Bursa latitudo* (7).
Sta. CP25.-230-235 m, 24°44' S, 168°09' E: *Sassia remensa* (2medI), *Bursa latitudo* (1), *B. quirihorai* (1).
Sta. DW40.-240-300 m, 23°41' S, 168°01' E: *Halgyrineum louisae* (1), *Sassia remensa* (2SR, 8medLI, 3medLM), *Distorsio habei* (1), *Bursa latitudo* (7), *B. quirihorai* (2 lv).
Sta. CP44.-230-250 m, 23°41' S, 168°01' E: *Sassia remensa* (3medLI), *Distorsio habei* (1).
Sta. CP45.-270-290 m, 23°40' S, 168°01' E: *Sassia remensa* (1medR), *Bursa quirihorai* (1).

Cruise BATHUS 2, N.O. *"Alis"*, coll. P. Bouchet & B. Richer de Forges-ORSTOM, May 1993. Station list and narrative: RICHER DE FORGES & CHEVILLON (1996).

Sta. DW714.-124 m, 22°38' S, 167°10' E: *Gyrineum longicaudatum* (1), *G. lacunatum* (1), *Cymatium comptum* (1).
Sta. DW717.-350-393 m, 22°44' S, 167°17' E: *Gyrineum longicaudatum* (1), *Distorsio decipiens* (2 large; 1 NZGS WM15819)
Sta. DW724.-344-358 m, 22°48' S, 167°26' E: *Sassia remensa* (4SR, 3medR, 3medI).
Sta. DW729.-400 m, 22°52' S, 167°12' E: *Sassia remensa* (1medR), *Distorsio perdistorta* (1 large lv), *Bursa fijiensis* (1).
Sta. DW730.-397-400 m, 23°03' S, 166°58' E: *Sassia remensa* (111; 40SR, 6medR, 71medI, 4medM; 10 NZGS WM15835), *Bursa fijiensis* (2), *B. latitudo* (1), *Personopsis purpurata* (1), *P. trigonaperta* (1 mature).
Sta. DW731.-300-370 m, 22°49' S, 166°45' E: *Sassia remensa* (2SR, 2medM, 1medR).
Sta. DW733.-520 m, 22°55' S, 166°49' E: *Sassia remensa* (2medR).
Sta. CP735.-530-570 m, 23°02' S, 166°56' E: *Distorsionella lewisi* (1 lv, largest seen).
Sta. CP742.-340-470 m, 22°33' S, 166°26' E: *Sassia remensa* (1medI).
Sta. DW758.-377-386 m, 22°18' S, 166°11' E: *Sassia remensa* (2SR, 3medR).
Sta. CP759.-370-420 m, 22°18' S, 166°10' E: *Sassia remensa* (2medR).
Sta. CP760.-455 m, 22°19' S, 166°11' E: *Sassia remensa* (5medR, 2medI).
Sta. CP761.-490-500 m, 22°19' S, 166°11' E: *Sassia remensa* (1SR).
Sta. CP765.-600-630 m, 22°10' S, 166°03' E: *Sassia remensa* (1medI).

Cruise BATHUS 3, N.O. *"Alis"*, coll. P. Bouchet, B. Richer de Forges-ORSTOM & A. Warén, November-December 1993. Station list and narrative: RICHER DE FORGES & CHEVILLON (1996).

Sta. DW781.-625-640 m, 23°54' S, 169°46' E: *Distorsionella lewisi* (1 lv.).
Sta. DW785.-607-608 m, 23°56' S, 169°46' E: *Distorsionella lewisi* (1 large).
Sta. DW800.-655 m, 23°35' S, 169°37' E: *Distorsionella lewisi* (1).
Sta. CP804.-244-278 m, 23°41' S, 168°00' E: *Bursa latitudo* (3).
Sta. CP805.-278-310 m, 23°41' S, 168°01' E: *Sassia remensa* (1medM, 2LM), *Bursa latitudo* (4), *B. quirihorai* (1 lv).
Sta. CP806.-308-312 m, 23°42' S, 168°01' E: *Sassia remensa* (1medM), *Bursa quirihorai*.
Sta. CP811.-383-408 m, 23°41' S, 168°15' E: *Sassia remensa* (6IR, 2LR).
Sta. CP814.-444-530 m, 23°48' S, 168°17' E: *Sassia remensa* (1medR).
Sta. DW816.-380-391 m, 23°41' S, 168°15' E: *Sassia remensa* (1LR).
Sta. DW818.-394-410 m, 23°44' S, 168°16' E: *Sassia remensa* (1SR, 18medR).
Sta. DW827.-381-469 m, 23°22' S, 168°00' E: *Sassia remensa* (1SR, 18medI), *Personopsis purpurata* (1).
Sta. DW829.-386-390 m, 23°21' S, 168°02' E: *Sassia remensa* (1medI).
Sta. DW830.-361-365 m, 23°20' S, 168°01' E: *Bursa fijiensis* (1 lv), *B. latitudo* (1), *B. quirihorai* (1 lv).
Sta. DW838.-400-402 m, 23°01' S, 166°56' E: *Sassia remensa* (81; 26SR, 3medM, 52medI), *Bursa fijiensis* (5), *Distorsio perdistorta* (1 lv adult, 1 juv.).
Sta. CP847.-405-411 m, 23°01' S, 166°58' E: *Sassia remensa* (2medM).

Cruise CALSUB, N.O. *"Cyana"*, February-March 1989. Station list and narrative: ROUX (1994).

Dive 21.-340 m, 22°45' S, 167°09' E: *Charonia lampas* (1 large lv, dried animal intact).

LOYALTY RIDGE

Cruise MUSORSTOM 6, N.O. *"Alis"*, coll. P. Bouchet & B. Richer de Forges, February 1989. Station list and narrative: RICHER DE FORGES (1990).

Sta. DW391.-390 m, 20°47' S, 167°06' E: *Gyrineum hirasei* (1 small), *Sassia remensa* (4medR, 2medI), *Bufonaria ignobilis* (1), *Distorsio decipiens* (1).

Sta. DW392.-340 m, 20°47' S, 167°05' E: *Sassia remensa* (1SR, 1medR), *Bufonaria ignobilis* (1).
Sta. DW397.-380 m, 20°47' S, 167°05' E: *Gyrineum hirasei* (1 small), *Bursa quirihorai* (2), *Distorsio decipiens* (1).
Sta. DW398.-370 m, 20°47' S, 167°06' E: *Biplex pulchra* (1), *Sassia remensa* (1medM), *Bursa quirihorai* (2), *Distorsio decipiens* (1).
Sta. DW399.-282 m, 20°42' S, 167'00' E: *Sassia remensa* (23: 6SR, 2medI, 13LI, 2LM), *Bursa latitudo* (1), *B. quirihorai* (2), *Bufonaria nobilis* (1), *Distorsio graceiellae* (1, incomplete), *D. habei* (1).
Sta. CP401.-270 m, 20°42' S, 167°00' E: *Sassia remensa* (2LI).
Sta. DC402.-520 m, 20°30' S, 166°49' E: *Sassia remensa* (1SR).
Sta. DW406.-373 m, 20°41' S, 167°07' E: *Sassia remensa* (29; 3SR, 12medR, 13medI, 1medM), *Bursa fijiensis* (4; 2 lv).
Sta. DW407.-360 m, 20°41' S, 167°07' E: *Sassia remensa* (2medI, 3medR, 1LR), *Bursa latitudo* (1).
Sta. CP408.-380 m, 20°41' S, 167°07' E: *Sassia remensa* (1medR).
Sta. DW410.-490 m, 20°38' S, 167°07' E: *Sassia remensa* (1medR), *Bursa fijiensis* (2; 1 lv).
Sta. DW413.-463 m, 20°40' S, 167°03' E: *Sassia remensa* (1medR).
Sta. DW417.-283 m, 20°42' S, 167°04' E: *Biplex pulchra* (1 juv.), *Sassia remensa* (9; 2SR, 2medR, 2medI, 2medM, 1LM), *Distorsio decipiens* (?) (1 juv.).
Sta. DW418.-283 m, 20°42' S, 167°03' E: *Sassia remensa* (7; 2SR, 1medR, 4 med), *Bursa latitudo* (2), *B. quirihorai* (3).
Sta. DW419.-283 m, 20°42' S, 167°03' E: *Sassia remensa* (1medI).
Sta. DW421.-245 m, 20°26' S, 166°40' E: *Sassia remensa* (1 LR), *Bufonaria ignobilis* (1).
Sta. DW422.-257 m, 20°26' S, 166°40' E: *Sassia remensa* (1LI), *Bursa latitudo* (1), *B. fijiensis* (1 lv), *Distorsio decipiens* (1).
Sta. DW423.-280 m, 20°26' S, 166°41' E: *Sassia remensa* (1SR, 1medR, 4medM).
Sta. DW428.-420 m, 20°24' S, 166°13' E: *Sassia remensa* (13; 4SR, 8medR, 1medI), *Bursa fijiensis* (3), *Distorsio perdistorta* (3; 1 lv).
Sta. DW430.-30 m, 20°21' S, 166°07' E: *Cymatium vespaceum* (1), *Bursa rosa* (1), *Distorsio anus* (1 lv, adult).
Sta. DW431.-21 m, 20°22' S, 166°10' E: *Cymatium labiosum* (1), *Bursa cruentata* (1 lv, adult), *B. granularis* (2).
Sta. DW432.-21 m, 20°21' S, 166°11' E: *Cymatium muricinum* (1), *Bursa granularis* (2; 1 NZGS_WM15786), *B. rosa* (1).
Sta. DW434.-23 m, 20°21' S, 166°09' E: *Cymatium mundum* (1), *Bursa granularis* (2).
Sta. DW436.-33 m, 20°20' S, 166°07' E: *Cymatium aquatile* (1).
Sta. DW439.-288 m, 20°46' S, 167°17' E: *Sassia remensa* (2SR, 1medR), *Distorsio decipiens* (1).
Sta. DW442.-200 m, 20°54' S, 167°17' E: *Biplex pulchra* (1), *Tutufa bufo* (1), *Distorsio decipiens* (1).
Sta. DW444.-300 m, 20°54' S, 167°18' E: *Bursa quirihorai* (1), *Distorsio habei* (1).
Sta. DW451.-330 m, 20°59' S, 167°25' E: *Sassia remensa* (2medR), *Distorsio decipiens* (2), *D. habei* (1).
Sta. DW452.-300 m, 21°00' S, 167°25' E: *Sassia remensa* (5LI, 1LM), *Distorsio decipiens* (3)
Sta. DW453.-250 m, 21°00' S, 167°27' E: *Sassia remensa* (1LI).
Sta. DW455.-260 m, 21°01' S, 167°26' E: *Distorsio habei* (1).
Sta. DW456.-240 m, 21°01' S, 167°26' E: *Biplex pulchra* (1).
Sta. DW457.-353 m, 21°00' S, 167°29' E: *Sassia remensa* (18; 3SR, 2medR, 12medI, 1medM), *Personopsis purpurata* (1).
Sta. DW458.-400 m, 21°01' S, 167°30' E: *Bursa fijiensis* (1 lv), *Distorsionella pseudaphera* (2).
Sta. DW459.-425 m, 21°01' S, 167°31' E: *Sassia remensa* (20; 5SR, 13medR, 2medI), *Bursa fijiensis* (1 lv).
Sta. DW460.-420 m, 21°02' S, 167°31' E: *Sassia remensa* (11 med; 7R, 4I).
Sta. DW461.-240 m, 21°06' S, 167°26' E: *Bufonaria ignobilis* (1).
Sta. DW462.-200 m, 21°05' S, 167°27' E: *Biplex pulchra* (2 lv), *Gyrineum longicaudatum* (1), *Cymatium exaratum* (1).
Sta. DW464.-430 m, 21°02' S, 167°32' E: *Sassia remensa* (2medR, 1medI), *Bursa fijiensis* (1 lv), *Distorsionella pseudaphera* (1).
Sta. DW465.-480 m, 21°04' S, 167°32' E: *Sassia remensa* (1medR).
Sta. DW472.-300 m, 21°09' S, 167°55' E: *Sassia remensa* (1medM), *Bursa quirihorai* (3), *B. fijiensis* (1 lv).
Sta. DW473.-236 m, 21°09' S, 167°55' E: *Bursa quirihorai* (1).
Sta. DW478.-400 m, 21°09' S, 167°54' E: *Sassia remensa* (1SR, 2medM), *Bursa latitudo* (1), *Distorsionella pseudaphera* (2).
Sta. DW479.-310 m, 21°09' S, 167°55' E: *Sassia remensa* (1SR, 2medI), *Bursa quirihorai* (1).
Sta. DW480.-380 m, 21°08' S, 167°56' E: *Sassia remensa* (1SR, 5medI), *Bursa latitudo* (1), *Distorsio habei* (1).
Sta. DW481.-300 m, 21°22' S, 167°50' E: *Sassia remensa* (1SR, 1medI).
Sta. DW482.-375 m, 21°21' S, 167°47' E: *Sassia remensa* (2medR, 1medM).
Sta. DW485.-350 m, 21°23' S, 167°59' E: *Personopsis trigonaperta* (1 small specimen).
Sta. DW487.-500 m, 21°23' S, 167°46' E: *Sassia remensa* (5medR, 1medI), *Bursa fijiensis* (1 lv), *Bursa latitudo* (1), *Distorsio perdistorta* (1 juv.).

Cruise CALSUB, N.O. *"Cyana"*, February-March 1989. Station list and narrative: ROUX (1994).

Dive 5.- 150-954 m, 20°47' S, 167°01' E: *Bursa latitudo* (1).
Dive 9.- 256 m, 20°53' S, 167°03' E: *Distorsio habei* (1).

Cruise VOLSMAR, N.O. *"Alis"*, coll. B. Richer de Forges-ORSTOM, May-July 1989. Station list and narrative: RICHER DE FORGES (1993).

Sta. DW37.-500-550 m, 22°23' S, 168°43' E: *Distorsionella lewisi* (1).
Sta. DW38.-380-420 m, 22°22' S, 168°44' E: *Sassia remensa* (1SR, 1medR).
Sta. DW39.-280-305 m, 22°20' S, 168°44' E: *Distorsio habei* (1).
Sta. DW40.-275-295 m, 22°20' S, 168°41' E: *Sassia remensa* (1medM).
Sta. DW41.-195-250 m, 22°19' S, 168°41' E: *Sassia remensa* (1LI), *Bursa latitudo* (3), *Distorsio euconstricta* (1), *D. graceiellae* (1 small but mature).

NEW HEBRIDES ARC

Cruise VOLSMAR, N.O. *"Alis"*, coll. B. Richer de Forges-ORSTOM, May-July 1989. Station list and narrative: RICHER DE FORGES (1993).

Hunter & Matthew Volcanoes

Sta. DW7.-325-400 m, 22°26' S, 171°44' E: *Sassia remensa* (2LM), *Bursa quirihorai* (1), *Distorsio habei* (2).
Sta. DW9.-275-300 m, 22°23' S, 171°41' E: *Distorsio habei* (1).
Sta. DW16.-420-500 m, 22°25' S, 171°41' E: *Sassia remensa* (1SR, 2medR, 2medM, 2LM).
Sta. DW17.-260-300 m, 22°23' S, 171°41' E: *Sassia remensa* (2SR, 2medI), *Bursa quirihorai* (1).

Gemini Seamounts

Sta. DW49.-285 m, 21°00' S, 170°04' E: *Sassia remensa* (1medI).
Sta. DW50.-425 m, 20°59' S, 170°04' E: *Sassia remensa* (1SR, 1LM), *Bursa latitudo* (1, juv. red-brown).
Sta. DW51.-450 m, 20°59' S, 170°03' E: *Sassia remensa* (13; 2medI, 11medLR; 3 NZGS WM15838), *Personopsis trigonaperta* (1).
Sta. DW59.-320 m, 21°00' S, 170°17' E: *Bursa latitudo* (1, juv. red-brown).

Cruise SMIB 9, N.O. *"Alis"*, coll. ORSTOM, March 1993.

Sta. DW16.- 360-500 m, 22°25' S, 171°42' E: *Sassia remensa* (4SR, 1SI, 3SM), *Distorsio habei* (1 dd, crabbed).

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Valid names are in **bold**. Page numbers in *italics* refer to illustrations; numbers in **bold** indicate full taxonomic treatments.

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Alan BEU is senior scientist with the New Zealand Institute of Geological and Nuclear Sciences. He is the author of numerous works on the Tertiary and Recent mollusc fauna of New Zealand. He is the world authority on the gastropod families covered in this volume, which will appeal to the experienced collector and professional taxonomist alike.

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INDO-WEST PACIFIC RANELLIDAE, BURSIDAE AND PERSONIDAE (MOLLUSCA: GASTROPODA)

A monograph of the New Caledonian fauna and revisions of related taxa

Alan G. BEU