

Conus monachus LINNÉ, 1758

(Plate 15, Figures 9-14; Map 26)

highly speckled by scattered white flecks. Larval shell white in E. Africa and Oman, grey to pale brown in India and W. Thailand, grey to red or orange in the Philippines, translucent grey in W. Australia, grey to orange in N. Australia and pale reddish brown in Solomon Is. Teleoconch spire with radial markings, matching surface and background clouds of last whorl in colour; on early postnuclear sutural ramps, maculation often reduced to regularly set dots at outer margin. Aperture white to bluish grey.

Periostracum yellowish or olive to reddish brown, varying in thickness, translucent to opaque, sometimes within the same specimen, with widely spaced tufted spiral ridges and fringed shoulders.

Dorsum of foot cream, mottled with orange or brown; a dotted black pre-marginal line merges into a large spotted black trilobate area at the centre of the anterior part. Sole of foot reddish brown or mottled brown, darker medially. Sides of foot white, mottled with brown. Rostrum buff, variously mottled with brown. Tentacles white, may be tipped with tan. Siphon white to buff, mottled with brown and red on dorsal half; tip of siphon white (Pl. 74, Fig. 28) (Kohn, 1978a & unpubl. observ.; Chaberman, pers. comm., 1981).

Radular teeth with a strong adapical barb opposite a large second barb; backward-pointing third barb with a recurved tip; neither serration nor basal spur present (Peile, 1939).

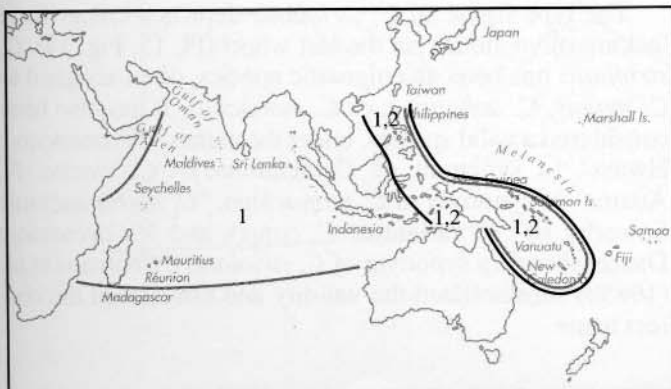
Habitat and Habits: Intertidal and uppermost subtidal; in sand under rocks, coral rubble and crevices beneath corals. In mixed colonies with *C. monachus* in E. New Britain (Richards, 1989).

C. achatinus is known to prey on small fishes (Kohn & Nybakken, 1975).

Egg capsules (N. Australia) within the same cluster vary from 10 x 7 mm to 12-13 x 6-7 mm; capsules of larger females 17 x 13 mm or 19 x 10 mm. Capsules attached individually to hard substrate, e.g. bivalve shells.

Discussion: *C. achatinus* is similar to *C. monachus*, *C. striolatus* and *C. catus* in shell characters and feeding type; for comparison, see the Discussions of those species.

Map 26

1: *C. achatinus* 2: *C. monachus*

- 1758 *Conus monachus* Linné, Syst. Nat., 10 ed., 1: 714, no. 262
 1791 *Conus nebulosus* Gmelin, Syst. Nat., 13 ed., 1: 3387, no. 29
 1798 *Cucullus cinerarius* Röding, Mus. Bolten., 2: 46, no. 590/89
 1798 *Cucullus maculosus* Röding, Mus. Bolten., 2: 48, no. 620/112
 1798 *Cucullus guttatus* Röding, Mus. Bolten., 2: 48, no. 621/113
 1848 *Conus contusus* Reeve, Conch. Icon., 1, *Conus* suppl.: Pl. 2 sp. 276
 1854 *Conus vinctus* A. Adams, Proc. Zool. Soc. London, 1853: 118
 1898 *Conus barbara* Brazier, Proc. Linn. Soc. New South Wales, 22: 781
 1898 *Conus frostiana* Brazier, Proc. Linn. Soc. New South Wales, 22: 781

Types: *C. monachus*: Lectotype (Kohn, 1963) figured in Regenfuss (1758: Pl. 12 fig. 68) (43 x 26 mm); *C. nebulosus*: Lectotype (Kohn, 1966) in MSNP (41 x 24 mm); *C. cinerarius*: Lectotype (Kohn, 1975) figured in Knorr (1768: Pl. 16 fig. 3) (43 x 21 mm); *C. maculosus*: Lectotype (Kohn, 1975) figured in Knorr (1771: Pl. 18 fig. 4) (34 x 19 mm); *C. contusus*: Holotype in BMNH (32.5 x 15 mm); *C. vinctus*: Type in BMNH (40 x 21 mm); *C. barbara*: Holotype in SAM (40 x 20 mm); *C. frostiana*: Holotype in SAM (18 x 9.5 mm).

Type Localities: *C. contusus*: "Moluccas"; *C. vinctus*: "Australia"; *C. barbara*: "Solomon Islands"; *C. frostiana*: "Solomon Islands."

Range: Indonesia to Philippines and Melanesia; additional localities in literature probably refer to *C. achatinus*.

Description: Medium-sized to moderately large, moderately solid. Last whorl ventricosely conical, outline variably convex. Aperture wider at base than near shoulder. Shoulder angulate, occasionally subangulate. Spire of low to moderate height, outline straight to slightly concave. Larval shell of 2.75-3 whorls, maximum diameter about 0.7 mm. First 4-5 postnuclear whorls weakly tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1-2 increasing to 4-6 spiral grooves; spiral sculpture weak on latest ramps. Last whorl with rather widely set, sometimes granulose spiral ribs on basal fourth or third.

***C. monachus* Shell Morphometry**

L	35 - 70 mm
RW	0.15 - 0.28 g/mm (L 35-50 mm)
RD	0.57 - 0.65
PMD	0.74 - 0.85
RSH	0.10 - 0.16

Ground colour white, heavily suffused with various shades of blue-grey or beige. Last whorl with a nebulous pattern of greenish grey to blackish brown axial flames, clouds and flecks often coalescing into a coarse irregular meshwork. On either side of centre, axial markings denser and emphasized by an underlying greenish beige to tan

spiral band; a paler spiral band often below shoulder. Spiral rows of brown dots and dashes, with or without intermittent white dashes, cover entire last whorl or are restricted to the basal area. Larval whorls brown. Teleoconch sutural ramps heavily maculated with dark brown radial markings, sometimes with regularly spaced dots at both margins of the ramp. Aperture bluish white.

Habitat and Habits: Shallow subtidal; in sand, muddy sand or mud; in mixed colonies with *C. achatinus* in E. New Britain (Richards, 1989).

Discussion: *C. monachus* is often confused with *C. achatinus*. *C. monachus* appears rather uniformly greenish blue, while *C. achatinus* is more variable in colour and pattern; the latter species has more pronounced dotted spiral lines on its last whorl, more tuberculate postnuclear whorls, a lighter-coloured larval shell, and more prominent spiral sculpture on both last whorl and sutural ramps. Where both species occur together, they apparently do not intergrade, supporting separation at the species level. For comparison with *C. striolatus*, see the Discussion of that species.

C. contusus (Pl. 15, Fig. 13) is probably a colour variant of *C. monachus* with a solid beige shell with sparse pale spiral lines, but this has not been conclusively determined.

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Conus striolatus KIENER, 1845

(Plate 15, Figures 15-17; Plate 75, Figure 29;
Plate 79, Third row, right; Map 27)

1845 *Conus striolatus* Kiener, Coq. Vivant., 2: Pl. 105 fig. 1; 1849: 266

1910 *Conus magus* var. *decurtata* Dautzenberg, J. Conchyl. (Paris), 58: 26

Types: *C. striolatus*: Original figure 28.5 x 15 mm; *C. m.* var. *decurtata*: Lectotype (Coomans et al., 1985b) in IRSN (28.5 x 16.5 mm).

Type Localities: *C. m.* var. *decurtata*: "L'Ile de Rua-Sura (Archipel Salomon)."

Range: W. Thailand to Micronesia, Taiwan to Queensland; probably also Seychelles.

Description: Moderately small to medium-sized, moderately solid. Last whorl usually ventricosely conical to ovate; outline variably convex. Shoulder angulate to almost rounded. Spire of moderate height, outline straight to slightly convex. Larval shell multispiral, maximum diameter about 0.7 mm. Teleoconch sutural ramps flat to concave, with 2 increasing to 4-6 spiral grooves. Last whorl with widely spaced spiral ribs at base.

Ground colour pale grey to pale tan. Last whorl with olive or brown axial clouds, emphasized by bordering blue-grey background clouds, fusing into an interrupted or con-

tinuous spiral band on each side of centre. Spiral rows of alternating brown to black and white dots and dashes extend from base to shoulder. In some specimens, clouds absent from last whorl. Larval whorls pink to orange. Late sutural ramps with tan to olive radial streaks and blotches. Aperture white to bluish white.

C. striolatus Shell Morphometry

L	25 - 40 mm
RW	0.10 - 0.27 g/mm
RD	0.61 - 0.67
PMD	0.71 - 0.80
RSH	0.12 - 0.19

Dorsum of foot beige medially, with tan radial streaks; a dotted black pre-marginal line merges into a prominent saddle-shaped or irregular black blotch near anterior margin; marginal zone either alternating black and white or buff to dark orange variably mottled with brown laterally and posteriorly; white spots sometimes occur near anterior corners. Sole of foot grey to buff, with fewer tan streaks than dorsum. Rostrum buff to pale orange, occasionally mottled with brown dorsally. Tentacles white to buff, sometimes tipped with brown. Siphon white or tan, mottled darker brown dorso-laterally; tip buff to pale orange (Pl. 75, fig. 29; Pl. 79, Third row, right) (Chaberman, pers. comm., 1981; Kohn, unpubl. observ.).

Habitat and Habits: Intertidal and upper subtidal, on muddy sand. Sympatric with *C. achatinus* and *C. monachus* in New Britain (Richards, 1989).

In Palau, egg diameter of 224 µm suggests a minimum pelagic period of about 21 days (Perron & Kohn, 1985, as "*C. nigropunctatus*").

Discussion: *C. achatinus* is larger (40-82 mm), often with a narrower last whorl (RD 0.54-0.69) and less regular colour pattern, and with distinctly tuberculate early postnuclear whorls. *C. monachus* is also larger, blue clouds and blotches dominate its last whorl, and its larval shell is brown. For comparison with *C. catus*, see the Discussion of that species.

The type figure of *C. striolatus* depicts a colour form lacking olive clouds on the last whorl (Pl. 15, Fig. 17). *C. striolatus* has been an enigmatic species, often assigned to *C. magus*, *C. achatinus*, or *C. monachus*. It has also been considered a valid species, under the names "*C. ranunculus* Hwass" (a synonym of *C. achatinus*), "*C. vinctus* A. Adams" (a synonym of *C. monachus*), "*C. nigropunctatus* Sowerby III" (a variant of *C. catus*), and "*C. decurtatus* Dautzenberg" (a synonym of *C. striolatus*). Coomans et al. (1985b) substantiated the validity and established the correct name.

***Conus catus* HWASS in BRUGUIÈRE, 1792**

(Plate 15, Figures 18-28; Plate 75, Figure 30;
Plate 79, Second row, middle and right; Map 27)

- 1792 *Conus catus* Hwass in Bruguière, *Encycl. Méth.*, 1: 707-708, no. 99
1798 *Cucullus nutilus* Röding, *Mus. Bolt.*, 2: 46, no. 586/85
1833 *Conus discrepans* Sowerby I, *Conch. Ill.*: Pt. 29, fig. 28
1858 *Conus nigropunctatus* Sowerby II, *Thes. Conch.*, 3, *Conus*: 38, no. 332, pl. 15 fig. 342
1863 *Conus purus* Pease, *Proc. Zool. Soc. London*, 1862: 279
1877 *Conus reflectus* Sowerby III, *Proc. Zool. Soc. London*, 1876: 754, pl. 75 fig. 6
1887 *Conus reflexus* Sowerby III, *Thes. Conch.*, 5, suppl.: 252 (emendation for *C. reflectus* Sowerby III)
1937 *Conus catus* var. *rubrapapillosa* Dautzenberg, *Mém. Mus. Roy. Hist. Nat. Belgique*, 2 (18): 62, pl. 1 fig. 7
1937 *Conus catus* var. *fusoolivaceus* Dautzenberg, *Mém. Mus. Roy. Hist. Nat. Belgique*, 2 (18): 62, pl. 1 fig. 8
1971 *Conus catus* var. *granulata* nov. var. Wils et al., *Fam. Conidae*: 60, no. 94
1971 *Conus nigropunctatus elatensis* Wils et al., *Fam. Conidae*: 61, no. 97
1971 *Conus nigropunctatus* var. *peledi* Wils et al., *Fam. Conidae*: 64, no. 98, pl. 11 fig. 1
1991 *Dendroconus (Floraconus) morrisoni* G. Raybaudi Massilia, *La Conchiglia*, 22 (260): 20-25, text figs.

Types: *C. catus*: Lectotype (Kohn, 1968) in MHNG (40 x 23 mm); *C. nutilus*: No type; *C. discrepans*: Lectotype (Kohn, 1992) figured in Sowerby (1833: Pt. 29 fig. 28) (27 x 17 mm); *C. nigropunctatus*: Lectotype (Wils, 1986) figured in Sowerby II (1858: Pl. 15 fig. 342) (30 x 16 mm); *C. purus*: Holotype in MCZ (40 x 21 mm); *C. reflectus*: Holotype in NMWC (24.5 x 15.5 mm); *C. c.* var. *fusoolivaceus*: Original figure 34 x 20 mm; *C. c.* var. *rubrapapillosa*: Original figure 36 x 24 mm; *C. n. elatensis*: Lectotype (Coomans et al., 1986) in ZMA (28 x 15 mm); *C. n.*

var. *peledi*: Original figure 43 x 24 mm; *D. morrisoni*: Holotype in MHNG (27.5 x 16 mm).

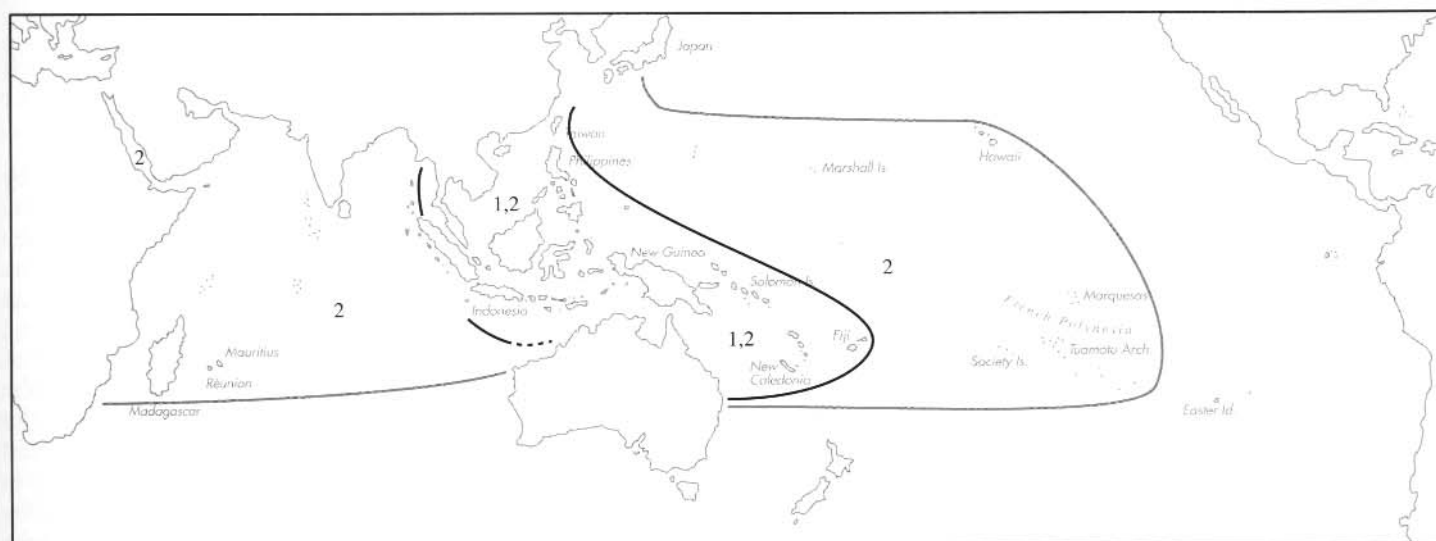
Type Localities: *C. catus*: "Mauritius (Isle de France)" (Kohn, 1968); *C. nigropunctatus*: "Eilat, Gulf of Aqaba, Red Sea" (Wils, 1986); *C. purus*: "Niihau Is." (Pease, *J. Conchol.*, 19: 89); *C. c.* var. *fusoolivaceus* & var. *rubrapapillosa*: "Tjilaoet Eureun"; *C. c.* var. *granulata*: "Malaita (Solomons eilanden)"; *C. n. elatensis*: "Nordelijk deel Golf van Akaba"; *C. n.* var. *peledi*: "Eilat, in de Golf van Akaba (Rode zee)"; *D. morrisoni*: "Ashmore Reef located at 12° 20' N, 122° E in Timor Sea approximately 610 kms north of Broome in N. W. Australia."

Range: Entire Indo-Pacific; in the Red Sea and Oman only form *nigropunctatus*.

Description: Moderately small to medium-sized, moderately solid to solid; relative weight of similarly sized specimens may vary by 40%. Last whorl usually ventricosely conical to broadly and ventricosely conical; outline variably convex adapically and mostly straight below; left side occasionally sigmoid. Shoulder angulate to rounded. Spire of low to moderate height, outline slightly concave to slightly convex. Larval shell multispiral, maximum diameter 0.6-0.7 mm. First 2-3 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1 increasing to 4-8 spiral grooves; latest ramps with additional subsutural spiral striae. Last whorl variable in spiral sculpture. Shells with well separated, weak spiral ribs on basal third vary continuously with shells having strong, variably broad ribs or ribbons, usually minutely to strongly granulose and often with 1-2 fine smooth ribs in between, from base to shoulder.

Form *nigropunctatus* (Pl. 15, Figs. 24-27) with a slightly less solid shell. Last whorl ventricosely conical or conoid-cylindrical. Spire outline either straight or slightly convex. First 3-5 postnuclear whorls tuberculate. Late sutural ramps with 5-6 spiral grooves. Last whorl consistently with a few well separate spiral ribs near base.

Map 27



1: *C. striolatus* 2: *C. catus*

***C. catus* Shell Morphometry**

L	25 - 52 mm
- form <i>nigropunctatus</i>	30 - 50 mm
RW	0.15 - 0.50 g/mm
- form <i>nigropunctatus</i>	0.13 - 0.34 g/mm
RD	0.62 - 0.78
- form <i>nigropunctatus</i>	0.61 - 0.68
PMD	0.78 - 0.87
- form <i>nigropunctatus</i>	0.76 - 0.85
RSH	0.10 - 0.19

Ground colour white to bluish grey. Pattern of last whorl variable in colour, arrangement and extent. Colour ranges from yellowish brown to olive-brown, blackish brown and orange or red. Shells with sparse small flecks on each side of centre intergrade with solidly dark shells except for a narrow spiral ground-colour band at centre. Surface pattern emphasized by bluish grey or brownish violet background clouds. Spiral rows of brown dots and dashes extend from base to shoulder, either containing intermittent white markings or fusing into solid dark lines. Rows variably spaced and ranging from complete absence to dominant pattern element. Larval whorls usually red, less frequently white to brown. Teleoconch sutural ramps with radial streaks or confluent blotches that match pattern elements of last whorl in colour. Aperture white or cream.

Periostracum yellowish brown, smooth, varying in thickness as well as in translucency (Kohn, 1959a, 1978a; Cernohorsky, 1964).

Form *nigropunctatus* with a more greyish ground. Pattern of last whorl consists of light to blackish brown surface clouds and blue-grey background clouds. Clouds usually aligned in a spiral row on each side of centre, sometimes absent or fusing into large solid zones. Spiral rows of dots and dashes always pronounced, with regularly or irregularly intermittent white markings. Apex pink to orange. Early postnuclear sutural ramps with regularly spaced dark brown dots at outer margin; in late whorls, dots sparse or missing, additional brown radial streaks or blotches often present. Aperture white.

Periostracum yellow, thin, translucent, smooth.

In typical form, foot grey to pale brown; dorsum variously mottled with tan to blackish brown, darker anteriorly; sole usually mottled with brown, occasionally immaculate and brighter at ends. Rostrum white to buff, mottled or longitudinally streaked with brown, more densely proximally. Tentacles white. Siphon white to grey, sometimes grading to buff or brown on dorsal side of proximal portion; mottled with brown, more heavily dorsally and proximally (Pl. 75, Fig. 30; Pl. 79, Second row, middle and right) (Kohn, 1959a, 1978a & unpubl. observ.; Chaberman, pers. comm., 1981); form *nigropunctatus* matching typical form in colour pattern (Fainzilber et al., 1992); in form *morrisoni*, body colouration similar except tip of siphon pink to orange (G. Raybaudi, 1991).

In typical form, radular teeth with 3 strong barbs adaptically, with a recurved tip on posterior barb; neither serration nor basal spur present (Peile, 1939; James, 1980; Kohn, unpubl. observ.; Nybakken, 1990).

Habitat and Habits: Intertidal to about 20 m; in protected and exposed sites on benches, rocky shores and subtidal coral reef flats, occupying crevices, pockets or patches of sand with or without vegetation, bare limestone, algal turf and coral rubble. On intertidal benches, the peak density of animals is found halfway across the habitat (Kohn, 1959a, b, 1960, 1978a; Kohn & Nybakken, 1975; Cernohorsky, 1964; Huish, 1978; Kay, 1979; Estival, 1981; Grosch, pers. comm., 1989). Form *nigropunctatus* on coral reefs on sand bottom near coral rubble or buried amongst eel-grass roots (Sharabati, 1984; Fainzilber et al., 1992). Form *morrisoni* reported in 3-5 m, in channels on coarse sand and rubble among live coral (G. Raybaudi, 1991).

Typical form of *C. catus* and form *nigropunctatus* feed on small fishes. The venom is toxic to fishes and small mammals but has no effects on invertebrates; it may be dangerous to man (Kohn, 1959b; Endean & Rudkin, 1963; Fainzilber et al., 1992).

Egg capsules with a tall stalk. In Hawaii, capsules of 10-12 x 8.5-10 mm contain an average of 1,650 eggs. Egg diameter is 220 µm in Hawaii, 231 µm in Palau and 241 µm in the E. Indian Ocean, suggesting minimal pelagic periods of 22, 20 or 19 days (Kohn, 1961a; Perron & Kohn, 1985).

Discussion: *C. catus* is allied to *C. achatinus*, *C. monachus* and *C. striolatus*. *C. achatinus* attains larger size, has a less solid shell and more tuberculate postnuclear whorls. It has usually a narrower last whorl (RD 0.54-0.69) and its periostracum has tufted spiral ridges and fringed shoulders. *C. striolatus* tends to have a more ovate last whorl (PMD 0.71-0.80) than *C. catus* and lacks tuberculate early postnuclear whorls. Both *C. achatinus* and *C. striolatus* can also be distinguished from *C. catus* by their animals having a large saddle-shaped black blotch on the anterior dorsum of the foot. *C. monachus* has a less solid shell, attains larger size but has a relatively narrower last whorl, and usually has a more angulate shoulder as well as weaker spiral sculpture on the late sutural ramps. Moreover, it is set apart by its nebuloze pattern and its darker larval shell. For comparison of *C. catus* with *C. cocceus*, see the Discussion of the latter species.

C. nigropunctatus is considered a distinct species by Coomans et al. (1985b) and Richard (1990), and as a variety of *C. catus* by E. A. Smith (1891). Specimens from Red Sea and Oman and Mozambique conforming to its description intergrade with typical *C. catus* from the W. Indian Ocean in all conchological characters. *C. morrisoni* (Pl. 15, Fig. 28) is considered as a distinctively coloured local form of *C. catus* (pattern orange to red) from Ashmore Reef in the Timor Sea and from Thevenard Id., W. Australia. The synonyms of typical *C. catus* refer to infrasubspecific forms, which are not restricted geographically. *C. discrepans* and *C. purus* seem to refer to completely white shells, and *C. reflexus* is based on a shell with sparse orange flecks on a white ground.

Conus fischoederi RÖCKEL & DA MOTTA, 1983

(Plate 15, Figures 29-33; Map 28)

1983 *Conus fischoederi* Röckel & da Motta, Bull. Inst. Malac., Tokyo, 1 (8): 117-118, pl. 40 figs. 3, 4

Type: Holotype in SMF (33.5 x 16.5 mm).

Type Locality: "Coron, Palawan, Philippines."

Range: Philippines (Palawan, Sulu Sea), W. Thailand.

Description: Moderately small to medium-sized, moderately solid. Last whorl ventricosely conical; outline convex adapically, less so or straight below; left side sigmoid. Shoulder subangulate. Spire of moderate height, outline slightly concave or slightly sigmoid. Larval shell multispiral, maximum diameter about 0.8 mm. First 4-5 postnuclear whorls tuberculate. Teleoconch sutural ramps flat, with 2 increasing to 4 spiral grooves; additional spiral striae on latest ramps. Last whorl with weak spiral threads, grading to pronounced ribs near base.

C. fischoederi Shell Morphometry

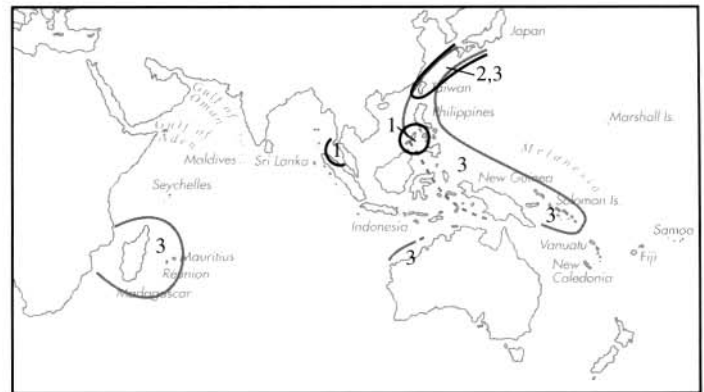
L	30 - 49 mm
RW	0.10 - 0.22 g/mm
RD	0.54 - 0.62
PMD	0.77 - 0.85
RSH	0.11 - 0.17

Ground colour white. Last whorl with medium-sized to large, orange to brown axial blotches, usually connected to an irregular meshwork that often outlines triangular white areas. Shells with reduced reticulate pattern intergrade with shells having last whorl overlaid with orange except for white blotches at centre and below shoulder. Dotted to solid orange to brown spiral lines extend from base to shoulder but are often reduced. Postnuclear sutural ramps with radial blotches of orange to dark brown. Aperture white.

Habitat and Habits: Reported from about 30 m; living on coral rubble and patches of sand.

Discussion: *C. fischoederi* is similar in shape to *C. achatinus*, *C. monachus*, *C. striolatus* and *C. catus* but differs so clearly from all these species in its colour pattern as to exclude any confusion. For comparison of *C. fischoederi* with *C. magus*, see the Discussion of that species. *C. fischoederi* may be very similar in colour pattern to *C. spectrum* form *conspersus* from Moluccas and to *C. spectrum* from Philippines, mainly in the presence of dashed to solid brown spiral lines on the last whorl. However, differences from shells, original description and original figure of *C. conspersus* justify *C. fischoederi* as a provisionally valid species and the assignment of *C. conspersus* to *C. spectrum* (see Coomans et al., 1985a). For distinctions, see the Discussion of *C. spectrum*.

Map 28



1: *C. fischoederi* 2: *C. fulmen* 3: *C. kinoshitai*

Conus fulmen REEVE, 1843

(Plate 16, Figures 1-4; Map 28)

1833 *Conus modestus* Sowerby I, Conch. Ill.: Pt. 28, fig. 19 (unused senior synonym; referred to the ICZN, Kohn, 1991)

1843 *Conus fulmen* Reeve, Conch. Icon., 1, *Conus*: Pl. 39 sp. 215

1956 *Conus fulmen kirai* Kuroda, Venus, 19: 7-8

1970 *Conus (Chelyconus) wistaria* Shikama, Sci. Rep. Yokohama Natl. Univ., 2 (16): 24-25, text figs. 3, 4

Types: *C. modestus*: Lectotype (Kohn, 1992) figured in Sowerby (1833: Pt. 28 fig. 19) (48 x 22 mm); *C. fulmen*: Syntype in NMWC (71.5 x 36 mm); *C. f. kirai*: Holotype 65 x 33 mm acc. Kuroda; *C. wistaria*: Holotype in Shikama coll. (60.5 x 28.5 mm).

Type Localities: *C. modestus*: "Japan" (Kohn, 1992); *C. fulmen*: "Island of Capul, Philippines"; *C. fulmen kirai*: "Tanoura, Kii"; *C. wistaria*: "Bungo Channel."

Range: Japan to Taiwan.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl ventricosely conical; outline convex adapically, less so or straight below. Shoulder subangulate to rounded. Spire of low to moderate height, outline straight to slightly convex. Larval shell of about 2.75 whorls, maximum diameter about 0.9 mm. About first 4 postnuclear whorls tuberculate. Teleoconch sutural ramps convex to almost flat, with 2 increasing to 4 spiral grooves in early whorls, and many spiral striae in late whorls. Last whorl with wrinkled spiral ribs abapically, often followed by spiral threads.

C. fulmen Shell Morphometry

L	45 - 80 mm
RW	0.18 - 0.34 g/mm (L 45-65 mm)
RD	0.55 - 0.62
PMD	0.75 - 0.85
RSH	0.10 - 0.15

Colour violet blending with white. Last whorl encircled with continuous, broad or narrow, violet to tan bands above and below a narrow light band at centre. Solid or dotted brown spiral lines and dark brown axial blotches and flames vary in number, arrangement and prominence; form *kirai* (Pl. 16, Fig. 3) without axial flames and blotches. Larval whorls orangish red. Teleoconch sutural ramps with variably broad reddish to blackish brown radial blotches. Aperture white or pale violet.

Periostracum dark brown, thick, opaque.

Habitat and Habits: In 10-100 mm; typical form to 30 m, form *kirai* in 35-100 m.

Discussion: *C. fulmen* resembles *C. kinoshitai* and *C. circumcissus*; for comparison, see the Discussions of those species.

The holotype of *C. wistaria* is a light violet shell with only traces of spiral banding. Its shape and colouration favour provisional assignment to *C. fulmen*.

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Conus kinoshitai (KURODA, 1956)

(Plate 16, Figures 5-15; Map 28)

- 1956 *Chelyconus kinoshitai* Kuroda, Venus, **19**: 6-7, 4 (text fig. 7)
 1973 *Conus (Virgiconus) tamikoe* Shikama, Sci. Rep. Yokohama Natl. Univ., **2** (20): 7-8, pl. 8 figs. 8, 9 (misspelled as *C. tamikoana*)
 1979 *Conus (Strioconus) brontodes* Shikama, Sci. Rep. Yokosuka City Mus., **26**: 4-5, pl. 1 figs. 13, 14
 1979 *Conus (Chelyconus) kinoshitai* Shikama forma *calliginosus* nom. nov. Shikama, Sci. Rep. Yokosuka City Mus., **26**: 5, pl. 1 figs. 15, 16
 1979 *Conus (Chelyconus) kinoshitai* Shikama forma *tamikoana* Shikama, Sci. Rep. Yokosuka City Mus., **26**: 5-6, pl. 1 fig. 17

Types: *C. kinoshitai*: Holotype in KSM (71 x 35.5 mm); *C. tamikoe*: Holotype in KPF (84 x 39.5 mm); *C. brontodes*: Holotype in NSMT (46 x 23.5 mm); *C. k. f. calliginosus*: Specimen from which form described in coll. Kawamura (51.5 x 21.5 mm).

Type Localities: *C. kinoshitai*: "Kii"; *C. tamikoe*: "north of the Senkaku Islands"; *C. brontodes*: "off Taiwan."

Range: Japan to Philippines and Solomon Is.; also recorded from N. W. Australia, Mozambique, Madagascar, and Réunion.

Description: Moderately large to large, moderately solid to solid. Last whorl narrowly conical, conical or ventricosely conical; outline convex adapically, less so or straight below. Shoulder angulate to rounded. Spire of low to moderate height, outline straight to slightly convex. Larval shell of 3-3.5 whorls, maximum diameter about 1 mm. First 3.5-6 postnuclear whorls tuberculate. Teleoconch sutural ramps almost flat, with 2-4 increasing to 5-9 variably spaced spiral grooves; latest ramps usually with additional spiral striae. Basal third or sometimes half of last whorl with

weak to pronounced, variably spaced spiral ribs occasionally grading to ribbons posteriorly.

C. kinoshitai Shell Morphometry

L	55 - 94 mm
RW	0.20 - 0.77 g/mm
RD	0.48 - 0.58
PMD	0.76 - 0.91
RSH	0.07 - 0.18

Colour pale bluish to greyish violet, with scattered bluish grey streaks, dashes or spots on last whorl. Dark coloured and heavily patterned shells intergrade with light coloured and almost patternless ones. Usual pattern of last whorl with 3 interrupted or continuous reddish brown spiral bands, below shoulder and on both sides of centre; areas between variably mottled with reddish brown triangles, dots and axial lines; overlying spiral rows of brown dots and dashes vary considerably, and often contain light dashes basally. Base and siphonal fasciole often grey. Larval whorls white to brown. In typically patterned shells, teleoconch sutural ramps crossed by reddish to blackish brown streaks and blotches; in light-coloured shells, pattern reduction matches that of last whorl. Aperture white.

Periostracum olive, thin, translucent, with widely spaced or irregularly set tufted spiral ridges on last whorl; adapical ridges usually more closely set and sometimes obsolete, shoulder strongly or weakly tufted.

Habitat and Habits: In 20-240 m; in Philippines, form *tamikoe* in 240-400 m.

Discussion: *C. kinoshitai* resembles *C. fulmen*; in particular, the colour form *calliginosus* of *C. kinoshitai* (see below) resembles forms *kirai* and *wistaria* of *C. fulmen* in the plain pattern of brown spiral bands and interrupted lines. *C. fulmen* differs in its generally broader last whorl (RD 0.55-0.62), weaker spiral sculpture of the late sutural ramps, bright orange-red larval shell, and in its broader and darker blotches on the spire. In addition, its periostracum is darker, thicker and opaque and lacks tufted spiral ridges. Typical shells of these two species are easier to distinguish, because *C. fulmen* has a predominant colour pattern of dark brown axially arranged blotches and spiral lines, rather than the interrupted reddish brown spiral bands of *C. kinoshitai*. For comparison with *C. bruuni*, see the Discussion of that species.

C. tamikoe (Pl. 16, Figs. 12, 15) refers to a yellow colour variant of *C. kinoshitai*. Shikama used two spellings for this taxon: *C. tamikoe* with the description, *C. tamikoana* with the figures. We have accepted the first spelling. In 1979, Shikama described the same colour variant as form *tamikoana* of *C. kinoshitai*. Form *calliginosus* (Pl. 16, Fig. 14) is based on pale greyish violet shells with a variably reduced pattern and narrow last whorl. *C. brontodes* (Pl. 16, Fig. 13) most probably refers to a large subadult specimen

of *C. kinoshitai* with an exceptional low spire and conical shape.

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Conus bruuni POWELL, 1958

(Plate 16, Figures 16-21; Map 29)

1958 *Conus (Dauciconus) bruuni* Powell, Rec. Auckland Inst. Mus., 5: 84, pl. 10 fig. 3

Type: Holotype in AIM (43.5 x 21 mm; long term loan from ZMUC).

Type Locality: "Galathea St. 674, 29° 15' S; 177° 57' W; off Raoul Island, Kermadecs."

Range: Kermadec Is., Chesterfield Is., New Caledonia, and Loyalty Is.

Description: Medium-sized, moderately solid. Last whorl conical; outline convex at adapical half to three-fourths and straight (right side) or concave (left side) below. Shoulder angulate. Spire of low to moderate height, outline straight to slightly concave. Larval shell of about 3 whorls, maximum diameter 1.1-1.2 mm. First 2.5-3 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly concave, with 3 increasing to 8-11 spiral grooves; latest ramps with additional spiral striae. Last whorl with variably spaced, smooth spiral ribs on basal fourth; juveniles with granulose ribs from base to shoulder.

C. bruuni Shell Morphometry

L	35 - 61 mm
RW	0.12 - 0.32 g/mm
RD	0.55 - 0.66
PMD	0.84 - 0.91
RSH	0.10 - 0.18

Colour light violet to light purple, occasionally pale yellow. Last whorl with pale orange to dark reddish brown flecks or clouds forming 2-3 spiral bands, well below and just above centre and often below shoulder. Base and siphonal fasciole may be lighter in colour. Larval shell grey. Early teleoconch sutural ramps white; late ramps violet, with brown radial blotches producing tessellated white and brown outer margins. Aperture matches exterior background in colour.

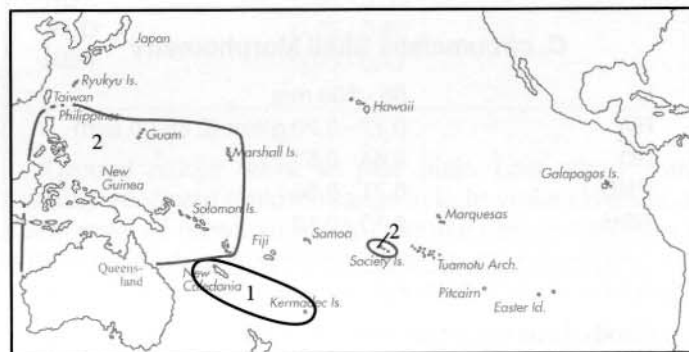
Periostracum yellowish to light brown, translucent, with finely tufted ridges following ribs of the last whorl.

Habitat and Habits: In 60 to 430 m; in 60-85 m at Raoul Id.; in 200-430 m at Chesterfield Is., New Caledonia and Loyalty Is.

Discussion: *C. bruuni* is similar to form *calliginosus* of *C. kinoshitai*, which can be separated by its larger size, usually narrower and more conical last whorl and more

numerous tuberculate postnuclear whorls. More detailed information may support the status of *C. bruuni* as either a valid species or a geographic subspecies of *C. kinoshitai*. *C. bruuni* also has a wider larval shell and lacks the speckled appearance of *C. kinoshitai*. For comparison with *C. klemae*, see the Discussion of that species.

Map 29



1: *C. bruuni* 2: *C. circumciscus*

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Conus circumciscus BORN, 1778

(Plate 16, Figures 22-27; Plate 75, Figure 32;

Plate 79, First row, left & Third row, left; Map 29)

1778 *Conus circumciscus* Born, Index Mus. Vindob., 1: 147; 1780: Test. Mus. Vindob.: 163

1791 *Conus laevis* Gmelin, Syst. Nat., 13 ed., 1: 3391, no. 49

1791 *Conus affinis* Gmelin, Syst. Nat., 13 ed., 1: 3391, no. 50

1792 *Conus dux* Hwass in Bruguière, Encycl. Méth., 1: 732-733, no. 126

1798 *Cucullus terebellum* Röding, Mus. Bolten., 2: 50, no. 642/128 (non *C. terebellum* Linné, 1758)

1798 *Cucullus purpuratus* Röding, Mus. Bolten., 2: 50, no. 644/130

1881 *Conus brazieri* Sowerby III, J. Conchol. (London), 3: 234, pl. 1 fig. 9

Types: *C. circumciscus*: Lectotype (Kohn, 1964) in MHNG (71 x 27 mm); *C. laevis*: Lectotype (Kohn, 1966) figured in Valentyn (1773: Pl. 8 fig. 70) (50 x 20 mm); *C. affinis*: Lectotype (Kohn, 1966) figured in Martini (1773: Pl. 52 fig. 571) (40 x 17 mm); *C. dux*: Lectotype (Kohn, 1968) same as lectotype of *C. circumciscus*; *C. terebellum*: Lectotype (Kohn, 1975) in MNG (54 x 22 mm); *C. purpuratus*: Holotype same as lectotype of *C. affinis*; *C. brazieri*: Holotype in NMWC (73 x 32 mm).

Type Localities: *C. circumciscus*: "Moluccas" (Coomans et al., 1985a); *C. dux*: "aux mers des grandes Indes"; *C. brazieri*: "Solomon Islands."

Range: N. W. Australia, Moluccas and Philippines to Marshall Is. and to Solomon Is. and Vanuatu; probably Society Is.

Description: Moderately large to large, moderately solid to solid. Last whorl narrowly conoid-cylindrical to ventricosely conical, sometimes narrowly conical; outline varies from almost straight to almost evenly convex, adapical fourth usually convex. Aperture wider at base than near

shoulder. Shoulder angulate to rounded. Spire usually of moderate height, outline straight to domed. Larval shell of about 3.5 whorls, maximum diameter about 0.8 mm. First 3-5 postnuclear whorls tuberculate. Teleoconch sutural ramps convex to slightly concave, with 2-3 increasing to 4 spiral grooves, usually weak in latest whorls. Last whorl with equidistant spiral ribs, often weak above centre and sometimes with fine granules.

C. circumcisis Shell Morphometry

L	55 - 100 mm
RW	0.17 - 0.70 g/mm (L 55-90 mm)
RD	0.44 - 0.57
PMD	0.71 - 0.86
RSH	0.10 - 0.19

Ground colour white, variably suffused with yellow or violet. Last whorl with light brown spiral bands, varying in number and width but usually leaving one ground colour band below centre. Shells with a plain banding pattern intergrade with speckled shells with darker brown blotches, with spiral rows of alternating white and dark brown dots, spots and dashes and sometimes with additional brown spiral lines. Rows of alternating dark and light markings usually diminish during growth, dark flecks and blotches do so sometimes. Base yellow or yellowish orange. Larval whorls white. Early teleoconch sutural ramps immaculate white; late ramps with brown radial markings, becoming darker but smaller and often sparse during growth. Aperture white or pale violet.

Periostracum pale yellow, thin, translucent and smooth, becoming yellowish brown, thicker, almost opaque and slightly velvety in large adults; in life, periostracum reported to be orange to rust red (Granger, 1981).

Dorsum of foot white to pink, mottled with brown or heavily speckled with brown and red; pale posterior end immaculate. Sole of foot pink, grading to white posteriorly. Rostrum white proximally, tan distally. Tentacles white, tipped with brown. Siphon white to grey, mottled with brown; in juveniles, tip sometimes dark grey (Chaberman, pers. comm., 1981; Pearson, unpubl. observ.; de Couet, unpubl. observ.) (Pl. 75, Fig. 32; Pl. 79, First row, left, Third row, left). Foot orange or rust red in E. New Britain (Richards, pers. comm., 1988).

Habitat and Habits: In 4-200 m; in sand, coral rubble, clefts of coral reefs or on lagoon pinnacles, beneath dead coral rocks; also reported on shipwrecks and steep cliffs of the fore-reef (Papua New Guinea; Chaberman, pers. comm., 1981; Richards, pers. comm., 1988).

Discussion: *C. circumcisis* is sometimes similar to *C. aurisiacus*; for the distinctions, see the Discussion of the latter species. Shells of *C. circumcisis* lacking the spiral rows of alternating brown and white markings also resemble *C. fulmen*, which can be distinguished by its broader, consistently ventricosely conical last whorl (RD

0.55-0.62) and its orange-red instead of white apex. In addition, the brown blotches are darker in *C. fulmen*, with a less regular arrangement on the sutural ramps.

C. laevis, with large reddish brown blotches, and *C. brazieri* (Pl. 16 Figs. 24, 26) with reduced pattern, are colour forms of *C. circumcisis*.

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Conus aurisiacus LINNÉ, 1758

(Plate 16, Figures 28-32; Map 30)

1758 *Conus aurisiacus* Linné, Syst. Nat., 10 ed., 1: 716, no. 275

Type: Lectotype (Kohn, 1963) figured in Rumphius (1705: pl. 34 fig. A) (68 x 33 mm).

Type Locality: "Amboina, Moluccas" (Coomans et al., 1981).

Range: Moluccas, Sulawesi, and Philippines south of Mindanao.

Description: Medium-sized to large, solid. Last whorl ventricosely conical or conical; outline convex at adapical fourth, almost straight below. Shoulder sharply angulate. Spire usually of moderate height, outline straight to convex, apex domed. Larval shell of about 2.5 whorls, maximum diameter 0.7-0.8 mm. First 4-6 postnuclear whorls tuberculate. Teleoconch sutural ramps concave, to deeply concave in late whorls, with 3-4 increasing to 5-8 sometimes weak spiral grooves. Last whorl with rather evenly spaced spiral ribs on basal third, or extending to adapical part.

C. aurisiacus Shell Morphometry

L	45 - 95 mm
RW	0.24 - 0.46 g/mm (L 45-61 mm)
RD	0.57 - 0.62
PMD	0.81 - 0.87
RSH	0.10 - 0.16

Ground colour white, variably suffused with pink. Last whorl usually with 2-3 variably broad, pinkish brown spiral bands. Spiral rows of alternating white dashes and reddish to blackish brown dots, dashes and bars from base to shoulder; rows variable in size and number of brown markings. Base yellow. Apex immaculate white. Late sutural ramps largely light pinkish violet, usually with sparse brown blotches, occasionally with sparse white blotches; outer and inner margins of late sutural ramps barred with blackish brown. Aperture white or pale pink.

Periostracum pale yellow, thin, translucent, smooth.

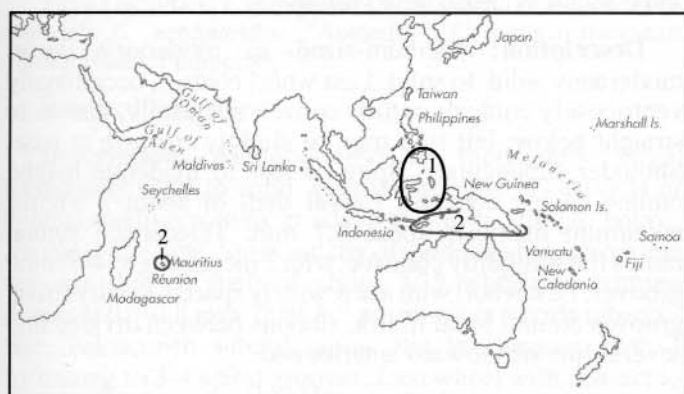
Radular teeth relatively long (shell/tooth-ratio 11:1), with 2 small barbs and a long backward-pointing, distally recurved third barb at the apex; neither serration nor basal spur present (James, 1980).

Habitat and Habits: In 20-80 m; Cernohorsky (1978) reports an intertidal occurrence.

Structure of radular teeth suggests piscivory.

Discussion: *C. aurisiacus* closely resembles *C. circumcissus*, which can be distinguished by its distinctly narrower (RD 0.44-0.57) and more cylindrical last whorl, its subangulate to rounded rather than sharply angulate shoulder and by its less concave sutural ramps with a less pronounced spiral sculpture.

Map 30



1: *C. aurisiacus* 2: *C. timorensis*

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Conus timorensis HWASS in BRUGUIÈRE, 1792

(Plate 17, Figures 1-3; Map 30)

- 1792 *Conus timorensis* Hwass in Bruguière, Encycl. Méth., 1: 731-732, no. 124
- 1825 *Conus vespertinus* Sowerby I, Cat. Tankerville: 91, no. 2446; Pl. 8 figs. 3, 4
- 1828 *Conus gracilis* Wood, Index. Test. Suppl.: 8, pl. 3 fig. 3 (non *C. gracilis* Sowerby I, 1823)
- 1937 *Conus euschemon* Tomlin, Proc. Malac. Soc. London, 22: 206 (nom. nov. for *C. gracilis* Wood)

Types: *C. timorensis*: Lectotype (Kohn, 1992) in MHNG (39 x 18 mm); *C. vespertinus*: Holotype figured in Sowerby (1825: Pl. 8 fig. 4) (48 x 21 mm); *C. gracilis*: Holotype figured in Wood (1828: Pl. 3 fig. 3) (38 x 16 mm).

Type Localities: *C. timorensis*: "des mers des grandes Indes."

Range: Mauritius, St. Brandon, Timor, Tagala Is., and Papua New Guinea.

Description: Moderately small to medium-sized, moderately light to moderately solid. Last whorl usually conoid-cylindrical to narrowly conoid-cylindrical; outline convex at adapical third, straight below. Shoulder angulate. Spire of low to moderate height, with slightly convex to slightly concave outline. Larval shell of about 2.5 whorls, maximum diameter 0.7-0.9 mm. Teleoconch sutural ramps

flat to slightly concave; late ramps with 3-4 spiral grooves grading into many striae. Last whorl with a few weak spiral ribs at base.

C. timorensis Shell Morphometry

L	30 - 50 mm
RW	0.07 - 0.22 g/mm (L 30-45 mm)
RD	0.48 - 0.55
PMD	0.75 - 0.86
RSH	0.06 - 0.17

Ground colour white to pale pink. Last whorl with variably confluent pinkish orange to light violet clouds and spiral rows of broad, similarly coloured dashes alternating with white dashes. Apex white. Late sutural ramps blotched with white and pinkish orange. Aperture white to pale pink.

Habitat and Habits: Shallow subtidal; at St. Brandon, in 3-8 m.

Discussion: *C. timorensis* is a very distinctive species; for comparison with *C. richeri*, see the Discussion of that species.

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Conus nimbosus HWASS in BRUGUIÈRE, 1792

(Plate 17, Figures 4-8; Plate 75, Figure 31; Map 31)

- 1792 *Conus nimbosus* Hwass in Bruguière, Encycl. Méth., 1: 732, no. 125
- 1802 *Conus tenellus* Holten, Enum. Syst. Conch.: 39, no. 489

Types: *C. nimbosus*: Lectotype (Kohn, 1968) in MHNG (35 x 16 mm); *C. tenellus*: Holotype in UZMC (34 x 16 mm).

Type Localities: *C. nimbosus*: "aux mers des grandes Indes."

Range: Indian Ocean: Mozambique, Madagascar, Seychelles, India, and Sri Lanka; Pacific: Papua New Guinea, Vanuatu, and Samoa.

Description: Medium-sized, moderately solid. Last whorl conoid-cylindrical, outline slightly convex. Aperture slightly wider at base than near shoulder. Shoulder angulate. Spire low, outline concave. Larval shell multispiral, maximum diameter about 0.7 mm. Teleoconch sutural ramps flat, with 1 increasing to 4-6 spiral grooves. Last whorl with closely spaced, narrow or wide spiral ribbons from base to shoulder; ribbons narrow at base and just below shoulder, often less pronounced adapically.

Ground colour white clouded with violet. Last whorl with rows of alternating brown to blackish brown and white dashes and dots on the spiral ribbons, sometimes confined to the adapical portions of ribbons. A dark colour-pattern

variant endemic to Vanuatu (Pl. 17, Fig. 4) has solid, dark brown lines on the spiral ribbons leaving only sparsely scattered ground-colour flecks. Apex immaculate greyish white. Late sutural ramps matching last whorl pattern in size, intensity and colour of the radially arranged markings. Aperture white to orange.

***C. nimbosus* Shell Morphometry**

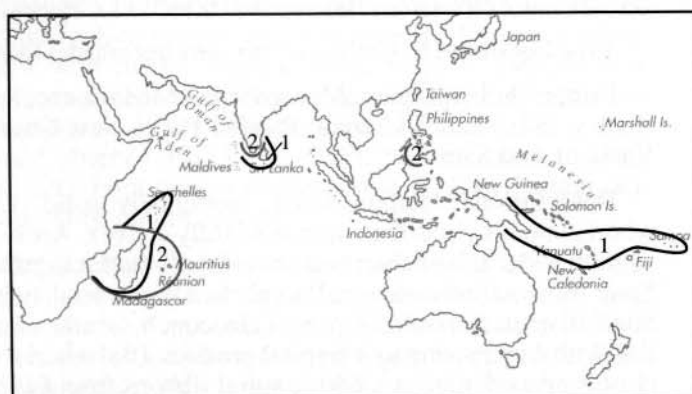
L	35 - 54 mm
RW	0.12 - 0.30 g/mm (L 35-50 mm)
RD	0.49 - 0.56
PMD	0.77 - 0.82
RSH	0.07 - 0.11

In N. Papua New Guinea, dorsum of foot yellowish grey washed with tan, with a large orange semi-circle at anterior end that is overlaid with tan except for the anterior edge; a spotted tan pre-marginal line parallels lateral and posterior sides. Sole of foot pale yellow. Rostrum cream and tan. Tentacles white. Siphon reddish grey ventrally, grading to reddish brown dorsally, with dark brown spots behind the solid dark brown tip; spots denser toward dorsal side (Pl. 75, Fig. 31) (as "*C. tenellus*"; Chaberman, pers. comm., 1981). This description may, however, refer to *C. artoptus* that has sometimes been erroneously referred to as "*C. tenellus* Holten" (see Estival, 1981).

Habitat and Habits: From the infralittoral fringe to about 60 m. In Mozambique, on banks and flats of sand, often along narrow channels (Grosch, pers. comm., 1989); in Vanuatu, on muddy bottoms in 3-6 m (Estival, 1981).

Discussion: *C. nimbosus* cannot be confused with any of its congeners.

Map 31



1: *C. nimbosus* 2: *C. janus*

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***Conus janus* HWASS in BRUGUIÈRE, 1792**

(Plate 17, Figures 9-12; Map 31)

1792 *Conus janus* Hwass in Bruguière, Encycl. Méth., 1: 690-691, no. 79

1858 *Conus latifasciatus* Sowerby II, Thes. Conch., 3: 35, no. 304, pl. 20 (206) fig. 485

Types: *C. janus*: Lectotype (Kohn, 1968) in MHNG (76 x 35 mm); *C. latifasciatus*: Type in BMNH (37 x 18 mm).

Type Localities: *C. janus*: "l'Océan asiatique."

Range: Mozambique and Madagascar; probably also Mascarenes, S. India, and Philippines.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl conical, occasionally ventricosely conical; outline convex apically, less so to straight below; left side may be slightly concave at base. Shoulder subangulate. Spire of low to moderate height, outline deeply concave. Larval shell of about 3 whorls, maximum diameter about 0.7 mm. Teleoconch sutural ramps flat to slightly concave, with 2 increasing to 4-6 spiral grooves. Last whorl with a few widely spaced, axially striate grooves around basal fourth; ribbons between divided into several fine ribs toward anterior end.

***C. janus* Shell Morphometry**

L	45 - 75 mm
RW	0.15 - 0.47 g/mm
RD	0.53 - 0.58
PMD	0.81 - 0.89
RSH	0.11 - 0.18

Ground colour white. Last whorl with 3 variably broad yellowish to dark brown or orange spiral bands, below shoulder and above and well below centre; bands occasionally with darker brown spiral lines or variably reduced. Straight or wavy, yellowish to dark brown axial streaks of variable width extend from base to shoulder and onto spire; streaks separate or confluent, continuous or interrupted, sometimes absent from spiral colour bands. Base pale yellow. Apex brown; late sutural ramps with brown to blackish brown radial markings. Aperture white or suffused with pale yellow or orange.

Habitat and Habits: In 8-20 m; on sand and fine shell debris with sparse seaweed, exposed to strong tidal currents (Mozambique: Grosch, pers. comm., 1989).

Discussion: *C. janus* resembles *C. subulatus* and *C. inscriptus*; for comparison, see the Discussions of those species.

Conus neptunus REEVE, 1843

(Plate 17, Figures 13-19; Map 32)

- 1843 *Conus neptunus* Reeve, Conch. Icon., 1, *Conus*: Pl. 6 sp. 30
 1880 *Conus neptunoides* E.A. Smith, Proc. Zool. Soc. London, 1880: 479, pl. 48 fig. 2
 1981 *Conus colorovariegatus* Kosuge, Bull. Inst. Malac. Tokyo, 1 (6): 94-95, pl. 32 figs. 1-5

Types: *C. neptunus*: Holotype in BMNH (44 x 19 mm); *C. neptunoides*: Holotype in BMNH (43.5 x 21 mm); *C. colorovariegatus*: Holotype in IMT (63.5 x 27.5 mm).

Type Localities: *C. neptunus*: "Jacna, Island of Bohol, Philippines"; *C. neptunoides*: "Australia"; *C. colorovariegatus*: "Bohol Island, Philippines."

Range: Philippines.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl narrowly conical or conical, outline convex at adapical fourth, straight below. Shoulder angulate. Spire usually of moderate height, outline concave. Larval shell of about 2.75 whorls, maximum diameter 0.7-0.8 mm. First 3-7 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to concave, with 1 increasing to 3-4 spiral grooves. Last whorl with distinct to obsolete widely spaced spiral grooves on basal half.

***C. neptunus* Shell Morphometry**

L	45 - 80 mm
RW	0.18 - 0.36 g/mm (L 45-73 mm)
RD	0.46 - 0.55
PMD	0.84 - 0.93
RSH	0.11 - 0.21

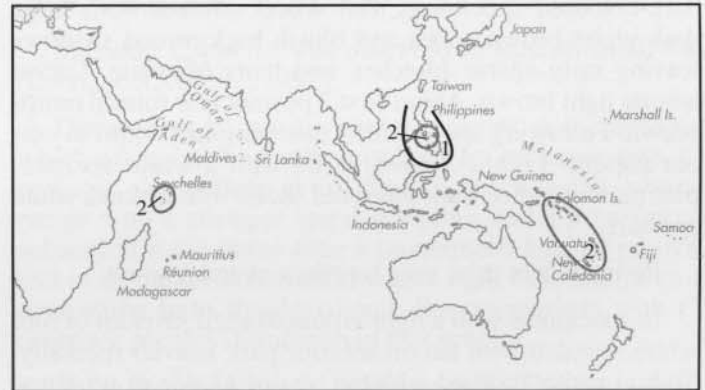
Ground colour white. Last whorl with a reticulate pattern of fine brown lines. Darker brown flecks concentrated in a spiral band on each side of centre, occasionally with underlying salmon bands. Base often tinged with salmon. In form *colorovariegatus* (Pl. 17, Figs. 17-19), network pattern replaced by confluent brown blotches sometimes colouring last whorl solid brown. Larval whorls white. Teleoconch spire matching last whorl in colour pattern. Aperture white or pale pink.

Periostracum olive-grey, thin, translucent, smooth.

Habitat and Habits: In 120-240 m.

Discussion: *C. neptunus* is similar to *C. lienardi* and *C. iodostoma*; for comparison, see the Discussions of those species.

C. neptunoides, known only from the holotype (Pl. 17, Fig. 16) (RD 0.56; PMD 0.80; RSH 0.15), closely resembles *C. neptunus* and *C. lienardi*; we provisionally assign it to the former. Its provenance is uncertain.



1: *C. neptunus* 2: *C. lienardi*

Conus lienardi BERNARDI & CROSSE, 1861

(Plates 17, Figures 20-27; Map 32)

- 1861 *Conus lienardi* Bernardi & Crosse, J. Conchyl. (Paris), 9: 49-50, pl. 1 fig. 2
 1881 *Conus prevosti* Sowerby III, Proc. Zool. Soc. London, 1881: 636, pl. 56 fig. 3

Types: *C. lienardi*: Original figure 45 x 21 mm; *C. prevosti*: Syntype in BMNH (40 x 16.5 mm).

Type Localities: *C. lienardi*: "Nova Caledonia"; *C. prevosti*: "New Caledonia."

Range: New Caledonia, Solomon Is., Vanuatu, and Philippines; probably also Amirante Is.

Description: Medium-sized to moderately large, moderately light to moderately solid. Last whorl usually ventricosely conical or conical; outline convex adapically, straight below; left side somewhat concave near base. Shoulder angulate to subangulate. Spire usually of moderate height, outline variably concave. Larval shell of 2.25-2.5 whorls, maximum diameter 0.8-0.9 mm. First 3-5 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to concave, with 0-1 increasing to 2-4 spiral grooves; latest ramps with weak or obsolete grooves but many additional spiral striae. Last whorl with widely spaced spiral grooves on basal third or half.

***C. lienardi* Shell Morphometry**

L	35 - 63 mm
RW	0.07 - 0.17 g/mm (L 32-52 mm)
RD	0.49 - 0.54
PMD	0.78 - 0.87
RSH	0.12 - 0.25

Ground colour white. In light-coloured specimens, last whorl with a generally fine and often incomplete, brown or orange reticulate pattern and variously sized flecks aligned

in a spiral row on each side of centre; sometimes pattern only of scattered curved or zigzag-shaped axial dashes. In dark-coloured specimens, last whorl covered with large dark violet-brown zones and bluish background shadows leaving only sparse blotches and tents of white. Larval whorls light brown. About first 2 postnuclear sutural ramps brown. Following spirewhorls matching last whorl in colour pattern. Light-coloured shells with a white aperture, pale pink or violet; dark-coloured shells with a bluish white aperture.

Periostracum thin, very translucent and smooth.

In specimens with a light-coloured shell, dorsum of foot white, mottled with tan on anterior part, heavier medially. Siphon white, mottled with tan on dorsal side of proximal portion (Estival, unpubl. observ.).

Habitat and Habits: In 3-60 m on sand; active at nightfall and reported to prey on worms (Tirard, pers. comm., 1989).

Discussion: *C. lienardi* resembles *C. neptunus*, *C. cinereus*, *C. oishii*, and *C. iodostoma*. *C. neptunus* attains larger size, has white larval whorls, and its last whorl is generally less ventricose but straighter in outline. For comparison with *C. cinereus*, *C. oishii*, and *C. iodostoma*, see the Discussions of those species.

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Conus radiatus GMELIN, 1791

(Plate 18, Figures 1-3; Plate 75, Figure 33;
Map 33)

1791 *Conus radiatus* Gmelin, Syst. Nat., 13 ed., 1: 3386, no. 26

1843 *Conus martinianus* Reeve, Proc. Zool. Soc. London, 11: 173-174; 1844: Conch. Icon., 1, *Conus*: pl. 40 sp. 217

Types: *C. radiatus*: Lectotype (Kohn, 1966) figured in Martini (1773: pl. 53 fig. 584) (46 x 22 mm); *C. martinianus*: 2 syntypes in BMNH (55 x 27; 53 x 28 mm).

Type Localities: *C. martinianus*: "Putao, Province of Albay, island of Luzon, Philippines."

Range: Taiwan to Philippines, Papua New Guinea, Solomon Is., and Fiji.

Description: Moderately small to large, moderately solid to solid. Last whorl narrowly conoid-cylindrical, conoid-cylindrical or ventricosely conical; outline convex at apical third, less so or straight below. Shoulder subangulate or rounded. Spire low, outline concave to straight. Larval shell multispiral, maximum diameter about 0.7 mm. Teleoconch sutural ramps flat to slightly concave, with a pronounced subsutural ridge and 1 increasing to 6-8 spiral grooves; additional spiral striae on last ramp. Last whorl with variably spaced and wide axially striate spiral grooves on basal third to half; grooves separating broad ribbons apically and narrower ribbons and ribs near base.

C. radiatus Shell Morphometry

L	30 - 109 mm
RW	0.12 - 0.55 g/mm (L 30-88 mm)
RD	0.48 - 0.61
PMD	0.74 - 0.82
RSH	0.05 - 0.11

Last whorl beige to dark brown, sometimes shaded with pale violet, often with a narrow white or grey spiral band at shoulder and less frequently with irregularly arranged white to bluish grey axial streaks. Larval shell beige. Teleoconch sutural ramps white or grey to dark brown, occasionally shaded with violet, often bicoloured or maculated dark and light; colour of spire may contrast with colour of last whorl. Aperture white, sometimes tinged with brown or violet.

Periostracum dark brown, thin, opaque, and smooth.

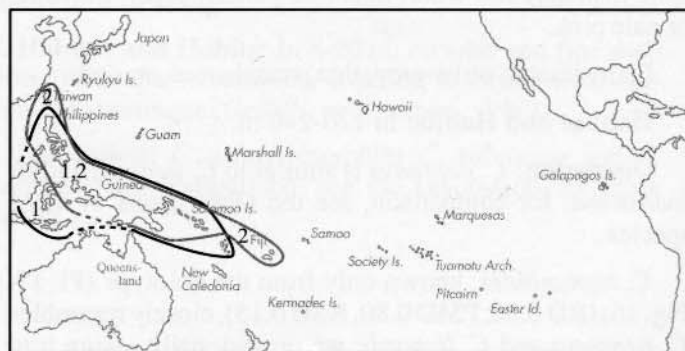
Dorsum of foot white to beige, spotted with tan and brown except for anterior median area, with a dotted black pre-marginal line ending in anterior corners and a tan spot beneath the operculum. Sole of foot blending white and tan. Rostrum cream, dotted with dark brown except for tip. Tentacles white tipped with tan. Siphon immaculate white ventrally, grading to tan dorso-laterally, with transverse black mottling (Pl. 75, Fig. 33) (Chaberman, pers. comm., 1981).

Habitat and Habits: In 10-30 m; on mud and muddy sand bottoms (Cernohorsky, 1964; Chaberman, pers. comm., 1981).

Discussion: *C. radiatus* is similar to *C. parius*, *C. ochroleucus*, *C. cinereus* form *gubba* and *C. hyaena concolor*. *C. hyaena concolor* differs in its usually more conical last whorl (PMD 0.81-0.89) and its angulate shoulder, in the absence of a pronounced subsutural ridge and the absence of ribbons at the base. For comparisons with *C. parius*, *C. ochroleucus* and *C. cinereus* see the Discussions of the latter species.

There is a remarkable variability in adult size within *C. radiatus*. In Solomon Is., adults are moderately small to medium-sized, while in Taiwan, Philippines and Papua

Map 33



1: *C. parius* 2: *C. radiatus*

New Guinea, the average adult size in most populations is 60-90 mm.

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Conus parius REEVE, 1844

(Plate 18, Figures 4-7; Plate 75, Figure 34; Plate 79, First row, middle; Map 33)

1843 *Conus parius* Reeve, Proc. Zool. Soc. London, **11**: 175-176; 1844: Conch. Icon., **1**, *Conus*: Pl. 43 sp. 235.

Type: Original figure 32 x 18.5 mm.

Type Locality: Not given.

Range: Philippines and Indonesia to Papua New Guinea, Solomon Is., and Vanuatu.

Description: Moderately small to medium-sized, moderately solid. Last whorl ventricosely conical; outline convex adapically, less so or straight below. Shoulder subangulate or rounded. Spire usually low, outline variably concave. Larval shell multispiral, maximum diameter 0.7-0.8 mm. Teleoconch sutural ramps flat, with 0-1 increasing to 2-4 spiral grooves, additional spiral striae in latest whorls; sculpture usually weak on last ramp but with a distinct adaxial groove. Last whorl with almost equally spaced axially striate spiral grooves on basal half; ribbons between may turn into groups of ribs toward base.

C. parius Shell Morphometry

L	30 - 43 mm
RW	0.10 - 0.20 g/mm
RD	0.53 - 0.63
PMD	0.76 - 0.84
RSH	0.09 - 0.13

Colour grey or cream white, grading to light brown; juveniles dark brown. Some of these colour tones often blend together both on last whorl and late sutural ramps. Larval whorls grey to light brown. Early postnuclear sutural ramps brown. Aperture usually white, or shaded with violet deep within; orange in specimens from Moluccas.

Periostracum dark brown, thin, opaque, and smooth, absent in spiral grooves of last whorl.

Dorsum of foot beige except for white median zone and broad brown transverse band on anterior part; a brown pre-marginal line runs into brown transverse band; black dots on brown band, on anterior median zone and along each side of pre-marginal line. Sole of foot grey to salmon. Rostrum light brown dotted with black. Tentacles brown. Siphon beige, with dorso-lateral clusters of black dots; ventral side white and tip brown. (Pl. 75, Fig. 34; Pl. 79, First row, middle) (Chaberman, pers. comm., 1981).

Habitat and Habits: In 2-20 m, on mud and muddy sand bottoms (Estival, 1981; Chaberman, pers. comm., 1981; Loch, pers. comm., 1992).

Subadult *C. parius* was observed to feed on small fish (Loch, pers. comm., 1992).

Discussion: *C. parius* is most similar to *C. radiatus*, which often can be easily separated by its larger size. *C. radiatus* also differs in its slightly concave late sutural ramps with a stronger spiral sculpture and a pronounced subsutural ridge rather than a pronounced adaxial groove, and in its darker colouration with a light base and often a contrasting light shoulder band. For comparison with *C. cinereus*, see the Discussion of that species.

In the Solomon Is. and probably in W. Thailand, shells intermediate in sculpture between *C. radiatus* and *C. parius* occur (Pl. 18, Fig. 4). These shells resemble *C. parius* more closely with respect to morphometry:

L	33 - 41 mm
RW	0.12 - 0.20 g/mm
RD	0.55 - 0.59
PMD	0.77 - 0.78
RSH	0.09 - 0.12

They differ from both *C. parius* and *C. radiatus* in their last whorl pattern of well-separated brown axial streaks and flames on a white ground. Some specimens show traces of a spiral band within the adapical and abapical thirds. We provisionally assign these specimens to *C. parius* rather than to *C. radiatus*.

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Conus cinereus HWASS in BRUGUIÈRE, 1792

(Plate 18, Figures 8-15; Map 34)

- 1792 *Conus cinereus* Hwass in Bruguière, Encycl. Méth., **1**: 673-674, no. 67
- 1798 *Cucullus cinereus* Röding, Mus. Bolten., **2**: 46, no. 589/89
- 1798 *Cucullus clavatus* Röding, Mus. Bolten., **2**: 46, no. 588/87
- 1810 *Conus caeruleus* Lamarck, Ann. Mus. Hist. Nat. Paris, **15**: 423, no. 130 (non *C. caeruleus* Schröter, 1803)
- 1817 *Conus nissus* "Chemnitz" Dillwyn, Descr. Catal. Rec. Shells, **1**: 388
- 1843 *Conus exaratus* Reeve, Proc. Zool. Soc. London, **11**: 176; 1844: Conch. Icon., **1**, *Conus*: Pl. 44 sp. 238
- 1845 *Conus bernardii* Kiener, Coq. Vivant., **2**: Pl. 100 fig. 2; 1848: 220-221
- 1845 *Conus gabrielii* Kiener, Coq. Vivant., **2**: Pl. 74 fig. 4; 1849-1850: 315-316
- 1845 *Conus gubba* Kiener, Coq. Vivant., **2**: Pl. 104 fig. 1; 1849-1850: 289-290

1875 *Conus politus* Weinkauff, Syst. Conch. Cab. Martini Chemnitz, 4 (2), 1, *Conus*: 334, pl. 62 figs. 2, 3

Types: *C. cinereus* Hwass: Lectotype (Kohn, 1968) in MHNG (48 x 24 mm); *C. cinereus* Röding: Lectotype (Coomans et al., 1983) figured in Martini (1773: Pl. 52 fig. 578) (49 x 24 mm); *C. clavatus*: Lectotype (Coomans et al., 1985a) same as lectotype of *C. cinereus* Röding; *C. caerulescens*: Lectotype (Kohn, 1981) figured in Chemnitz (1795: Pl. 183 figs. 1776, 1777) (45 x 21 mm); *C. nusus*: Holotype in UZMC (29 x 13 mm); *C. exaratus*: Type in BMNH (21 x 9 mm); *C. bernardii*: Original figure 46 x 20 mm; *C. gabrielii*: Original figure 42 x 19 mm; *C. gubba*: Original figure 40.5 x 19 mm; *C. politus*: Original figure 39 x 19 mm.

Type Localities: *C. cinereus* Hwass: "l'océan asiatique"; "the Moluccas" (Coomans et al., 1983); *C. caerulescens*: "Les mers des Iles Moluques"; *C. nusus*: "in ostindischen Gewässern" (Chemnitz, 1795).

Range: Japan to Indonesia, Papua New Guinea, Solomon Is., New Caledonia, and Vanuatu.

Description: Moderately small to medium-sized, moderately light to moderately solid. Last whorl narrowly conoid-cylindrical, conoid-cylindrical or ventricosely conical; outline convex adapically, less so or straight below. Aperture wider at base than near shoulder. Shoulder subangulate or rounded. Spire of low to moderate height, outline deeply concave to straight or slightly sigmoid. Larval shell of about 2.25 whorls, maximum diameter about 0.8 mm. Teleoconch sutural ramps flat to convex, with 1 increasing to 3-5 spiral grooves, usually weaker on late ramps and sometimes visible only on early ramps; spiral sculpture dominated by a strong subsutural groove. Basal fourth to half of last whorl with widely spaced axially striate spiral grooves and flat ribbons between; basal grooves wider and often with a spiral thread.

C. cinereus Shell Morphometry

L	30 - 57 mm
RW	0.06 - 0.30 g/mm
RD	0.47 - 0.60
PMD	0.75 - 0.86
RSH	0.09 - 0.20

Colour light violet to greenish grey or shading from beige to orange or blackish brown; sometimes with tan and olive spiral bands. Last whorl with spiral rows of orange to dark brown and pale ground-colour dots and dashes; rows highly variable in number, sometimes absent, with alternating dark and light markings or all light or all dark markings. Dark shells either immaculate or with additional spirally aligned white or grey flecks; light shells with additional spirally aligned orangish to dark brown markings. Larval whorls pale to dark brown. Early postnuclear sutural ramps immaculate, often similar in colour to larval shell. Late sutural ramps immaculate, or with dark radial markings, or with scattered white spots in very dark shells; sometimes outer margins with regularly set orange to brown dots.

Aperture white, bluish white or violet behind a translucent outer margin and an adjacent narrow orange or brown zone.

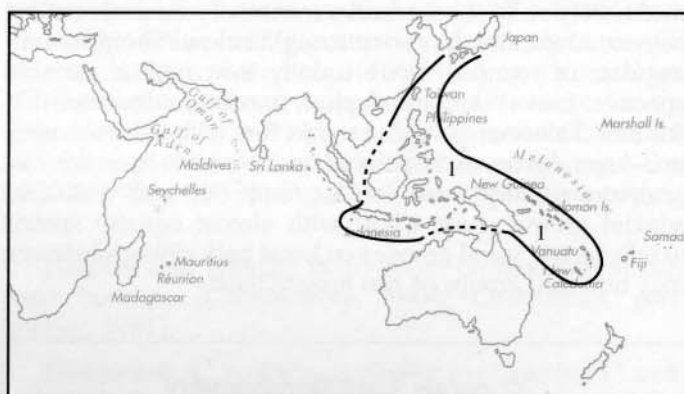
Periostracum thin, translucent, and smooth.

Dorsum of foot with a beige median zone spotted with black and dotted with white, numerous spots and dots and 2 large tan latero-frontal blotches anteriorly; lateral submarginal zones white, variably maculated with black, and solid black posteriorly; margins beige, grading to tan in posterior third. Sole of foot white to tan. Rostrum dark brown. Tentacles beige. Siphon white, mottled with various shades of brown; mottling sparse on ventral side and absent from the tip (Hansa Bay, N. Papua New Guinea; Chaberman, pers. comm., 1981).

Habitat and Habits: Upper subtidal.

In Philippines, egg diameter of 521 μ m predicts benthic development (Perron & Kohn, 1985).

Map 34



1: *C. cinereus*

Discussion: *C. cinereus* resembles *C. lienardi*, *C. parius*, *C. radiatus*, and *C. oishii*. *C. lienardi* differs in its rather angulate shoulder, complete or reduced reticulate pattern on last whorl and spire, and in the absence of any spirally aligned dots and dashes; its early postnuclear whorls are tuberculate. *C. parius* can be distinguished by its uniformly light coloured shells with an opaque periostracum; its aperture lacks an orange to brown collabral zone. *C. radiatus* differs from *C. cinereus* in its usually larger size (to 109 mm), usually lower spire (RSH 0.05-0.11), less regular spiral sculpture of the last whorl and in more and stronger spiral grooves on the late sutural ramps. For comparison with *C. oishii*, see the Discussion of the latter species.

C. cinereus is a polytypic species, and variability may be high within populations; this has led to a number of synonyms:

- *C. caerulescens* and *C. exaratus* refer to subadult specimens, which have spiral grooves from base to shoulder.

- *C. bernardii* (Pl. 18, Figs. 9, 12) is a reddish brown colour variant with spirally arrayed grey or white markings at shoulder, within adapical third and near centre. It occurs

sympatrically with the typical form in Philippines and Indonesia.

- *C. politus* refers to a blackish brown form with hieroglyphic-shaped white markings on the last whorl, occurring in Philippines.

- *C. gubba* (Pl. 18, Figs. 14, 15) was described as having a uniformly blackish brown adult shell, and a juvenile shell with white flecks. It seems to be restricted to Manus Id., Papua New Guinea. It cannot be separated from *C. cinereus* by shape or sculpture of the shell but its distinctive colouration and limited distribution may justify subspecies status.

Shells from Java have a broader last whorl than those from other localities.

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Conus ochroleucus GMELIN, 1791

(Plate 18, Figures 16-21; Map 35)

- 1791 *Conus ochroleucus* Gmelin, Syst. Nat., 13 ed., 1: 3391, no. 48
 1792 *Conus praefectus* Hwass in Bruguière, Encycl. Méth., 1: 734-735, no. 128
 1798 *Cucullus eburneus* Röding, Mus. Bolten., 2: 45, no. 565/74 (non *C. eburneus* Hwass, 1792)
 1854 *Conus sulciferus* A. Adams, Proc. Zool. Soc. London, 1853: 116 (non *C. sulciferus* Deshayes, 1835, a fossil)
 1858 *Conus fasciatus* Sowerby II, Thes. Conch., 3: 35, no. 306, pl. 20 (206) figs. 487-489 (non *C. fasciatus* Schröter, 1803)
 1937 *Conus tmetus* Tomlin, Proc. Malac. Soc. London, 22: 206 (nom. nov. for *C. sulciferus* A. Adams)
 1974 *Conus (Phasmoconus) pilkeyi* Petuch, Veliger, 17 (1): 40-41, figs. 3-6, 9

Types: *C. ochroleucus*: Lectotype (Kohn, 1966) figured in Martini (1773: pl. 52 fig. 573) (53 x 21 mm); *C. praefectus*: Lectotype (Kohn, 1968, as "holotype"; Walls, [1979]) figured in Tableau (1798: Pl. 343 fig. 6) (63 x 25 mm); *C. eburneus*: Lectotype (Kohn, 1975) same as lectotype of *C. ochroleucus*; *C. sulciferus*: Type in BMNH (23 x 10 mm); *C. fasciatus*: Original figures 69 x 31; 66 x 30; 69 x 29 mm; *C. pilkeyi*: Holotype in CAS (59 x 25 mm).

Type Localities: *C. praefectus*: "des mers d'Amérique"; *C. sulciferus*: "New Ireland"; *C. pilkeyi*: "Marau Sound (10° 02' S; 159° 00'), north of Guadalcanal, British Solomon Islands."

Range: *C. o. ochroleucus*: Taiwan and Philippines. *C. o. tmetus*: Papua New Guinea to Fiji; Indonesia and India.

Description: *C. o. ochroleucus* (Pl. 18, Figs. 16-17) moderately large to large, *C. o. tmetus* (Pl. 18, Figs. 18-21) medium sized to moderately large; moderately solid to solid. Last whorl narrowly conoid-cylindrical to ventricosely conical; outline convex near shoulder, almost straight below. Aperture somewhat wider at base than near shoulder; siphonal fasciole usually prominent and siphonal notch curved to dorsal side in larger specimens. Shoulder angulate (*C. o. ochroleucus*) or subangulate (*C. o. tmetus*). Spire of moderate height, outline concave. Larval shell of 3-3.5 whorls, maximum diameter 0.8-0.9 mm. Teleoconch

sutural ramps variably concave, with 1-2 increasing to 4-7 spiral grooves; additional spiral striae on last 2 ramps. Abapical half of last whorl with pronounced narrow to wide spiral grooves, either separating regularly spaced ribbons or ribbons and ribs in varying sequence.

C. ochroleucus Shell Morphometry

L	55 - 88 mm (<i>C. o. ochroleucus</i>) 45 - 74 mm (<i>C. o. tmetus</i>)
RW	0.15 - 0.40 g/mm (<i>C. o. ochroleucus</i> : L 55-83 mm) 0.15 - 0.28 g/mm (<i>C. o. tmetus</i> : L 45-68 mm)
RD	0.47 - 0.54
PMD	0.78 - 0.85
RSH	0.12 - 0.19

Ground colour cream in *C. o. ochroleucus*. Last whorl with spiral bands and axial streaks of yellowish brown to brown often leaving only a narrow ground-colour band of varying prominence near centre. Larval whorls light brown, adjacent 3-4 sutural ramps solid brown. Late sutural ramps with tan radial markings often producing regularly alternating dark and light spots at outer margins of middle ramps. Aperture yellowish tan to light orange.

In *C. o. tmetus*, last whorl light to dark brown except for yellowish to orangish brown basally; a pale central or subcentral spiral band sometimes present. Larval whorls and a few adjacent sutural ramps brown. Late sutural ramps pale grey or cream, with dark brown curved streaks and marginal spots; dark markings more numerous, larger and confluent on last 2 ramps. Aperture dark orange or yellow.

Periostracum dark brown, moderately thick, opaque, and velvety smooth.

Foot of *C. o. tmetus* brown (Richards, 1988).

Radular teeth of *C. o. ochroleucus* with an adapical barb opposite a short blade; serration of about 11-16 pointed denticles ends in a well-separated posterior cusp; shaft distinctly broader at base than adapically, base with a spur (Röckel, 1985b).

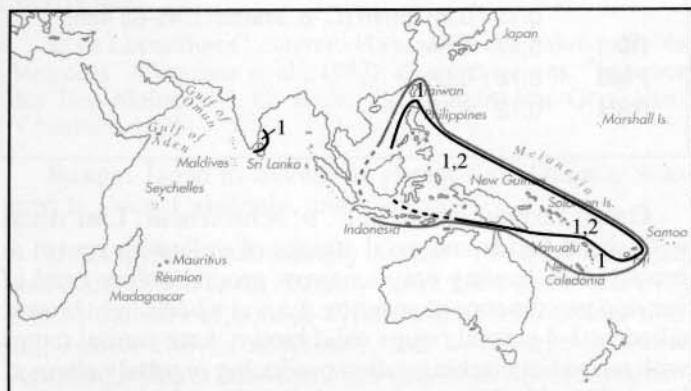
Habitat and Habits: In 6-90 m; on muddy bottom and on rocky substrate with patches of rubble and coarse sand. In E. New Britain, dark brown variant in 15-25 m, light brown variant below 25 m (Petuch, 1974; Estival, 1981; Richards, 1988).

Discussion: *C. ochroleucus* is very similar to the sympatric *C. flavus*; for comparison, see the Discussion of the latter species. *C. radiatus* has a lower spire (RSH 0.05-0.12) with prominent subsutural ridges, its aperture lacks yellow or orange shades, and its last whorl is more cylindrical and less conical (PMD 0.74-0.82) and has a light spiral band at shoulder rather than near center.

C. pilkeyi as represented by the holotype from the Solomon Is. has only minor differences from *C. ochroleucus* from Philippines but agrees with the latter in important conchological characters (see **Description**). Because of the

striking similarity of specimens from Fiji, Vanuatu and Papua New Guinea that agree with the description of *C. pilkeyi* we consider the allopatric populations a subspecies of *C. ochroleucus*. *C. tmetus* refers to a juvenile specimen of *C. pilkeyi*. As *C. tmetus* has priority over *C. pilkeyi*, the correct name for the eastern subspecies is *C. o. tmetus*. *C. praefectus*, *C. fasciatus* and *C. eburneus* (Röding) are synonyms of *C. o. ochroleucus*.

Map 35



1: *C. ochroleucus* 2: *C. flavus*

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Conus flavus RÖCKEL, 1985

(Plate 18, Figures 22-27; Map 35)

1985 *Conus flavus* Röckel, Spixiana, 8 (2): 165-170, figs. a, b

Type: Holotype in ZSM (55 x 24.5 mm)

Type Locality: "Batangas Bay, Luzon, Philippines."

Range: Philippines, Papua New Guinea, Solomon Is., and Fiji.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl ventricosely conical, sometimes ovate; outline convex at adapical third, less so or straight below, often with a straighter right side. Siphonal fasciole prominent and siphonal notch often slightly curved to dorsal side. Shoulder subangulate or rounded. Spire of moderate height, outline concave to sigmoid. Larval shell multispiral, maximum diameter 0.8-1.0 mm. Teleoconch sutural ramps flat to slightly concave, with 1-2 increasing to 2-6 spiral grooves; additional spiral striae on last 2 ramps. Last whorl with closely and widely spaced, narrow and wide spiral grooves on a varying portion of basal half; grooves separating ribs and ribbons in irregular sequence, with the former predominantly occurring basally and the latter adapically.

Ground colour white to cream. Last whorl with light yellow to tan spiral and axial zones, blending with adjacent

ground-colour areas and sometimes covering a large portion of last whorl; occasionally 3 spiral colour bands, located below shoulder and on each side of centre. Irregularly arranged dark brown spots, flecks and flammules of varying numbers are often seen in Philippines shells (Pl. 18, Figs. 23, 25) and rarely in shells from Papua New Guinea (Pl. 18, Fig. 24). Variant from Palawan, Philippines (Pl. 18, Figs. 26, 27) with 3 tan spiral bands on last whorl, crossed by long interrupted or continuous dark brown axial streaks or flames extending from shoulder ramp to base or nearly so. Base light yellow to tan except for nearly white shells from Papua New Guinea. Larval whorls white to pale brown; adjacent sutural ramps solid brown. Late sutural ramps pale grey, often tinged with yellowish tan, with sparse and faint to many pronounced brown radial markings. Aperture yellow to orange behind a lighter marginal zone.

C. flavus Shell Morphometry

L	45 - 70 mm 50 - 78 mm (Palawan variant)
RW	0.16 - 0.40 g/mm (L 45-61 mm) 0.18 - 0.40 g/mm (Palawan variant)
RD	0.52 - 0.60 0.49 - 0.52 (Palawan variant)
PMD	0.72 - 0.85
RSH	0.11 - 0.17

Periostracum dark brown, moderately thick, opaque, and velvety.

Foot yellowish brown (Richards, 1988).

Radular teeth with a rather uniformly narrow shaft and hardly any adapical armature; serration short, with 5-8 blunt denticles; centre of shaft with a cusp, base with a spur (Röckel, 1985b).

Habitat and Habits: In 10-30 m, on sand and mud bottoms.

Discussion: *C. flavus* was referred to by Petuch (1974) as a "light color variety" of *C. pilkeyi*. Sympatric *C. ochroleucus* often differs from *C. flavus* in having a narrower last whorl (RD 0.47-0.54) with a straighter outline. *C. ochroleucus* lacks dark brown axial markings on the last whorl of adult specimens, while *C. flavus* lacks marginal spots on the middle sutural ramps. *C. o. ochroleucus* can also be distinguished by its angulate shoulder and by shape and armature of its radular teeth. *C. o. tmetus* differs additionally in its mostly dark last whorl with a contrasting light base.

In spite of a narrower last whorl, somewhat lighter weight, weaker sculpture on the last whorl and a pronounced axially lineate pattern, the variant from Palawan (Pl. 18, Figs. 26, 27) shares all other characters with *C. flavus* from other Philippine localities. We thus assign these shells to this species.

***Conus oishii* (SHIKAMA, 1977)**

(Plate 18, Figures 28-32; Map 36)

1977 *Asprella* (?) *oishii* Shikama, Sci. Rpts. Yokohama Natl. Univ., 2 (24): 22, pl. 1 figs. 6 a, b**Type:** Holotype in KPM (31.5 x 13 mm).**Type Locality:** "East China Sea."**Range:** Taiwan and Indonesia (Sumba).

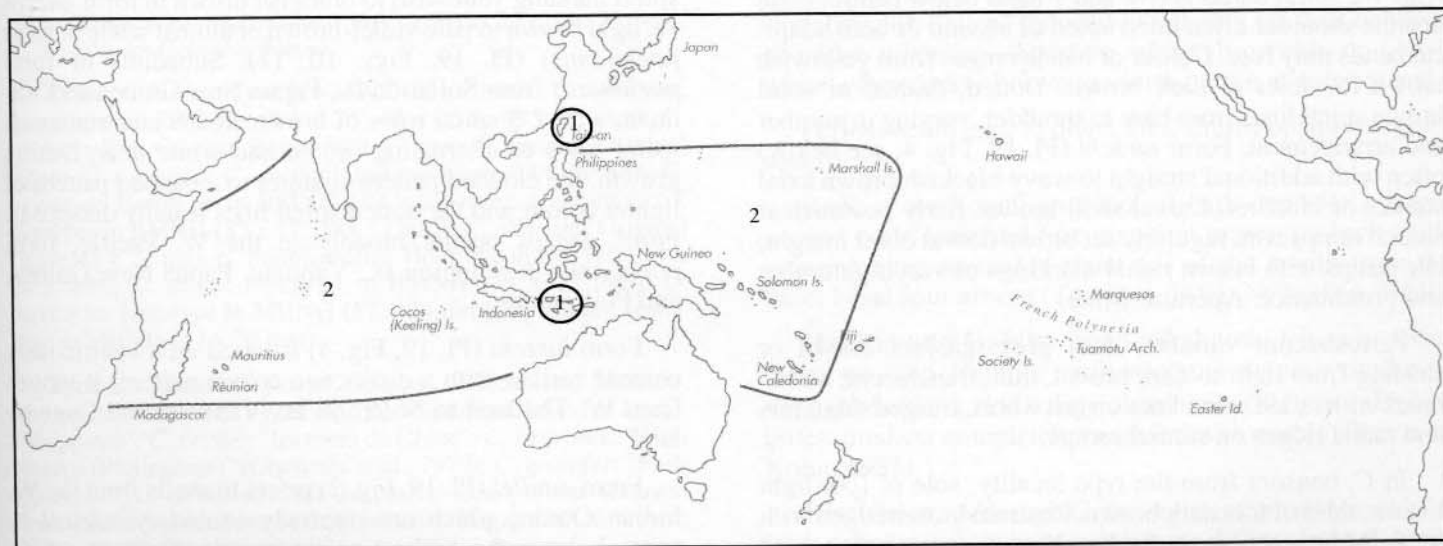
Description: Moderately small to medium-sized, usually moderately light. Last whorl ventricosely conical; outline convex, less so basally. Aperture wider basally than near shoulder. Shoulder subangulate. Spire of moderate height, outline slightly concave to slightly sigmoid. Larval shell of about 2.25 whorls, maximum diameter about 1.1 mm. Teleoconch sutural ramps almost flat, with 1-2 increasing to 3-4 spiral grooves; additional spiral striae on last 2 ramps. Last whorl with regularly or irregularly spaced punctate spiral grooves from base to shoulder.

***C. oishii* Shell Morphometry**

L	30 - 44 mm
RW	0.06 - 0.12 g/mm (L 29-40 mm)
RD	0.52 - 0.67
PMD	0.78 - 0.82
RSH	0.15 - 0.18

Ground colour white to greyish white. Last whorl with interlaced orange, red or brown axial flames and blotches, sometimes forming a coarse meshwork or replaced by pale spiral bands on each side of centre. Base often violet or orange. Larval whorls white. Late sutural ramps with confluent radial markings matching pattern of last whorl in

Map 36

1: *C. oishii* 2: *C. consors*

colour and intensity. Aperture white or light violet deep within.

Habitat and Habits: Subtidal; reported from muddy sand bottoms.

Discussion: *C. oishii* is similar to *C. cinereus* in size and shape. The latter species differs in its colour pattern, which lacks white ground colour and reticulate pattern but has spiral rows of dark and light markings on the last whorl. *C. cinereus* has a brown apex, a narrower larval shell (0.8 vs. 1.1 mm) and weaker spiral sculpture on its later sutural ramps; its early postnuclear sutural ramps bear a pronounced subsutural groove while those of *C. oishii* are more evenly sculptured. *C. lienardii* resembles *C. oishii* in size and pattern. It can be distinguished by its finer pattern, narrower last whorl, angulate shoulder, tuberculate early postnuclear whorls, and brown apex.

Shells of *C. oishii* from Indonesia (Pl. 18, Figs. 31, 32) differ from those from Taiwan in their broader last whorl.

***Conus consors* SOWERBY I, 1833**

(Plate 19, Figures 1-12; Plate 75, Figure 35; Map 36)

- 1833 *Conus consors* Sowerby I, Conch. Ill.: Pt. 36, fig. 42
 1854 *Conus anceps* A. Adams, Proc. Zool. Soc. London, 21 (1853): 119
 1854 *Conus innexus* A. Adams, Proc. Zool. Soc. London, 21 (1853): 118
 1858 *Conus daullei* Crosse, Rev. Mag. Zool., (2) 10: 81; 1858: 119-120, pl. 2 figs. 2, 2a
 1887 *Conus poehlianus* Sowerby III, Thes. Conch., 5, *Conus* suppl.: 257, no. 474, pl. 31 (509) figs. 682, 683
 1985 *Conus turschi* da Motta, Publ. Ocas. Soc. Portuguesa Malac., 5: 1-7, pl. 1 figs. 1, 2; pl. 2 fig. 4

Types: *C. consors*: Lectotype (Kohn, 1992) figured in Sowerby I (1833: Pt. 36, fig. 42) (62 x 34 mm); *C. anceps*: Lectotype (Coomans et al., 1980) in BMNH (78 x 36 mm); *C. innexus*: 3 syntypes in BMNH (48 x 22; 51 x 24; 58 x 27 mm); *C. daullei*: Original figure 69 x 33 mm; *C. poehlianus*: Holotype in BMNH (48 x 22 mm); *C. turschi*: Holotype in MHNG (82.5 x 35 mm).

Type Localities: *C. consors*: "Singapore" (Coomans et al., 1985a); *C. anceps*: "Moluccas"; *C. innexus*: "Natal"; *C. daullei*: "insulam Mayotte"; *C. poehlianus*: "New Ireland"; *C. turschi*: "Andaman Sea off Kantang, S.W. Thailand."

Range: Indo-Pacific to Marshall Is., Melanesia, and Queensland; absent from Red Sea.

Description: Medium-sized to large, moderately solid to heavy. Last whorl narrowly conical or narrowly conoid-cylindrical to ventricosely conical; outline convex adapically, straight below and sometimes slightly concave at centre. Siphonal fasciole varies from weak to prominent. Shoulder sharply angulate to almost rounded. Spire of low to moderate height, outline straight to slightly convex. Larval shell of about 3 whorls, maximum diameter about 0.8 mm. Adults of 50-90 mm with about 9-11 postnuclear whorls, the first 4-8 tuberculate. Teleoconch sutural ramps flat to concave, with 2 increasing to 5-8 spiral grooves; occasionally latest ramps with 10-12 variably fine spiral grooves. Last whorl with spiral grooves at base, separating broad ribbons or strong ribs.

C. consors Shell Morphometry

L	50 - 118 mm
RW	0.20 - 1.10 g/mm (L 50-95 mm)
RD	0.44 - 0.63
PMD	0.77 - 0.88
RSH	0.08 - 0.20

Ground colour white to pale brown; in subadult specimens of form *poehlianus* (Pl. 19, Figs. 10, 11; see below), white ground suffused with pale brownish violet. Last whorl with 1-2 spiral bands above and 1 band below centre; band nearest shoulder often interrupted or absent, or both adapical bands may fuse. Colour of bands ranges from yellowish brown to violet or dark brown. Dotted, dashed or solid brown spiral lines from base to shoulder, varying in number and arrangement. Form *turschi* (Pl. 19, Fig. 4; see below) often with additional straight to wavy blackish brown axial streaks or blotches. Larval shell brown. Early postnuclear sutural ramps with regularly set brown dots at outer margin; late ramps with brown radial markings of varying number and prominence. Aperture white.

Periostracum variable; dark grey, greyish brown or shading from light to dark brown, thin, translucent; sometimes with tufted spiral lines on last whorl, fringed shoulders and radial ridges on sutural ramps.

In *C. consors* from the type locality, sole of foot light brown, sides of foot dark brown. Rostrum brown edged with buff. Proboscis orange. Siphon brown, sparsely speckled

with darker brown (Kohn, unpubl. observ.). In form *poehlianus* from N. Papua New Guinea (Pl. 75, Fig. 35), foot orange-pink, lighter dorsally; dorsum mottled with brown, bearing a dotted brown pre-marginal line, a white post-opercular spot, and tan radial streaks on lateral marginal zones; sole mottled with tan centrally and posteriorly. Rostrum mottled white and tan. Tentacles white, tipped with brown. Siphon white with tan spots and tan transverse streaks, denser dorsally and proximally; distal edge grey (Chaberman, pers. comm., 1981).

Radular teeth similar to those of *C. striatus*. (Kohn, Saunders & Wiener, 1960).

Habitat and Habits: Slightly subtidal to 200 m; in sand and silt. Form *poehlianus* to 35 m in adult stage and to 50 m in juvenile stage, near river mouths, on reef and fore-reef; in silt, coral sand and rubble with sand, often beneath rotting logs (Chaberman, pers. comm., 1981; Richards, pers. comm., 1989; Kengalu, pers. comm., 1989). In New Caledonia, form *anceps* and typical form from 5 m on the reef to 67 m within the lagoon (Estival, 1981; Richer de Forges & Estival, 1986; Tirard, pers. comm., 1989); in Philippines, both forms in 40-80 m but may range to 200 m. Type specimens of form *turschi* from 35-75 m (da Motta, 1985).

Egg diameter varies from 389 μ m (Palau) to 434 μ m (Marshall Is.); the minimum pelagic period is 7 days in Palau and is estimated to be about 4 days in Marshall Is. (Perron & Kohn, 1985).

Discussion: *C. consors* is very similar to the smaller species *C. magus*. For distinctions, see the Discussion of the latter species.

The nominal species *C. consors*, *C. anceps*, *C. daullei*, *C. poehlianus*, and *C. turschi* refer to forms of the same species with overlapping ranges.

The typical form is strictly conical and has the broadest last whorl amongst all forms.

Form *anceps* and form *poehlianus* are narrowly to ventricosely conical, not distinguishable from each other by shell shape, and differ only in the colour pattern (shades of spiral banding yellowish to orangish brown in form *anceps* vs. light brown to pale violet-brown or almost white in form *poehlianus*) (Pl. 19, Figs. 10, 11). Subadults of form *poehlianus* from Solomon Is., Papua New Guinea and Vanuatu with 2-3 spiral rows of brown clouds and numerous spiral rows of alternating brown and white dots. During growth, the clouded pattern changes to a banded pattern of lighter colour and the dotted spiral lines usually disappear. Form *anceps* occurs broadly in the W. Pacific, form *poehlianus* in Solomon Is., Vanuatu, Papua New Guinea, and Philippines.

Form *turschi* (Pl. 19, Fig. 4) is based on a ventricosely conical variant with a distinctive colour pattern; it ranges from W. Thailand to Solomon Is., Vanuatu, and Queensland.

Form *daullei* (Pl. 19, Fig. 2) refers to shells from the W. Indian Ocean, which are narrowly conoid-cylindrical to conical, have the highest spires among all forms of *C.*

consors (RSH 0.13-0.20 vs. 0.08-0.16 in other forms), and a dark brown pattern; this form intergrades in shape and pattern with the typical form in the W. Indian Ocean and with form *turschi* in W. Thailand. In Solomon Is., form *turschi* lives syntopically and intergrades with the forms *anceps* and *poehlianus*. In Philippines, the typical form, form *anceps*, form *turschi*, and form *poehlianus* all intergrade.

81

Conus furvus REEVE, 1843

(Plate 19, Figures 13-31; Map 37)

- 1843 *Conus furvus* Reeve, Conch. Icon., 1, *Conus*: Pl. 13 sp. 69
 1843 *Conus lignarius* Reeve, Conch. Icon., 1, *Conus*: Pl. 24 sp. 136
 1843 *Conus crepusculum* Reeve, Proc. Zool. Soc. London, 11: 178; 1844: Conch. Icon., 1, *Conus*: Pl. 45 sp. 251
 1843 *Conus buxus* Reeve, Proc. Zool. Soc. London, 11: 180; 1844: Conch. Icon., 1, *Conus*: Pl. 47 sp. 265 (non *C. buxus* (Röding, 1798))
 1845 *Conus cecilei* Kiener, Coq. Vivant., 2: Pl. 98 fig. 4, pl. 107 fig. 3 (var.); 1849-1850: 286-287
 1849 *Conus aegrotus* Reeve, Conch. Icon., 1, *Conus* suppl.: Pl. 5 sp. 250
 1849 *Conus granifer* Reeve, Conch. Icon., 1, *Conus* suppl.: Pl. 7 sp. 272
 1857 *Conus albicans* Sowerby II, Thes. Conch., 3: 3, sp. 13, pl. 5 fig. 98
 1875 *Conus multilineatus* Sowerby III, Proc. Zool. Soc. London, 1875: 126 (non *C. multilineatus* Pecchioli, 1869, a fossil)
 1887 *Conus albus* Sowerby III, Thes. Conch., 5: 274, sp. 532, pl. 36 fig. 761
 1937 *Conus polygrammus* Tomlin, Proc. Malac. Soc. London, 22 (4): 206 (nom. nov. for *C. multilineatus* Sowerby III)
 1985 *Conus turritinus* da Motta, Publ. Ocas. Soc. Portuguesa Malac., 4: 1-2, pl. 1 figs. 1a, b
 1985 *Conus nivalis* da Motta, Publ. Ocas. Soc. Portuguesa Malac., 4: 4-5, pl. 1 figs. 4a, b
 1991 *Conus neobuxus* da Motta, La Conchiglia, 22 (258): 73 (nom. nov. for *C. buxus* Reeve)

Types: *C. furvus*: Type in NMWC (45 x 20 mm); *C. lignarius*: 3 syntypes in BMNH (48.5 x 25; 49 x 25.5; 48 x 25 mm); *C. crepusculum*: Original figure 30 x 17 mm; *C. buxus*: Original figure 37 x 16 mm; *C. cecilei*: Original figure 44 x 20 mm; *C. aegrotus*: Holotype in BMNH (49 x 27 mm); *C. granifer*: 2 syntypes in BMNH (33 x 17; 26 x 12 mm); *C. albicans*: Original figure 45 x 22 mm; *C. multilineatus*: Holotype in NMWC (39 x 20.5 mm); *C. albus*: Holotype in BMNH (49 x 25 mm); *C. turritinus*: Holotype in MHNG (57 x 24 mm); *C. nivalis*: Holotype in MHNG (47 x 20 mm).

Type Localities: *C. furvus*: "Islands of Ticao and Masbate, Philippine Islands"; *C. lignarius*: "Port Sacloban, Island of Leyte, Philippines"; *C. cecilei*: "les mers de Chine"; *C. aegrotus*: "West Negros (Philippines)" (Coomans et al., 1979); *C. granifer*: "Philippine Is."; *C. turritinus*: "off the eastern coast of the Malayan Peninsula in South China Sea"; *C. nivalis*: "Ragay Gulf, Southern Luzon, Philippines."

Range: Andaman Is., E. Malaysia, Indonesia, New Guinea, Philippines to Japan.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl conical, ventricosely conical or conoid-cylindrical; outline almost straight to moderately convex. Shoulder usually angulate, smooth to tuberculate. Spire of low to moderate height, occasionally stepped; outline straight to concave. Larval shell of about 2.5 whorls, maximum diameter 0.8-1.0 mm. First 4-9 post-nuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1-2 increasing to 4-7 spiral grooves, sometimes fine and weak on all ramps. Last whorl variable in sculpture; shells with weak and smooth spiral ribs on basal fourth intergrade with shells with granulose ribs from base to shoulder. Surface sculpture uniform in some forms, highly variable in others.

C. furvus Shell Morphometry

L	35 - 71 mm
RW	0.10 - 0.40 g/mm (L 35-66 mm)
RD	0.50 - 0.69
PMD	0.80 - 0.94
RSH	0.03 - 0.23

Ground colour white to tan. Pattern of last whorl ranges from uniformly white to blackish brown spiral banding. Spiral colour bands vary from yellow to blackish brown; a spiral ground-colour band usually at or just below centre, another sometimes within apical third, and another rarely on basal third. Spiral rows of brown dots extend from base to shoulder but vary considerably in number and arrangement, sometimes fusing into solid spiral or axial lines, occasionally restricted to spiral ribs or completely absent. Base and siphonal fasciole sometimes coloured like adjacent part of last whorl, more often contrasting yellow to pink or brown to purple. Larval shell white, pink or brown; adjacent postnuclear sutural ramps usually of same colour. Late sutural ramps white to brown, immaculate or with radial lines and streaks in various shades of brown; occasionally spire pattern reduced to variably set dots between shoulder tubercles. Aperture white, brownish or bluish white, often darker brown to violet-brown at anterior end.

Periostracum grey to olive, thin, almost opaque, slightly rough.

Radular teeth with an adapical barb opposite a larger second barb; long and fine serration present; a backward-pointing cusp protrudes about 1/7 of the length from the base; basal spur absent (Troschel, 1868; Nybakken, 1990).

Habitat and Habits: From infralittoral fringe to about 60 m; on sand. Radular tooth structure suggests molluscivory (Nybakken, 1990). Egg diameter of 591 µm in Philippines, predicts completely benthic development (Perron & Kohn, 1985).

Discussion: Although *C. furvus* is extremely variable in its conchological characters, it is quite distinct from all other

congeners. It appears to be characterized by the isolation of local populations. Because of the variability within and intergrades among these populations, it is hard to decide whether they deserve recognition as geographic subspecies. We regard the following nominal species-group taxa as forms of *C. furvus*:

- *C. aegrotus* (Pl. 19, Fig. 23): With dotted spiral lines on white ground. Similar in shape to form *cecilei*.

- *C. albicans* (Pl. 19, Fig. 25): Last whorl conical. Shoulder often distinctly tuberculate. Colour white, except for violet base; with sparse remnants of spirally aligned dots on last whorl. Form *albicans* may be considered a subspecies from N. Indonesia and Palawan, S.W. Philippines.

- *C. albus* (Pl. 19, Fig. 29): Completely white. Spire low (RSH 0.09). Postnuclear whorls tuberculate except for last 2 whorls. Teleoconch sutural ramps with 3-6 spiral striae in late whorls. Last whorl conical (RD 0.57), with a few spiral ribs at base. We provisionally assign *C. albus* to *C. furvus*, because no shell characters justify separation at the species level. Coomans et al. (1980) synonymized *C. albus* with *C. magus*. However, the latter species differs in its stronger spiral sculpture on the late sutural ramps and its adapically more convex outline of the last whorl.

- *C. cecilei*: Last whorl conical, outline slightly convex. Shoulder often undulate. Sculpture of last whorl consists of minutely granulate spiral ribs at base. Last whorl white to brown, with spiral rows of dots, brown to brownish violet at base.

- *C. crepusculum*: Last whorl conical, outline almost straight; colour of yellow tones; pattern without spiral lines; base violet.

- *C. granifer* (Pl. 19, Figs. 19, 20): Last whorl conical, outline convex. Shoulder often undulate. Number of tuberculate postnuclear whorls comparatively high. Granulose spiral ribs often extend from base to shoulder. Ground colour white to brown. Spiral rows of brown dots on and between granulose ribs. Intergrades with form *cecilei* in shape in Sulu Archipelago, Philippines, but differs in its granulose surface.

- *C. lignarius* (Pl. 19, Fig. 28): Lighter brown than typical form of *C. furvus*, with a darker base and solid spiral lines on last whorl.

- *C. neobuxeus* (Pl. 19, Fig. 15): Very similar to form *cecilei* in colour pattern, except for a lighter base.

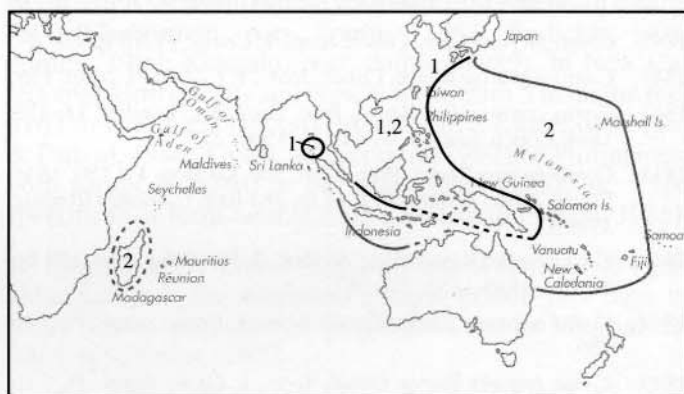
- *C. nivalis* (Pl. 19, Fig. 27): Last whorl conical to conoid-cylindrical, slightly narrower than in other forms (RD 0.50-0.58 vs. 0.51-0.63 in most forms). Early postnuclear whorls with very weak tubercles, teleoconch sutural ramps with fine to obsolete spiral sculpture. Form *nivalis* may be a subspecies of *C. furvus*, from the northern shores of the Sibuyan Sea between southern Luzon and northern Samar.

- *C. polygrammus* (Pl. 19, Fig. 24): Essentially similar to form *lignarius*.

- *C. turritinus* (Pl. 19, Fig. 26): Last whorl conoid-cylindrical; spire often stepped. Larval shell white. Last whorl yellowish brown, with a white spiral band at centre and without spiral rows of dots; base of the same colour as rest of last whorl.

- A very distinctive shape and colour variant is known from Philippines (Pl. 19, Figs. 30, 31). Last whorl conical to conoid-cylindrical and broader than in all other forms (RD 0.61-0.69 vs. 0.50-0.63). Entire shell white to pale cream, except for yellowish pink apex and base. We provisionally assign these shells to *C. furvus* as an unnamed form. Information on range and conchological variation is inadequate to permit a more definitive conclusion.

Map 37



1: *C. furvus* 2: *C. magus*

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Conus magus LINNÉ, 1758

(Plate 20, Figures 1-32; Plate 45, Figures 22-25; Plate 75, Figure 36; Plate 79, First row, right; Fourth row, left; Map 37)

- 1758 *Conus magus* Linné Syst. Nat., 10 ed., 1: 716, no. 276
- 1792 *Conus raphanus* Hwass in Bruguière, Encycl. Méth., 1: 722-723, no. 118
- 1798 *Cucullus caesius* Röding, Mus. Bolten., 2: 48, no. 616/109
- 1822 *Conus carinatus* Swainson, Zool. Ill., 2: Pl. 112
- 1843 *Conus metcalfii* Reeve, Proc. Zool. Soc. London, 11: 171-172; Conch. Icon., 1, *Conus*: Pl. 36 sp. 192
- 1843 *Conus epistomium* Reeve, Proc. Zool. Soc. London, 11: 174; 1844: Conch. Icon., 1, *Conus*: Pl. 42 sp. 227
- 1843 *Conus ustulatus* Reeve, Proc. Zool. Soc. London, 11: 176; 1844 Conch. Icon., 1, *Conus*: Pl. 44 sp. 239
- 1849 *Conus fucatus* Reeve, Conch. Icon., 1, *Conus* suppl.: Pl. 7 sp. 271
- 1854 *Conus assimilis* A. Adams, Proc. Zool. Soc. London, 21: 118
- 1858 *Conus circae* "Chem." Sowerby II, Thes. Conch., 3: 39, no. 338, pl. 21 figs. 513, 514; variety: Pl. 22 fig. 525 (non *C. circae* "Chemnitz")
- 1860 *Conus rollandi* Bernardi, J. Conchyl. (Paris): 8: 332, pl. 12 fig. 4
- 1864 *Conus consul* Boivin, J. Conchyl. (Paris), 12: 33-35, pl. 1 figs. 5, 6

- 1865 *Conus frauenfeldi* Crosse, J. Conchyl. (Paris), **13**: 307, pl. 10 figs. 1, 1a
- 1865 *Conus signifer* Crosse, J. Conchyl. (Paris), **13**: 308, pl. 10 fig. 6
- 1866 *Conus tasmaniae* Sowerby II, Thes. Conch., **3**, *Conus* suppl.: 328, no. 430, pl. 27 (288) fig. 636
- 1866 *Conus borneensis* Sowerby II, Thes. Conch., **3**, *Conus* suppl.: 329, no. 439, pl. 28 (289) fig. 648 (non *C. borneensis* Adams & Reeve, 1848)
- 1875 *Conus epistomioides* Weinkauff, Syst. Conch. Cab. Martini Chemnitz, **4** (2), 1, *Conus*: 315-316, pl. 57 figs. 6, 7
- 1977 *Conus (Phasmoconus) ambaroides* Shikama, Sci. Rep. Yokohama Natl. Univ., (2) **24**: 20-21, pl. 4 figs. 3a, b, pl. 5 fig. 3
- 1982 *Conus fulvobullatus* da Motta, Publ. Ocas. Soc. Portuguesa Malac., **1**: 13-14, pl. figs. 12a, b
- 1983 *Conus cernohorskyi* da Motta, Publ. Ocas. Soc. Portuguesa Malac., **2**: 2-3, figs. 9-13

Types: *C. magus*: Neotype (Kohn, 1963) in ZIUU (43 x 19 mm); *C. raphanus*: Lectotype (Kohn, 1968) in MHNG (61 x 31 mm); *C. caesus*: Lectotype (Kohn, 1975) figured in Martini (1773: Pl. 52 fig. 580) (45 x 19 mm); *C. carinatus*: Holotype figured in Swainson (1822: Pl. 112) (69 x 33.5 mm); *C. epistomium*: Lectotype (Coomans et al., 1986) in BMNH (48 x 21 mm); *C. metcalfii*: 2 syntypes in BMNH (28 x 14; 26 x 13 mm); *C. ustulatus*: Type in BMNH (42 x 21 mm); *C. fucatus*: 2 syntypes in BMNH (19 x 9.5; 17 x 98.5 mm); *C. assimilis*: Lectotype (Coomans et al., 1981) in BMNH (53 x 27 mm); *C. circae*: Original figures 52 x 26; 51 x 28 mm; *C. rollandi*: Holotype MNHN (33 x 17 mm); *C. consul*: Holotype 43 x 19 mm (acc. Boivin); *C. frauenfeldi*: Lectotype (Tomlin, 1937) in BMNH (43.5 x 23.5 mm); *C. signifer*: Holotype in BMNH (40 x 19 mm); *C. tasmaniae*: Type in BMNH (40.5 x 20 mm); *C. borneensis* Sowerby II: Holotype in BMNH (32 x 15 mm); *C. epistomioides*: Holotype in LMD (32 x 15.5 mm); *C. ambaroides*: Holotype in KPM (33 x 16 mm); *C. fulvobullatus*: Holotype in MHNG (52.5 x 25 mm); *C. cernohorskyi*: Holotype in MHNG (46 x 27 mm).

Type Localities: *C. raphanus*: "l'Océan asiatique"; *C. carinatus*: "Asiatic Ocean"; *C. epistomium*: "Mauritius"; *C. ustulatus*: "New Holland"; *C. fucatus*: "Philippine Islands"; *C. assimilis*: "Australia"; *C. frauenfeldi*: "Madagascar", corrected to "Padang South-west Sumatra, E. Indian Ocean" (G. Raybaudi Massilia, 1992); *C. circae*: "Philippines"; *C. borneensis*: "Borneo"; *C. tasmaniae*: "Tasmania"; *C. epistomioides*: "Wahrscheinlich Ostafrika"; *C. ambaroides*: "Philippines"; *C. fulvobullatus*: "east coast of Malaysia"; *C. cernohorskyi*: "in the vicinity of Borogon, Samar Oriental, Philippines."

Range: Indonesia to Japan and to the Marshall Is., Wallis and Fiji. Most reports from the central and western Indian Ocean are doubtful; probably Madagascar.

Description: Moderately small to large, moderately solid to moderately heavy; relative weight varies in specimens of similar size by 50% within the same population. Last whorl narrowly conoid-cylindrical to conoid-cylindrical, or narrowly conical to ventricosely conical, sometimes narrowly ovate to ovate; outline almost straight to evenly convex. Aperture variably wider at base than near shoulder. Shoulder angulate to subangulate. Spire of low to moderate height, outline concave to convex. Larval shell of 1.75-2.0 whorls, maximum diameter 0.7-0.8 mm. First 3-8 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to often concave in last whorl, with 1-2 increasing to 4-7 spiral grooves; latest ramps often with punctate grooves, sometimes only 2 of them distinct. Last whorl usually with weak

spiral ribs at base and finer wrinkled elevations above. Closely set axial threads sometimes produce a minute granulation on basal ribs. In specimens described as *C. cernohorskyi* (Pl. 20, Fig. 18), spiral ribs and granules stronger, occasionally extending to shoulder.

C. magus Shell Morphometry

L	30 - 94 mm
RW	0.10 - 0.83 g/mm (L 30-89 mm)
RD	0.47 - 0.69
	0.47 (form <i>epistomium</i>)
	0.57 - 0.69 (form <i>cernohorskyi</i>)
PMD	0.72 - 0.91
RSH	0.05 - 0.19

Ground colour sometimes blue or pink, usually white but often grading to yellow or tan. Last whorl with one adapical and one abapical spiral colour band, dashed and dotted spiral lines and irregular axial streaks, flames or blotches. Colour bands and axial markings pink, orange, olive, greenish to bluish grey or shading from yellow to dark brown or black; spiral bands and axial markings either of the same or different colour. Bands vary considerably in width, ranging from completely absent to leaving remnants of ground colour only at centre, shoulder and base; axial markings varying considerably either set off from or merging with spiral bands. Spiral rows of brown to black dots and dashes vary from absent to numerous and pronounced, often with intermittent light dots and dashes. Pattern ranges from monochrome to multicoloured, heavily patterned shells intergrade with immaculate white shells. Larval whorls and a few of adjacent postnuclear sutural ramps white to beige, pink or brown; colour may vary considerably within a population. Late sutural ramps sparsely to heavily marked with radial lines, streaks or blotches, usually matching pattern of last whorl in one or two of its major colours. Aperture white, occasionally pale pink or with brown blotches.

Periostracum light olive to brown, thin, translucent to opaque, smooth or with fine, close-set spiral and axial ridges; spiral elevations often finely tufted both on last whorl and spire.

Dorsum of foot white, variably mottled with brown medially; marginal zones often pale orange to light brown, dotted with white and edged with yellow or orange anteriorly; a large transverse black blotch on anterior part, sometimes divided into 3 smaller blotches or reduced to one central blotch; a dotted grey pre-marginal line varies from prominent to absent, often broader at posterior end. Occasionally, dorsum of foot pale pink to pale orange, with typical black pattern. Sole of foot immaculate pink, or white mottled with brown. In some specimens, entire foot mottled tan and brown, without typical black pattern on dorsum. Rostrum white mottled with brown; tip usually immaculate. Tentacles white, mottled with brown or pale orange dorsally; tip often brown. Siphon white, often grading to pink

dorsally, mottled with brown and grey; mottling usually sparse distally and absent from the tip (Cernohorsky, 1964; Chaberman, pers. comm., 1981; Kohn, unpubl. observ.; Estival, unpubl. observ.; Pearson, unpubl. observ.). (Pl. 75, Fig. 36; Pl. 79, First row, right; Fourth row, left).

Specimens with shell larger than 10.5 mm with relatively large radular teeth with a long shaft terminating in 2 short adapical barbs and an additional posterior barb with a recurved tip; both serration and a basal spur are absent. Juveniles smaller than 9 mm have relatively short teeth with a stout shaft lacking armature. Specimens of shell length 9-10.5 mm possess intermediate radular teeth (small, with a stout shaft and adult armature). Length of radular teeth varies from 0.06 to 0.1 x shell length, with largest teeth observed in Fiji specimens (Cernohorsky, 1964; James, 1980; Nybakken & Perron, 1988). Radular studies by Rolán proved form *frauenfeldi* to have teeth identical to those of typical *C. magus* from Philippines (G. Raybaudi, in press).

Habitat and Habits: Intertidal and upper subtidal; juveniles sometimes in 100 m and more. A sand-dweller on coral reef and in sheltered bays, often beneath rocks and dead coral (Cernohorsky, 1964; Kohn & Nybakken, 1975; Tirard, pers. comm., 1989; Richards, pers. comm., 1989). Form *frauenfeldi* on muddy sand in about 5 m, at the ocean-side of coral reef (Sumatra; Huber, pers. comm., 1992). *C. magus* becomes active at night and preys upon fishes when shell length is at least 9 mm. Smaller juveniles feed on syllid polychaetes (Nybakken & Perron, 1988). The change in diet is associated with a change in morphology of radular teeth (see above). Venom of adult specimens highly toxic to fishes and small mammals, variably toxic to worms and gastropods (Endean & Rudkin, 1965). Egg diameter of about 560 μ m predicts completely benthic development (Perron & Kohn, 1985).

Discussion: *C. magus* is often very similar to *C. consors* and sometimes similar to *C. fischoederi*. *C. magus* and *C. consors* often cannot be distinguished by shape, sculpture or colour pattern of the shell. *C. consors* is usually larger (51-118 mm), and it differs in its multispiral (about 3 whorls) larval shell, as would be expected in a species with a smaller egg and planktonic larva. Shells of *C. consors* with beige to brown larval shells can be separated for similar shells of *C. magus* by this character. In addition, the spiral ribs on the sutural ramps are usually weaker in *C. consors*. Very close to *C. consors* in colour pattern is *C. magus* form *raphanus*, but the latter can easily be distinguished by its pink apex and yellow and olive dots on the adjacent post-nuclear sutural ramps. Specimens of *C. fischoederi* with a reduced reticulate pattern resemble similarly patterned forms of *C. magus*. The latter shells are less ventricose and have a more angulate shoulder; their pattern shows no remnants of a meshwork and tents. For comparison with *C. gubernator*, see the Discussion of the latter species.

In Indonesia and Philippines, *C. magus* is characterized by a remarkable conchological divergence between separate populations, while the species is rather uniform from New Caledonia to Queensland. Within the same population, *C. magus* may be either largely uniform or fairly variable in shell morphology. The taxonomic status of most nominal

species assigned to *C. magus* therefore remains hypothetical and disputed. We consider the following as forms:

- *C. ambaroides* (Pl. 20, Fig. 30): Last whorl reddish brown, with white axial flecks at centre; based on a subadult specimen.

- *C. assimilis* (Pl. 20, Fig. 12): Last whorl ventricosely conical. Known from various localities.

- *C. carinatus* (Pl. 20, Fig. 15): Last whorl conical, conoid-cylindrical or ventricosely conical. Ground colour white to tan. Colour pattern comparatively uniform, consisting of spiral bands and lines and axial streaks in various shades of brown. Known from Philippines (Sulu Sea, S. Luzon).

- *C. cernohorskyi* (Pl. 20, Fig. 18): Moderately small to medium-sized, moderately solid. Last whorl usually ventricosely conical; surface comparatively rough. Larval whorls consistently pink. Although this variant attains broader last whorls than all other forms of *C. magus*, the overlap in relative diameter allows no clear separation; neither do the differences in surface sculpture. Known from various Philippine localities. We consider it a infrasubspecific form but perhaps it is a sibling species.

C. cernohorskyi may be a synonym of *C. metcalfii*.

- *C. circae*: Similar to *C. raphanus* in shell shape, but last whorl often less inflated below shoulder and grading to ventricosely conical. Known from New Caledonia and the Solomon Islands.

- *C. consul* (Pl. 20, Figs. 13, 14): Essentially similar to *C. assimilis* and *C. fulvobullatus*.

- *C. epistomium* (Pl. 20, Fig. 20): Last whorl narrowly conoid-cylindrical; pattern similar to that of *C. raphanus*.

- *C. frauenfeldi* (Pl. 45, Figs. 22-25): In small specimens, last whorl conical to ventricosely conical. Pattern consists of blackish-brown axial flames and dotted or dashed spiral lines; spiral lines sometimes sparse, often with intermittent white dots and dashes. In E. Sumatra shells almost matching the type specimens of *C. frauenfeldi* occur and also intergrade with typical *C. magus*. They differ from the type specimens of *C. frauenfeldi* in an orange to brown instead of white to pink apex; however this difference is in the range of variability of *C. magus*. We therefore consider *C. frauenfeldi* a form of *C. magus*; the type locality "Madagascar" needs to be confirmed.

- *C. fulvobullatus* (Pl. 20, Fig. 11): Essentially similar to *C. assimilis*.

- *C. metcalfii* (Pl. 20, Figs. 17, 19): Relatively small and stout. Last whorl with yellow and dark brown to black blotches. Probably the same variant as *C. cernohorskyi*.

- *C. raphanus* (Pl. 20, Figs. 21, 22): Shell relatively solid. Last whorl conical, usually more inflated below shoulder in adult specimens than in other forms of *C. magus*. Ground colour white. Pattern consists of yellow to light brown spiral bands, brown axial streaks of varying prominence, and dotted yellow to brown spiral lines either on entire last

whorl or restricted to colour bands. Known from various localities in Indonesia and Philippines.

- *C. rollandi* (Pl. 20, Fig. 28): Last whorl white with red-brown flames and axial streaks.

- *C. signifer* (Pl. 20, Fig. 25): Last whorl tinged with reddish brown, with white flecks at centre and below shoulder. In Fiji, this colour form lives sympatrically with other colour variants.

- *C. tasmaniae*: Last whorl comparatively narrow, with brown axial streaks.

- *C. ustulatus* (Pl. 20, Fig. 26): Last whorl with closely set spiral ribs from base to shoulder and 2 broad pale yellow spiral bands. Known from the Louisiade Archipelago (Solomon Sea) and Palawan, Philippines.

- Specimens from Papua New Guinea, sometimes erroneously called "*C. melancholicus* Lamarck" (see Marsh & Rippingale, 1964) (Pl. 20, Figs. 7-9): Last whorl narrowly ovate to ovate, with light to dark brown axial streaks and flames. Aperture comparatively wide. These specimens may represent a geographic variant or a closely related distinct species. *C. melancholicus* Lamarck is a nomen dubium (Kohn, 1981).

We regard the following as synonyms of *C. magus* rather than forms: *C. caesius*, *C. fucatus* (Pl. 20, Fig. 31) (juvenile type specimens), *C. borneensis*, and *C. epistomioides* (Pl. 20, Fig. 29) (based on a subadult specimen).

83

Conus ferrugineus HWASS in BRUGUIÈRE, 1792

(Plate 21, Figures 2-10; Plate 75, Figure 37; Plate 80, First row, left and right; Map 38)

- 1792 *Conus ferrugineus* Hwass in Bruguière, Encycl. Méth., 1: 649-650, no. 49
- 1857 *Conus chenui* Crosse, J. Conchyl. (Paris), 6: 381-382, pl. 11 figs. 3, 4
- 1865 *Conus mirmillo* Crosse, J. Conchyl. (Paris), 13: 300-302, pl. 9 fig. 2
- 1873 *Conus loebbeckeanus* Weinkauff, Syst. Conch. Cab. Martini Chemnitz, 1, *Conus*: 4 (2): 221-222, pl. 36 figs. 3, 4
- 1875 *Conus (Rhizoconus) sophiae* Brazier, Proc. Linn. Soc. New South Wales, 1: 7-8

Types: *C. ferrugineus*: Lectotype (Kohn, 1968, as "holotype"; Walls, [1979]) in MHNG (52 x 28 mm); *C. chenui*: Holotype in MNHN (50 x 28 mm); *C. mirmillo*: Holotype in BMNH (53 x 30.5 mm); *C. loebbeckeanus*: Holotype in LMD (52 x 28 mm); *C. sophiae*: Holotype in AMS (39 x 22.5 mm).

Type Localities: *C. ferrugineus*: "la Guinée"; *C. chenui*: "Nova Caledonia"; *C. sophiae*: "Hammond's or Bannietta Islands, Solomon Archipelago."

Range: Indonesia to Marquesas, Queensland to N.W. Australia; reports from localities further west in the Indian Ocean probably refer to *C. striatellus*.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl ventricosely conical or conical; outline convex at adapical fourth or third, less so or straight below. Shoulder angulate. Spire of low to moderate height, outline slightly convex to slightly concave. Larval shell of about 3-3.5 whorls, maximum diameter about 0.8 mm. First 0.5 postnuclear whorls tuberculate, grading to smooth within adjacent 2.5 whorls. Teleoconch sutural ramps flat, often slightly concave in late whorls; with 1 increasing to 4-6 or sometimes 8 spiral grooves; spiral sculpture may be weak and fine on last 2 ramps. Last whorl with often granulose spiral ribs on basal third, occasionally extending to shoulder.

Conus ferrugineus Shell Morphometry

L	40 - 75 mm
RW	0.20 - 0.75 g/mm (L 40-70 mm)
RD	0.54 - 0.65
PMD	0.78 - 0.88
RSH	0.06 - 0.16

Ground colour usually cream to yellowish brown. Last whorl with a variably broad yellowish tan to brown spiral band on each side of centre, either solid or interrupted, sometimes blending with adjacent areas to produce an almost uniform colouration. Bands may be gradually reduced and replaced by rows of irregular dark brown axial markings sometimes extending to shoulder. Well separated, dotted, dashed or solid brown spiral lines often extend from base to shoulder. Base and siphonal fasciole contrastingly darker brown than adjacent area. Apex pale yellow. Late sutural ramps with radial dark brown markings. Aperture uniformly white to cream.

Periostracum yellow to brown, variably thin, translucent to opaque, with tufted spiral ridges on last whorl and fringed sutural ramps.

Animal yellow; dorsum of foot paler medially, sometimes with a black spot near posterior end, otherwise immaculate or with sparse brown mottling at centre of anterior part and laterally. Tentacles immaculate or with a narrow black ring. Siphon with 1 or sometimes 2 dark brown or black half-rings 1/2 or 1/3 the length from the tip (Pl. 75, Fig. 37; Pl. 80, First row, left and right) (Chaberman, pers. comm., 1981; Estival, 1981 & unpubl. observ.).

Habitat and Habits: Intertidal to about 50 m; on sand, often under coral (Cernohorsky, 1964) or on sand with algae (Estival, 1981; Richer de Forges & Estival, 1986; Tirard, pers. comm., 1989). Egg diameter of about 214 µm predicts a minimum pelagic period of about 22 days (Philippines; Perron & Kohn, 1985).

Discussion: *C. ferrugineus* is most similar to *C. planorbis*, from which it is not distinguishable by size and

shape of the shell. For comparison of *C. ferrugineus* with *C. planorbis* as well as with *C. striatellus*, *C. circumactus* and *C. swainsoni*, see the Discussions of those species.

C. ferrugineus is usually called "*C. planorbis* Born." However, the lectotype of *C. planorbis* has a faded violet blotch at the anterior end of its aperture, a character also stated in Born's description. Röckel (1981) considered *C. vulpinus* and *C. ferrugineus* to refer to the same species, because the lectotypes of both *C. vulpinus* (Pl. 21, Fig. 1) and *C. ferrugineus* (Pl. 21, Fig. 9) are white inside, and he selected the former as the name for the species. However, Hwass himself stated in his diagnosis of *C. vulpinus* "intus violacea", and we cannot exclude that the lectotype lost its violet blotch by fading. We therefore provisionally assign *C. vulpinus* to *C. planorbis*.

C. chenui (Pl. 21, Fig. 8) refers to a colour form of *C. ferrugineus* with spiral rows of dark axial markings replacing the brown spiral bands on the last whorl. Originally described from New Caledonia, it is also known from Philippines, co-occurring and intergrading with the typical form in both regions. *C. mirmillo* represents a cream white variant with pale yellow spiral bands on both sides of the centre. *C. sophiae* (Pl. 21, Fig. 10) is based on a variant with granulose spiral ribs to the shoulder. *C. loebbeckeanus* is very similar to typical *C. ferrugineus*, with about 20 fine dark spiral lines from base to shoulder. We consider it a colour form of *C. ferrugineus* known from French Polynesia and Papua New Guinea.

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Conus planorbis BORN, 1778

(Plate 21, Figures 1, 11-21; Plate 75, Figure 38;
Plate 79, Fourth row, right; Fifth row, left;
Map 38)

- 1778 *Conus planorbis* Born, Index Mus. Vindob., 1: 148; 1780: Test. Mus. Vindob.: Pl. 7 fig. 13
1791 *Conus polyzonias* Gmelin, Syst. Nat., 13 ed., 1: 3392, no. 53
1792 *Conus vitulinus* Hwass in Bruguière, Encycl. Méth., 1: 648, no. 47
1792 *Conus vulpinus* Hwass in Bruguière, Encycl. Méth., 1: 648-649, no. 48
1829 *Conus vulpinus* Schubert & Wagner, Neues Syst. Conch.-Cab., 12: 56-57, pl. 222 fig. 3073
1942 *Conus praeclarus* Fenaux, Bull. Inst. Océan. (Monaco), 814: 2, fig. 3

Types: *C. planorbis*: Lectotype (Kohn, 1964) in NMW (41 x 23 mm); *C. polyzonias*: Lectotype (Kohn, 1966) figured in Born (1780: Pl. 7 fig. 13) (45 x 28 mm); *C. vulpinus* Hwass: Lectotype (Kohn, 1968) in MHNG (51 x 26 mm); *C. vitulinus*: Lectotype (Kohn, 1968) in MHNG (50 x 39 mm); *C. vulpinus* Schubert & Wagner: Lectotype (Kohn, 1988) figured in Schubert & Wagner (1829: Pl. 222 fig. 3073) (50 x 27 mm); *C. praeclarus*: Original figure 31.5 x 16 mm.

Type Localities: *C. vulpinus* Hwass: "la Guinée"; *C. vitulinus*: "l'Océan asiatique"; *C. vulpinus* Schubert & Wagner: "in den afrikanischen Meeren"; *C. praeclarus*: "Bermudes."

Range: W. and Central Pacific; probably also Indian Ocean (Mascarenes, Seychelles).

Description: Medium-sized to moderately large, moderately solid to solid; form *vitulinus* (Pl. 21, Figs. 16-19, see below) slightly heavier than typical form but its relative weight may vary by 50% among specimens of similar size. Last whorl conical or ventricosely conical; outline convex at apical fourth, almost straight below. Shoulder angulate. Spire low, usually lower in form *vitulinus*; outline slightly concave, sigmoid or convex. Larval shell of about 3 whorls, maximum diameter about 0.8 mm. Teleoconch sutural ramps flat, often concave in late whorls, with 1 increasing to 5-7 spiral grooves; spiral sculpture occasionally weak on last 2 ramps. Last whorl with variably raised and granulose spiral ribs on basal third or fourth, sometimes weakly ribbed above; ribs variably spaced but usually more closely set toward base.

C. planorbis Shell Morphometry

L		40 - 82 mm
RW	typical form	0.25 - 0.60 g/mm (L 40-60 mm)
	form <i>vitulinus</i>	0.30 - 0.82 g/mm (L 40-62 mm)
RD		0.55 - 0.65
PMD		0.80 - 0.92
RSH	typical form	0.08 - 0.13
	form <i>vitulinus</i>	0.03 - 0.11

Ground colour white, sometimes suffused with cream to tan on last whorl, but rarely so on sutural ramps. In typical form (Pl. 21, Fig. 15), last whorl with a broad yellowish to dark brown spiral band on each side of centre, sometimes blending with adjacent areas but usually leaving a ground-colour band at centre and below shoulder; subshoulder band may be very narrow and interspersed with brown axial markings. In form *vitulinus* (Pl. 21, Figs. 16-19), last whorl with a broad tan to dark brown band on each side of centre, either solid or reduced and split into axial streaks and flames. Dark brown axial streaks or flames cross brown and intervening ground-colour bands; the latter spiral bands vary in width and are sparsely to heavily interspersed with dark brown axial markings. Both colour forms intergrade in numerous geographic localities.

In both forms as well as intermediates, overlying dotted, dashed or solid brown to dark brown spiral lines may extend from base to shoulder, varying from few to numerous and from closely to widely spaced. Base and siphonal fasciole violet, often obscured by overlying dark brown. Apex cream. Late sutural ramps with variably numerous brown radial markings, often extending to subshoulder area in form *vitulinus* and intermediates. Aperture white, violet to brown at base.

Periostracum grey, yellow or brown, thin and translucent to thick and almost opaque, with tufted spiral lines on last

whorl and sutural ramps; shoulders with slightly longer fringes (Kohn, 1959a; Cernohorsky, 1964; Chaberman, pers. comm., 1981; Pearson, unpubl. observ.).

Animal yellow. Dorsum of foot lighter medially, sometimes dotted with white laterally and anteriorly; marginal zones maculated with brown to black markings large and confluent at anterior end and clustered or absent at posterior end. Sole of foot dark yellow with pale flecks, sparsely mottled with brown. Rostrum dark yellow, proboscis somewhat paler. Siphon pale yellow, edged with darker yellow, with a blackish brown ring 1/3 or 1/2 the length from the tip (Pl. 75, Fig. 38; Pl. 79, Fifth row, left) (form *vitulinus*; Kohn, 1959a; Chaberman, pers. comm., 1981; Pearson, unpubl. observ.).

Radular teeth of form *vitulinus* small, with an adapical barb opposite a long second barb; a double row of prominent denticles forms a serration as long or twice as long as second barb; base with a distinct spur (James, 1980; Kohn, unpubl. observ.).

Habitat and Habits: Intertidal to about 60 m; on reef rock beneath dead coral, sand bottom with algae, and on coral and rubble. In Hawaii, form *vitulinus* epifaunally in 0.6-55 m, uncommonly on subtidal reef flats and more commonly in 16-40 m (Kohn, 1959a, b; Cernohorsky, 1964; Kay, 1979; Estival, 1981; Tirard, pers. comm., 1989).

In Hawaii, form *vitulinus* feeds on eunicid polychaetes (Kohn, 1959b). Its egg capsules are deposited in irregular clusters affixed to the underside of rocks by confluent basal plates. Capsules of about 23 x 16-17 mm contain eggs 225 µm in diameter, suggesting a minimum pelagic period of about 21 days (Kohn, 1961a; Perron & Kohn, 1985).

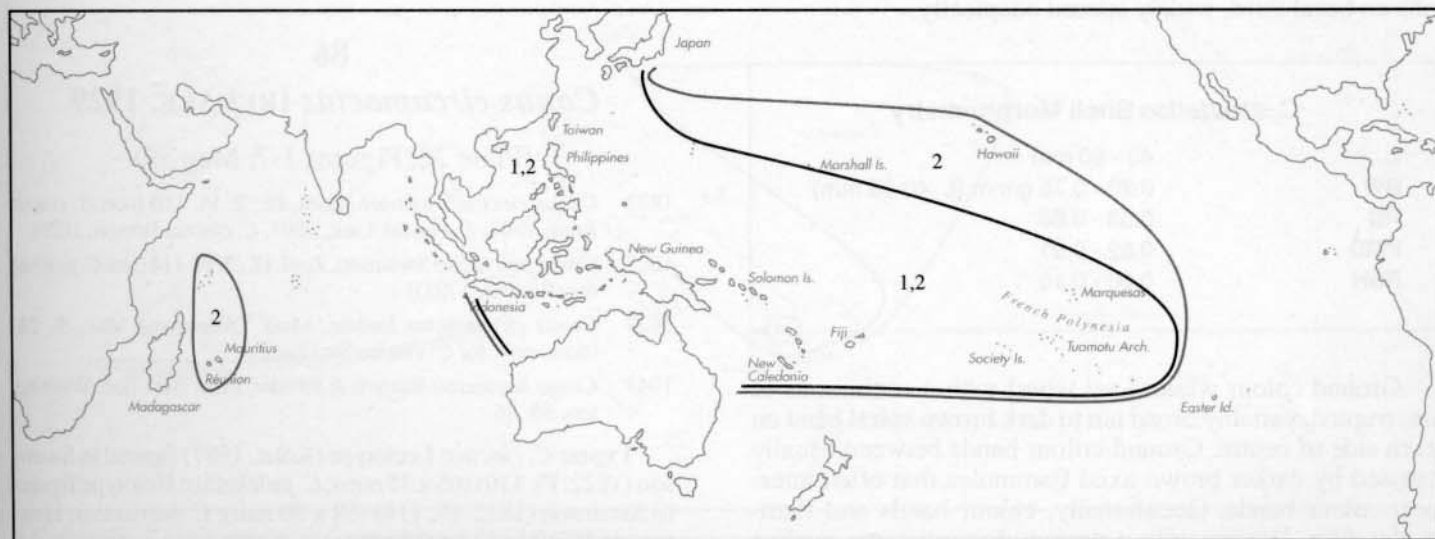
Discussion: This species is closely allied to *C. ferrugineus*, *C. striatellus*, *C. circumactus* and *C. swainsoni*; for comparison with the latter three species, see the Discussions of those species. Form *vitulinus* sometimes also resembles *C. litoglyphus*; for the distinctions see the Discussion of the latter species. *C. planorbis* is not distinguishable from *C.*

ferrugineus by size and shape of the shell. The only reliable difference is the uniformly white aperture of *C. ferrugineus*, in contrast to the violet to violet brown base of the aperture in *C. planorbis*. In addition, the white subshoulder band of *C. planorbis* rarely occurs in *C. ferrugineus*, and the granulate ribs on basal part of last whorl are often light coloured in *C. planorbis* but usually overlaid with a dark spiral line in *C. ferrugineus*.

The violet colour of the basal end of the shell (most pronounced within the aperture) is a distinctive character of this species. It is present in the lectotypes of both *C. vitulinus* and *C. planorbis*. As specimens intermediate in colour pattern between *C. planorbis* and *C. vitulinus* occur in most populations that consist primarily of one of these variants, we consider both to represent forms of the same species. For the assignment of *C. vulpinus* Hwass to *C. planorbis*, see the Discussion of *C. ferrugineus*.

A local population from Kwajalein, Marshall Is. (Pl. 21, Fig. 20), characterized by Pearson (1988) as "golden cones," has very similar shell characters and animal colouration to *C. planorbis* form *vitulinus*. The shells are 34-56 mm long. They differ from the sympatric form *vitulinus* in the light yellowish brown rather than dark brown pattern on both last whorl and spire, and in the absence of the violet brown colour of base, siphonal fasciole, and anterior end of the aperture. The thin and very translucent periostracum bears spirally arranged bristles on the last whorl and has fringed shoulders. The animal shades from light to dark yellow. The dorsum of the foot bears many white and scattered brown spots that are larger and more closely spaced along the lateral margins and across the anterior part. The sole of the foot has a brown mottling that is heavier laterally and forms a broad transverse band of axial stripes close behind the distal edge. The rostrum is dark yellow, while the tentacles are pale except for their tips. The siphon grades to cream or white distally, has a yellow distal edge and a black transverse band halfway back from the tip (Pl. 79, Fourth row, right). The animals occur epifaunally

Map 38



1: *C. ferrugineus* 2: *C. planorbis*

among living and dead coral in 1-3 m in the lagoon (Pearson, unpubl. observ.). We provisionally assign this population to *C. planorbis*. Similar shells are also known from W. Samoa (Plate 21, Fig. 21).

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Conus striatellus LINK, 1807

(Plate 21, Figures 22-31; Map 39)

- 1792 *Conus lineatus* Hwass in Bruguière, Encycl. Méth., 1: 645-646, no. 44 (non *C. lineatus* Solander, 1766, a fossil)
 1807 *Conus striatellus* Link, Besch. Nat. Samml. Univ. Rostock, 3: 103
 1864 *Conus lictor* Crosse, J. Conchyl. (Paris), 12: 36-37, pl. 1 figs. 1,2
 1921 *Conus pulchrelineatus* Hopwood, J. Conchol. (London), 16: 151 (nom. nov. for *C. lineatus* Hwass)
 1933 *Conus lineatus granulosus* Barros e Cunha, Mem. Est. Mus. Zool. Univ. Coimbra, (1) 71: 118-119 (non *C. granulosus* (Röding, 1798))

Types: *C. lineatus*: Lectotype (Kohn, 1968, as "holotype", Walls, [1979]) in MHNG (46 x 23 mm); *C. striatellus*: Lectotype (Kohn, 1981) figured in Chemnitz (1788: Pl. 138 fig. 1285) (36 x 18 mm); *C. lictor*: Original figure 40 x 22 mm; *C. l. granulosus*: Holotype 47 x 25 mm acc. Barros e Cunha.

Type localities: *C. lineatus*: "l'Océan Asiatique"; *C. striatellus*: "Diego Suarez, Madagascar" (Wils, 1986).

Range: Natal to Red Sea and to Japan and Fiji; absent from Australia.

Description: Medium-sized to large, moderately solid to solid; relative weight may vary by 50 % in specimens of similar size. Last whorl conical, ventricosely conical or conoid-cylindrical; outline almost straight to convex. Shoulder angulate. Spire of low to moderate height, outline slightly concave to straight. Larval shell multispiral, maximum diameter 0.7-0.9 mm. Earliest postnuclear whorls weakly tuberculate. Teleoconch sutural ramps flat, often slightly concave in late whorls, with 1-2 increasing to 4-6 spiral grooves. Last whorl with weak, often granulose spiral ribs on basal third, widely spaced adapically.

C. striatellus Shell Morphometry

L	40 - 90 mm
RW	0.20 - 0.75 g/mm (L 40-68 mm)
RD	0.53 - 0.66
PMD	0.82 - 0.91
RSH	0.06 - 0.16

Ground colour white. Last whorl with a continuous or interrupted, variably broad tan to dark brown spiral band on each side of centre. Ground-colour bands between usually crossed by darker brown axial flammules that often intersect colour bands. Occasionally, colour bands and flammules fuse, leaving only a narrow discontinuous median

band. Closely spaced, dotted, dashed or solid brown spiral lines extend from base to shoulder, sometimes restricted to brown bands and rarely absent. Base yellowish to dark brown, contrasting with lighter adjacent area. Apex yellowish grey. Late sutural ramps tessellated with dark brown. Aperture white to cream.

Periostracum greyish brown, moderately thick, and rough.

Animal bright yellow; siphon with a dark brown half-ring 1/3 the length from the tip (Kohn, unpubl. observ.).

Radular teeth with an adapical barb opposite a blade; serration terminates in a cusp at the central waist; base with a prominent spur (Peile, 1939; Nybakken, 1990). Bandel (1984) depicted a tooth with a long second barb instead of a blade and with a short serration without a terminal cusp.

Habitat and Habits: Intertidal to about 20 m; on sand, often with algae or mixed with coral rubble. In Mozambique, *C. striatellus* inhabits semi-sheltered sites inside reefs (Cernohorsky, 1964; Sharabati, 1984; Grosch, pers. comm., 1989; Tirard, pers. comm., 1989; Fainzilber et al., 1992). Egg diameter of 193 µm predicts a minimum pelagic period of about 24 days (Palau; Perron & Kohn, 1985).

Discussion: *C. striatellus* is similar to *C. ferrugineus*, *C. planorbis*, *C. circumactus* and *C. swainsoni*. *C. ferrugineus* differs in its fewer and more widely spaced spiral lines on the last whorl, cream to yellowish brown ground colour, and its thinner, translucent and tufted periostracum. *C. planorbis* is distinguished by the violet-brown colour of the anterior end of its aperture and the usually more widely spaced spiral lines on its last whorl. Neither of these two species has shells with a conoid-cylindrical last whorl. For comparisons with *C. circumactus* and *C. swainsoni*, see the Discussions of those species.

C. lictor (Pl. 21, Figs. 30, 31) refers to a colour variant with reduced axially streaked pattern.

86

Conus circumactus IREDALE, 1929

(Plate 22, Figures 1-7; Map 39)

- 1822 *Conus cinctus* Swainson, Zool. Ill., 2: Pl. 110 (non *C. cinctus* Bosc, 1801, *C. cinctus* Link, 1807, *C. cinctus* Borson, 1820)
 1822 *Conus pulchellus* Swainson, Zool. Ill., 2: Pl. 114 (non *C. pulchellus* (Röding, 1798))
 1829 *Conus circumactus* Iredale, Mem. Queensland Mus., 9: 281 (nom. nov. for *C. cinctus* Swainson)
 1943 *Conus hammatus* Bartsch & Rehder, Proc. Biol. Soc. Washington, 56: 86

Types: *C. cinctus*: Lectotype (Kohn, 1987) figured in Swainson (1822: Pl. 110) (65 x 35 mm); *C. pulchellus*: Holotype figured in Swainson (1822: Pl. 114) (58 x 30 mm); *C. hammatus*: Holotype in USNM (22.5 x 12 mm).

Type Localities: *C. cinctus*: "Amboina" (Coomans et al., 1985a); *C. pulchellus*: "Amboina"; *C. hammatus*: "near Kauai Island, Hawaiian Islands."

Range: Natal and Mozambique to Hawaii.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl conical or ventricosely conical; outline convex at adapical fourth to half, less so or straight below. Shoulder angulate. Spire of low to moderate height, outline concave. Larval shell multispiral, maximum diameter 0.8 mm. Early postnuclear whorls weakly tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1 increasing to 3-4 spiral grooves, occasionally obsolete on late ramps. Last whorl with smooth and granulose spiral ribs near base to two-thirds and spiral rows of punctations above; granulose ribs with several smooth ribs between, primarily toward base.

C. circumactus Shell Morphometry

L	40 - 75 mm
RW	0.19 - 0.63 g/mm (L 35-57 mm)
RD	0.58 - 0.68
PMD	0.80 - 0.93
RSH	0.04 - 0.14

Ground colour white, variably suffused with violet. Last whorl with a broad yellowish tan to brown spiral band on each side of centre; colour bands variably wide, solid or interrupted, sometimes covering most of last whorl. Widely spaced spiral rows of brown dots and dashes from base to shoulder, varying from pronounced to obsolete and from numerous to absent. Base and siphonal fasciole purple. Larval whorls light brown. Teleoconch sutural ramps with brown radial streaks, occasionally extending to subshoulder area. Aperture white except for purple anterior end; occa-

sionally with a violet marginal band to shoulder and exhalent notch.

Periostracum light brown, moderately thin, partially translucent, with axial and tufted spiral ridges on last whorl (Philippines; New Caledonia). In Hawaii, periostracum yellowish brown, rather thick and opaque in subadult specimens, becoming slightly translucent and yellow during further growth (Kohn, 1959a).

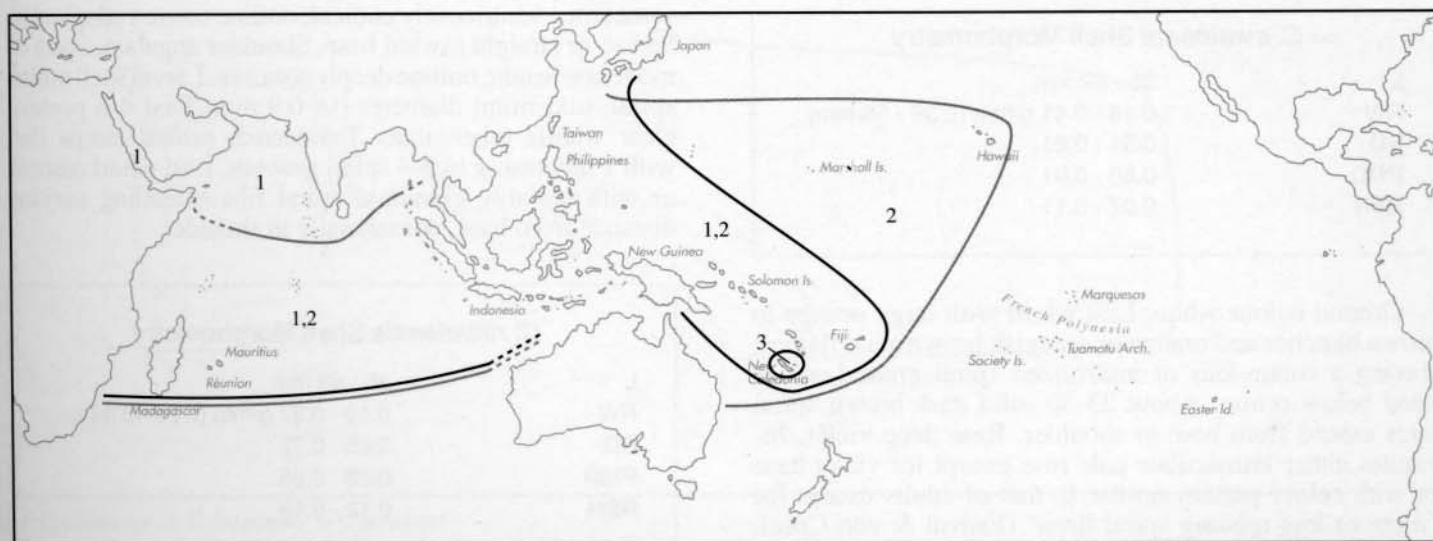
Marginal parts of foot pale lemon yellow, with sparse brown markings dorsally, larger on posterior parts. Siphon pale yellow, with a brown distal edge and a brown half-ring 1/3 the length from the tip (Hawaii, New Caledonia; Kohn & Weaver, 1962; Estival, unpubl. observ.).

Habitat and Habits: Usually in 10-240 m, down to 600 m in Hawaii; on sand, sand mixed with rubble, or on coralline gravel, either in semi-sheltered habitats or exposed to strong tidal currents (Cernohorsky, 1964; Estival, 1981; Estival & von Cosel, 1986; Tirard, pers. comm., 1989; Grosch, pers. comm., 1989).

Discussion: The closest relative of *C. circumactus* is *C. swainsoni* from New Caledonia; for comparison see the Discussion of that species. *C. circumactus* also resembles *C. ferrugineus*, *C. planorbis* and *C. striatellus*. All of these species differ from *C. circumactus* in lacking violet in their background colouration. The anterior end of the aperture is dark violet-brown in *C. planorbis*, white in *C. ferrugineus* and *C. striatellus* but purple to light violet brown in *C. circumactus*. *C. striatellus* moreover differs in having closely spaced spiral lines on the last whorl. These three species occur in intertidal and usually shallower subtidal habitats. For distinction between *C. circumactus* and *C. rawaiensis*, see the Discussion of the latter species.

Estival & von Cosel (1986) considered *C. connectens* A. Adams, 1855 an earlier name for *C. circumactus*. Coomans et al. (1985a) considered the type specimen of *C. connectens* indeterminate, but Röckel (1988b) concluded that it is a

Map 39



1: *C. striatellus* 2: *C. circumactus* 3: *C. swainsoni*

specimen of *C. daucus* Hwass from the W. Atlantic. In any case it seems not to be an earlier name for *C. circumactus*.

Coomans et al. (1985a) separate this species into *C. circumactus* s.s. and *C. hammatus* (Pl. 22, Fig. 7), but these two forms intergrade in colour pattern, shape and sculpture in both Indian and Pacific Ocean populations (Estival & von Cosel, 1986). In agreement with Estival & von Cosel (1986) we consider *C. hammatus* to apply to deep-water shells of *C. circumactus*, although this requires further study. Indian Ocean specimens of *C. circumactus* are more uniformly coloured than most shells from the Pacific Ocean and often have the late sutural ramps more concave and with weaker spiral sculpture.

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Conus swainsoni ESTIVAL & VON COSEL, 1986

(Pl. 22, Figs. 8-12; Map 39)

1986 *Conus swainsoni* Estival & von Cosel, Venus **45** (2): 87-98, pl. 1 figs. 1-3, pl. 2 figs. 1-6

Type: Holotype in MNHN (56 x 28 mm).

Type Locality: "New Caledonia, off Nouméa, between Ilot Canard and Ilot Maître."

Range: New Caledonia.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl conical or ventricosely conical, outline convex adapically, less so or straight below. Shoulder angulate. Spire low; outline concave, straight or sigmoid in adults, domed in subadults. Larval shell multi-spiral, maximum diameter 0.8-0.9 mm. Teleoconch sutural ramps with 1 increasing to 3-5 weak spiral grooves. Last whorl with prominent spiral rows of granules toward base; interspaces with an usually weaker central row of granules.

C. swainsoni Shell Morphometry

L	36 - 62 mm
RW	0.18 - 0.41 g/mm (L 36 - 55 mm)
RD	0.51 - 0.61
PMD	0.80 - 0.91
RSH	0.07 - 0.11

Ground colour white. Last whorl with large orange to brown blotches and orange or orangish brown axial flames, leaving a continuous or interrupted spiral ground-colour band below centre. About 23-30 solid dark brown spiral lines extend from base to shoulder. Base deep violet. Juveniles either immaculate pale rose except for violet base or with colour pattern similar to that of adults except for "more or less missing spiral lines" (Estival & von Cosel, 1986). Larval shell beige. Teleoconch sutural ramps with

brown radial markings. Aperture white except for deep violet anterior end.

Animal yellow (Estival, 1981).

Habitat and Habits: In 12 to more than 60 m (Richard, pers. comm., 1991). Estival (1981) reported juveniles from "the outer side of barrier-reef in sand, deeper than 40 m". According to Estival & von Cosel (1986) and Tirard (pers. comm., 1989), *C. swainsoni* occurs in 12-25 m on coarse muddy sand with algae and rubble.

Discussion: This species is very similar to *C. circumactus*. The latter species has a broader last whorl (RD 0.58-0.68) and a concave spire rather than with domed early whorls. Juvenile shells (length about 20 mm) (Pl. 22, Fig. 10) of these two species differ strikingly in shape and colour pattern, and they do not appear to intergrade where they co-occur in New Caledonia. *C. planorbis*, *C. ferrugineus* and *C. striatellus* also tend to have somewhat broader last whorls. The anterior end of the aperture is white in *C. ferrugineus* and *C. striatellus*, violet-brown in *C. planorbis* but deep violet in *C. swainsoni*. *C. striatellus* also differs in having a greater number of more closely spaced spiral lines on the last whorl.

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Conus rawaiensis DA MOTTA, 1978

(Plate 22, Figures 13-15; Map 40)

1978 *Conus rawaiensis* da Motta, Centre Thai nat. Study: 8, text figs., 6, figs., Addenda.

Type: Holotype in MHNG (39 x 22 mm).

Type locality: "off Raya Island, Phuket."

Range: Raya Id., W. Thailand, and Sri Lanka.

Description: Moderately small to medium-sized, moderately solid. Last whorl conical or broadly conical, sometimes ventricosely conical; outline convex adapically, less so or straight toward base. Shoulder angulate. Spire of moderate height, outline deeply concave. Larval shell multi-spiral, maximum diameter 0.8-0.9 mm. First 4-6 postnuclear whorls tuberculate. Teleoconch sutural ramps flat, with 1 increasing to 3-4 spiral grooves. Last whorl smooth or with variably granulose spiral ribs extending varying distance from base, occasionally to shoulder.

C. rawaiensis Shell Morphometry

L	25 - 48 mm
RW	0.10 - 0.37 g/mm (L 25-43 mm)
RD	0.65 - 0.72
PMD	0.83 - 0.95
RSH	0.12 - 0.19

Colour orange, often lighter at base of last whorl. In smaller specimens, last whorl often with a pale or distinct yellow spiral band at centre. Larval shell white. First 4-5 postnuclear sutural ramps white; late ramps may have brown radial blotches in subadults. Aperture white.

Periostracum brown, becoming thicker and opaque during growth, with widely set and strongly tufted spiral ridges on last whorl crossing closely set axial ridges; sutural ramps with heavy, regularly wide-set radial tufts.

Habitat and Habits: In 25-40 m; on sand bottom with rocks.

Discussion: *C. rawaiensis* is most similar to *C. circumactus*, which attains larger size and has a narrower last whorl (RD 0.58-0.67), lower spire (RSH 0.05-0.14), and a violet base.

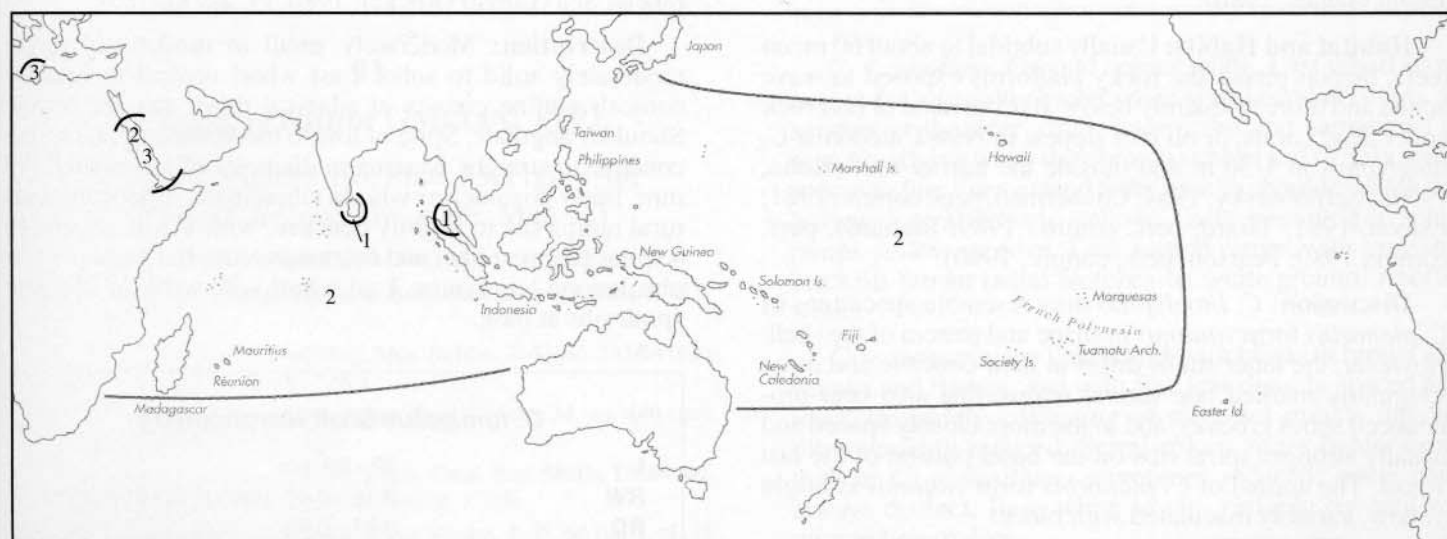
89

Conus litoglyphus HWASS in BRUGUIÈRE, 1792

(Plate 22, Figures 16-22; Plate 75, Figure 39; Plate 80, Second row, left; Map 40)

- 1792 *Conus litoglyphus* Hwass in Bruguière, Encycl. Méth., 1: 692-693, no. 81
 1798 *Cucullus cinamomeus* Röding, Mus. Bolten., 2: 43, no. 534/53
 1798 *Cucullus orleanus* Röding, Mus. Bolten., 2: 44, no. 558/68
 1833 *Conus bicolor* Sowerby I, Conch. Ill.: Pt. 24, fig. 2 (March) (non *C. bicolor* Sowerby I, 1833 (post July))
 1841 *Conus albomaculatus* Sowerby II, Conch. Ill.: Index (nom. nov. for *C. bicolor* Sowerby I)

Map 40



1: *C. rawaiensis* 2: *C. litoglyphus* 3: *C. fumigatus*

- 1845 *Conus lacinulatus* Kiener, Coq. Vivant, 2: Pl. 108 fig. 2; 1849-1850: 312, 313
 1865 *Conus carpenteri* Crosse, J. Conchyl. (Paris), 13: 302-303, pl. 9 fig. 1
 1874 *Conus (Rhizoconus) seychellensis* Nevill & Nevill, J. Asiatic Soc. Bengal, 43 (2): 22
 1952 *Conus inermis* Tinker, Pacific Seashells: 178, Center row (mis-spelling for *C. ermineus*, error for *C. litoglyphus*)

Types: *C. litoglyphus*: Lectotype (Kohn, 1968 as "holotype", Walls, [1979]) in MHNG (52 x 29 mm); *C. cinamomeus*: Lectotype (Kohn, 1975) figured in Martini (1773: Pl. 57 fig. 631) (50 x 23 mm); *C. orleanus*: Lectotype (Kohn, 1975) figured in Chemnitz (1788: Pl. 140 fig. 1298) (37 x 20 mm); *C. bicolor*: Lectotype (Kohn, 1992) in Sowerby I (1833: Pt. 24, fig. 2) (18 x 10 mm); *C. albomaculatus*: Lectotype (Kohn, 1992) figured in Sowerby (1833: Pt. 24, fig. 2) (17.5 x 9.5 mm); *C. lacinulatus*: Original figure 39 x 23 mm; *C. carpenteri*: Holotype in BMNH (46.5 x 25 mm); *C. seychellensis*: Holotype in ZSI (L 38.5 mm).

Type Localities: *C. litoglyphus*: "les mers des grandes Indes"; *C. albomaculatus*: "Moluccas, Indonesia" (Coomans et al., 1979b); *C. carpenteri*: "Nova Guinea, Oceaniae"; *C. seychellensis*: "Seychelle Islands."

Range: E. Africa to Hawaii.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl usually conical; outline straight, convex below shoulder. Shoulder angulate. Spire low; outline usually concave, occasionally convex in early whorls. Larval shell multispiral, maximum diameter about 0.8 mm. Early postnuclear whorls tuberculate. Teleoconch sutural ramps flat, with 1-3 spiral grooves disappearing in late whorls. Last whorl with coarse, widely spaced, partially granulose spiral ribs basally, sometimes replaced by obsolete smooth ribs or followed by scattered spiral rows of granules to shoulder.

C. litoglyphus Shell Morphometry

L	40 - 75 mm
RW	0.20 - 0.60 g/mm (L 40-60 mm)
RD	0.51 - 0.60
PMD	0.83 - 0.95
RSH	0.04 - 0.13

Ground colour white. Last whorl overlaid with brownish olive or orangish to dark brown, leaving spiral ground-colour bands at shoulder and below centre. White bands solid, regularly or irregularly interrupted by axial colour markings, or covered with olive to dark brown. Base dark brown. Larval whorls and adjacent sutural ramps grey. Late ramps with confluent radial blotches matching last whorl pattern in colour. Aperture white or pale brown, dark brown at base.

Periostracum light brown, thin, translucent to opaque, with widely spaced tufted spiral ridges on last whorl.

In Hawaii and Marshall Is., animal olive, sparsely to heavily mottled with darker grey, black and dark brown, often variably dotted with white. Proboscis yellow. Siphon, rostrum and tentacles may appear grey, dark brown or even black depending on mottling and absence of white dots (Kay, 1979; Kohn, unpubl. observ.; Pearson, unpubl. observ.) (Pl. 80, Second row, left). In Papua New Guinea, foot pale pink, brighter laterally and posteriorly and shading to orangish red at anterior edge (Pl. 75, Fig. 39) (Chaberman, pers. comm., 1981). In Seychelles, dorsum of foot reddish brown dotted with white, sole of foot yellowish brown grading to brown anteriorly; siphon greyish tan dotted with white; tentacles brown dotted with white, and rostrum reddish brown tipped with immaculate red but otherwise dotted with white (Kohn, unpubl. observ.)

Radular teeth small, with an adapical barb opposite a long blade; serration extends from posterior end of barb halfway down the tooth and terminates in a cusp; basal spur absent (James, 1980).

Habitat and Habits: Usually subtidal to about 60 m; on reefs, lagoon pinnacles, rocky platforms exposed to wave action and more frequently below 10 m on sand or reef rock under dead corals, or on reef slopes. In New Caledonia, *C. litoglyphus* in 1-30 m and outside the barrier-reef (Kohn, 1959a; Cernohorsky, 1964; Chaberman, pers. comm., 1981; Estival, 1981; Tirard, pers. comm., 1989; Richards, pers. comm., 1989; Pearson, pers. comm., 1990).

Discussion: *C. litoglyphus* may resemble specimens of *C. planorbis* form *vitulinus* in shape and pattern of the shell. However, the latter shells differ in their concave and more irregularly marked late sutural ramps, that also bear pronounced spiral grooves, and in the more closely spaced and usually stronger spiral ribs on the basal portion of the last whorl. The animal of *C. planorbis* form *vitulinus* is bright yellow, variably maculated with black.

C. albomaculatus refers to a heavily granulose subadult shell of *C. litoglyphus*. *C. lacinulatus* is a variant of *C. litoglyphus* with white spiral bands with flames extending

into the brown areas. *C. carpenteri* (Pl. 22, Fig. 22) is a banded form with light and dark brown, leaving only a narrow white band below centre. *C. seychellensis* (Pl. 22, Fig. 17) is a colour form completely lacking white bands.

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Conus fumigatus HWASS in BRUGUIÈRE, 1792

(Plate 22, Figures 23-30; Pl. 34, Figure 21; Map 40)

- 1792 *Conus fumigatus* Hwass in Bruguière, Encycl. Méth., 1: 704, no. 94
1845 *Conus blainvillei* Kiener, Coq. Vivant., 2: Pl. 111 fig. 1; 1849-1850: 358 (non *C. blainvillii* Vignard, 1829)
1848 *Conus luctificus* Reeve, Conch. Icon. 1, *Conus* suppl.: Pl. 2 sp. 280
1857 *Conus pazii* Bernardi, J. Conchyl. (Paris), 6: 385-386, pl. 11 figs. 1, 2
1860 *Conus henoquei* Bernardi, J. Conchyl. (Paris), 8: 380-381, pl. 13 fig. 4
1866 *Conus excavatus* Sowerby II, Thes. Conch., 3 suppl.: 326, no. 411; pl. 25 fig. 616
1942 *Conus richardi* Fenaux, Bull. Inst. Océan. (Monaco), 814: 4, fig. 11

Types: *C. fumigatus*: Lectotype (Kohn, 1968) in MHNG (35 x 21 mm); *C. blainvillei*: Original figure 37 x 23 mm; *C. luctificus*: Lectotype (Coomans & Moolenbeek, 1990) in BMNH (39 x 21 mm); *C. pazii*: Holotype in IRSN (48 x 32.5 mm); *C. henoquei*: Holotype in MNHN (37.5 x 21.5 mm); *C. excavatus*: Holotype in BMNH (41 x 29 mm); *C. richardi*: Original figure 43 x 23 mm.

Type Localities: *C. fumigatus*: "les mers d'Amerique"; "Dahlak Archipelago (Ethiopia), Red Sea" (Wils, 1986); *C. richardi*: "Madagascar."

Range: Red Sea; recently reported from the Mediterranean Sea (Libya) (Röckel, 1986; Pl. 22, Fig. 25).

Description: Moderately small to moderately large, moderately solid to solid. Last whorl conical to broadly conical; outline convex at adapical third, straight below. Shoulder angulate. Spire of low to moderate height, outline concave to straight. Maximum diameter of larval shell 0.9 mm. Early postnuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1-2 increasing to 4 spiral grooves, finer and more numerous but weak or even obsolete on late ramps. Last whorl with weak or obsolete spiral ribs at base.

C. fumigatus Shell Morphometry

L	30 - 69 mm
RW	0.16 - 0.40 g/mm (L 30-51 mm)
RD	0.57 - 0.79
PMD	0.85 - 0.95
RSH	0.10 - 0.19

Ground colour pale grey. Last whorl with a broad grey to brown spiral band on each side of centre, leaving ground-colour bands at centre and at shoulder. Dashed and dotted brown spiral lines may extend from base to shoulder, mainly restricted to colour bands or absent. Base brown, contrasting with paler adjacent area. Larval whorls pale pink or grey. Teleoconch sutural ramps with numerous brown radial markings usually extending to subshoulder area. Aperture translucent, shaded with violet in large specimens.

Habitat and Habits: Shallow water.

Discussion: *C. fumigatus* resembles *C. lischkeanus*, *C. cumingii* and *C. splendidulus*; for comparison, see the Discussions of the latter species.

C. blainvillei (Pl. 22, Figs. 27, 28), *C. luctificus* (Pl. 34, Fig. 21), *C. pazii*, *C. excavatus* (Pl. 22, Fig. 29), *C. henoquei* (Pl. 22, Fig. 30), and *C. richardi* refer to variants of both colour pattern and shape. Comparing the type specimens and original figures, *C. fumigatus* and *C. pazii* refer to rather broad shells (RD 0.70 - 0.73), *C. blainvillei* is somewhat broader (RD about 0.77), *C. henoquei* and *C. excavatus* are somewhat narrower (RD 0.66 - 0.68), while *C. luctificus* and *C. richardi* have the narrowest shells (RD 0.61 - 0.62). Specimens as narrow as or narrower than *C. richardi* are known from the Djibouti area, while specimens as broad as or broader than *C. blainvillei* occur in the Dahlak Archipelago.

Coomans & Moolenbeek (1990) identified shells from the coast of Oman, as *C. luctificus*. However we regard those specimens as colour variants of *C. namocanus*; they attain larger size than *C. fumigatus* and differ in their 5-7 pronounced spiral grooves on the late sutural ramps, generally lower spire (RSH 0.04 - 0.14), and pink shading of spire, last whorl and aperture. *C. fumigatus* has often been misidentified as *C. coffeae* or assigned to *C. classarius* Hwass (a *nomen dubium*; Coomans et al., 1985a).

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Conus vexillum GMELIN, 1791

(Plate 23, Figures 1-6; Plate 75, Figure 40; Plate 80, Second row, right; Map 41)

- 1791 *Conus vexillum* Gmelin, Syst. Nat., 13 ed., 1: 3397, no. 68
 1792 *Conus sumatrensis* Hwass in Bruguière, Encycl. Méth., 1: 655-656, no. 54
 1798 *Cucullus canonicus* Röding, Mus. Bolten., 2: 43, no. 535/54 (non *C. canonicus* Hwass, 1792)
 1802 *Conus princeps* Holten, Enum. Syst. Conch.: 34, no. 440 (non *C. princeps* Linné, 1758)
 1817 *Conus leopardus* Dillwyn, Descr. Catal. Rec. Shells, 1: 364, no. 20 (non *Cucullus leopardus* Röding, 1798)
 1845 *Conus sulphuratus* Kiener, Coq. Vivant., 2: Pl. 66 fig. 3, pl. 78 fig. 4; 1847: 130-131
 1858 *Conus robillardii* Bernardi, J. Conchyl. (Paris), 7: 182-183, pl. 7 figs. 2, 3

Types: *C. vexillum*: Lectotype (Kohn, 1966) figured in Rumphius (1705: Pl. 31 fig. 5) (68 x 39 mm); *C. sumatrensis*: Lectotype (Walls, [1979]) figured in Chemnitz (1788: Pl. 144 A figs. a-b) (71 x 45 mm); *C. canonicus*: Lectotype (Kohn, 1975) figured in Martini (1773: Pl. 57 fig. 629) (63 x 35 mm); *C. princeps*: Lectotype (Kohn, 1981, as "holotype") same as lectotype of *C. sumatrensis*; *C. leopardus*: Lectotype (Walls, [1979]) same as lectotype of *C. sumatrensis*; *C. sulphuratus*: Original figures 21 x 11 mm and 27 x 16 mm; *C. robillardii*: Holotype in MNHN (27 x 14 mm).

Type Localities: *C. sumatrensis*: "l'Isle de Sumatra"; "Hurghada (Egypt)" (Wils, 1986); *C. leopardus*: "East Indian Seas, principally Sumatra."

Range: *C. v. vexillum*: Natal to Hawaii and French Polynesia, Japan to Australia; *C. v. sumatrensis*: Restricted to the N. W. Indian Ocean.

Description: Medium-sized to large, solid to heavy; *C. v. vexillum* (Pl. 23, Figs. 1, 2, 5, 6) larger but lighter than *C. v. sumatrensis* (Pl. 23, Figs. 3, 4). Last whorl conical or ventricosely conical to broadly or broadly and ventricosely conical; outline convex adapically, almost straight below. Shoulder angulate to rounded. Spire of low to moderate height, often higher in *C. v. vexillum*; outline straight to slightly convex. Larval shell of 3.5-5.5 whorls, maximum diameter 0.8-0.9 mm. First 0.25-2.5 postnuclear whorls tuberculate. Teleoconch sutural ramps flat, with 2-3 increasing to about 10 often punctate spiral grooves. Last whorl with weak spiral ribs at base.

C. vexillum Shell Morphometry

	<i>C. v. vexillum</i>	<i>C. v. sumatrensis</i>
L	65 - 183 mm	45 - 115 mm
RW	0.42 - 1.26 g/mm (L 65-134 mm)	0.42 - 1.74 g/mm (L 45-110 mm)
RD	0.58 - 0.72	0.62 - 0.76
PMD	0.82 - 0.89	0.80 - 0.88
RSH	0.07 - 0.17	0.06 - 0.13

C. v. vexillum: Ground colour white. Last whorl brown except for a variably broad white spiral band at centre, and another at shoulder, often interrupted and sometimes absent. Overlying wavy dark brown streaks and closely spaced coarse to fine lines extend from base to shoulder. Base dark brown. Larval whorls yellow. Early postnuclear sutural ramps yellow or olive. Late sutural ramps with greyish to blackish brown radial blotches on white ground. Aperture white.

C. v. sumatrensis: Last whorl with blackish brown axial streaks and flames, and with fine less densely spaced axial lines, frequently consisting of close-set minute dots and often variably reduced. Spiral colour zones lighter brown than in *C. v. vexillum*, sometimes reduced; white bands always distinct. Base white to tan, variably covered with minute brown dots.

Small juveniles (10 mm or less) of *C. v. vexillum* (Pl. 23, Figs. 5, 6) yellow or olive. During growth, colour changes

to brown. White ground appears gradually in adults. Small specimens with spirally arrayed, minute brown dots on spire and at base, sometimes over entire last whorl. During growth, dots become arranged into axial rows, clustered at base and so closely spaced as to produce solid lines. Center of last whorl transitionally with 1-2 spiral rows of brown spots. Larger subadults often with dark brown axial streaks, similar to *C. v. sumatrensis* adults. Juveniles of *C. v. sumatrensis* also yellow; axial streaks and flames are retained in adults.

Periostracum yellowish olive to dark brown, thin to thick, and translucent to opaque, smooth or rough, sometimes with widely spaced spiral rows of fine tufts on last whorl including shoulder (Kohn, 1959a, 1978; Cernohorsky, 1964; Kilburn & Rippey, 1982).

In *C. v. vexillum*, foot yellow-green to greenish black, may grade to black at sides. Dorsum of foot may bear a dotted black pre-marginal line fusing with a black blotch beneath the operculum and a black transverse band at anterior end; median zone either rather uniformly patterned with radial rows of dark brown dots or grading from brown toward a blackish green anterior blotch. Sole of foot with reticulated black lines. Hawaiian juveniles with a yellow foot. Rostrum nearly black. Tentacles grey to black. Siphon dark green or dark grey to black, sometimes edged with yellowish green (Pl. 75, Fig. 40; Pl. 80, Second row, right) (Kohn, 1959a, unpubl. observ.; Kohn & Weaver, 1962; Chaberman, pers. comm., 1981; Pearson, unpubl. observ.). In *C. v. sumatrensis*, foot brown with black markings. Siphon yellow, mottled with black distally (Fainzilber et al., 1992).

Radular teeth slender and elongate, with a small adapical barb opposite a blade; serration extends about 2/3 the length down the shaft ending in a cusp (Peile, 1939; Barnard, 1958; Kohn, unpubl. observ.). Bandel (1984) depicted a tooth for

C. v. sumatrensis (Port Sudan, Red Sea) with a large second barb instead of a blade and with a basal spur.

Habitat and Habits: *C. v. vexillum* intertidal to 70 m; juveniles on intertidal benches, larger individuals on subtidal reefs from the infralittoral fringe to about 30 m and to 50-70 m (Hawaii). It is reported from shallow water, lagoon pinnacles, on sand, sand with gravel, among weed or rocks and under dead coral (Kohn, 1959a, b; Kohn & Weaver, 1962; Cernohorsky, 1964; Estival, 1981; Kilburn & Rippey, 1982; Grosch, pers. comm., 1989; Richards, pers. comm., 1989). *C. v. sumatrensis* in 1-4 m on rocks and reef flats with algal turf (Sharabati, 1984; Fainzilber, 1985; Fainzilber et al., 1992).

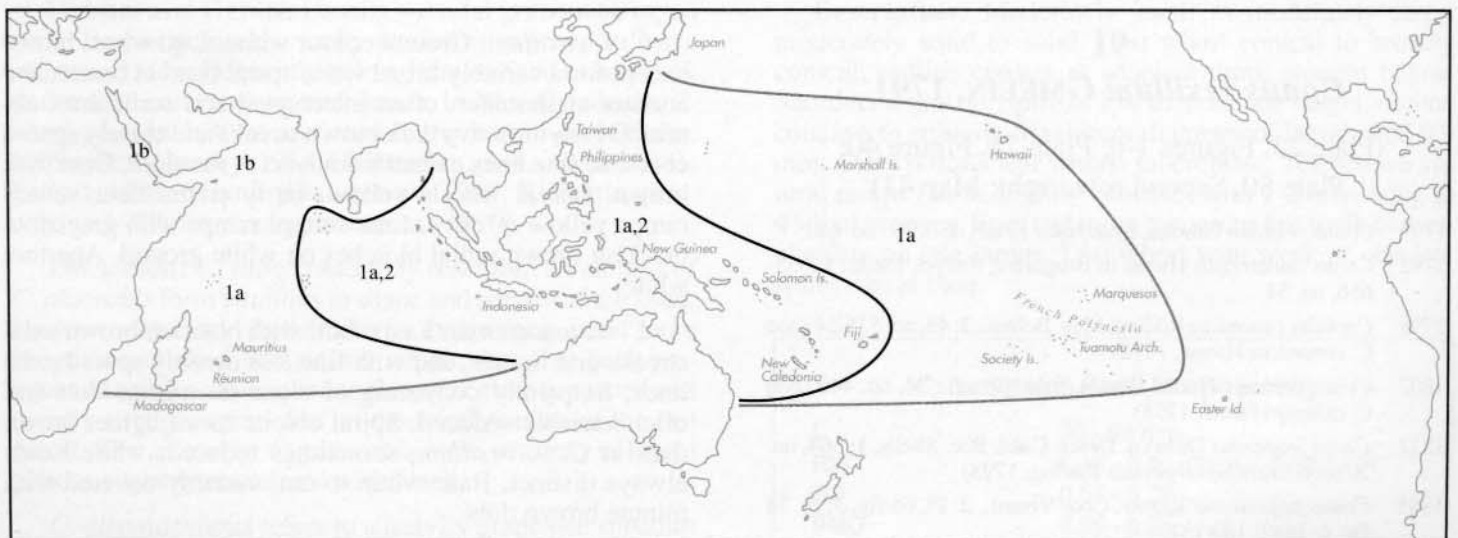
C. vexillum feeds on eunicid polychaetes (Kohn, 1959b).

Oviposition takes place under coral heads. Egg capsules of 20-31 x 13-21 mm deposited in irregular dense clusters and affixed to the substratum by confluent basal plates. An egg mass consists of about 35 capsules each containing 34,500 to 53,500 eggs. Egg diameter of 130-143 µm predicts a minimum pelagic period of about 28 days (Ostergaard, 1950; Kohn, 1961a; Perron, 1981a, b; Perron & Kohn, 1985).

Discussion: *C. vexillum* closely resembles *C. capitaneus*, *C. mustelinus*, *C. namocanus* and *C. miles*; for distinctions, see the Discussions of those species.

We separate *C. vexillum* into two subspecies, because of constant differences in shell morphometry and colour pattern between populations from the N. W. Indian Ocean (*C. v. sumatrensis*) and those throughout the rest of the species range (*C. v. vexillum*). *C. princeps* and *C. leopardus* refer to *C. v. sumatrensis*. Yellow juvenile specimens of *C. vexillum* have been described as *C. sulphuratus*, and *C. robillardii* was based on a brown subadult shell.

Map 41



1a: *C. vexillum vexillum* 1b: *C. vexillum sumatrensis* 2: *C. mustelinus*

Conus mustelinus HWASS in BRUGUIÈRE, 1792

(Plate 23, Figures 7-10; Plate 75, Figure 43; Map 41)

- 1792 *Conus mustelinus* Hwass in Bruguière, Encycl. Méth., 1: 654-655, no. 53.
 1803 *Conus australis* Schröter, Arch. Zool. Zoot., 3 (2): 71 (non *C. australis* Holten, 1802)
 1964 *Conus (Rhizoconus) melinus* Shikama, Venus 23 (1): 36-37, pl. 3 figs. 3-6
 1979 *Conus (Leptoconus) zukiae* Shikama, Sci. Rep. Yokosuka City Mus., 26: 3-4, pl. 1 figs. 9, 10

Types: *C. mustelinus*: Lectotype (Kohn, 1968) figured in Tableau (1798: Pl. 327 fig. 6) (65.5 x 36 mm); *C. australis*: Holotype in MNG (20 x 13 mm); *C. melinus*: Holotype in KPM (71 x 43 mm); *C. zukiae*: Holotype in NSMT (70.5 x 37.5 mm).

Type Localities: *C. mustelinus*: "l'Océan Asiatique"; *C. australis*: "aus den Südländern"; *C. melinus*: "Arafura Sea"; *C. zukiae*: "Off Philippines."

Range: Indian Ocean: Maldive and Chagos Archipelagoes to W. Australia; Pacific: Japan to Philippines, E. Australia, and Fiji.

Description: Moderately large to large, solid to moderately heavy. Last whorl usually conical; outline convex near shoulder, almost straight below. Shoulder angulate, sometimes subangulate. Spire low, outline straight to concave. Larval shell of 3-3.5 whorls, maximum diameter about 0.9 mm. About first 2.25 postnuclear whorls tuberculate. Teleoconch sutural ramps flat, weakly concave in late whorls of some specimens, with 2 increasing to 4-5 weak or strong, often punctate spiral grooves. Last whorl with weak spiral ribs at base; in subadults, ribs strong and followed by rather widely spaced spiral rows of punctations to centre.

C. mustelinus Shell Morphometry

L	55 - 107 mm
RW	0.35 - 0.80 g/mm (L 55-80 mm)
RD	0.56 - 0.70
PMD	0.84 - 0.91
RSH	0.06 - 0.13

Ground colour white. Last whorl spirally banded with greenish yellow or orange, leaving a ground-colour band at shoulder and centre. Central band edged but rarely crossed by dark brown to black spots and often shaded with tan; subshoulder band crossed by dark brown axial markings. A few spiral rows of coarse dark brown dots may occur on subshoulder area and centrally. Base and basal part of columella violet in juveniles; violet colour sometimes persists to adult stage. Larval whorls and about 3 adjacent sutural ramps white or pale yellow. Later sutural ramps white, with greyish olive to black radial blotches that may

extend to subshoulder area. Aperture translucent, becoming opaque and white in large adults.

Periostracum olive to dark brown and thin, becoming thicker during growth, translucent to opaque, with widely spaced spiral rows of tufts on last whorl and tufted axial ridges on sutural ramps; on last whorl, tufts may be restricted to collabral zone.

Animal either very similar to or distinctly different from that of *C. capitaneus* in colour pattern, where both species occur sympatrically. Foot dark olive, with yellow or black sides; dorsum shaded with black laterally and densely dotted with black at both ends, may grade to olive-brown medially; sole may grade to olive-black medially. Rostrum yellowish grey to olive, often edged with yellow. Tentacles yellow or olive. Siphon olive to black, often edged with yellow and sometimes with a few yellow spots; dorsal side may have densely set black dots centrally and proximally (Pl. 75, Fig. 43) (Chaberman, pers. comm., 1981; Kohn, unpubl. observ.).

Habitat and Habits: Intertidal and shallow subtidal; on reefs, on sand often beneath dead coral rocks, on rock or in holes and crevices. *C. mustelinus* feeds on eunicid and nereid polychaetes (Cernohorsky, 1964, 1978; Kohn & Nybakken, 1975; Reichelt & Kohn, 1985; Richards, pers. comm., 1989).

Discussion: *C. mustelinus* resembles *C. vexillum*, *C. capitaneus* and *C. namocanus*. *C. vexillum* attains larger size, has more spiral grooves (ca. 10) on the late sutural ramps, and lacks spiral rows of dark brown markings in adult last whorl pattern. Axial rows of minute brown dots are consistently present in *C. vexillum* but rarely seen in *C. mustelinus*. For distinctions of *C. mustelinus* from *C. capitaneus* and *C. namocanus*, see the Discussions of those species.

C. melinus refers to a pattern variant of *C. mustelinus* with spiral rows of dots on the adapical half of the last whorl. *C. zukiae* represents *C. mustelinus* with an unusually dark base.

Conus capitaneus LINNÉ, 1758

(Plate 23, Figures 11-15; Plate 75, Figure 42; Plate 80, Third row, left; Map 42)

- 1758 *Conus capitaneus* Linné, Syst. Nat., 10 ed., 1: 71, no. 254
 1858 *Conus ceciliae* "Chenu" Crosse, J. Conchyl. (Paris), 7: 381-382, pl. 14 fig. 5
 1972 *Conus capitaneus* var. forma *virginus* Wils, Familie Conidae: 91

Types: *C. capitaneus*: Lectotype (Kohn, 1963) in LSL (51 x 32 mm); *C. ceciliae*: Holotype in MHNG (33 x 19.5 mm).

Type Localities: *C. capitaneus*: "Asia"; restricted to "Larantuka, Flores, Indonesia" (Coomans et al., 1983).

Range: Natal and E. Africa to Hawaii, Samoa and Tonga, Japan to Australia; absent from Red Sea.

Description: Moderately large to large, solid. Last whorl conical or ventricosely conical to broadly or broadly and ventricosely conical; outline convex near shoulder, less so or straight below; left side concave near base. Shoulder angulate, sometimes subangulate. Spire low, outline slightly sigmoid, straight or concave. Larval shell of 3-3.5 whorls, maximum diameter about 0.9 mm. First 0.5 postnuclear whorl tuberculate, smooth within following 0.5 whorl. Teleoconch sutural ramps almost flat to slightly convex, with 2 increasing to 5-7 spiral grooves. Last whorl with widely spaced, often weak spiral ribs at base; in subadults, ribs followed by variably spaced spiral rows of punctations sometimes retained basally in small adults.

C. capitaneus Shell Morphometry

L	55 - 98 mm
RW	0.33 - 0.80 g/mm (L 55-85 mm)
RD	0.65 - 0.75
PMD	0.82 - 0.92
RSH	0.05 - 0.12

Ground colour white. Last whorl with broad, brown or olive spiral bands, leaving white bands at shoulder and centre. Central band edged with dark brown markings, some of which cross the band; subshoulder band crossed by dark brown streaks. Spiral colour bands interspersed by spiral rows of dark brown coarse dots or axial streaks of varying length. Numerous spiral rows of minute brown dots extend from base to shoulder, often sparse within white bands and densely clustered anteriorly, producing a dark brown base; dots become axially rather than spirally aligned during growth. Larval whorls yellow; adjacent sutural ramps greenish yellow. Late sutural ramps white, with variably

broad, brown to black radial blotches, some of which extend as streaks to subshoulder area. Aperture white. Pattern consistent from juveniles of about 15 mm to the adult stage.

Periostracum yellowish to brownish olive, rather thin but less so towards outer lip, translucent to almost opaque, with widely spaced and strongly tufted spiral ridges on last whorl and close-set spiral rows of bristles on sutural ramps.

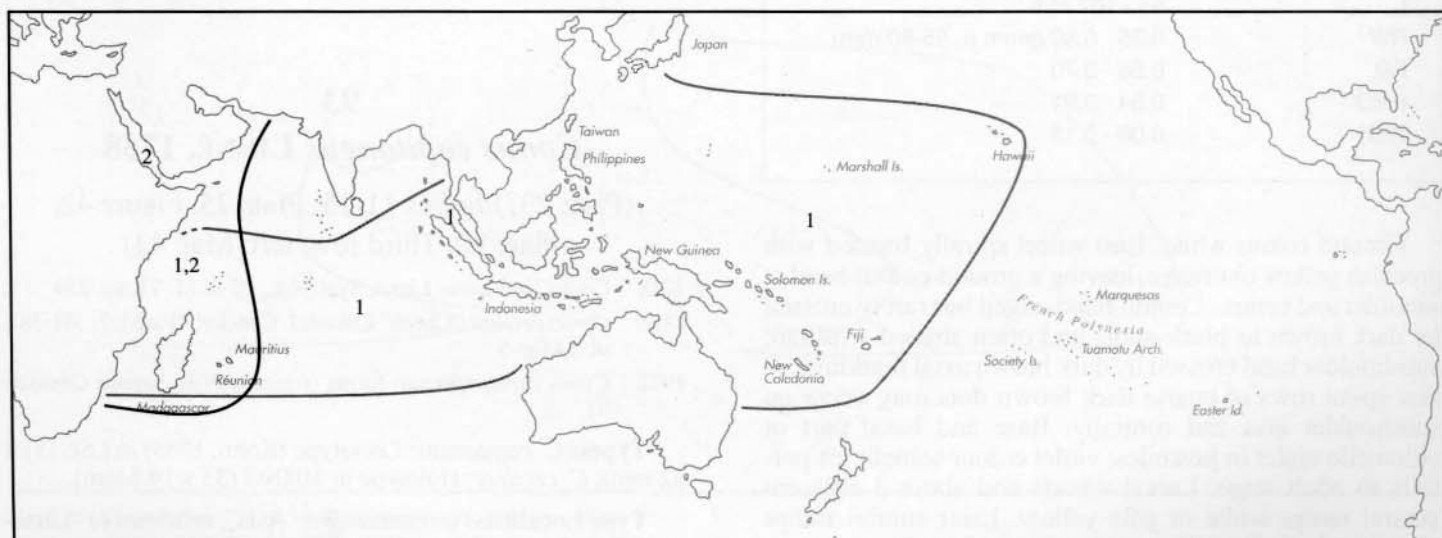
Foot varies from greyish yellow to olive or greenish black, has yellow to dark yellowish green sides, is sometimes dotted with white and mottled with black and may grade to nearly solid black on anterior part of dorsum. Rostrum yellowish green to black. Tentacles yellowish green, sparsely mottled with dark grey to black posterior from the tip. Siphon yellowish green, heavily mottled with black dorso-laterally and sparsely ventrally; sometimes either completely black or black except for yellowish green anterior portion (Pl. 75, Fig. 42; Pl. 80, Third row, left) (Walls, [1979]; Chaberman, pers. comm., 1981; Pearson, unpubl. observ.).

Radular teeth similar to those of *C. vexillum* but with weaker serration (Peile, 1939).

Habitat and Habits: Intertidal and entire subtidal; in Philippines to about 240 m; most common on slightly subtidal reef flats and stretches of sand passing into reef flats, on sand under coral rocks, on coral rock with coralline algal encrustation or in holes and crevices. *C. capitaneus* feeds on eunicid and nereid polychaetes (Kohn, 1959a, 1968b; Kohn & Weaver, 1962; Kohn & Nybakken, 1975; Reichelt & Kohn, 1985; Cernohorsky, 1964, 1978; Richards, pers. comm., 1989).

Egg capsules deposited on the underside of rocks, arranged in groups of about 12 and each group consisting of 2 parallel rows. Egg diameter of about 160 µm predicts a minimum pelagic period of 27 days (Risbec, 1932; Perron & Kohn, 1985).

Map 42



1: *C. capitaneus* 2: *C. namocanus*

Discussion: *C. capitaneus* is similar to *C. vexillum*, *C. mustelinus*, *C. namocanus*, *C. trigonus* and *C. capitaneus*. *C. vexillum* attains larger size, has more spiral grooves (ca. 10) on the late sutural ramps, and lacks the spiral rows of rather small dark brown markings in the adult last whorl pattern. In both subspecies of *C. vexillum*, greenish and olive tones are absent from last whorl pattern, and *C. v. vexillum* tends to have a narrower last whorl than *C. capitaneus* (RD 0.58-0.72). *C. mustelinus* often has a narrower last whorl (RD 0.56-0.70), weakly concave late sutural ramps and a less spirally maculated last whorl pattern. Dark brown markings across the central white band and axial rows of minute brown dots are usually absent in *C. mustelinus*, spiral rows of coarse brown dots occur only at subshoulder area and centrally, and the spiral colour bands consistently lack dark brown axial streaks. For the distinctions from *C. namocanus*, *C. trigonus*, and *C. capitaneus*, see the Discussions of those species.

C. ceciliae (Pl. 23, Fig. 14) is based on a subadult specimen of *C. capitaneus* with spiral rows of deep punctations on the last whorl.

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Conus namocanus HWASS in BRUGUIÈRE, 1792

(Plate 23, Figure 16-20; Map 42)

- 1792 *Conus namocanus* Hwass in Bruguière, Encycl. Méth., 1: 712, no. 106
 1845 *Conus badius* Kiener, Coq. Vivant., 2: Pl. 33 fig. 3; 1847: 89-90
 1858 *Conus laevigatus* Sowerby II, Thes. Conch., 3: 27, pl. 7 figs. 149, 150; variety: Pl. 9 fig. 207 (non *C. laevigatus* Link, 1807, non *C. laevigatus* Defrance, 1818)

Types: *C. namocanus*: Holotype in MHNG (87 x 47 mm); *C. badius*: Original figure 60 x 37 mm; *C. laevigatus*: Original figure (149) 75 x 44 mm.

Type Localities: *C. namocanus*: "l'isle de Namoca, dans l'océan pacifique"; *C. badius*: "the Red Sea coast near Obhur, Saudi Arabia" (Coomans et al., 1982); *C. laevigatus*: "Mauritius."

Range: Red Sea to Transkei and to Oman.

Description: Medium-sized to large, usually solid. Last whorl conical or ventricosely conical; outline variably convex at adapical fourth to half, straight below; left side slightly concave at base. Shoulder angulate, sometimes subangulate. Spire of low to moderate height, outline usually straight or convex. Larval shell of 2.5-3 whorls, maximum diameter 0.9-1 mm. First 1-1.5 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly concave, with 0-2 increasing to 4-5 spiral grooves, obsolete in latest whorls. Last whorl with a few weak spiral ribs at base; in subadults, ribs followed by spiral rows of punctations to centre.

Last whorl overlaid with brown, orange, yellow, olive or bluish grey, leaving a rather narrow white spiral band at

centre and sometimes also at shoulder. Brown or brownish olive axial streaks and blotches intersperse dark areas and often cross white bands. Juveniles may have spirally aligned minute brown dots that become more densely spaced during growth, producing coarse and fine, dotted, dashed or solid lines from base to shoulder; spiral lines sometimes obsolete. Larval whorls yellow. First 2-4 teleoconch sutural ramps yellowish green; following ramps white or bluish grey, with brown or orange brown radial blotches extending to sub-shoulder area. Aperture bluish violet, usually with white bands at centre and shoulder, becoming almost white during growth.

C. namocanus Shell Morphometry

L	40 - 100 mm
RW	0.29 - 0.80 g/mm (L 40-88 mm)
RD	0.60 - 0.70
PMD	0.80 - 0.95
RSH	0.04 - 0.14

Periostracum yellowish olive or brown, thin to fibrous thick, translucent to opaque, with spiral rows of tufts on last whorl.

Foot dull yellow, with darker transverse stripes. Siphon brighter yellow (Kohn, unpubl. observ.). Animal dark grey, with grey tentacles and a pale grey tip of siphon (Fainzilber et al., 1992).

Habitat and Habits: Intertidal and subtidal, on sand or muddy sand, on muddy gravel, dead coral heads and on rocks with coralline algal encrustation (Kilburn & Rippey, 1982; Grosch, pers. comm., 1989). In the N. Red Sea, from the outer edge of reef platform to 20 m on sand mixed with coral rubble (Fainzilber et al., 1992).

Discussion: *C. namocanus* is most similar to *C. vexillum*, which attains larger size, has about 10 pronounced spiral grooves on the late sutural ramps, a white aperture, and an axially instead of spirally lineate pattern in adults. *C. mustelinus* and *C. capitaneus* also resemble *C. namocanus* but lack the spiral lines on the last whorl, have the white central band prominently edged by dark markings and bear strong spiral grooves on the late sutural ramps. *C. capitaneus* also differs in its dark brown base, white aperture and its often broader last whorl (RD 0.65-0.75). For comparison with *C. trigonus* and *C. bondarevi*, see the Discussions of those species.

Coomans et al. (1982) considered *C. badius* (Pl. 23, Fig. 19) a geographic subspecies of *C. namocanus* from the Red Sea and the Gulf of Aden, differing from the nominal subspecies in its wider shoulder, flatter spire and finer and more numerous spiral lines around the last whorl. However, convincing evidence is lacking to regard it as a representative of the Red Sea population, and the variability in shape and spiral pattern observed in subadult and adult specimens from the Red Sea (Sharabati, 1984) falls within

the range of variation in populations outside the Red Sea, e.g. in Kenya and Zanzibar.

Distinctively coloured shells from Salalah and Al Masirah, Oman (Pl. 23, Fig. 20), largely agree with *C. namocanus* in size (L 40-88 mm), shape (RD 0.60-0.66; PMD 0.84-0.95; RSH 0.04-0.14) and sculpture. They differ in their white apex, pink background on spire, last whorl and within aperture, and in their more reddish brown pattern with spiral lines of larger dots and broader dashes. We consider these differences not to justify a separation at the species level and provisionally assign these shells to *C. namocanus*. Their status as form of *C. namocanus* or valid species depends on reliable data on co-occurrence and intergrading with the latter species. We do not accept allocation of these shells to *C. luctificus* (Coomans & Moolenbeek, 1990). Spiral grooves on sutural ramps are obsolete in the syntypes of *C. luctificus*, which we consider a synonym of *C. fumigatus*.

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Conus miles LINNÉ, 1758

(Plate 23, Figures 21-24; Plate 75, Figure 41; Map 43)

1758 *Conus miles* Linné, Syst. Nat., 10 ed., 1: 713, no. 255

Type: Lectotype (Kohn, 1963) in LSL (53 x 31 mm).

Type Locality: "India."

Range: Entire Indo-Pacific, except for Red Sea.

Description: Moderately large to large, solid to heavy. Last whorl conical or ventricosely conical, rarely broadly conical; outline almost straight at right side, convex at left side and concave at basal fourth. Subadult specimens often with slightly pyriform last whorl. Shoulder angulate, some-

times subangulate. Spire of low to moderate height, outline straight to slightly concave. Larval shell of 3 or more whorls, maximum diameter about 0.95 mm. Teleoconch sutural ramps flat to slightly concave in late whorls, with 2 increasing to 3-4 spiral grooves, obsolete in late whorls. Last whorl with widely spaced spiral ribs on basal third and a few spiral threads between; sculpture often obsolete in large specimens.

C. miles Shell Morphometry

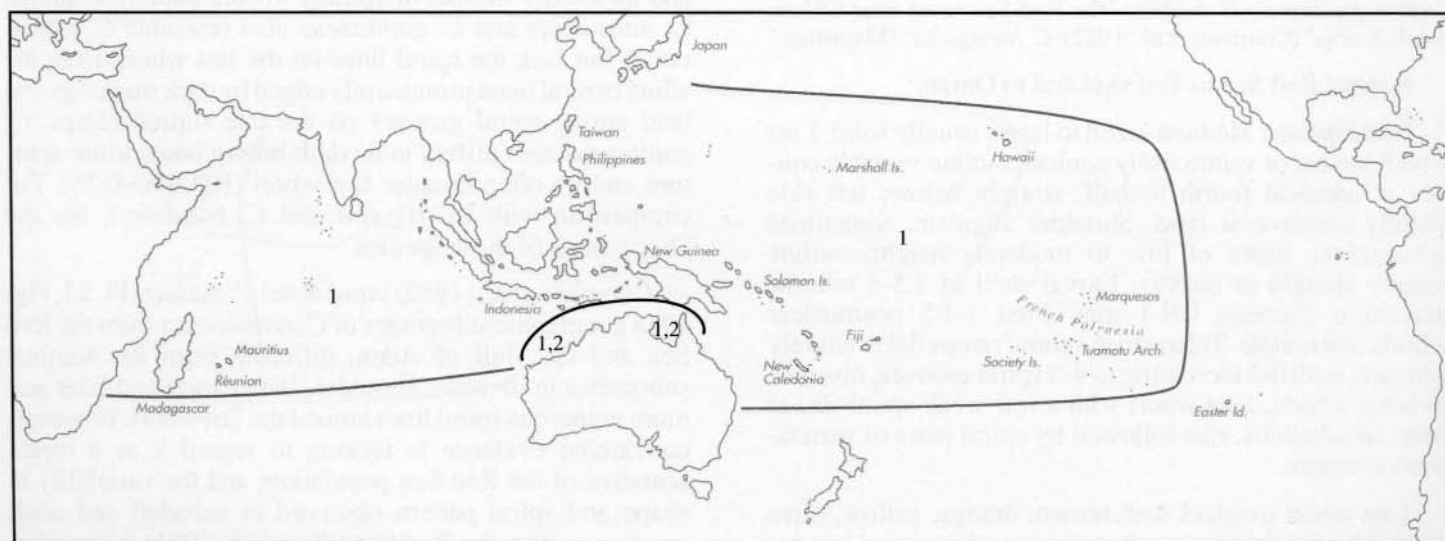
L	50 - 132 mm
RW	0.51 - 1.50 g/mm (L 50-99 mm)
RD	0.61 - 0.75
PMD	0.81 - 0.91
RSH	0.09 - 0.15

Ground colour white. Last whorl with a variably broad dark brown spiral band above centre, also dark brown on basal fourth to third. Remaining areas clouded with lighter brown or olive, crossed by closely spaced to well separated, fine, brown to orange axial lines that extend to shoulder ramp. In New Caledonia, shells occasionally have almost the entire last whorl black. Larval whorls and adjacent sutural ramps pale yellow. Late sutural ramps white, with fine brown or orange radial lines partly overlying tan or olive blotches. Aperture translucent, even in large specimens.

Periostracum yellow to greenish brown, thick, opaque and axially ridged, with widely spaced spiral rows of strong tufts on last whorl including shoulder edge; periostracum thinner, translucent and smooth in subadults.

Animal dark grey to greenish black or black. Foot stout, truncate at posterior end, with paler streaks and spots on dorsum. Siphon either of solid colour or mottled with white except for solid black distal edge (Pl. 75, Fig. 41) (Kohn,

Map 43



1: *C. miles* 2: *C. trigonus*

1959a; Estival, 1981; Chaberman, pers. comm., 1981; Pearson, unpubl. observ.).

Radular teeth with an adapical barb opposite an incurved blade; pronounced serration of 10-25 pairs of small and large denticles extends about halfway down the shaft; base with a prominent spur (Peile, 1939; Zelazny, 1974; James, 1980).

Habitat and Habits: Intertidal, more common in upper subtidal to about 50 m; on intertidal benches and reefs, in bays, on slightly subtidal reef flats and in deeper subtidal habitats. In shallow water on sand or gravel among rocks, on beachrock, rough truncated reef limestone and lagoon pinnacles (Kohn, 1959a, b, 1960, 1968b; Kohn & Nybakken, 1975; Cernohorsky, 1964, 1978; Estival, 1981; Kilburn & Rippey, 1982; Grosch, pers. comm., 1989). *C. miles* feeds on eunicid, nereid and spionid polychaetes (Kohn, 1959b; Kohn & Nybakken, 1975; Reichelt & Kohn, 1985; Kilburn & Rippey, 1982).

Spawning has been observed under rocks on reef flats, with egg capsules of 9.5 x 6 mm deposited in parallel rows (Cernohorsky, 1964; Loch, pers. comm., 1987). Egg diameter of 228 µm predicts a minimum pelagic period of 21 days (Perron & Kohn, 1985).

Discussion: *C. miles* has a very distinctive shell. It is readily distinguished from *C. capitaneus*, which lacks the pattern of fine brown or orange-brown axial lines over the last whorl and spire, and from *C. vexillum vexillum*, which differs in its lighter shell, more pronounced spiral sculpture on the late sutural ramps and its heavily blotched spire without fine radial lines; the spiral ground-colour bands on its last whorl are often narrower and irregularly edged or interrupted and sometimes obscured or absent.

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Conus trigonus REEVE, 1848

(Plate 24, Figures 1-5; Map 43)

1848 *Conus trigonus* Reeve, Conch. Icon., 1, *Conus* suppl.: Pl. 3 sp. 286

1988 *Conus adami* Wils, Gloria Maris, 27 (5): 83-85

Types: *C. trigonus*: Type in BMNH (39 x 19 mm); *C. adami*: Holotype in IRSN (71.5 x 49.5 mm).

Type Localities: *C. adami*: "off Cape York, Gulf of Carpentaria, N. Australia."

Range: W. and N. Australia, from Exmouth Gulf to Arafura Sea; probably also in N. Queensland.

Description: Medium-sized to large, moderately solid to solid; form *adami* (Pl. 24, Fig. 5) lighter than typical form. Last whorl conical or ventricosely conical to broadly or broadly and ventricosely conical; outline variably convex at adapical third to two-thirds, straight below. Basal part of columella with waist and weak plait posteriorly. Shoulder angulate; in form *adami*, shoulder carinate and outwardly curved. Spire low, particularly so in form *adami*; outline

slightly concave to slightly convex or apex protruding from an otherwise flat spire. Larval shell of about 1.5 whorls, maximum diameter 1.6-1.8 mm. Postnuclear spire whorls smooth, with a broadly carinate inner margin in form *adami*. Teleoconch sutural ramps flat or slightly concave, with 2-3 increasing to 5-12 spiral grooves that are separated by narrow but pronounced ribs. Last whorl usually with a few weak or strong ribs or ribbons at base; additional ribs may be present below shoulder and in some specimens these are followed by ribbons to base.

C. trigonus Shell Morphometry

L	40 - 92 mm
RW	0.18 - 0.50 g/mm (L 40-75 mm)
RD	0.65 - 0.76
- form <i>adami</i>	0.65 - 0.79
PMD	0.80 - 0.93
- form <i>adami</i>	0.90 - 0.97
RSH	0.03 - 0.12
- form <i>adami</i>	0.00 - 0.05

Ground colour white. Last whorl with 2 continuous or interrupted yellowish to dark brown spiral bands, usually leaving ground-colour zones of varying width below shoulder, at centre and at base. Dotted or coarse solid brown spiral lines extend from base to shoulder, usually sparse or absent within white zones. Posterior white bands may be interspersed with brown axial markings. White shells intergrade with largely brown shells. In form *adami*, dark areas variably reduced, central ground-colour band often edged with brown flecks adapically. Larval whorls white or brownish orange. Teleoconch sutural ramps with brown radial markings, ranging from completely white to nearly solid brown. Aperture white.

Periostracum light brown, thin, partially translucent, with spiral rows of tufts on last whorl (Turnbull, pers. comm., 1987). In form *adami*, periostracum greyish olive, thin and translucent, with spiral ridges on last whorl and a single row of long bristles along outer margin of sutural ramps.

Habitat and Habits: Intertidal to about 150 m; typical form to about 60 m, on muddy sand in intertidal habitats and on sand mixed with coral rubble in subtidal habitats (Turnbull, pers. comm., 1987); form *adami* in 80-150 m in the Gulf of Carpentaria and in the Arafura Sea. Structure of radular teeth predicts vermivory (Turnbull, pers. comm., 1987).

Discussion: *C. trigonus* somewhat resembles *C. capitaneus* and *C. namocanus* in outline and pattern of the shell. *C. capitaneus* differs in its yellow apex, narrower (0.9 mm) and multispiral larval shell, dark brown base and in the presence of brown flecks at either side of the central ground-colour band. *C. namocanus* can be distinguished by its consistently solid and usually finer spiral lines on the last whorl, purple or bluish violet aperture, weaker spiral sculpture on the late sutural ramps, and by the absence of a

contrastingly white base. The olive tones often seen in *C. namocanus* and *C. capitaneus* and the tubercles of their first postnuclear whorl are absent in *C. trigonus*.

C. adami (Pl. 24, Fig. 5) refers to a deep-subtidal form of *C. trigonus*. All characters mentioned above intergrade between the typical form and form *adami*; intermediate shells occur at various localities.

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Conus lischkeanus WEINKAUFF, 1875

(Plate 24, Figures 6-17; Plate 52, Figures 9, 10; Map 44)

- 1875 *Conus lischkeanus* Weinkauff, Syst. Conch. Cab. Martini Chemnitz, 4 (2), 1 *Conus*: 311, pl. 56 figs. 2, 3
1912 *Conus kermadecensis* Iredale, Proc. Malac. Soc. London, 10: 227, pl. 9 figs. 15, 16
1985 *Conus lischkeanus tropicensis* Coomans & Filmer, Beaufortia 35: 11-13, figs. 16, 17
1992 *Conus subroseus* Röckel & Korn, Acta Conchyl., 3: 19-21, pl. 3 figs. 8-15

Types: *C. lischkeanus*: Holotype in LMD (52 x 32 mm); *C. kermadecensis*: Lectotype (Coomans & Filmer, 1985) in CMC (47 x 24 mm); *C. l. tropicensis*: Holotype in ZMA (44.5 x 26.5 mm); *C. subroseus*: Holotype in SMNS (21.5 x 11.5 mm).

Type Localities: *C. lischkeanus*: "Japan - Insel Kiusiu"; *C. kermadecensis*: "Sunday Island, Kermadec Group"; *C. l. tropicensis*: "West Australia, Exmouth Gulf, east side of North West Cape"; *C. subroseus*: "Gulf of Aden."

Range: Pacific: Japan to Taiwan and Queensland to New Caledonia, N. New Zealand, and Kermadec Is.; reported from Philippines; Indian Ocean: Natal to Gulf of Aden and Oman, and W. Australia.

Description: Moderately small to moderately large, moderately solid to solid; heavier variants known from W. Australia and Somalia. Last whorl conical to broadly conical, sometimes ventricosely conical or conoid-cylindrical in Indian Ocean shells; outline variably convex adapically, straight below. Shoulder angulate, occasionally approaching subangulate. Spire of low to moderate height, outline straight to concave or slightly sigmoid. Larval shell of about 3.75 whorls, maximum diameter 0.8-1 mm. Teleoconch sutural ramps flat, sometimes concave in late whorls, with 1 increasing to 2-6 spiral grooves; on latest ramps, grooves usually obsolete in Pacific shells, distinct to obsolete in Indian Ocean shells. Last whorl either almost smooth or with weak to distinct, sometimes paired spiral ribs on basal third; in small adults, ribs occasionally from base beyond centre and slightly granulose.

Ground colour white, often variably suffused with light to darker rose or violet in E. African shells. Last whorl generally with a variably broad brown to orange-brown spiral band above and below centre, leaving ground-colour bands at shoulder, at or just below centre, and at base. In Indian Ocean shells, colour bands often yellowish to light

brown and covering the entire last whorl; some shells from E. Africa with dark brown to dark red-brown spiral bands, and with central ground-colour band either edged by darker brown spots or crossed by axial markings. Closely spaced, dotted and dashed darker brown spiral lines may occur over the entire geographical range of the species. Larval whorls white to light brown in the Pacific, brownish violet in W. Australia, and pale yellow to orange in the W. Indian Ocean. Postnuclear sutural ramps variably maculated with brown radial streaks and blotches, sometimes immaculate in Indian Ocean shells. Aperture usually white in Pacific shells, violet in W. Australian shells, and white to violet in shells from the W. Indian Ocean.

C. lischkeanus Shell Morphometry

L	30 - 75 mm
RW	0.12 - 0.53 g/mm (L 30-60 mm)
- heavier variants (W. Australia; Somalia)	0.25 - 0.67 g/mm (L 30-54 mm)
RD	0.61 - 0.73
PMD	0.82 - 0.95
RSH	0.07 - 0.25

In Japan and Taiwan, periostracum brown, thin and translucent, with widely spaced pairs of tufted spiral lines on last whorl and radial ridges forming subsutural fringes on spire; in specimens from Queensland eastward to the New Zealand and Kermadec area, periostracum brown, rather thick, opaque and smooth or with interlaced axial ridges; W. Australian shells with a thick, opaque and smooth periostracum that grades from brown to red toward the aperture (Turnbull, pers. comm., 1987); in W. Indian Ocean shells, periostracum greyish brown, thick, opaque, and with 15-20 widely spaced spiral rows of tufts.

In W. Australia, dorsum of foot red anteriorly; sole of foot pink, with black spots and a narrow transverse line; siphon pink, grading to red distally and to very pale pink laterally, with small black and white spots dorsally (Kohn, unpubl. observ.). Animal pale brown with a red siphon (Turnbull, pers. comm., 1987).

Specimens from W. Australia and Natal correspond closely in the morphology of their radular teeth: Tooth long and slender, with an adapical barb opposite a blade, with a basal spur but without serration (Rolán, pers. comm., 1992; Kohn, unpubl. observ.).

Habitat and Habits: Intertidal to about 200 m; reported from bare limestone pavement or sand, sometimes among weed or coral rubble. Pacific animals in 20-200 m except for a rare intertidal occurrence in New Zealand. W. Australian specimens on coral reefs and intertidal flats to about 15 m. Specimens from Oman near the infralittoral fringe, those from E. Africa in 2-70 m (Cernohorsky, 1976; Marshall, 1981; Coomans & Filmer, 1985; Turnbull, pers. comm., 1987; Kilburn, unpubl. observ.). In W. Australia, *C. lischkeanus* feeds on Amphinomidae and Terebellidae (Kohn &

Almasi, 1993), although its radular teeth lack the shape and armature of the teeth of typical amphinomid eaters.

Discussion: *C. lischkeanus* may be similar to *C. fumigatus*, and less often similar to *C. sazanka* or *C. eximius*. Small specimens from E. Africa may resemble *C. articulatus*. *C. fumigatus* attains larger size and has more widely spaced, coarser dashed and dotted spiral lines on the last whorl; its brown base contrasts with a lighter adjacent area and the spiral sculpture on its late sutural ramps is consistently obsolete. *C. sazanka* can be distinguished by its usually narrower last whorl (RD 0.56-0.64) and its undulate or weakly tuberculate shoulder; most specimens of *C. sazanka* and *C. lischkeanus* have distinctly different colours and patterns. For comparison of *C. lischkeanus* with *C. eximius* and *C. articulatus*, see the Discussions of those species.

Coomans and Filmer (1985) recognized 3 geographic subspecies of *C. lischkeanus*, from the Kermadec Is., W. Australia, and the W. Indian Ocean. However, within these regions, rather straight-sided and usually multicoloured shells with comparatively higher spires occur sympatrically with heavier, low-spined, rather convex-sided and often uniformly coloured shells as well as intermediate specimens. The morphological differences indicated by Coomans and Filmer (1985) are now known to be either slight or not consistently associated with geographic distribution. We thus abandon separation of this species into geographic subspecies.

C. subroseus (Pl. 52, Figs. 9, 10) was based on subadult rose coloured specimens of *C. lischkeanus* from the Gulf of Aden (Röckel & Korn, 1993).

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Conus rattus HWASS in BRUGUIÈRE, 1792

(Plate 24, Figures 18-23; Plate 75, Figure 44;
Plate 80, Third row, right; Map 44)

- 1792 *Conus rattus* Hwass in Bruguière, Encycl. Méth., 1: 700, no. 89
1792 *Conus taitensis* Hwass in Bruguière, Encycl. Méth., 1: 713, no. 108
1817 *Conus chemnitzii* Dillwyn, Descr. Catal. Rec. Shells, 1: 363, no. 18
1843 *Conus taheitensis* Reeve, Conch. Icon. 1, *Conus*: Pl. 15 sp. 78 (emendation for *C. taitensis* Hwass)
1857 *Conus viridis* Sowerby II, Thes. Conch. 3: 20, pl. 5(191) fig. 102
1882 *Conus semivelatus* Sowerby III, Proc. Zool. Soc. London, 1882: 118, pl. 5 fig. 3
1933 *Conus tahitiensis* Dautzenberg, J. Conchyl. (Paris), 77: 89 (emendation for *C. taitensis* Hwass)

Types: *C. rattus*: Lectotype (Kohn, 1968) figured in Tableau (1798: Pl. 338 fig. 7) (45 x 29 mm); *C. taitensis*: Lectotype (Kohn, 1968) figured in Tableau (1798: Pl. 336 fig. 9) (36 x 23 mm); *C. chemnitzii*: Holotype figured in Chemnitz (1795: Pl. 182 figs. 1764, 1765) (37 x 23 mm); *C. viridis*: Lectotype (Wils, 1986) figured in Sowerby II (1857: Pl. 5 (191) fig. 102) (22 x 12.5 mm); *C. semivelatus*: Holotype in NMWC (18 x 11.5 mm).

Type Localities: *C. rattus*: "les mers d'Amérique"; *C. taitensis*: "l'Isle d'Otaïti, dans l'Océan pacifique"; *C. chemnitzii*: "Ceylon" (Chemnitz, 1795); *C. viridis*: "Hurghada, Egypte, Rode Zee" (Wils 1986); *C. taheitensis*: "Islands of Taheita, Annaa etc."; *C. semivelatus*: "Red Sea."

Range: Entire Indo-Pacific.

Description: Moderately small to moderately large, moderately solid to solid. Last whorl conical or ventricosely conical to broadly and sometimes broadly and ventricosely conical; outline variably convex at adapical third to three-fourths, left side concave below. Shoulder angulate. Spire of low to moderate height, outline slightly convex to concave. Larval shell of 3 or more whorls, maximum diameter 0.6-0.8 mm. Teleoconch sutural ramps flat, with 2-3 increasing to 3-6 spiral grooves. Last whorl with variably prominent fine spiral ribs at base, gradually obsolete adapically.

C. rattus Shell Morphometry

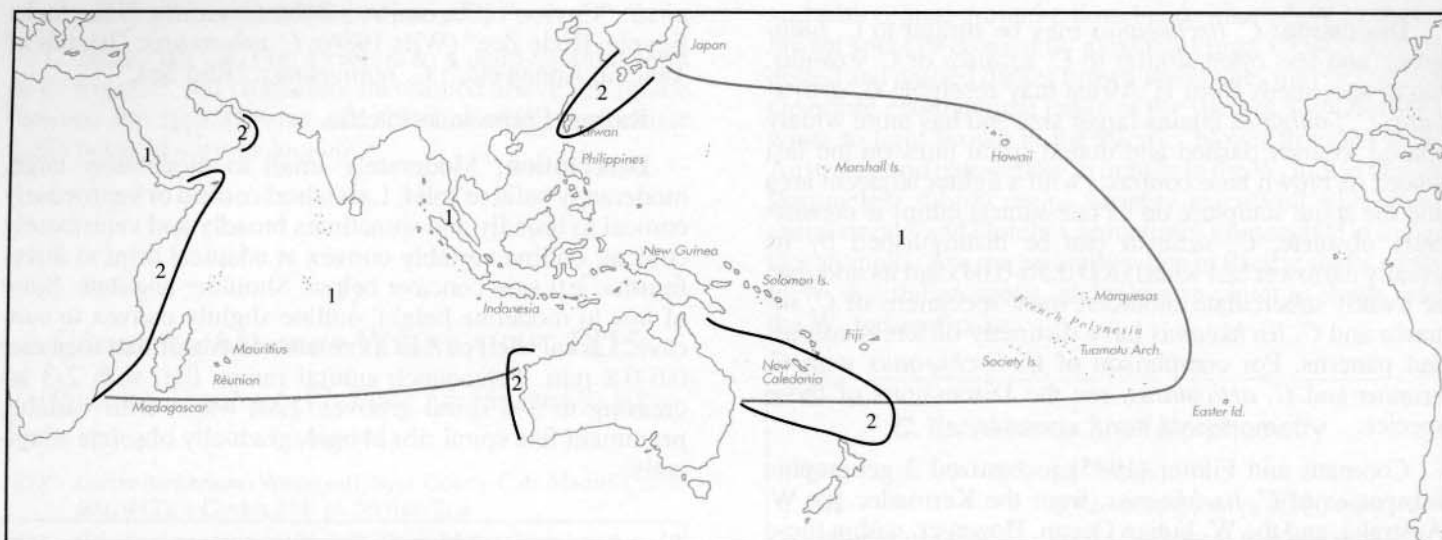
L	30 - 63 mm
RW	0.24 - 0.73 g/mm (L 30-54 mm)
RD	0.59 - 0.76
PMD	0.78 - 0.90
RSH	0.05 - 0.14

Ground colour bluish white to greyish blue. Last whorl overlaid with various shades of olive, brown or orangish brown, leaving a broad interrupted spiral ground-colour band below shoulder and another obsolete to broad one at centre. Solid darker brown spiral lines may extend from base to subshoulder area; on some portions of last whorl, brown spiral lines articulated with white dots producing a speckled appearance. Uniformly dark brown shells intergrade with shells with numerous white dots and blotches. Base violet or dark brown. Larval whorls and some adjacent sutural ramps often pale yellow. Late sutural ramps with olive or brown radial markings on white ground. Aperture violet, in large shells variably overlaid with white deep within.

Periostracum yellow to olive, variable in thickness, translucent to opaque, either smooth (Hawaii, India: Kohn, 1959a, 1978a) or with variably spaced tufted spiral ridges on last whorl including shoulder (Natal, Somalia, Philippines, Fiji: Cernohorsky, 1964; Kilburn & Rippey, 1982).

Animal solid black or dark green mottled with black. Dorsum of foot may have a short diagonal row of white dots in each anterior corner; sole may be lighter with a yellow stripe at posterior edge. Rostrum and tentacles may be lighter and siphon may be darker than dorsum of foot (Pl. 75, Fig. 44; Pl. 80, Third row, right) (Kohn, 1959a; Chaberman, pers. comm., 1981; Pearson, unpubl. observ.; Fainzilber et al., 1992).

Radular teeth with an adapical barb opposite a long blade; serration parallels the blade and the base bears a single spur (James, 1980). The tooth depicted by Bandel



1: *C. rattus* 2: *C. lischkeanus*

(1984) for *C. semivelatus* (Port Sudan, Red Sea) corresponds completely with the preceding description, while that of *C. rattus* from the same locality appears to be teratological.

Habitat and Habits: On intertidal benches, intertidal and subtidal reef platforms, to about 15 m, occupying exposed as well as sheltered sites. On benches, on reef limestone with or without algal turf and in pockets or patches of sand sometimes with sparse vegetation, hiding beneath rocks or corals. On reef flats, on bare limestone, limestone with algal turf, coral rubble, dead coral, beach rock with or without sand, in rubble mixed with sand and in pure sand bottom often beneath coral rocks. It is also reported from gravel bottom and from crevices (Kohn, 1959b, 1960, 1968b; Kohn & Nybakken, 1975; Reichelt & Kohn, 1985; Cernohorsky, 1964; Huish, 1978; Kilburn & Rippey, 1982; Grosch, pers. comm., 1989; Tirard, pers. comm., 1989; Fainzilber et al., 1992).

C. rattus probably feeds exclusively on polychaete worms within its entire range, usually preferring Eunicidae to Nereidae (Kohn, 1959b, 1960; Kohn & Nybakken, 1975; Reichelt & Kohn, 1985; Marsh, 1971). Its venom is toxic to worms and partially to small fishes but does not affect mice (Endean & Rudkin, 1965).

Egg capsules measure 8-15 x 5-11 mm and contain 2,000-7,500 eggs each. In Sri Lanka and the Seychelles, they are deposited in 0.15-1.5 m to the underside of coral rocks, affixed by confluent basal plates, and arranged in irregular clusters. Egg diameter of 124-175 µm predicts a minimum pelagic period of 30-26 days (Seychelles, Persian Gulf, India, Sri Lanka, Palau, Hawaii: Ostergaard, 1950; Kohn, 1961b; Perron, 1981b, c; Perron & Kohn, 1985).

Discussion: *C. rattus* is similar to *C. balteatus* in shape and colouration of the shell. The latter species is distinguished by the tuberculate shoulder of its shell and its brownish red animal. *C. rattus* could be confused with *C. namocanus*. The latter species attains much larger size, lacks the violet or dark brown base as well as the fine white markings on its last whorl, and has a weaker spiral sculpture on its late sutural ramps. The foot of *C. namocanus* is predominantly dull yellow.

C. taitensis (Pl. 24, Figs. 22, 23) refers to largely dark brown shells from French Polynesia, but such specimens also occur in Philippines. *C. semivelatus* (Pl. 24, Fig. 21) refers to a subadult specimen from the Red Sea lacking the extensive white dots and blotches. *C. viridis* is a synonym (see Wils, 1986). However, these specimens co-occur with shells heavily speckled with white (Sharabati, 1984). Smaller subadults from the Red Sea often have a dark violet-blue ground colour anterior to the bluish white subshoulder band and lack the yellow apex.

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Conus capitanellus FULTON, 1938

(Plate 24, Figures 24-26; Map 45)

1938 *Conus capitanellus* Fulton, Proc. Malac. Soc. London, **23**: 55, pl. 3 figs. 1, 1a

Type: Holotype in BMNH (36 x 20 mm).

Type Locality: "Kii, Japan."

Range: Japan to Philippines and New Caledonia.

Description: Moderately small to medium-sized, moderately solid. Last whorl conical or ventricosely conical, sometimes broadly conical; outline variably convex at adapical third to two-thirds, straight below. Shoulder angulate, rarely outwardly curved. Spire usually low, outline concave to almost straight. Larval shell of 3-3.5 whorls, maximum diameter 0.9-1 mm. First 1-2.5 postnuclear whorls tuberculate. Teleoconch sutural ramps flat or weakly concave, with 1-3 increasing to 5-6 spiral grooves. Last whorl with a few weak spiral ribs or ribs and ribbons at base.

C. capitanellus Shell Morphometry

L	25 - 40 mm
RW	0.13 - 0.19 g/mm
RD	0.60 - 0.71
PMD	0.81 - 0.94
RSH	0.07 - 0.13

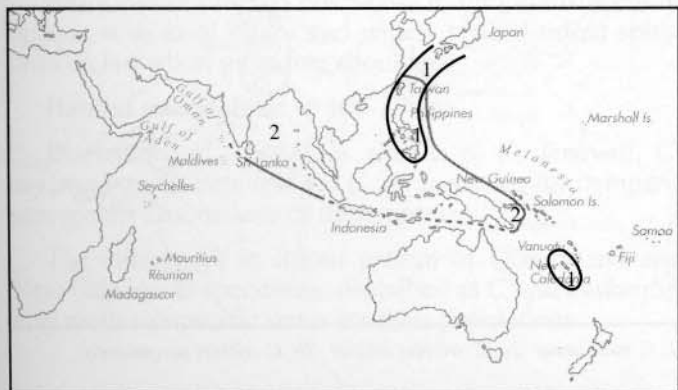
Ground colour white, occasionally tinged with yellow to tan in places. Last whorl with a broad brown spiral band on each side of centre and brown axial streaks from base to shoulder ramp. Larval whorls yellow to white. Teleoconch sutural ramps with brown radial streaks. Aperture white, slightly translucent except in large adults.

Periostracum grey, thin, translucent and smooth in juveniles, becoming grey-olive, thicker and partly opaque during growth, with axial ridges on spire and last whorl and with widely spaced tufted spiral lines from base to shoulder.

Habitat and Habits: In 80-500 m.

Discussion: *C. capitanellus* is similar to *C. capitaneus* and *C. plinthis*; the former species attains much larger size, and its last whorl is less convex in outline, bears spiral rows of coarse and minute brown dots and has a dark brown base. For comparison with *C. plinthis*, see the Discussion of that species.

Map 45



1: *C. capitanellus* 2: *C. eximius*

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Conus eximius REEVE, 1849

(Plate 25, Figures 1-5; Map 45)

1849 *Conus eximius* Reeve, Conch. Icon., 1, *Conus* suppl.: Pl. 6 sp. 256

Type: Type in BMNH (27.5 x 15 mm).

Type Locality: "Moluccas."

Range: Bay of Bengal to Papua New Guinea, Philippines and Taiwan.

Description: Moderately small to medium-sized, moderately light to solid. Last whorl conical, sometimes ventricosely conical; outline slightly convex at adapical third to half, straight below. Shoulder angulate. Spire low to high, outline concave to deeply concave. Larval shell of about 3.5 whorls, maximum diameter 0.8 mm. Teleoconch sutural ramps flat to slightly concave, with 1 increasing to 3-5 spiral grooves; grooves weaker and finer on latest ramps. Basal half of last whorl with variably spaced punctate spiral grooves separating ribs anteriorly and a few ribbons posteriorly.

C. eximius Shell Morphometry

L	30 - 58 mm
RW	0.08 - 0.40 g/mm
RD	0.60 - 0.68
PMD	0.82 - 0.94
RSH	0.08 - 0.26

Ground colour white. Last whorl with a broad, continuous or interrupted brown spiral band on each side of centre; often brown axial flames extend from posterior brown band to shoulder ramp. Some specimens with dashed darker brown spiral lines within and spiral rows of brown dots outside the colour bands; dots vary in number and arrangement. Pattern varies from largely white shells sparsely maculated with brown to largely brown shells with narrow white bands at base, centre and shoulder. Larval whorls white to pale brown. Teleoconch sutural ramps with brown radial markings. Aperture white.

Periostracum greyish olive, thin, translucent, with fine axial ridges.

Habitat and Habits: In 20-100 m; east of Madras, *C. eximius* was collected in 45 m on mud bottom (Kohn, 1978a).

Discussion: *C. eximius* is most similar to *C. lentiginosus*, *C. malacanus* and *C. lenavati*; for comparison, see the Discussions of those species. *C. lischkeanus* resembles *C. eximius* in shape but differs in its less concave spire outline, often more prominent spiral sculpture on the late sutural ramps, either prominently tufted or smooth but thick and opaque periostracum, and in the absence of brown axial flames from the adapical part of its last whorl.

101

***Conus malacanus* HWASS in BRUGUIÈRE, 1792**

(Plate 25, Figures 6-9; Map 46)

- 1792 *Conus malacanus* Hwass in Bruguière, Encycl. Méth., 1: 645, no. 43
- 1817 *Conus canaliculatus* Dillwyn, Descr. Catal. Rec. shells, 1: 360, no. 13 (non *C. canaliculatus* Brocchi, 1814)
- 1865 *Conus subcarinatus* Sowerby II, Proc. Zool. Soc. London, 1865: 518, pl. 32 figs. 12, 13
- 1873 *Conus cuneatus* Sowerby III, Proc. Zool. Soc. London, 1873: 146, pl. 15 fig. 5

Types: *C. malacanus*: Holotype figured in Tableau (1798: Pl. 325 fig. 9) (53 x 31 mm); *C. canaliculatus*: Lectotype (Walls, [1979]) same as holotype of *C. malacanus*; *C. subcarinatus*: 2 syntypes in BMNH (45 x 25; 40 x 23 mm); *C. cuneatus*: Holotype in ZMA (33 x 20 mm).

Type Localities: *C. malacanus*: "Pres du détroit de Malacca"; *C. canaliculatus*: "the coasts of Ceylon, and the Nicobar Islands. Chemnitz. Straits of Malacca. Bruguière"; *C. subcarinatus*: "Nicobar Islands."

Range: S. India and Sri Lanka. Probably also Papua New Guinea.

Description: Usually medium-sized to moderately large, solid to heavy. Last whorl conical or ventricosely conical to broadly conical; outline variably convex at apical third, straight below. Shoulder carinate. Spire of low to moderate height, outline concave to straight or sigmoid. Maximum diameter of larval shell 0.9-1 mm. First 3-5 postnuclear whorls tuberculate, later whorls carinate. Teleoconch sutural ramps flat to concave or sigmoid, with 1-2 increasing to 4-7 spiral grooves; on latest ramps, grooves weaker and with additional spiral striae. Last whorl with distinct or weak spiral ribs and ribbons at base.

***C. malacanus* Shell Morphometry**

L	45 - 83 mm
RW	0.35 - 1.13 (L 45-81 mm)
RD	0.65 - 0.74
PMD	0.81 - 0.92
RSH	0.10 - 0.17

Ground colour white. Last whorl usually with 2 variably broad, continuous or interrupted brown spiral bands, leaving ground-colour zones below shoulder, at centre and at base. White bands usually interspersed with dark brown axial streaks and flames and occasionally with additional brown spiral lines. Dashed dark brown spiral lines extend from base to shoulder but vary in number and arrangement. Pattern very variable; largely white shells intergrade with shells overlaid with various shades of brown and shells with primarily spirally arranged pattern intergrade with shells

with axial arrangement. Larval whorls white to pale orange. Late sutural ramps with very sparse to numerous brown markings; intensity of maculation not correlated with last whorl pattern. Aperture white.

Periostracum yellow, thin, translucent, smooth (Kohn, 1978a).

Habitat and Habits: In 5-55 m, mainly on sand (Kohn, 1978a).

Discussion: *C. malacanus* is similar to *C. sukhadwalai* and sometimes also to *C. lenavati*; for comparison, see the Discussions of those species. Subadult specimens of *C. malacanus* may be confused with *C. eximius*. However, shells of the latter species differ in their usually narrower last whorl (RD 0.60-0.68), often higher spire (RSH 0.08-0.26), and neither tuberculate nor carinate spire whorls.

The holotype of *C. cuneatus* is a subadult specimen of *C. malacanus* with reduced pattern.

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***Conus tribblei* WALLS, 1977**

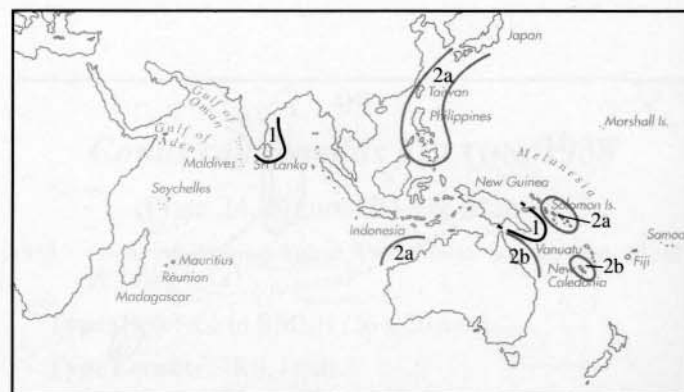
(Plate 25, Figures 10-15; Map 46)

- 1977 *Conus tribblei* Walls, The Pariah, 1: 2-3, fig.
- 1979 *Conus (Rhizoconus) suluensis* Shikama, Sci. Rep. Yokosuka City Mus., 26: 3, pl. 1 figs. 7, 8
- 1984 *Conus queenslandis* da Motta, La Conchiglia, 16 (178-179): 25-26, figs. 3a, b

Types: *C. tribblei*: Holotype in DMNH (62.5 x 29mm); *C. suluensis*: Holotype in NSMT (54.5 x 23 mm); *C. queenslandis*: Holotype in MHNG (121.5 x 58.5 mm).

Type Localities: *C. tribblei*: "China Sea off Taiwan"; *C. suluensis*: "Sulu Sea, off Cebu Island, Philippines"; *C. queenslandis*: "between Lord Howe Island and Lady Musgrave Island off the coast of Queensland, Australia."

Map 46

1: *C. malacanus* 2a: *C. tribblei tribblei* 2b: *C. tribblei queenslandis*

Range: *C. t. tripplei*: Japan to Philippines, N. W. Australia, Solomon Is., *C. t. queenslandis*: New Caledonia and Queensland.

Description: Moderately large to large, usually solid to moderately heavy. Last whorl narrowly conical to conical, occasionally ventricosely conical; outline slightly convex at adapical fourth or sometimes two-thirds, straight below, often with a slightly concave central area. Shoulder angulate to broadly carinate. Spire low, outline concave; early whorls usually projecting from an otherwise rather flat spire. Larval shell of 3-3.5 whorls, maximum diameter 0.8-1 mm. First 3-6 postnuclear whorls tuberculate; late whorls usually carinate. Teleoconch sutural ramps flat to slightly concave, with 2 increasing to 4-7 spiral grooves, often weaker in latest whorls. Shells with variably spaced and strongly granulose spiral ribs from base to subshoulder area intergrade with shells with variably prominent, smooth or granulose ribs at base.

C. tripplei Shell Morphometry

L	60 - 138 mm
RW	0.30 - 1.01 g/mm (L 60-111 mm)
RD	0.47 - 0.61
PMD	0.82 - 0.96
RSH	0.04 - 0.13

Ground colour white, often suffused with cream in *C. t. queenslandis*. Last whorl with tan to brown axial streaks and blotches on adapical two-thirds and a continuous or interrupted spiral band of the same colour on each side of centre. Anterior colour band often weaker or even absent. *C. t. queenslandis* (Pl. 25, Figs. 13-15) with cream to orangish brown colour bands and without axial streaks and blotches. Coarse dashed or dotted brown spiral lines may be present but vary in number and arrangement. Base white or sometimes pale yellow. Larval whorls light brown, lighter in *C. t. queenslandis*. Teleoconch sutural ramps with variably numerous brown radial markings; in *C. t. queenslandis* ramps sometimes tinged with violet, and radial markings rather sparse and lighter in colour, often with an orange shade. Aperture white, often shaded with cream or violet in specimens from Queensland and New Caledonia.

Periostracum olive to olive-brown, thin, translucent to opaque, with axial ridges and widely spaced tufted spiral lines on last whorl including shoulder.

Habitat and Habits: In 100-300 m.

Discussion: *C. tripplei* is similar to *C. lenavati*, *C. sugimotoi*, *C. sieboldii* and *C. recluzianus*; for comparison, see the Discussions of those species.

The differences in colour pattern of Queensland and New Caledonian specimens, described as *C. queenslandis*, may merit subspecific status for their populations.

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Conus lenavati DA MOTTA & RÖCKEL, 1982

(Plate 25, Figures 16-20; Map 47)

1982 *Conus lenavati* da Motta & Röckel, Publ. Ocas. Soc. Portuguesa Malac., 1: 17-18, pl. 3 figs. 16a, b

Type: Holotype in MHNG (62 x 33 mm).

Type Locality: "off Punta Engano, Cebu Island, Philippines."

Range: Philippines and South China Sea.

Description: Moderately large to large, solid. Last whorl usually conical or ventricosely conical, often pyriform; outline convex at adapical third to two-thirds, straight to concave below. Shoulder angulate. Spire usually low, outline concave. Larval shell of about 3.5 whorls, maximum diameter 0.9-1 mm. First 2.5-4.5 postnuclear whorls tuberculate. Teleoconch sutural ramps flat, with 1-2 increasing to 4-6 spiral grooves. Last whorl with weak spiral ribs and/or ribbons at base.

C. lenavati Shell Morphometry

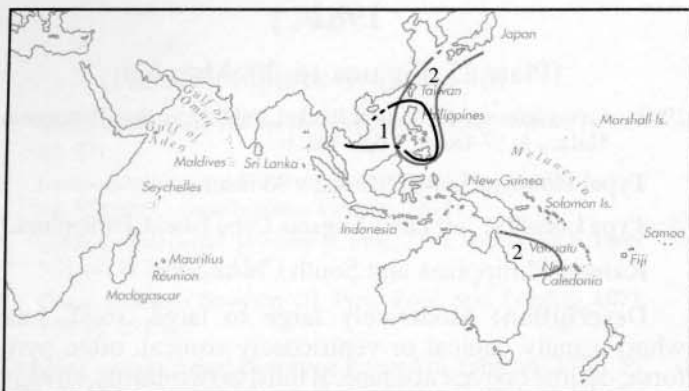
L	55 - 91 mm
RW	0.30 - 0.57 g/mm (L 55-85 mm)
RD	0.56 - 0.71
PMD	0.80 - 0.89
RSH	0.02 - 0.13

Ground colour white. Last whorl with brown axial blotches on adapical three-fourth and an incomplete spiral band of the same colour on each side of centre. Central ground-colour band usually continuous; subcentral pattern elements may be absent. Base usually white, occasionally variably tinged with cream. Larval whorls white. Teleoconch sutural ramps with irregularly set brown radial markings. Aperture white.

Periostracum olive, thin, translucent to opaque, with axial threads and widely spaced tufted spiral lines on last whorl; thickness increases toward base and tufts are stronger at base and shoulder.

Habitat and Habits: In 100-240 m.

Discussion: For comparison with the similar *C. sugimotoi* and *C. sieboldii*, see the Discussions of those species. *C. tripplei* has a similar colour pattern but attains larger size (to 138 mm), generally has a narrower last whorl (RD 0.47-0.61) with an almost straight rather than sigmoid outline; its late whorls have carinate shoulders and the spiral sculpture is heavier on its last whorl. *C. eximius* is considerably smaller, its spire generally higher (RSH up to 0.26), its periostracum lacks tufted spiral lines and its last whorl pattern often contains dashed and dotted spiral lines. *C. malacanus* differs in its heavier shell, usually higher spire (RSH to 0.17), less pyriform last whorl, carinate late whorls, and its smooth periostracum.

1: *C. lenavati* 2: *C. sugimotonis*

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***Conus sugimotonis* KURODA, 1928**

(Plate 25, Figures 21-24; Map 47)

- 1928 *Conus sugimotonis* Kuroda, Venus, **1**: Pl. 1 fig. 6; 1929: 81
 1978 *Conus (Rhizoconus) sugimotonis vicdani* Lan, Bull. Malac. Rep. China, **5**: 66-67, 65 (fig.), 68 (fig.)
 1985 *Conus whiteheadae* da Motta, La Conchiglia, **17** (190-191): 26-27, figs. 3 a, b

Types: *C. sugimotonis*: Holotype in coll. Sugimoto (95 x 48.5 mm); *C. s. vicdani*: Holotype in TMT (78.5 x 44 mm); *C. whiteheadae*: Holotype in MHNG (96.5 x 51 mm).

Type Localities: *C. sugimotonis*: "Tosa"; *C. s. vicdani*: "Pan-lao, Bohol, the Philippines"; *C. whiteheadae*: "in the vicinity of Lord Howe and Lady Musgrave Is."

Range: Japan to Philippines; Queensland and Coral See.

Description: Moderately large to large, usually solid. Last whorl conical to ventricosely conical or slightly pyriform; outline convex at adapical fourth to half, straight or slightly concave below. Shoulder angulate. Spire low; outline concave to sigmoid, often with early whorls projecting from an otherwise flat or slightly domed spire. Larval shell of about 3 whorls, maximum diameter about 1 mm. First 3-5 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1 increasing to 5-8 spiral grooves, sometimes with additional spiral striae in latest whorls. Last whorl with weak to distinct spiral ribs and ribbons at base.

***C. sugimotonis* Shell Morphometry**

L	60 - 103 mm
RW	0.30 - 0.85 g/mm
RD	0.54 - 0.62
PMD	0.80 - 0.94
RSH	0.02 - 0.11

Ground colour white. Last whorl immaculate or variably shaded with yellow or tan; shells from Philippines may have additional brown axial streaks spirally aligned just above centre; shells from Queensland may additionally be suffused or banded with very pale violet. Larval whorls white or beige. In Japanese and Philippine shells, early teleoconch sutural ramps may be tinged with yellow. Outer margins of sutural ramps sometimes with a varying number of brown dots, persisting at edge of shoulder in some specimens. Aperture white, sometimes bluish white.

Periostracum yellow-olive to brown, rather thin and opaque, with a variably fringed shoulder.

Habitat and Habits: In 200-400 m.

Discussion: *C. sugimotonis* resembles *C. tribblei*, *C. lenavati* and *C. sieboldii*. *C. tribblei* differs in the variable brown spiral bands on its last whorl, the brown radial markings on its sutural ramps, its carinate late whorls, and its generally narrower last whorl (RD 0.47-0.61) with an almost straight rather than slightly sigmoid outline. The spiral sculpture is weaker on the late sutural ramps of *C. tribblei* but stronger on its last whorl. *C. lenavati* can be distinguished by its brown spiral bands and axial blotches on the last whorl, brown flecks rather than dots on the sutural ramps, and the weaker spiral sculpture of its late sutural ramps. For comparison with *C. sieboldii*, see the Discussion of that species.

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***Conus ione* FULTON, 1938**

(Plate 25, Figures 25-28; Map 48)

- 1938 *Conus ione* Fulton, Proc. Malac. Soc. London, **23**: 55, pl. 3 fig. 2

Type: Holotype in BMNH (58 x 29 mm).

Type Locality: "Kii, Japan."

Range: Japan to Philippines, N.W. Australia, Loyalty Is., and New Caledonia; also Mozambique. Recently reported from Réunion.

Description: Moderately large, moderately solid to solid. Last whorl usually slightly pyriform, outline slightly sigmoid. Shoulder broadly carinate. Spire of moderate height, outline concave to slightly sigmoid. Larval shell of about 3.75 whorls, maximum diameter 1.1-1.2 mm. Post-nuclear spire whorls carinate, first 2-5 also tuberculate. Teleoconch sutural ramps concave, with regularly set axial threads and obsolete spiral striae; in some specimens, first 2 ramps with 1-2 weak spiral grooves. Last whorl with pronounced spiral ribbons on abapical fourth, sometimes grading to ribs at base.

C. ione Shell Morphometry

L	55 - 76 mm
RW	0.15 - 0.35 g/mm (L 54-63 mm)
RD	0.55 - 0.64
PMD	0.77 - 0.84
RSH	0.11 - 0.17

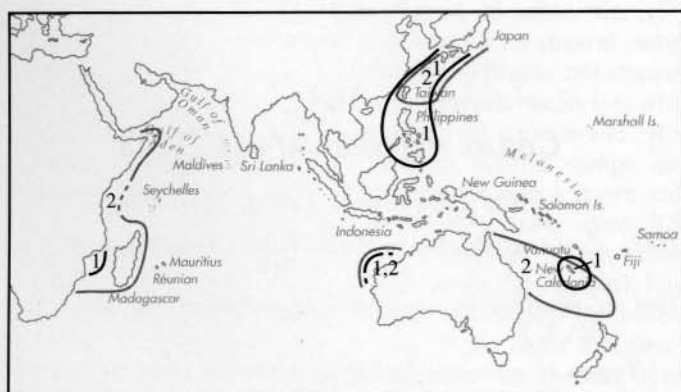
Ground colour white to bluish violet. Last whorl with irregular confluent brown blotches forming a usually incomplete spiral band on each side of centre. Spiral rows of brown dots extend from base to shoulder but vary in number and arrangement. Larval whorls beige. Teleoconch sutural ramps with widely spaced brown dots along carinate outer margins, sometimes also with scattered brown radial markings. Aperture generally somewhat translucent, white in large adults.

Periostracum greyish brown, thin and translucent, thicker and opaque on sutural ramps.

Habitat and Habits: In 50-560 m. Outside the New Caledonia lagoon, the species has been dredged in 340-560 m (Richer de Forges & Estival, 1986); in Philippines dredged in 240-400 m (Guillot de Suduiraut, pers. comm., 1992).

Discussion: *C. ione* is similar to *C. lenavati* and *C. sieboldii*. *C. lenavati* has a more solid shell with an often broader last whorl (RD 0.56-0.71) and a lower spire (RSH 0.02-0.13); its postnuclear whorls are not carinate, its flat sutural ramps bear pronounced spiral grooves, and spirally arranged brown dots are absent from its last whorl and the outer margins of its sutural ramps. For comparison with *C. sieboldii*, see the Discussion of that species.

Map 48



1: *C. ione* 2: *C. teramachii*

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Conus teramachii (KURODA, 1956)

(Plate 26, Figures 1-5; Map 48)

- 1901 *Conus torquatus* von Martens, Sitzungsber. Ges. Naturf. Freunde Berlin, **1901**: 15; 1903: Redescribed and figured in Tiefsee Exp., **7**: 75-76, pl. 1 fig. 1 (non *C. torquatus* (Röding, 1798))
- 1956 *Asprella* (*Endemoconus*?) *teramachii* Kuroda, Venus, **19** (1): 8-9, pl. 1 fig. 4
- 1985 *Conus neotorquatus* da Motta, La Conchiglia, **17** (190-191): 27 (nom. nov. for *C. torquatus* von Martens)

Types: *C. torquatus*: Original figure 65 x 28 mm; *A. teramachii*: Holotype in coll. Teramachi, Toba Aquarium (115 x 57 mm).

Type Localities: *C. torquatus*: "Ostafrika, von 20° 27' S.Br. bis 4° 4' N.Br."; *A. teramachii*: "Off Tosa."

Range: Natal and Madagascar to Somalia, Japan to Taiwan, N. of New Zealand, Queensland, and W. Australia.

Description: Moderately large to large, moderately solid to solid. Last whorl conical or ventricosely conical, occasionally slightly pyriform; outline varies from almost evenly straight to convex at adapical three-fourths and concave below. Shoulder broadly carinate, may have densely set rounded tubercles in smaller adults. Spire usually of moderate height and stepped, outline slightly concave to slightly convex. Postnuclear spire whorls carinate, with closely spaced rounded tubercles in first 5-10 whorls. Teleoconch sutural ramps flat to concave, with numerous spiral grooves or spiral striae; sculpture eroded on early ramps. Last whorl with prominent or sometimes weak spiral ribs on basal fourth and closely set spiral striae above.

C. teramachii Shell Morphometry

L	55 - 111 mm
RW	0.13 - 0.50 g/mm (L 55-105 mm)
D	0.51 - 0.58
PMD	0.81 - 0.93
RSH	0.11 - 0.22

Colour cream to orangish tan (shells from Somalia, Pl. 26, Figs. 4, 5), sometimes axially streaked with darker and lighter shades. Aperture orange.

Periostracum olive-brown, rather thin, opaque, with fine axial ridges.

Operculum long, elongately ovate to pisciform, deeply scalloped or toothed on right side.

Habitat and Habits: Occurs primarily at continental slope depths. Japanese and Taiwanese shells have been trawled in 250-360 m, Australian specimens are reported from about 450 m, N.W. Madagascar specimens from 550 m, and specimens from New Caledonia in 435-675m. Specimens collected by the Valdivia during the Deutsche Tiefsee-Expedition came from depths as great as 1134 m.

Discussion: *C. teramachii* resembles *C. sieboldii* and *C. gradatulus* Weinkauff (see Vol. 2) most closely. For comparison with *C. sieboldii*, see the Discussion of that species. *C. gradatulus* generally has a broader last whorl (RD ca. 0.55-0.64), bears only weak to obsolete spiral striae on its sutural ramps, and lacks carinate postnuclear whorls with distinct rounded tubercles; it does not have toothed operculum and often has brown axial blotches on the last whorl.

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Conus bozzettii LAUER, 1991

(Plate 26, Figures 6-9; Map 49)

1991 *Conus bozzettii* Lauer, Apex, 6 (2): 33-50, figs. 1-14

Type: Holotype in MNHN (62.5 x 26.5 mm).

Type Locality: "a few miles off Cape Raas Haafuun, North-Eastern Somalia".

Range: Known only from N. Somalia.

Description: Medium-sized to moderately large, usually moderately solid. Last whorl conical or ventricosely conical; outline convex at adapical third, less so at central third, and straight (right side) or concave (left side) below. Shoulder subangulate to rounded, usually broadly carinate. Spire of moderate height, outline straight to slightly convex, with projecting, stepped apex. Larval shell of about 3 whorls, maximum diameter about 1.2 mm. First 4-6 post-nuclear whorls tuberculate, late whorls carinate. Teleoconch sutural ramps flat or slightly concave, with closely spaced axial threads and almost obsolete spiral striae. Last whorl with punctate or axially striate spiral grooves at base and weak ribs or narrow ribbons between.

C. bozzettii Shell Morphometry

L	40 - 63 mm
RW	0.09 - 0.17 g/mm (L 40-60 mm)
RD	0.51 - 0.60
PMD	0.77 - 0.90
RSH	0.13 - 0.23

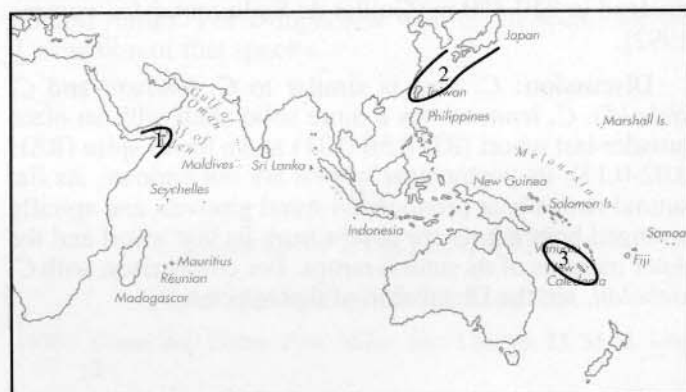
Ground colour white. Last whorl usually with an interrupted spiral band of brown axial blotches above centre, sometimes with traces of a similar band below shoulder. Generally sparse spiral rows of variably numerous light brown dots, dashes or bars occur primarily adapically. Completely white shells intergrade with heavily dotted specimens. Larval whorls white. Teleoconch sutural ramps either immaculate or with very sparse brown dots or dashes, often aligned at outer margin in early whorls. Aperture white.

Periostracum olive-brown, rather thin, opaque, with fine interlaced axial ridges on last whorl and separate prominent radial ridges on spire.

Habitat and Habits: In 150-200 m.

Discussion: *C. bozzettii* resembles *C. ione*, *C. teramachii* and *C. gradatulus* Weinkauff, 1875 (see Vol. 2). *C. ione* attains larger size (to 76 mm), is heavier (RW 0.15-0.35 g/mm), and generally has a broader last whorl (RD 0.55-0.64). It differs also in its slightly pyriform last whorl, more angulate or carinate shoulder, and in its more prominent spiral sculpture on the last whorl. The violet shades often present in *C. ione* are absent in *C. bozzettii*; in the former species, brown blotches form a spiral band on each side of the centre of the last whorl. *C. teramachii* is a larger species (to 111 mm) and lacks any pattern; its shoulder is more angulate and strongly carinate, and its sutural ramps have a prominent spiral sculpture. *C. gradatulus* attains larger size, has a generally broader last whorl (RD to 0.64), its pattern lacks spiral rows of dots, and the pink background shades often seen in this species are absent in *C. bozzettii*.

Map 49



1: *C. bozzettii* 2: *C. sieboldii* 3: *C. luciae*

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Conus sieboldii REEVE, 1848

(Plate 26, Figures 10-12; Map 49)

1848 *Conus sieboldii* Reeve, Conch. Icon., 1, *Conus* suppl.: Pl. 1 sp. 269

1961 *Conus (Asprella) petricosus* Azuma, Venus, 21 (3): 302, text figs. 8, 11

Types: *C. sieboldii*: Holotype in BMNH (51 x 21 mm); *C. petricosus*: Holotype in coll. Azuma (80 x 33.5 mm).

Type Localities: *C. sieboldii*: "Japan"; *C. petricosus*: "off Tosa."

Range: Japan and Taiwan.

Description: Moderately large to large, moderately solid to solid. Last whorl usually conical or ventricosely

conical; outline variably convex at adapical third to half, straight below; left side often slightly concave toward base. Shoulder broadly carinate. Spire of moderate height and stepped, outline straight to slightly concave. Larval shell of 3 whorls, maximum diameter 1.1 mm. Postnuclear spire whorls carinate, first 4-7 also tuberculate. Teleoconch sutural ramps concave, with densely spaced radial threads, sometimes with numerous spiral striae in late whorls. Last whorl with punctate or axially striate spiral grooves from base to centre, separating narrow ribbons or ribs anteriorly and broad ribbons posteriorly.

***C. sieboldii* Shell Morphometry**

L	60 - 129 mm
RW	0.14 - 0.60 g/mm (L 60-111 mm)
RD	0.49 - 0.56
PMD	0.82 - 0.89
RSH	0.13 - 0.20

Ground colour white, sometimes bluish grey. Last whorl with sparse brown axial markings, mainly above centre, sometimes forming an interrupted spiral band. Spiral rows of widely spaced brown dots occur in some specimens. Larval whorls white. Teleoconch sutural ramps with very sparse brown radial markings, primarily in early whorls. Aperture white.

Periostracum olive to brown, rather thin, slightly translucent to opaque, with fine axial ridges that are strong on sutural ramps.

Operculum long, elongately ovate, smooth at edges.

Habitat and Habits: In 50-400 m; reported from mud bottom.

Discussion: *C. sieboldii* resembles *C. tribblei*, *C. lenavati*, *C. sugimotonis*, *C. ione*, *C. teramachii*, and *C. boholensis*. *C. tribblei* has a similar colour pattern but differs in its more solid shell in specimens of same size (RW 0.30-1.01), the strong spiral grooves on its sutural ramps, and in its lower spire (RSH 0.04-0.13) that is not stepped. *C. lenavati* also has a similar colour pattern but its last whorl is distinctly broader (RD 0.56-0.71), its spire lower (RSH 0.02-0.13) and not carinate, and its sutural ramps have distinct spiral grooves. *C. sugimotonis* has a more solid shell, broader last whorl (RD 0.54-0.62), lower spire (RSH 0.02-0.11), and pronounced spiral grooves on its sutural ramps. *C. ione* does not become as large (to 76 mm), has a broader and slightly pyriform last whorl (RD 0.55-0.64), and bears regularly set brown dots at the outer margins of its sutural ramps. *C. teramachii* differs in the absence of any brown pattern elements, the distinct spiral grooves on the sutural ramps, and in the distinctive serrated operculum. For comparison with *C. boholensis*, see the Discussion of that species.

Azuma (1961) distinguished *C. petricosus* from *C. sieboldii* by the absence of any pattern elements, its "very solid" shell and its different radular teeth. However, the

conchological differences largely fall within the range of variation observed in *C. sieboldii*, and Azuma did not discuss the radular differences in detail. Therefore we provisionally assign *C. petricosus* to *C. sieboldii*.

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***Conus luciae* MOOLENBEEK, 1986**

(Plate 26, Figures 13-15; Map 49)

1986 *Conus luciae* Moolenbeek, Bull. Zool. Mus. Univ. Amsterdam, **10** (25): 211-214, figs. 1-3

Type: Holotype in MNHS (55.5 x 28 mm).

Type Locality: "Coral Sea, Banc Nova (22° 35' 20 S - 159° 15' 50 E)".

Range: Coral Sea, New Caledonia, and Loyalty Is.

Description: Medium-sized to moderately large, moderately solid. Last whorl conical, outline convex at adapical fourth, straight below. Base of columella with a projecting plait, more pronounced in larger specimens. Shoulder angulate or subangulate, slightly outwardly curved. Spire usually of moderate height and variably stepped, outline almost straight to concave. Larval shell of about 3 whorls, maximum diameter 0.9 mm. First 5-8 postnuclear whorls tuberculate. Teleoconch sutural ramps slightly concave, with 2 increasing to 4-5 spiral grooves. Last whorl with weak spiral ribs at base.

***C. luciae* Shell Morphometry**

L	37 - 62 mm
RW	0.1 g/mm (L 37 mm)
RD	0.59 - 0.62
PMD	0.89 - 0.94
RSH	0.15 - 0.25

Ground colour pale violet, grading to white on spire. Last whorl with variably spaced dotted brown spiral lines, very sparse on central and subshoulder areas. A few brown spots and axial streaks are spirally aligned above and below centre; oblique brown axial dashes arrayed below shoulder edge, partially extending onto shoulder ramp. Teleoconch sutural ramps may have irregularly set brown blotches and streaks. Aperture purple.

Periostracum greyish brown, translucent.

Habitat and Habits: In 280-610 m.

Discussion: *C. ione* is similar in colour pattern but differs in its slightly pyriform last whorl, the carinate shoulders of its postnuclear whorls, prominent spiral sculpture of its last whorl, and in the absence of spiral grooves on its sutural ramps. In addition, *C. ione* has brown dots at the outer margins of its teleoconch sutural ramps and lacks a plait at the base of its columella.

***Conus pergrandis* (IREDALE, 1937)**

(Plate 26, Figures 16-19; Map 50)

- 1937 *Embrikena pergrandis* Iredale, Festschr. Prof. Embrik Strand, Univ. Lettland, Riga, 3: 407-408, pl. 18 fig.
 1972 *Conus fletcheri* Petuch & Mendenhall, Veliger, 15 (2): 96, figs. 1, 2
 1980 *Conus (Embrikena) potusmarumai* Kosuge, Bull. Inst. Malac. Tokyo, 1 (5): 81-82, pl. 28 figs. 1-4

Types: *E. pergrandis*: Holotype in AMS (137 x 62 mm); *C. fletcheri*: Holotype in CAS (105 x 44.5 mm); *C. potusmarumai*: Holotype in IMT (103.5 x 47.5 mm).

Type Localities: *E. pergrandis*: "New Britain, (Thali Bay)"; *C. fletcheri*: "southwest of the Penghu Island Group, Taiwan, Republic of China"; *C. potusmarumai*: "East China Sea."

Range: Taiwan, Philippines, Papua New Guinea, New Caledonia, and Queensland.

Description: Large, solid to heavy. Last whorl ventricosely conical to slightly pyriform; outline convex at adapical fourth to three-fourths, straight to slightly concave below; columella curved to left at base in very large specimens. Shoulder angulate to rounded. Spire of moderate height, outline slightly sigmoid to concave. Maximum diameter of larval shell about 1.3 mm. First 5-10 postnuclear whorls tuberculate. Teleoconch sutural ramps slightly concave to slightly convex, with 3 increasing to 8-10 spiral grooves. Adult specimens with weak or obsolete spiral ribs at base of last whorl. In subadult shells, entire last whorl with wide punctate or axially striate spiral grooves and ribbons between; ribbons narrow at base; some grooves with a central spiral rib.

***C. pergrandis* Shell Morphometry**

L	90 - 161 mm
RW	0.60 - 1.30 g/mm (L 90-142 mm)
RD	0.51 - 0.59
PMD	0.77 - 0.82
RSH	0.16 - 0.18

Ground colour white. Last whorl usually with variably numerous and brown axial streaks and blotches on both sides of centre, sometimes fused into broad, interrupted spiral bands. Central area immaculate or with a few brown markings. Early teleoconch sutural ramps immaculate, late ramps with scattered brown markings. Aperture white.

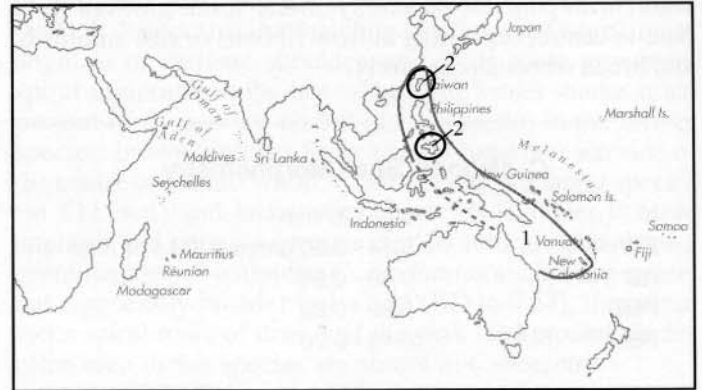
Periostracum olive, thin, translucent and smooth in subadult Philippine specimens, but "light brown" and "pilose" in the holotype (Iredale, 1937).

Habitat and Habits: In 50-530 m.

Discussion: *C. pergrandis* is similar to *C. tisii*; for comparison, see the Discussion of the latter species.

The holotype of *C. pergrandis* lacks dark pattern elements, while the holotype of *C. potusmarumai* is based on a slightly lower-spined shell.

Map 50

1: *C. pergrandis* 2: *C. tisii****Conus tisii* LAN, 1978**

(Plate 26, Figures 20-23; Map 50)

- 1978 *Conus (Rhizoconus) tisii* Lan, Bull. Malac. Rep. China, 5: 63-64 (figs. 1-6), 68 (fig.)

Type: Holotype in TMT (113 x 61 mm).

Type Locality: "NE off Taiwan near Tiao-yu-tai Isles."

Range: Taiwan, Philippines.

Description: Large, solid to heavy. Last whorl conical or ventricosely conical; outline convex adapically, straight (right side) or concave (left side) below. Shoulder subangulate to rounded. Spire of low to moderate height, outline sigmoid, first postnuclear whorls domed. Larval shell of 2-2.5 whorls, maximum diameter 1.1-1.2 mm. First 5-6 postnuclear whorls tuberculate. Teleoconch sutural ramps flat, with 2 increasing to 7-9 spiral grooves. Last whorl with numerous closely set spiral ribs at base, followed by spiral striae to shoulder.

***C. tisii* Shell Morphometry**

L	98 - 154 mm
RW	0.42 - 1.30 g/mm (L 98-150 mm)
RD	0.51 - 0.61
PMD	0.81 - 0.88
RSH	0.09 - 0.17

Ground colour white to pale violet. Last whorl with 2 darker violet spiral bands bearing brown axial blotches, on basal third and just above centre; adult specimens also with

irregular brown spots and axial streaks. Shoulder edge with brown spots, occasionally also present in preceding whorls. Aperture white to light purple.

Periostracum light brown, thin and translucent to rather thick and opaque.

Habitat and Habits: In 120-400 m.

Discussion: *C. tisii* most closely resembles *C. pergrandis*. It differs from the latter in its more conical last whorl (PMD in *C. pergrandis* 0.77-0.82), generally lower (RSH in *C. pergrandis* 0.16-0.18) and domed spire, and in its light purple ground colour. The pronounced spiral sculpture on the last whorl of subadult *C. pergrandis* is absent in subadult *C. tisii*.

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Conus excelsus SOWERBY III, 1908

(Plate 26, Figures 24-28, Map 51)

1894 *Conus pulcherrimus* Brazier, Proc. Linn. Soc. New South Wales (2) 9 (1): 187 (non *C. pulcherrimus* Heilprin, 1879, a fossil)

1908 *Conus excelsus* Sowerby III, Ann. Mag. Nat. Hist., (8) 1:465-466, text fig 95.

1945 *Asprella tannaensis* Cotton, Rec. South Australian Mus., 8 (2): 270-271, pl. 4 fig. 3

1968 *Turriconus nakayasui* Shikama & Habe, Venus, 26 (3-4): 57-59, pl. 6 figs. 1-4

Types: *C. pulcherrimus*: Holotype in SAM (80 x 27 mm); *C. excelsus*: Holotype in BMNH (88.5 x 33 mm); *A. tannaensis*: Holotype same as holotype of *C. pulcherrimus* Brazier; *T. nakayasui*: Holotype 101.5 x 32.5 mm.

Type Localities: *C. pulcherrimus*: "Tanna, New Hebrides"; *C. excelsus*: "New Caledonia?"; *A. tannaensis*: "Tanna, New Hebrides"; *T. nakayasui*: "The sea around Kashiwajima, a small island near Cape Ashizuri, Kochi Pref., Shikoku."

Range: Japan to Philippines; Solomon Is., New Caledonia, Loyalty Is., and Queensland; Andaman Sea off Burma.

Description: Moderately large to large, moderately solid to solid. Last whorl ventricosely conical or conical; outline slightly convex at subshoulder area, straight below. Shoulder angulate. Spire unusually high and stepped, outline straight. Larval shell of about 3.25 whorls, maximum diameter about 1 mm. First 5-12 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1 increasing to 3-4 spiral grooves. Shells with an almost smooth last whorl intergrade with shells having variably spaced, axially striate spiral grooves from base to shoulder, separated by sometimes granulose ribbons.

C. excelsus Shell Morphometry

L	60 - 102 mm
RW	0.14 - 0.30 g/mm (L 60-80 mm)
RD	0.54 - 0.60
PMD	0.81 - 0.91
RSH	0.37 - 0.43

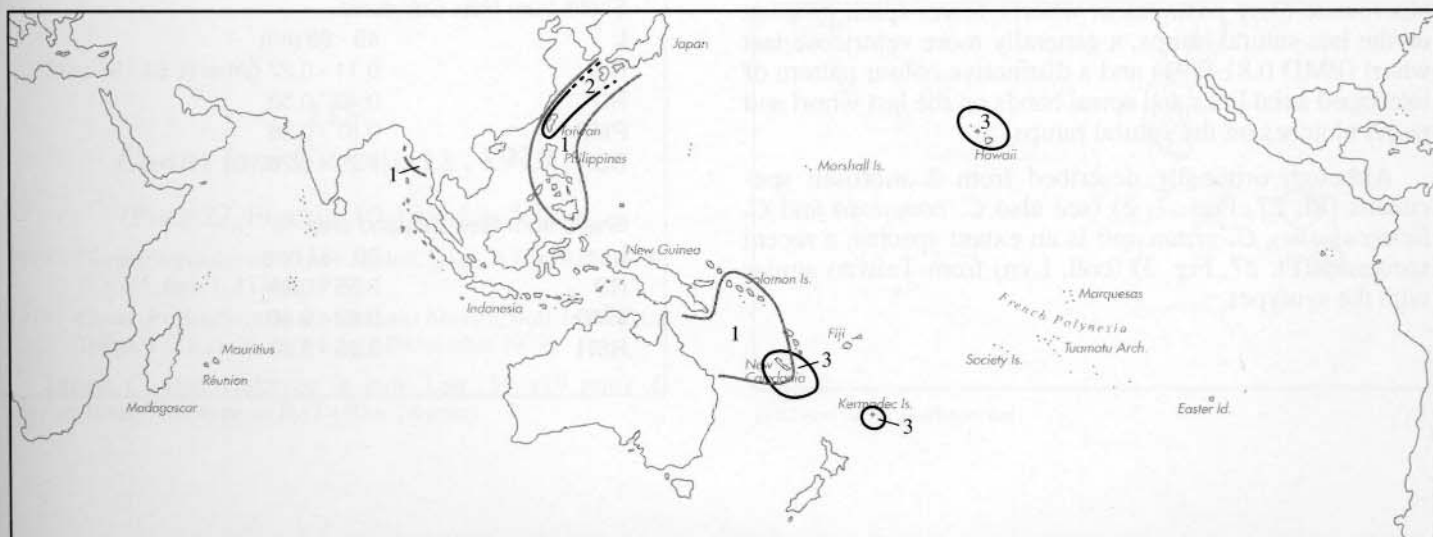
Ground colour white. Last whorl with interlaced wavy brown axial lines and a continuous or interrupted brown spiral band on each side of centre that contains variously shaped white markings and spiral rows of alternating white spots and brown axial dashes. Larval whorls grey. Early teleoconch sutural ramps immaculate, late ramps with brown radial blotches of varying size. Aperture white.

Periostracum yellow, thin, translucent, smooth.

Habitat and Habits: In 100-400 m.

Discussion: *C. excelsus* cannot be mistaken for any other *Conus* species.

Map 51



1: *C. excelsus* 2: *C. gratacapii* 3: *C. smirna*

T. nakayasui refers to a variant with reduced colour pattern; such specimens intergrade with extensively patterned ones.

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Conus gratacapii PILSBRY, 1904

(Plate 27, Figures 1-3; Map 51)

1904 *Conus gratacapii* Pilsbry, Proc. Acad. Nat. Sci. Philadelphia, 56: 7, pl. 1 figs. 10, 10a

Type: 2 syntypes in ANSP (30.5 x 11.5; 29.5 x 11 mm).

Type Locality: "Kikai, Osumi, in a Pliocene (?) deposit."

Range: Taiwan and Ryukyu Is.; possibly also in central Japan.

Description: Moderately small. Last whorl conical; outline of right side straight, of left side slightly sigmoid. Shoulder angulate. Spire high, outline almost straight. Teleoconch sutural ramps slightly concave, with 7-8 spiral grooves in late whorls. Last whorl with spiral grooves from base to shoulder, deeper and more closely spaced basally.

C. gratacapii Shell Morphometry

L	28 - 31 mm
RD	0.54 - 0.56
PMD	0.89 - 0.95
RSH	0.34 - 0.39

Colour white.

Habitat and Habits: Type specimens are probably from a late Pleistocene deposit (Kohn, unpubl. observ.). Recent shells are reported from deep water.

Discussion: *C. gratacapii* recalls subadult specimens of *C. excelsus*. However, the latter species has a stepped spire, tuberculate early postnuclear whorls, fewer spiral grooves on the late sutural ramps, a generally more ventricose last whorl (PMD 0.81-0.91) and a distinctive colour pattern of interlaced axial lines and spiral bands on the last whorl and radial blotches on the sutural ramps.

Although originally described from 2 subfossil specimens (Pl. 27, Figs. 1, 2) (see also *C. comatosa* and *C. tuberculosus*), *C. gratacapii* is an extant species; a recent specimen (Pl. 27, Fig. 3) (coll. Lyn) from Taiwan agrees with the syntypes.

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Conus smirna BARTSCH & REHDER, 1943

(Plate 27, Figures 4-9; Map 51)

1943 *Conus smirna* Bartsch & Rehder, Proc. Biol. Soc. Washington, 56: 87

Type: Holotype in USNM (61 x 23 mm).

Type Locality: "at Station 4132, near Lanai, Hawaiian Islands."

Range: Confirmed only from the type locality; shells from Midway Id. and Oahu (Hawaii), New Caledonia, and the New Zealand area (Wanganella Bank, Kermadec Ridge) may refer to this species.

Description: Moderately large, moderately solid. Last whorl slightly pyriform, outline convex adapically, slightly concave below. Shoulder indistinct from spire but with a prominent edge. Spire high, outline almost straight. Larval shell of more than 2 whorls, maximum diameter about 1.1 mm (shells from New Caledonia). First 5-6 postnuclear whorls tuberculate. Teleoconch sutural ramps flat, with 1-2 increasing to 4-6 spiral grooves, obsolete in late whorls. Last whorl with spiral ribs on basal third, followed by spiral threads to shoulder.

C. smirna Shell Morphometry

Holotype

L	61 mm
RD	0.51
PMD	0.90
RSH	0.27

Shells from Midway and Hawaiian Is.

L	61 - 69 mm
RW	0.12 g/mm (L 61 mm)
RD	0.52 - 0.54
PMD	0.82 - 0.89
RSH	0.25 - 0.29

Shells from New Caledonia

L	49 - 98 mm
RW	0.11 - 0.27 g/mm (L 64 - 98 mm)
RD	0.49 - 0.53
PMD	0.81 - 0.86
RSH	0.21 - 0.28

Shells from New Zealand area

L	39 - 84 mm
RD	0.55 - 0.61
PMD	0.82 - 0.88
RSH	0.25 - 0.30

Ground colour white. Larval whorls light brown. Last whorl with a broad pale brown spiral band on each side of centre. Aperture white.

Periostracum olive-brown, thin, somewhat translucent, smooth.

Habitat and Habits: In 470-570 m (holotype).

Discussion: *C. smirna* is hard to separate from similarly shaped and probably related species. For comparison to *C. lani*, *C. profundorum*, *C. ikedai*, *C. scopulicola*, *C. darkini*, and *C. jeanmartini*, see the Discussions of those species.

Walls, [1979] figured a specimen from S.W. of Midway Id., Hawaii as representative of "typical" Hawaiian *C. smirna*. A somewhat smaller, but otherwise closely corresponding shell (Pl. 27, Figs. 8, 9) was collected in 510 m near Oahu, Hawaii. These shells differ from the holotype of *C. smirna* (Pl. 27, Figs. 4, 5) mainly in their broader and ventricosely conical to conical last whorls, their darker brown spiral bands, pale brown aperture, and less distinct shoulder edge; they resemble the type of *C. profundorum*, and their assignment to *C. smirna* remains doubtful.

Specimens collected outside the New Caledonian lagoon in 545-560 m (Pl. 27, Fig. 7) were identified as *C. smirna* (Richer de Forges & Estival, 1986; Richard, 1990). They correspond with *C. smirna* in relative diameter and outline of the last whorl, in size and in relative spire height. They differ in their more ventricose shape (PMD 0.81-0.86 vs. 0.90), the absence of spiral grooves on sutural ramps, and in the axial as well as spiral arrangement of their pattern. Their assignment to *C. smirna* also remains doubtful.

Similar specimens from subtropical waters north of New Zealand (Pl. 27, Fig. 6) live in 200-1,180 m. They recall the New Caledonian shells in pattern, sculpture and shape except for their broader last whorl (RD 0.55-0.61). According to Marshall (1981), their multispiral larval shell excludes conspecificity with the similar *C. scopulicola*; he assigned them to *C. smirna*, which he considered conspecific with *C. profundorum*. Their relatedness to the shells from the New Caledonian area as well as to *C. smirna* needs further research.

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Conus lani CRANDALL, 1979

(Plate 27, Figures 10-12; Map 52)

1979 *Conus (Profundiconus) lani* Crandall, Quart. J. Taiwan Mus., **30**: 113-115, figs. 1, 2 (June 1979)

1979 *Conus (Profundiconus) nigrostriatus* Kosuge, Bull. Inst. Malac. Tokyo, **1** (2): 21-22, pl. 4 fig. 10 (November 1979)

Types: *C. lani*: Holotype in coll. Lan (53 x 19 mm); *C. nigrostriatus*: Holotype in IMT (50 x 18 mm).

Type Localities: *C. lani*: "off NE Taiwan near Tiao-yu-tai (Uotsuri Shima)"; *C. nigrostriatus*: "South China Sea."

Range: Taiwan, Philippines, Solomon Is., Loyalty Is., and New Caledonia.

Description: Medium-sized, moderately solid. Last whorl usually conical, outline nearly straight. Shoulder subangulate to indistinct. Spire high, outline straight to slightly convex. Larval shell of almost 2 whorls, maximum diameter about 0.9 mm. First 4-5 postnuclear whorls tuberculate. Teleoconch sutural ramps nearly flat, with 2-3 increasing to 5-7 spiral grooves, weaker in late whorls. Last whorl with fine spiral ribs from base to shoulder, sometimes obsolete adapically and minutely granulose at base.

C. lani Shell Morphometry

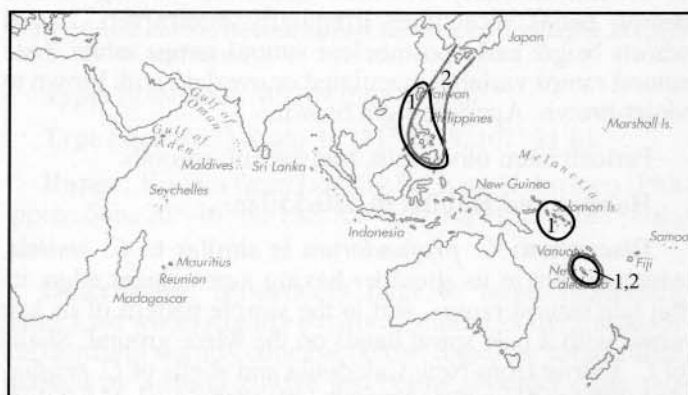
L	41 - 54 mm
RW	0.10 - 0.14 g/mm
RD	0.50 - 0.55
PMD	0.84 - 0.89
RSH	0.23 - 0.29

Colour light to dark brown, with scattered white markings on last whorl and late sutural ramps. In some specimens, white markings form an indistinct spiral band below centre of last whorl. Larval whorls and first 2-4 teleoconch sutural ramps white. Aperture white.

Habitat and Habits: In 75-560 m (New Caledonia).

Discussion: *C. lani* resembles *C. smirna* in shape, but the latter species attains larger size, its last whorl has a slightly pyriform outline, and it lacks uniform brown colouration with scattered white spots. For distinctions from *C. profundorum*, *C. ikedai*, *C. scopulicola* and *C. darkini*, see the Discussions of those species.

Map 52



1: *C. lani* 2: *C. profundorum*

***Conus profundorum* (KURODA, 1956)**

(Plate 27, Figs. 13-17; Map 52)

1956 *Chelyconus* (?) (*Profundiconus*) *profundorum* Kuroda, Venus, 19 (1): 5-6, 4 (text figs. 8, 9)1964 *Profundiconus soyomaruuae* Okutani, J. Fac. Sci. Univ. Tokyo, (2) 15: 436-437, pl. 4 fig. 1**Types:** *C. profundorum*: Holotype in coll. Teramachi, Toba Aquarium (83 x 38 mm); *P. soyomaruuae*: Holotype in GIUT (75.5 x 31.5 mm).**Type Localities:** *C. profundorum*: "South-western part of off Tosa"; *P. soyomaruuae*: "33° 05.4' N, 139° 58.4' E, 6 miles off Hachijo Island."**Range:** Japan, Philippines, New Caledonian area; possibly also S. E. Pacific.**Description:** Moderately large to large, solid. Last whorl conical, ventricosely conical or slightly pyriform; outline strongly convex to convex adapically, straight to concave below. Shoulder rounded, occasionally indistinct. Spire of moderate height to high, outline nearly straight or slightly sigmoid, occasionally slightly concave. Larval shell of 3 or more whorls, maximum diameter 1-1.1 mm. First 4-7 postnuclear whorls tuberculate. Teleoconch sutural ramps flat, slightly concave or sigmoid in late whorls, with spiral striation. Last whorl with fine spiral ribs at base.***C. profundorum* Shell Morphometry**

L	52 - 114 mm
RW	0.15 - 0.33 g/mm (L 52 - 81 mm)
RD	0.54 - 0.63
PMD	0.78 - 0.87
RSH	0.16 - 0.28

Ground colour white to cream. Last whorl with a broad apical violet-brown or brown spiral band and often one or several similarly coloured bands of varying widths below; bands sometimes irregularly interrupted. Larval whorls beige; early postnuclear sutural ramps white. Late sutural ramps variably maculated or overlaid with brown to violet-brown. Aperture light brown.

Periostracum olive, thin, translucent, smooth.

Habitat and Habits: In 180-550 m.**Discussion:** *C. profundorum* is similar to *C. smirna*, which differs in its shoulder having a prominent edge, its flat late sutural ramps, and in the simple pattern of its last whorl with 2 pale spiral bands on the white ground. Shells of *C. smirna* from New Caledonia and shells of *C. profundorum* from New Caledonia can be distinguished by their shape (RD 0.49-0.53 vs. 0.62-0.63), relative spire height (RSH 0.21-0.28 vs. 0.16-0.17), and colour pattern. For comparison with the similar *C. ikedai*, *C. scopulicola*, and *C. darkini*, see the Discussions of those species. *C. lani* is a smaller species (to 54 mm) with a narrower, more conical

last whorl (RD 0.50-0.55; PMD 0.84-0.89) with straighter outline, flat late sutural ramps and a plain brown colouration with white spots.

C. soyomaruuae (Pl. 27, Fig. 17) was assigned to *C. smirna* by Richard (1990), although the latter species has a less ventricose and distinctly narrower last whorl (RD of holotypes: 0.51 vs. 0.56). We consider *C. soyomaruuae* a colour form of *C. profundorum* with a more prominent, darker brown banding, because all its other conchological characters fall within the range of variation of the latter species.***Conus ikedai* NINOMIYA, 1987**

(Plate 27, Figures 18-19; Map 53)

1987 *Conus* (*Profundiconus*) *ikedai* Ninomiya, Venus, 46 (1): 7-12, pl. 1 figs. 1-4, pl. 2 figs. 5, 6**Type:** Holotype in NSMT (25.5 x 11 mm).**Type Locality:** "Southwest off Jogashima Islet, Miura Peninsula, Japan."**Range:** Sagami Bay, Japan.**Description:** Moderately small. Last whorl ventricosely conical; outline convex adapically, less so (right side) or concave (left side) below. Shoulder rounded. Spire of moderate height, outline nearly straight to slightly sigmoid. Larval shell of 2 whorls. First 3 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly convex, with several spiral threads. Last whorl with fine spiral ribs.***C. ikedai* Shell Morphometry**

L	25 - 30 mm
RD	0.53 - 0.56
PMD	0.81 - 0.84
RSH	0.16 - 0.21

Colour white or white suffused with orangish yellow. Larval whorls white. Aperture white.

Periostracum "dull white" (Ninomiya, 1987).

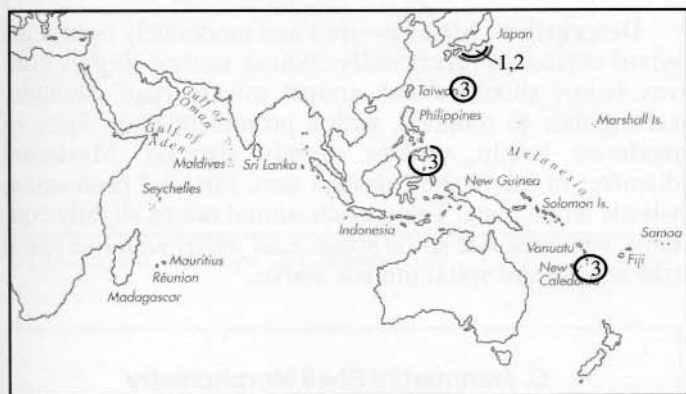
Operculum ovately paddle-shaped.

Habitat and Habits: In 20-300 m. Structure of radular teeth suggests vermivory (Ninomiya, 1987).**Discussion:** *C. ikedai* is considered a valid species, although it may represent a subadult stage. The attachment of *C. ikedai* to *C. profundorum* as suggested by Kuroda et al. (1971) can no longer be maintained. *C. profundorum* has a generally higher spire (RSH 0.16-0.28), an elongately ovate operculum, 3 or more larval whorls, and its last whorl pattern consists of distinct brown spiral bands. *C. smirna* differs from *C. ikedai* in its higher spire (RSH 0.21-0.30),

larger number of tuberculate postnuclear whorls (5-6), and in the spiral colour bands on its last whorl. *C. lani* can be distinguished by the more conical shape of its last whorl, its high spire (RSH 0.25-0.29), and its brown colouration with scattered white spots. For comparison with *C. jeanmartini*, *C. scopulicola* and *C. darkini*, see the Discussions of those species.

Specimens similar to the type specimens of *C. ikedai* were recently collected in the New Caledonian area.

Map 53



1: *C. ikedai* 2: *C. scopulicola* 3: *C. darkini*

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Conus scopulicola (OKUTANI, 1972)

(Plate 27, Figures 20-21; Map 53)

1972 *Profundiconus scopulicola* Okutani, Bull. Tokai Reg. Fish. Res. Lab., 72: 98-99, pl.2 fig. 12

Type: Holotype in NSMT (22 x 9 mm).

Type Locality: "Hyotanse (D 29), 34° 21.5' N, 139° 04.5' E."

Range: Hyotanse Bank, Izu-Shichito Is., off Honshu, Japan.

Description: Small. Last whorl ventricosely conical; outline convex adapically, less so (right side) or concave (left side) below. Shoulder rounded to indistinct. Spire high, outline slightly sigmoid. Larval shell of 2 whorls. First postnuclear whorl weakly tuberculate. Teleoconch sutural ramps slightly convex, with 3 increasing to 5 spiral grooves. Last whorl with fine closely spaced spiral ribs.

C. scopulicola Shell Morphometry

L	17 - 22 mm
RD	0.55 - 0.58
PMD	0.77 - 0.80
RSH	0.25 - 0.28

Ground colour cream. Last whorl with brown axial flames forming 3 variably continuous spiral bands, below shoulder and on both sides of centre. Adapical and central ground-colour band with 1-2 spiral rows of brown spots. Larval whorls and adjacent teleoconch sutural ramp white. Following sutural ramps with brown radial streaks and blotches, covering nearly the entire ramp in late whorls. Aperture white.

Periostracum thin (Okutani, 1972).

Habitat and Habits: In about 200 m (Okutani, 1972).

Discussion: *C. scopulicola* is only provisionally considered a valid species, as it may represent the subadult stage of a larger member of the species-group represented by *C. smirna*. *C. lani* differs in its narrower, more conical last whorl (RD 0.50-0.55; PMD 0.84-0.89) with straight outline, and in its more uniform colouration. *C. smirna* has a less ventricose last whorl and its spire has more tuberculate whorls (5-6). *C. profundorum* has more tuberculate spire whorls (4-7), 3 or more larval whorls, a generally more distinct shoulder and a spirally orientated last whorl pattern with only one adapical colour band. *C. ikedai* can be distinguished by its generally narrower and less ventricose last whorl (RD 0.53-0.56; PMD 0.81-0.84), lower spire (RSH 0.16-0.21), greater number of tuberculate spire whorls (3), more distinct shoulder, and by the absence of a brown pattern. For comparison with *C. darkini* and *C. jeanmartini*, see the Discussions of those species. The closest resemblance in colour pattern is shown by those specimens from New Caledonia and the New Zealand area that we have tentatively assigned to *C. smirna* (see the Discussion of *C. smirna*).

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Conus darkini RÖCKEL, KORN & RICHARD, 1992

(Plate 27, Figures 22-25; Map 53)

1993 *Conus darkini* Röckel, Korn & Richard, La Conchiglia 25 (267): 49-49, text figs. 1-4

Type: Holotype in MNHN (68 x 23 mm).

Type Locality: "Loyalty Is. (21° 05' S, 167° 32' E)."

Range: Known from Loyalty Is., Kita-Koho area (Philippine Sea, 26° 46' N, 135° 22' E), and Philippines (Balut Id.).

Description: Moderately large to large, moderately solid. Last whorl slightly pyriform, outline convex at adapical third and slightly concave below. Shoulder subangulate, marked by a spiral groove just below shoulder edge, producing a keeled appearance. Spire of moderate height to high, stepped; outline straight to slightly concave. Larval shell of about 3.5 whorls, maximum diameter about 1.1 mm. Specimens of about 50 mm with 11 postnuclear whorls, the

first 9-10 tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1 increasing to 3-5 weak spiral grooves. Last whorl with about 15 weak spiral ribs near base.

***C. darkini* Shell Morphometry**

L	51 - 87 mm
RW	0.12 - 0.33 g/mm
RD	0.52 - 0.59
PMD	0.83 - 0.89
RSH	0.20 - 0.30

Ground colour white. Last whorl with dark reddish brown axial flames from base to shoulder, extending onto shoulder ramp. Flames connected spirally at base and at each side of the central area. Larval whorls white. Early postnuclear whorls with a brown subsutural ridge and brown tubercles. Late sutural ramps with dark reddish brown radial blotches. Aperture white.

Periostracum yellowish brown, thin, translucent, smooth.

Habitat and Habits: Deep subtidal. Kita-koho area: In about 325 m (Darkin, pers. comm., 1991); Balut Id.: In 280-300 m on rocky and muddy bottom (Guillot de Suduiraut, pers. comm., 1992); Loyalty Is.: In 575 m (holotype) and in 480 m (paratype 1).

Discussion: *C. darkini* is a distinctive member within the group of species of which *C. smirna* was the first described. The large number of strongly tuberculate spire whorls, the keeled appearance of the shoulder and the brown colour of the subsutural ridge and tubercles in the early postnuclear whorls distinguishes it from all the other members. The multispiral larval shell of *C. darkini* differs from *C. smirna*, *C. ikedai*, and *C. scopulicola* (3.5 vs. 2 whorls). *C. ikedai* differs in colour pattern, while *C. scopulicola* differs in arrangement of the spiral colour bands (third band below shoulder instead of at base). Typical *C. smirna* also differs in the absence of axial pattern elements and the smaller number of postnuclear whorls in similar sized specimens (8-9 vs. 11). The shells from New Caledonia assigned to *C. smirna* are also distinguished by their narrower last whorl (RD 0.49-0.53), and those from the New Zealand area by their higher spire (RSH 0.25-0.30). *C. profundorum* can be distinguished by its rounded shoulder, the brown shades within its aperture and the primarily spiral arrangement of its last whorl pattern. *C. lani* has a last whorl with straight outline, and brown colouration with scattered white spots.

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***Conus jeanmartini* (G. RAYBAUDI MASSILIA, 1992)**

(Plate 27, Figures 26-28; Map 54)

1992 *Profundiconus jeanmartini* G. Raybaudi Massilia, La Conchiglia, **23** (263): 46-50, pl. 1, figs. 1, 3

Type: Holotype in MNHN (41.5 x 18 mm)

Type Locality: "Off Saint Paul Bay, W. coast of Réunion Island, W. Indian Ocean (21° 00' S, 55° 16' E)."

Range: Known only from the type locality.

Description: Medium-sized and moderately light. Last whorl conical to ventricosely conical, outline slightly convex below shoulder and straight toward base. Shoulder subangulate to rounded, with a prominent edge. Spire of moderate height, outline slightly sigmoid. Maximum diameter of larval shell about 1 mm. First 4-7 postnuclear whorls tuberculate. Teleoconch sutural ramps slightly concave, with obsolete spiral striae. Last whorl with fine spiral ribs at base and spiral threads above.

***C. jeanmartini* Shell Morphometry**

L	42 mm
RW	0.07 - 0.09 g/mm
RD	0.52 - 0.56
PMD	0.82 - 0.86
RSH	0.19 - 0.23

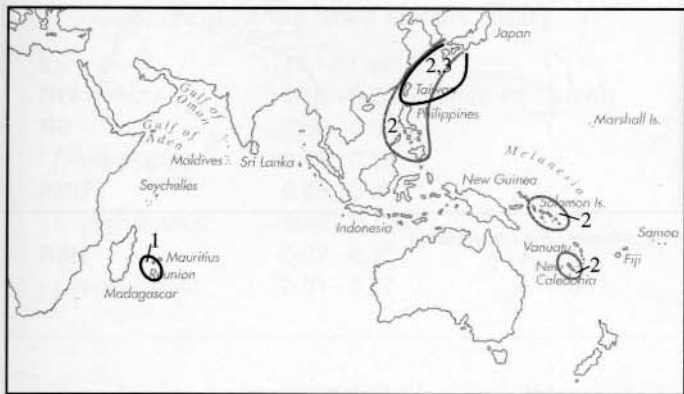
Colour beige, with an inconspicuous narrow light brown spiral band just below shoulder edge. Aperture cream.

Habitat and Habits: In about 700 m.

Discussion: *C. jeanmartini* resembles *C. ikedai*, *C. scopulicola*, *C. lani*, *C. smirna*, and *C. profundorum*. *C. ikedai* differs in its more ventricose last whorl (PMD 0.81-0.84) with a sigmoid left side, its generally lower spire (RSH 0.16-0.21), rounded shoulder, and in the more distinct spiral sculpture on its sutural ramps. *C. scopulicola* has a somewhat broader, distinctly ventricose last whorl (PMD 0.77-0.80) with a sigmoid left side, a rounded and rather indistinct shoulder, prominent spiral sculpture on its sutural ramps, and a pattern of brown axial flames and spiral bands; only its first postnuclear whorl is tuberculate. *C. lani* has a higher spire (RSH 0.25-0.29), a prominent spiral sculpture on its sutural ramps, and a brown colouration. *C. smirna* (including similar shells from Midway Id., New Caledonia, and New Zealand area) attains larger size, has more pattern on its last whorl, and its spire is higher (RSH 0.21-0.30). *C. smirna* and allied shells also differ in the pronounced spiral grooves on their early teleoconch sutural ramps, and their indistinct shoulders. *C. profundorum* attains larger size and has a light brown aperture. Similarly sized subadult specimens of *C. profundorum* from New Caledonia differ in their angulate shoulder. However, these conchological dif-

ferences are difficult to evaluate, because *C. jeanmartini* is based on only two specimens and nothing can be said about its intraspecific variability. We consider *C. jeanmartini* only provisionally a valid species.

Map 54



1: *C. jeanmartini* 2: *C. stupa* 3: *C. stupella*

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Conus stupa (KURODA, 1956)

(Plate 28, Figures 1-3; Map 54)

1956 *Embrikenia stupa* Kuroda, Venus, **19** (1): 1-3, pl. 1 fig. 1

Type: Holotype in coll. Teramachi, Toba Aquarium (100 x 48 mm).

Type Locality: "Off Tosa, Shikoku Island."

Range: Japan to Taiwan and Philippines, Solomon Is., and Loyalty Is.

Description: Moderately large to large, solid. Last whorl ventricosely conical, broadly and ventricosely conical or pyriform; outline convex at adapical two-thirds, straight to concave below; left side consistently sigmoid. Shoulder angulate to subangulate, approaching rounded in very large shells. Spire high, stepped, outline slightly concave. First 8-12 postnuclear whorls tuberculate. Early teleoconch sutural ramps flat to concave, with 2-3 spiral grooves; late ramps deeply concave with a weak spiral striation. Last whorl with weak spiral ribs at base.

C. stupa Shell Morphometry

L	68 - 100 mm
RW	0.37 - 0.74 g/mm (L 68-88 mm)
RD	0.63 - 0.73
PMD	0.78 - 0.85
RSH	0.26 - 0.30

Ground colour white. Last whorl with about 7-13 reddish brown dotted spiral lines. Irregular, reddish to dark brown flecks often form an interrupted spiral band above centre. Teleoconch sutural ramps with a variable number of brown radial streaks and blotches extending across outer margins onto steps. Aperture white.

Periostracum yellowish brown, thin, translucent, smooth.

Habitat and Habits: In 150-430 m.

Discussion: *C. stupa* is most similar to its simultaneously described close ally *C. stupella*, sympatric in Japanese and Taiwanese waters. For the distinctions, see the Discussion of the latter species.

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Conus stupella (KURODA, 1956)

(Plate 28, Figures 4-6; Map 54)

1956 *Embrikenia stupella* Kuroda, Venus, **19** (1): 3, pl. 1 fig. 3

Type: Holotype in coll. Teramachi, Toba Aquarium (72.5 x 35.5 mm).

Type Locality: "Off Tosa."

Range: Japan to Taiwan, Philippines and Philippine Sea (Kita-Koho area).

Description: Moderately large to large, solid. Last whorl usually pyriform, outline usually sigmoid. Shoulder subangulate to rounded. Spire of moderate height or high, stepped, outline straight. Maximum diameter of larval shell 0.9-1 mm. First 3-10 postnuclear whorls tuberculate, late whorls undulate or smooth. Teleoconch sutural ramps slightly concave or almost flat, with 2 increasing to 4 spiral grooves. Last whorl with a few weak spiral ribs at base.

C. stupella Shell Morphometry

L	54 - 98 mm
RW	0.28 - 0.48 g/mm (L 54-73 mm)
RD	0.64 - 0.74
PMD	0.80 - 0.89
RSH	0.20 - 0.30

Ground colour white suffused with reddish violet. Last whorl with widely spaced spiral rows of brown spots. Some specimens also with sparse light brown flecks, spirally aligned above centre. Teleoconch sutural ramps with brown spots at outer margins, between tubercles in early whorls. Aperture light violet.

Habitat and Habits: Below 100 m.

Discussion: *C. stupella* can be easily confused with *C. stupa*. The latter species generally attains larger size, its spire outline is concave, its late teleoconch sutural ramps are deeply concave and usually lack spiral grooves, and it has spiral rows of dots rather than spots on last whorl. We only provisionally consider *C. stupella* a distinct species.

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Conus hirasei (KIRA, 1956)

(Plate 28, Figures 7-9; Map 55)

1956 *Rhizoconus* (?) *hirasei* Kira, Venus, **19** (1): 3-5, text fig. 10

Type: Holotype (lost in World War II) 62.5 x 31.5 mm.

Type Locality: "Kashiwajima, Tosa."

Range: Japan to Philippines and South China Sea.

Description: Medium-sized to large, solid. Last whorl conical, ventricosely conical or slightly pyriform; outline convex adapically, straight to slightly concave below. Shoulder angulate to subangulate, slightly carinate. Spire of low to moderate height, outline slightly concave to slightly sigmoid. Early postnuclear whorls tuberculate. Teleoconch sutural ramps flat, with 3 increasing to 5-6 spiral grooves; additional spiral threads on last 2 ramps. Last whorl with a few broad but rather weak spiral ribs at base.

C. hirasei Shell Morphometry

L	50 - 92 mm
RW	0.28 - 0.35 g/mm (L 50-62 mm)
RD	0.59 - 0.61
PMD	0.81 - 0.92
RSH	0.09 - 0.14

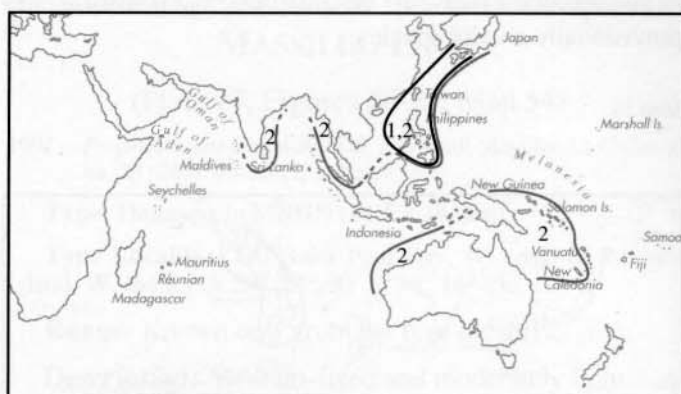
Ground colour white tinged with violet. Last whorl with about 18-30 rather regularly spaced reddish brown spiral lines from base to subshoulder area. Larval whorls white. Outer margins of teleoconch sutural ramps with regularly spaced reddish to blackish brown spots. Aperture white except for violet area near shoulder.

Periostracum yellowish brown, thin, translucent, smooth.

Habitat and Habits: In 100-240 m.

Discussion: *C. hirasei* may resemble *C. kanakinus* in colour-pattern. For the distinctions, see the Discussion of that species

Map 55



1: *C. hirasei* 2: *C. recluzianus*

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Conus recluzianus BERNARDI, 1853

(Plate 28, Figures 10-25; Map 55)

1853 *Conus recluzianus* Bernardi, J. Conchyl. (Paris), **4**: 148-149, pl. 6 fig. 6

1961 *Conus* (*Rhizoconus*) *gloriakiensis* Kuroda & Ito, Venus, **21** (3): 258-259, pl. 17 figs. 6, 7

1961 *Conus* (*Rhizoconus*) *urashimanus* Kuroda & Ito, Venus, **21** (3): 259-260, pl. 17 figs. 13, 14

1990 *Conus roseorapum* G. Raybaudi & da Motta, La Conchiglia, **22** (253-255): 41-43, text figs.

Types: *C. recluzianus*: Holotype in LMD (58.5 x 28 mm); *C. gloriakiensis*: Holotype in KSM (51.5 x 27.5 mm); *C. urashimanus*: Holotype in coll. Teramachi (70 x 37.5 mm); *C. roseorapum*: Holotype in MHNG (50.5 x 23 mm).

Type Localities: *C. recluzianus*: "les mers de Chine"; *C. gloriakiensis*: "Nada coast, Gobo, Kii Peninsula"; *C. urashimanus*: "Nada, Gobo, Kii Peninsula"; *C. roseorapum*: "Bohol, Philippine Islands."

Range: S.E. India and Sri Lanka to Singapore; Japan to Philippines, Solomon Is., New Caledonia, Papua New Guinea, W. Australia, Arafura Sea, and Queensland.

Description: Medium-sized to large, moderately solid to solid; relative weight may vary by about 50% among similarly sized specimens from different regions. Last whorl usually conical, sometimes narrowly conical in form *roseorapum* (Pl. 28, Figs. 21-25) and rarely ventricosely conical in form *urashimanus* (Pl. 28, Fig. 13; see below); outline variably convex at adapical fourth, straight below; form *roseorapum* convex at adapical third and often with a concave left side near base. Shoulder angulate and undulate to tuberculate, the undulations or tubercles evenly spaced; weakly to prominently tuberculate in form *roseorapum*. Spire low, outline concave to somewhat sigmoid; in form *roseorapum*, apex often projecting above an otherwise almost flat spire. Larval shell of 3-3.25 whorls, maximum diameter 0.8-1.0 mm. About first 1.5 postnuclear whorls

variably tuberculate; following whorls undulate, more strongly so toward shoulder. Teleoconch sutural ramps flat to slightly concave, with 1-2 increasing to 4-7 spiral grooves, weaker in late whorls. Last whorl with spiral ribs at base and a few widely spaced weak elevations above. In form *roseorapum*, last whorl glossier than in other variants.

***C. recluzianus* Shell Morphometry**

L	45 - 80 mm
RW	0.14 - 0.73 g/mm (L 45-79 mm)
RD	0.50 - 0.60
- f. <i>roseorapum</i>	0.49 - 0.56
PMD	0.85 - 0.96
- f. <i>urashimanus</i>	rarely to 0.83
RSH	0.02 - 0.10
- f. <i>roseorapum</i>	0.01 - 0.07

Ground colour white to pale brown, or violet; in form *roseorapum*, ground pale violet, often suffused with pink, orange or reddish-brown. Last whorl with a broad yellow to brown spiral band on each side of centre, solid or interrupted and either distinct or merging with adjacent areas; apical band may extend to shoulder. In form *roseorapum*, bands reddish violet or orangish brown to bright orange. Central ground-colour band may be edged apically by small to large brown spots. Darker axial streaks of varying prominence may occur. Solid and dotted brown spiral lines frequently present in Indian Ocean shells (Pl. 28, Figs. 16, 17), rather sparse and inconspicuous in shells from the other localities. Larval whorls brown. Teleoconch sutural ramps with brown radial markings; immaculate spires intergrade with heavily maculated ones. Aperture white, often tinged with violet.

Periostracum of subadult specimens olive-grey, thin, slightly translucent, with widely spaced single or double rows of strong tufts around last whorl including shoulder and with strong radial ridges on sutural ramps. During growth, periostracum becomes brown, thicker and opaque, with stronger tufts and with axial ridges on last whorl. In form *roseorapum*, periostracum thinner; during growth, spirally aligned tufts become axially interlaced, forming a network of tufted patches on last whorl.

In form from Taiwan, radular teeth with a barb opposite a blade, short serration ending in a cusp somewhat posterior the blade, shaft with a narrow central waist, base with a spur. Form *roseorapum* from Philippines has a slightly narrower blade; its serration is as long as the blade, and the waist is anterior of the centre (Rolán, unpubl. observ.).

Habitat and Habits: In 25-240 m; form *roseorapum* reported from 100-240 m (Guillot de Suduiraut, pers. comm., 1992).

Discussion: *C. recluzianus* resembles *C. shikamai*, *C. sukhadwalai*, *C. voluminalis*, and *C. tribblei*. For comparison with the first three, see the Discussions of those species. *C. tribblei* attains larger size, has the first 3-6 postnuclear

whorls tuberculate but its late whorls have smooth, carinate rather than undulate to tuberculate shoulders.

The holotype of *C. recluzianus* (Pl. 28, Fig. 10) has faded yellow spiral bands and closely resembles specimens described as *C. gloriakiensis* (Pl. 28, Fig. 14), although it lacks the brown spots at the apical edge of the central ground-colour band and its last whorl is somewhat narrower (0.52 vs. 0.53-0.60). Specimens conforming to the description of *C. urashimanus* have a rather uniform violet-brown colouration with often discontinuous darker brown spiral bands; their shoulder is sometimes distinctly tuberculate. Form *gloriakiensis* and form *urashimanus* occur sympatrically from Japan to Taiwan, attain the highest relative weight, and are inseparable by soft part characters (Ninomiya, pers. comm., 1983). Indian Ocean shells (Pl. 28, Figs. 16, 17) are comparatively light and have distinct brown or orange-brown spiral bands on a white ground. Shells from Australia (Pl. 28, Figs. 19, 20) are similar to those from Taiwan. Specimens referred to as *C. roseorapum* (Pl. 28, Figs. 21-25) occur from the South China Sea to the Solomon Is. and intergrade with *C. recluzianus* in shape and colour pattern in Philippines. We therefore provisionally assign *C. roseorapum* to *C. recluzianus* as a form.

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***Conus sukhadwalai* RÖCKEL & DA MOTTA, 1983**

(Plate 29, Figures 1-3; Map 56)

1983 *Conus sukhadwalai* Röckel & da Motta, Arch. Moll., **114** (1/3): 1-5, pl. 1 figs. 1-3

Type: Holotype in SMF (40 x 24 mm)

Type Locality: "Süd-Indien; gedreht in einem Umkreis von 50 Meilen um Madras."

Range: S. India.

Description: Medium-sized, moderately solid. Last whorl conical to slightly pyriform, outline convex at adapical third and straight to slightly concave below. Shoulder angulate. Spire low; outline concave; apex projects from an otherwise almost flat spire. Larval shell of about 3 whorls, maximum diameter 0.8 mm. Teleoconch sutural ramps flat to slightly concave, with 2 increasing to 4-5 spiral grooves in early whorls, grading into many weak spiral striae in late whorls. Last whorl with a few weak spiral ribs at base.

***C. sukhadwalai* Shell Morphometry**

L	37 - 50 mm
RW	0.19 - 0.29 g/mm
RD	0.59 - 0.66
PMD	0.85 - 0.97
RSH	0.01 - 0.07

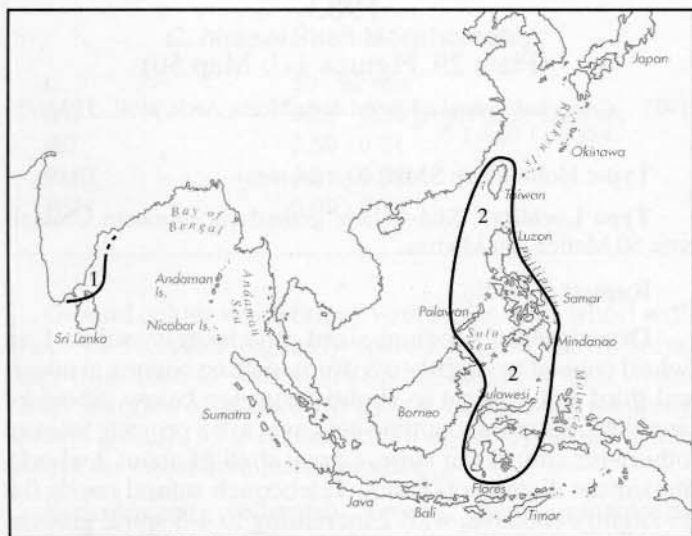
Ground colour white suffused with violet. Last whorl with a broad, continuous to interrupted orange to orangish brown spiral band on each side of centre; dark brown spots and axial flames edge the adapical band on both sides and the upper side of the abapical band. Larval whorls light orange. Teleoconch sutural ramps with brown radial markings. Aperture pale violet.

Periostracum olive-brown, thin, translucent, with about 8-10 widely spaced tufted spiral lines on last whorl including shoulder.

Habitat and Habits: In 15-150 m, in sand.

Discussion: *C. sukhadwalai* is similar to *C. malacanus*, *C. recluzianus*, *C. shikamai*, and *C. voluminalis*. *C. malacanus* is a larger and somewhat heavier (L 45 mm: RW 0.35) sympatric species, which differs in its broader last whorl (RD 0.65-0.74), higher spire (RSH 0.10-0.17), and tuberculate early and carinate late postnuclear whorls. The periostracum of *C. malacanus* has no tufted spiral lines. *C. recluzianus* attains larger size and is lighter in weight (L 45 mm: RW 0.14-0.22); it has a narrower last whorl (RD 0.49-0.60), prominent spiral sculpture on its late sutural ramps and undulate to tuberculate postnuclear whorls. For distinctions to *C. shikamai* and *C. voluminalis*, see the Discussions of those species.

Map 57



1: *C. sukhadwalai* 2: *C. shikamai*

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Conus shikamai COOMANS, MOOLENBEEK & WILS, 1985

(Plate 29, Figures 4-7; Map 56)

- 1979 *Conus clandestinus purpuratus* Shikama, Sci. Rep. Yokosuka City Mus., 26: 2-3, pl. 1 figs. 5, 6 (non *C. purpuratus* (Röding, 1798))

- 1985 *Conus shikamai* Coomans, Moolenbeek & Wils, Basteria, 48 (6): 233, fig. 472 (nom. nov. for *C. clandestinus purpuratus* Shikama)

Type: Holotype in NSMT (45.5 x 21.5 mm).

Type Locality: "South China Sea, off Taiwan."

Range: Taiwan to Philippines, Indonesia (Sulawesi).

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl usually conical, outline slightly convex below shoulder, then straight. Shoulder angulate, irregularly undulate to weakly tuberculate. Spire low, outline concave. Larval shell of 3-3.5 whorls, maximum diameter 0.8-0.9 mm. First 3 postnuclear whorls weakly tuberculate to irregularly undulate; adjacent whorls nearly smooth, late whorls undulate. Teleoconch sutural ramps slightly concave, with 2-3 increasing to 4-6 spiral grooves, obsolete in latest whorls. Last whorl with variably spaced spiral ribs at base.

C. shikamai Shell Morphometry

L	45 - 70 mm
RW	0.17 - 0.45 g/mm (L 45-60 mm)
RD	0.49 - 0.53
PMD	0.85 - 0.94
RSH	0.04 - 0.08

Ground colour pale bluish violet. Last whorl with a broad, usually continuous, brown spiral band on each side of centre and with brown axial flames, usually crossing spiral bands and adjacent ground-colour areas. Rather evenly spaced, fine dark brown spiral lines cover entire last whorl of subadult specimens but are mainly restricted to the brown spiral bands in adult shells. Larval whorls brown. Teleoconch sutural ramps heavily maculated with dark brown radial markings. Aperture violet.

Periostracum olive, thin, translucent, with widely spaced spiral rows of tufts on last whorl, including shoulder.

Habitat and Habits: Generally in 100-240 m.

Discussion: The earlier name proved unavailable according to the rules of the ICZN, and Coomans et al. (1985a) renamed this species *C. shikamai*.

C. shikamai is similar to *C. recluzianus*, *C. sukhadwalai*, and *C. voluminalis*. *C. recluzianus* in all its forms can generally be separated by the presence of distinct spiral grooves on late sutural ramps, the regularly spaced undulation or tuberculation of the shoulder, the coarser spiral lines on the last whorl, and the thicker, less translucent periostracum with heavier tufts. *C. recluzianus* from Japan and Taiwan (including form *urashimianus* and form *gloria-kiiensis*) also has a broader last whorl (RD 0.53-0.60) and different colouration. *C. recluzianus* from the Indian Ocean may look similar because of its pronounced spiral lines, but has a white ground colour. Form *roseorapum* of *C. recluzianus* can also be distinguished by the more prominent tuberculation of its late postnuclear whorls, its different

colouration, and by the absence of pronounced spiral lines from its last whorl. *C. sukhadwalai* differs from *C. shikamai* in having a distinctly broader and less straight-sided last whorl (RD 0.59-0.66), smooth postnuclear whorls, and absence of spiral lines from its last whorl. For comparison with *C. voluminalis*, see the Discussion of that species.

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Conus bayani JOUSSEAUME, 1872

(Plate 29, Figures 8-12; Map 57)

1872 *Conus bayani* Jousseaume, Rev. Mag. Zool., (2), **23**: 200-202, pl. 18 fig. 1

Type: Holotype in BMNH (51 x 24 mm).

Type Locality: "Bourbon."

Range: India, Sri Lanka, Red Sea to Somalia; probably Madagascar.

Description: Medium-sized to moderately large, moderately solid. Last whorl conical, outline nearly straight to slightly sigmoid. Shoulder carinate, often outwardly curved. Spire of low to moderate height, outline usually deeply concave. Larval shell of about 2.25-3 whorls, maximum diameter about 0.9 mm. First 5-8 postnuclear whorls tuberculate, usually forming a tall projecting cone above an otherwise nearly flat spire. Teleoconch sutural ramps slightly concave; first 3 ramps may have 1-3 distinct spiral grooves, late ramps with inconspicuous spiral striae. Last whorl with distinct or weak spiral ribs and ribbons at base.

C. bayani Shell Morphometry

L	45 - 65 mm
RW	0.15 - 0.30 g/mm
RD	0.52 - 0.56
PMD	0.86 - 0.98
RSH	0.07 - 0.17

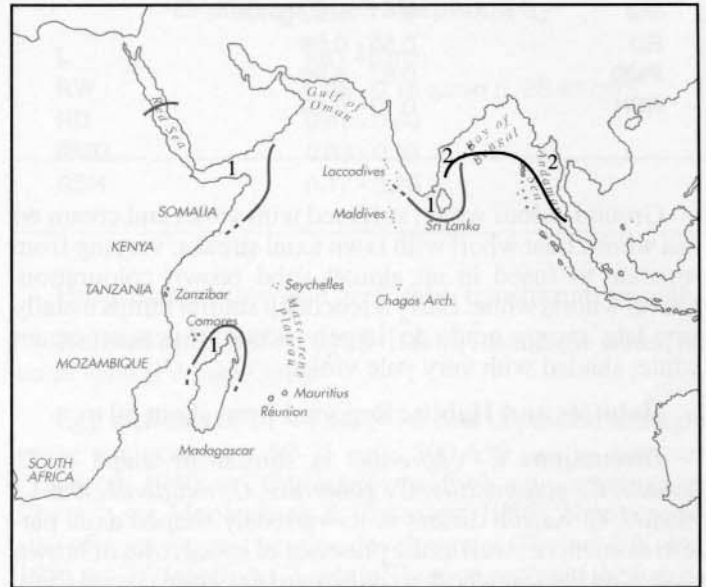
Ground colour white, often variably tinged with violet, occasionally with yellow. Last whorl with light to dark brown axial blotches, flames and streaks and with an overlying continuous or interrupted, brown spiral band on each side of centre; subshoulder area may have traces of an additional interrupted spiral band. Spiral rows of brown dashes may extend from base to shoulder, but vary widely in number and arrangement. Larval whorls brown. Early teleoconch sutural ramps immaculate white, late ramps with brown radial markings that may cross shoulder edge. Aperture white, occasionally shaded with pale violet.

Periostracum brown, thin, translucent, smooth.

Habitat and Habits: In 20-100 m, on sand.

Discussion: *C. bayani* is most similar to *C. capreolus*, *C. voluminalis*, *C. generalis*, *C. maldivus*, and *C. monile*. For comparison, see the Discussions of those species.

Map 57



1: *C. bayani* 2: *C. capreolus*

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Conus capreolus RÖCKEL, 1985

(Plate 29, Figures 13-15; Plate 70, Figures 4, 5; Map 57)

1870 *Conus semisulcatus* Sowerby III, Proc. Zool. Soc. London, **1870**: 257, pl. 22 fig. 13 (non *C. semisulcatus* Bronn, 1831)

1985 *Conus capreolus* Röckel, Arch. Moll., **115** (4/6): 267-271, pl. 1 figs. 1-3

Types: *C. semisulcatus*: Holotype in BMNH (21 x 10 mm); *C. capreolus*: Holotype in SMF (40.5 x 18.5 mm).

Type Localities: *C. capreolus*: "Seegebiet etwa 50 km vor der Stadt Visakhapatnam an der Ostküste Indiens."

Range: E. India to Andaman Sea.

Description: Medium-sized to moderately large, moderately solid. Last whorl conical, outline almost straight; subadult shells slightly convex apically, large shells with a concave right side. Shoulder sharply angulate. Spire of moderate height, early whorls stepped, outline regularly concave. Larval shell of about 2 whorls, maximum diameter 0.8-0.9 mm. First 5-7 postnuclear whorls tuberculate, later whorls carinate. Teleoconch sutural ramps flat to slightly concave, with pronounced closely set radial threads; early ramps with 1-2 increasing to 3 fine spiral grooves, late ramps with finer spiral striation. Last whorl

with a few spiral grooves at base, separated by ribs anteriorly and by ribbons posteriorly.

C. capreolus Shell Morphometry

L	36 - 65 mm
RW	0.11 - 0.22 g/mm
RD	0.55 - 0.58
PMD	0.87 - 0.96
RSH	0.13 - 0.19

Ground colour white, suffused with violet and cream on last whorl. Last whorl with fawn axial streaks, varying from separate to fused in an almost solid brown colouration. Larval whorls white. Early teleoconch sutural ramps usually tan, late ramps grade to largely white. Aperture cream white, shaded with very pale violet.

Habitats and Habits: Reported from about 50 m.

Discussion: *C. capreolus* is similar in shape to *C. bayani*, *C. voluminalis*, *C. generalis*, *C. maldivus*, and *C. monile*. *C. bayani* differs in its variously shaped axial pattern elements as well as the presence of spiral rows of brown dashes on the last whorl, in its brown (vs. white) larval shell, white (vs. brown) early teleoconch sutural ramps and its abruptly projecting apex (vs. gradually rising spire). It has the first 5-8 postnuclear whorls with smaller and more tubercles (see Röckel, 1985a). For distinctions from the other species, see their Discussions.

The holotype of *C. semisulcatus* Sowerby III (Pl. 70, Figs. 4, 5) is a juvenile and faded specimen without locality but with the subsequently added statement "Bay of Bengal, off Ceduba Isl. (Investigator)" on the original label. This island is located S. of Sittwe at the coast of Burma, within the geographical range of *C. capreolus*. *C. semisulcatus* has a slightly broader last whorl (RD 0.60) than *C. capreolus* from India and W. Thailand, but cannot be distinguished morphometrically otherwise. Therefore, we assign *C. semisulcatus* to *C. capreolus*. Other authors synonymized *C. semisulcatus* Sowerby III with *C. rutilus* (Walls, [1979], da Motta, 1987) or with *C. articulatus* (Cernohorsky, 1978); Richard (1990) considered it a valid species.

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Conus lentiginosus REEVE, 1844

(Plate 29, Figures 16-18; Map 58)

1843 *Conus lentiginosus* Reeve, Proc. Zool. Soc. London, 11: 177;
1844: Conch. Icon., 1, *Conus*: Pl. 44 sp. 245

Type: Syntype in BMNH (29 x 16 mm).

Type Locality: Not stated.

Range: W. coast of India.

Description: Moderately small to medium-sized, moderately light to moderately solid. Last whorl conical, ventricosely conical or slightly pyriform; outline convex at adapical two-thirds to three-fourths, straight or concave below; left side consistently sigmoid, right side sometimes almost straight. Shoulder angulate. Spire of moderate height, outline concave or sigmoid. Larval shell of about 2 whorls, maximum diameter 0.9-1.0 mm. First 3-5 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1 increasing to 1-3 spiral grooves, obsolete or replaced by many spiral striae in late whorls. Last whorl with axially striate spiral grooves on basal third, separated by ribs anteriorly and by ribbons posteriorly.

C. lentiginosus Shell Morphometry

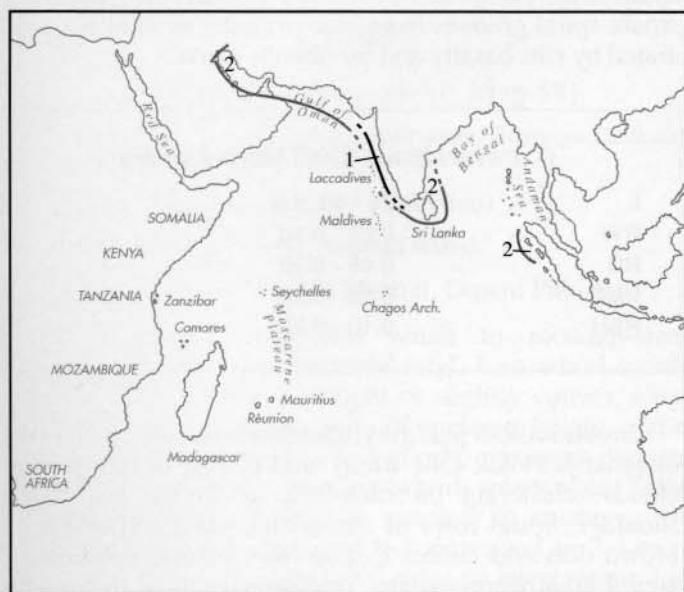
L	29 - 38 mm
RW	0.08 - 0.16 g/mm
RD	0.60 - 0.69
PMD	0.80 - 0.89
RSH	0.18 - 0.24

Ground colour white, variably tinged with violet. Last whorl with confluent brown axial flames, generally arranged in 3 spiral bands, below shoulder, near centre and within basal third. Spiral rows of brown dots and dashes extend from base to shoulder, varying in number and arrangement. Larval whorls white. Teleoconch sutural ramps with brown radial blotches. Aperture white, tinged with violet deep within.

Periostracum yellowish brown, thin, translucent, smooth.

Habitat and Habits: Inshore, shallow subtidal (Kohn, 1978).

Discussion: *C. lentiginosus* is similar to *C. dictator*, *C. milesi*, *C. traversianus*, *C. stocki*, and *C. eximius*. For comparison with the first 4 congeners, see the Discussions of those species. *C. eximius* attains larger size, often has a lower spire (RSH 0.08- 0.26), and is separable by its pale brown multispiral larval shell (3.5 whorls), smooth early postnuclear whorls, prominent spiral grooves on late sutural ramps, and white aperture.

1: *C. lentiginos* 2: *C. dictator*

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***Conus dictator* MELVILL, 1898**

(Plate 29, Figures 19-22; Map 58)

1898 *Conus (Leptoconus) dictator* Melvill, Mem. Proc. Manchester lit. phil. Soc., 42 (4): 9-10, pl. 1 fig. 10**Type:** Holotype in BMNH (46 x 19 mm).**Type Locality:** "Sheikh Shuaib Island, Persian Gulf."**Range:** Persian Gulf, Gulf of Oman and Pakistan, Sri Lanka, S.E. India, and N.W. Sumatra.

Description: Moderately small to medium-sized, moderately light to moderately solid. Last whorl narrowly conical or conical; outline slightly convex adapically, usually straight below; left side may be concave toward base. Shoulder angulate to sharply angulate. Spire of moderate height or high, outline concave. Larval shell of 1.75-2.25 whorls, maximum diameter 0.8-0.9 mm. Subadult specimens (L 19-28 mm) with 5.75-7.75 postnuclear whorls, adult specimens (L 33-38 mm) with 9-9.5. First 4-7 postnuclear whorls tuberculate. Teleoconch sutural ramps slightly concave, with closely spaced axial threads and 1-2 spiral grooves; latest ramps may also bear 1-2 finer spiral grooves and many spiral striae. Last whorl with spiral grooves separated by ribbons on basal third to two-thirds, sometimes to shoulder.

Ground colour cream to pale violet or grey. Last whorl with orange to brown axial clouds and streaks or flames, generally fusing into 3 spiral bands, within basal third, near centre and below shoulder. Numerous spiral rows of similarly coloured dots extend from base to shoulder; these vary in number and arrangement. Base pinkish to orangish red.

Larval whorls white. Teleoconch sutural ramps with brown radial streaks and blotches, partially reduced to spots along outer margins. Aperture white marginally, violet within; basal portion often orange.

***C. dictator* Shell Morphometry**

L	28 - 48 mm
RW	0.06 - 0.16 g/mm (L 28-43 mm)
RD	0.47 - 0.60
PMD	0.83 - 0.93
RSH	0.17 - 0.26

Periostracum brownish grey, thin, translucent, smooth.

Habitat and Habits: In 15-100 m; in shallow water, on coral sand (Persian Gulf).

Egg capsules of 11-14 x 6.5-7.5 mm deposited in single rows; each contains 50-75 eggs 500-650 µm in diameter (Thorson, 1940, as "*C. planiliratus* Swb. var. *acutangulus* Chem."; see Moolenbeek & Coomans, 1986). Number and size of eggs suggest benthic development (Perron & Kohn, 1985, as "*C. inscriptus*"), while Thorson reported the hatching to have planktonic stage.

Discussion: *C. dictator* may be mistaken for *C. lentiginos*. The latter species differs in the more convex, broader last whorl (RD 0.60-0.69) and usually has fewer tuberculate spire whorls, a coarser colour pattern and simpler colouration of the aperture. For comparison with *C. milesi*, *C. traversianus*, and *C. stocki*, see the Discussions of those species.

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***Conus milesi* E. A. SMITH, 1887**

(Plate 29, Figures 23-25; Map 59)

1887 *Conus milesi* E. A. Smith, J. Conchol. (London), 5: 244**Type:** Holotype in BMNH (20.5 x 7.5 mm).**Type Locality:** "Muscat, Arabia."**Range:** Gulf of Oman and Persian Gulf.

Description: Small to moderately small, light. Last whorl conical; outline straight or slightly convex adapically and straight (right side) to concave (left side) below. Shoulder angulate, completely or partly tuberculate. Spire high, outline slightly concave. Larval shell of 1.75-2.25 whorls, maximum diameter 0.8-0.9 mm. Shells of 21-26 mm with 8-9.25 postnuclear whorls, the first 7.5-9.0 tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1-2 increasing to 2-4 spiral grooves; latest ramps may have additional spiral striae. Entire last whorl with nearly regularly spaced spiral grooves separated by ribs at anterior

end and by ribbons above; very large specimens grade to smooth adapically.

***C. milesi* Shell Morphometry**

L	17 - 27 mm
RW	0.02 - 0.06 g/mm
RD	0.49 - 0.59
PMD	0.88 - 0.95
RSH	0.29 - 0.38

Ground colour white. Last whorl with largely separate brown axial flecks, streaks and flames. Larval whorls white. Later teleoconch sutural ramps with partially confluent brown radial blotches. Aperture white, suffused with pale violet.

Periostracum brown, thin, slightly translucent, velvety.

Habitat and Habits: In 9-45 m.

Discussion: Moolenbeek & Coomans (1986) considered *C. milesi* the juvenile stage of *C. dictator*. Subadult specimens of *C. dictator* (L 17-28 mm) are similar to *C. milesi* in shape, weight and sculpture, and small ones may also be so in pattern. However, *C. dictator* has a generally lower spire (RSH 0.17-0.26), fewer postnuclear whorls in similarly sized specimens (5.75-7.75), and only the first 4.5-7 postnuclear whorls are tuberculate. The periostracum of *C. dictator* is thinner, smoother and more translucent. Adults and large subadults of *C. dictator* also differ from *C. milesi* in their finer colour pattern with numerous spiral rows of dots. *C. lentiginosus* can be distinguished from *C. milesi* by its broader and more ventricose last whorl (RD 0.60-0.69; PMD 0.80-0.89), lower spire (RSH 0.18-0.24), and fewer tuberculate spire whorls (3-5) (Röckel, 1988a; Korn, 1990). For comparison with *C. elegans* and *C. acutangulus*, see the Discussions of those species.

to concave, with closely spaced axial threads and 1-2 increasing to 3-4 spiral grooves; latest ramps may also have spiral striae. Last whorl with rather regularly spaced, axially striate spiral grooves from base to centre or shoulder, separated by ribs basally and by ribbons above.

***C. traversianus* Shell Morphometry**

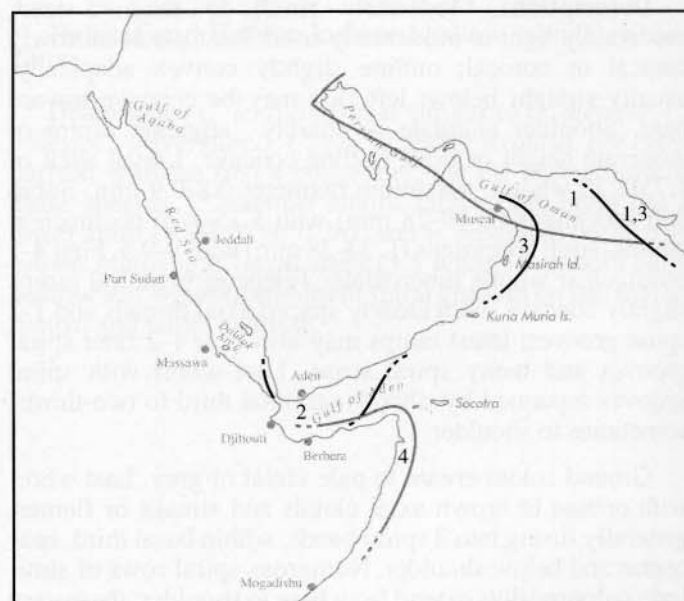
L	26 - 43 mm
RW	0.04 - 0.10
RD	0.45 - 0.48
PMD	0.88 - 0.96
RSH	0.10 - 0.20

Ground colour pale grey, sometimes suffused with violet or pinkish violet. Last whorl with orange or brown axial clouds, clustering on each side of centre and below shoulder. Spiral rows of alternating white and orange to brown dots and dashes extend from base to subshoulder area. Larval whorls white. Teleoconch sutural ramps with orange to brown radial markings that cross the outer margins. Aperture pale pinkish orange.

Habitat and Habits: Reported from upper subtidal.

Discussion: *C. traversianus* is similar to *C. stocki*, *C. lizarum*, and *C. dictator*. *C. dictator* is almost twice as heavy, tends to have a broader, more ventricose last whorl (RD 0.47-0.60; PMD 0.83-0.93) as well as a higher spire (RSH 0.17-0.26), has more distinctly tuberculate postnuclear whorls (4-7), and the spiral rows on its last whorl lack intermittent white markings. For comparison with *C. stocki* and *C. lizarum*, see the Discussions of those species.

Map 59



1: *C. milesi* 2: *C. traversianus* 3: *C. stocki* 4: *C. lizarum*

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***Conus traversianus* E. A. SMITH, 1875**

(Plate 29, Figures 26-28; Map 59)

1875 *Conus traversianus* E. A. Smith, J. Conchol. (London), 1: 107-108, text fig.

Type: Holotype in NMWC (41 x 17 mm).

Type Locality: Not stated.

Range: Aden and N. Somalia.

Description: Moderately small to medium-sized, light to moderately light. Last whorl narrowly conical, outline nearly straight. Shoulder angulate to broadly carinate, occasionally undulate in small adults. Spire usually of moderate height, outline concave. Larval shell of about 2 whorls, maximum diameter 0.8-1 mm. First 2.5-4 postnuclear whorls weakly tuberculate. Teleoconch sutural ramps flat

***Conus stocki* COOMANS & MOOLENBEEK,
1990**

(Plate 29, Figures 29-31; Map 59)

1990 *Conus stocki* Coomans & Moolenbeek, Bijdragen Dierkunde, **60**: 258-259, figs. 1-4

Type: Holotype in ZMA (37 x 16.5 mm).

Type Locality: "Oman, Masirah Island."

Range: Masirah Id. and Masqat, Oman; Pakistan.

Description: Moderately small to medium-sized, moderately light to moderately solid. Last whorl usually conical, outline almost straight or slightly convex adapically. Shoulder angulate. Spire of moderate height, outline concave. Larval shell of 1.75-2 whorls, maximum diameter 0.9-1 mm. First 1-4 postnuclear whorls tuberculate. Teleoconch sutural ramps slightly concave to concave, with closely set radial threads and 0-2 increasing to 2-4 spiral grooves, grading to many spiral striae on latest ramps. Last whorl with rather regularly spaced, axially striate spiral grooves from base to centre, separated by ribs at base and by ribbons above.

***C. stocki* Shell Morphometry**

L	28 - 45 mm
RW	0.07 - 0.10 (L 28-40 mm)
RD	0.50 - 0.58
PMD	0.84 - 0.93
RSH	0.11 - 0.18

Ground colour grey or bluish grey. Last whorl with confluent brown axial clouds and flames, often forming incomplete spiral bands within basal third and near centre, and sometimes below shoulder. Spiral rows of brown dots and dashes extend from base to subshoulder area, separated by regularly intermittent white markings in most rows, less so toward base. Base and basal part of columella brown. Larval whorls and about first 1-2 teleoconch sutural ramps brown. Following ramps usually with brown radial streaks or blotches, separating into variably set dots at inner margins and sometimes extending across outer margins. Aperture brown, darker at anterior end.

Radular teeth very small, with an apical barb opposite a long narrow blade; central waist and strong basal spur present, serration absent (Rolán, pers. comm., 1993; G. Raybaudi-Massilia & Rolán, in press).

Habitat and Habits: Shallow subtidal, among stones (Oman; Bosch & Bosch, 1982); in 20-25 m (Pakistan).

Discussion: Until Coomans and Moolenbeek proposed this *Conus* population from Oman as a separate valid species, it was assigned to *C. traversianus* or *C. dictator*, or erroneously named *C. lemniscatus* Reeve (see Vol. 2) by various authors (e. g. Walls, [1979]; Bosch & Bosch, 1982;

Lauer & Richard, 1989). *C. lemniscatus* from Brazil is a larger species that can be mistaken neither for *C. stocki* nor *C. traversianus*. *C. stocki* differs from *C. traversianus*, *C. dictator*, and *C. lentiginosus* in its brown anterior end of the last whorl, aperture and larval whorls. *C. lentiginosus* has a more solid shell with a more convex and broader last whorl (RD 0.60-0.69) and a higher spire (RSH 0.18-0.24). *C. dictator* also has a higher spire (RSH 0.17-0.26), and the dotted spiral lines on its last whorl lack white markings. *C. traversianus* also differs in its narrower, less ventricose last whorl (RD 0.45-0.48; PMD 0.88-0.96), lighter colouration, and less speckled pattern.

***Conus lizarum* (G. RAYBAUDI-MASSILIA
& DA MOTTA, 1992)**

(Plate 29, Figures 32-34; Map 59)

1992 *Hermes (Magelliconus) lizarum* G. Raybaudi-Massilia & da Motta, Publ. Ocas. Soc. Portuguesa Malac., **16**: 65-66, pl. figs. 1-3

Type: Holotype in MHNG (29 x 14 mm).

Type Locality: "off Cape Guardafui, Somalia, Western Indian Ocean."

Range: Somalia.

Description: Small to moderately small, light to moderately light. Last whorl conical, outline slightly convex adapically and straight toward base; left side may be slightly concave above base. Shoulder angulate or slightly carinate. Spire of low to moderate height, outline concave. Larval shell of about 2 whorls, maximum diameter about 0.9-1 mm. First 0.25-1.25 postnuclear whorls weakly to sometimes obsoletely tuberculate. Teleoconch sutural ramps concave, with prominent radial threads; early ramps with 1 adaxial spiral groove or with 1-2 increasing to 2-3 equally spaced spiral grooves, late ramps with obsolete spiral sculpture. Basal half of last whorl with punctate to axially striate spiral grooves; intervening ribbons grade to ribs at anterior end.

***C. lizarum* Shell Morphometry**

L	22 - 36 mm
RW	0.03 - 0.11
RD	0.50 - 0.56
PMD	0.87 - 0.95
RSH	0.08 - 0.14

Ground colour white, last whorl usually shaded with pink. Last whorl with orangish brown to brown axial blotches, fusing into an interrupted or solid spiral band on each side of centre. Closely spaced spiral rows of alternating reddish brown and white dots and dashes extend from base

to shoulder, sometimes obscured by spiral colour bands. Base orange to brown. Larval whorls grey to brown; following 2 sutural ramps of similar colour. Postnuclear sutural ramps with regularly aligned brown subsutural dots and orange-brown radial blotches that extend over outer margins and may fuse into an adaxial spiral band. Aperture pink to orange.

Habitat and Habits: "Deep water" (G. Raybaudi & da Motta, 1992).

Discussion: *C. lizarum* is similar to *C. dictator*, *C. traversianus*, and *C. stocki*. *C. dictator* attains larger size and has a higher spire (RSH 0.17-0.26), more tuberculate postnuclear whorls (4-7), and distinct spiral grooves on its late sutural ramps. Its last whorl is generally encircled with 3 colour bands, its larval whorls are white, and its teleoconch spire lacks subsutural dots. *C. traversianus* is also larger, has a narrower last whorl (RD 0.45-0.48), a higher spire (RSH 0.14-0.20), more tuberculate postnuclear whorls (2.5- 4), and 3-4 distinct spiral grooves on its late sutural ramps. Its larval whorls are white, its teleoconch spire lacks subsutural dots, and its last whorl is not shaded with pink. *C. stocki* also attains larger size, has a higher, gradually sloping spire (RSH 0.16-0.18), more pronounced spiral sculpture on the late sutural ramps, a pale brown aperture, and a dark brown pattern that tends to fuse into an additional subshoulder band. However, obvious similarities in shape, sculpture, and pattern elements of their teleoconchs as well as in their larval shells suggest close relationship between *C. lizarum* and *C. stocki*.

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Conus voluminalis REEVE, 1843

(Plate 30, Figures 1-18; Map 60)

- 1843 *Conus voluminalis* Reeve, Conch. Icon., 1, *Conus*: Pl. 37 sp. 206
 1857 *Conus macarae* Bernardi, J. Conchyl. (Paris), 6: 56-57, pl. fig. 2
 1913 *Conus* (*Ammirales*) *filicinctus* Schepman, Siboga Exp. 49'e, Prosobranchia 5, Toxoglossa: 384, pl. 25 fig. 1
 1979 *Conus* (*Rhizoconus*) *clandestinatus* Shikama, Sci. Rep. Yokosuka City Mus., 26: 2, pl. 1 figs. 3, 4

Types: *C. voluminalis*: Original figure 37 x 20 mm; *C. macarae*: Holotype in MNHN (39 x 19.5mm); *C. filicinctus*: Holotype in ZMA (27 x 15 mm); *C. clandestinatus*: Holotype in NSMT (44 x 23 mm).

Type Localities: *C. voluminalis*: "Straits of Malacca"; *C. filicinctus*: "Madera-bay"; *C. clandestinatus*: "South China Sea."

Range: Maldives to W. Australia; Ryukyu Is. and Taiwan to Solomon Is. and Papua New Guinea.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl conical; outline almost straight, slightly convex apically in small specimens. Shoulder angulate to broadly carinate, often outwardly curved producing a concave outline at subshoulder area. Spire of low to moderate height, outline concave to slightly

sigmoid; apex may project from an otherwise almost flat spire. Larval shell of 2-2.25 whorls, maximum diameter 0.9-1 mm. First 4-6 postnuclear whorls weakly tuberculate. Teleoconch sutural ramps flat to slightly concave, with 1-2 increasing to 4-5 spiral grooves, obsolete in late whorls. Last whorl with a few spiral ribs at base.

C. voluminalis Shell Morphometry

L	40 - 72 mm
RW	0.14 - 0.34 (L 40-63 mm)
RD	0.51 - 0.65
PMD	0.88 - 0.98
RSH	0.04 - 0.17

Ground colour white, yellow, orange or pale violet. Last whorl with a broad, continuous to sometimes interrupted, yellow or orange to brown spiral band on each side of centre, sometimes extending to shoulder and base. Long light to dark brown axial streaks may extend from shoulder ramp to base; most are interrupted centrally, producing blotches at both edges or only at the upper edge of the central area. Dotted to continuous spiral lines may cover entire last whorl, but vary in number and arrangement. Shells with no axial streaks or spiral lines occur. Larval whorls white to beige. Early teleoconch sutural ramps immaculate, often light pink; late ramps either of immaculate ground colour or more frequently with orange to dark brown radial markings. Aperture white, yellow, orange or violet.

Periostracum light olive, rather thin, translucent to opaque, with fine axial and widely spaced tufted spiral ridges on last whorl including shoulder.

Habitat and Habits: Intertidal to about 100 m.

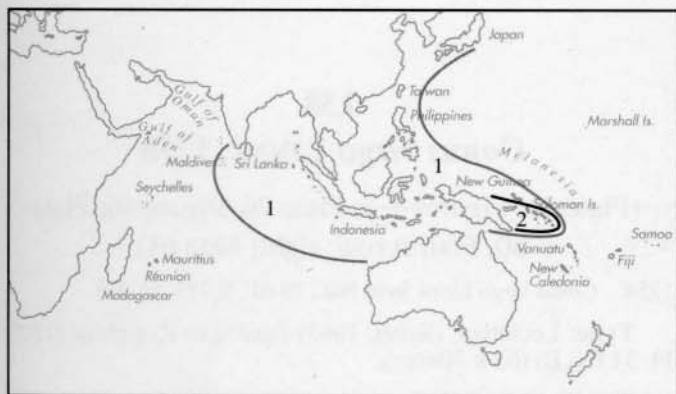
Discussion: *C. voluminalis* resembles *C. recluzianus*, *C. sukhadwalai*, *C. shikamai*, *C. bayani*, and *C. capreolus*. *C. capreolus* is of lighter weight (RW 0.19-0.22), has a generally higher spire (RSH 0.13-0.19) with carinate late whorls, and its last whorl pattern lacks all the spiral elements that characterize *C. voluminalis*. *C. bayani* is best distinguished by its taller, narrower and pure white conoid early postnuclear whorls. In addition, its larval shell is brown, its early teleoconch whorls are more strongly tuberculate, and its shoulder is generally more sharply carinate. In *C. bayani*, the last whorl colour pattern is of predominantly brown markings, rather than the predominantly yellow to orange spiral bands of *C. voluminalis*. The periostracum of *C. bayani* is untufted. *C. sukhadwalai* has usually a lower spire (RSH 0.01-0.07), a more convex last whorl and a light orange larval shell; its early postnuclear whorls are smooth and the spiral sculpture of its late sutural ramps is more prominent. *C. shikamai* differs in its undulate to tuberculate shoulder, multispiral brown larval shell (3-3.5 vs. 2-2.25 whorls) and fewer tuberculate spire whorls; its last whorl is generally narrower (RD 0.49-0.53) and its spire somewhat lower (RSH 0.04-0.08). *C. recluzianus* can be separated by its undulate to prominently tuberculate shoulder, brown multispiral larval shell (3-3.25 whorls), very small number

of tuberculate early postnuclear whorls (1.5 vs. 4-6), and by the distinct spiral grooves on its later sutural ramps; its spire is generally lower (RSH 0.02-0.10).

The whereabouts of the type(s) of *C. voluminalis* are unknown. However, specimens from W. Thailand (Pl. 30, Fig. 2), closely resemble the original figure in Reeve (Pl. 30, Fig. 1). The original descriptions of *C. voluminalis* and *C. macrae* as well as the holotype of *C. macrae* (Pl. 30, Fig. 3) correspond to the description of *C. voluminalis* we have given above, although the spiral grooves on sutural ramps, mentioned by Reeve for *C. voluminalis*, are obsolete on late ramps. We therefore agree with Walls, [1979] in synonymizing *C. macrae* with *C. voluminalis*.

C. filicinctus (Pl. 30, Fig. 4) is known from a worn and chipped subadult type specimen. Its shape and sculpture, with carinate shoulder, sutural ramps lacking conspicuous spiral striation, and first 5 postnuclear whorls probably tuberculate, as well as its colour pattern, fall within the range of variation observed in subadult *C. voluminalis*. The original description of *C. clandestinatus* agrees in all aspects with the description of *C. voluminalis* given above. Shikama (1979) distinguished it from *C. voluminalis* as having "distinct brown spiral lines, 2 orange colour bands and by brown axial lines on shoulder surface," but these are all characteristic features of *C. voluminalis*.

Map 60



1: *C. voluminalis* 2: *C. papuensis*

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Conus papuensis COOMANS & MOOLENBEEK, 1982

(Plate 30, Figures 19-22; Plate 76, Figure 45; Map 60)

1982 *Conus papuensis* Coomans & Moolenbeek, Bull. Zool. Mus. Univ. Amsterdam, 8 (15): 133-136, figs. 1, 2

Type: Holotype in ZMA (26.5 x 12.5 mm).

Type Locality: "Northwest of Laing Island in Hansa Bay (4° 10' S, 144° 50' W), New Guinea."

Range: Papua New Guinea (Hansa Bay, Bismarck Sea); probably also Solomon Is.

Description: Small to moderately small, moderately light to moderately solid. Last whorl conical; outline convex on adapical half, straight (right side) to concave (left side) below. Shoulder angulate, sometimes irregularly undulate. Spire high, outline concave. Larval shell of 2 whorls, maximum diameter about 0.9 mm. First 4-5 postnuclear whorls tuberculate, late whorls undulate to smooth. Teleoconch sutural ramps flat, with 1-2 increasing to 2-3 weak spiral grooves and many spiral striae. Last whorl with variably spaced, often finely granulose spiral ribs from base to shoulder, sometimes largely smooth adapically.

C. papuensis Shell Morphometry

L	19 - 34 mm
RW	0.07 - 0.09 (L 20-27 mm)
RD	0.61 - 0.66
PMD	0.87 - 0.93
RSH	0.24 - 0.28

Ground colour white. Entire last whorl encircled with closely spaced, fine and coarse, dotted and solid, yellowish to reddish brown lines; a pale spiral band may be present near centre, with brown axial markings above and below. First 1-2 adapical spiral lines consist partly or completely of axial dashes, some of which extend onto shoulder ramp. Larval whorls white. Postnuclear sutural ramps with irregularly spaced yellowish to reddish brown radial streaks. Aperture white.

Periostracum thin, with spiral rows of fine tufts (Coomans & Moolenbeek, 1982).

Dorsum of foot beige, radially mottled with brown and with a spotted blackish brown pre-marginal line; anterior marginal zone dull orange, followed by a cluster of blackish brown spots. Sole of foot beige washed with tan. Rostrum light tan, may be dotted with red. Tentacles light beige. Siphon white to beige, transversely mottled with light brown (Pl. 76, Fig. 45) (Coomans & Moolenbeek, 1982; Chaberman, pers. comm., 1981).

Habitat and Habits: In 40-90 m, in muddy sand off deep reefs, associated with purple algae. The species is reported to feed on polychaetes (Chaberman, pers. comm., 1981; Coomans & Moolenbeek, 1982).

Discussion: *C. papuensis* resembles *C. voluminalis*. *C. voluminalis* is twice as large and has a lower, more concave spire (RSH 0.04-0.17) and a largely smooth last whorl; its shoulder is often broadly carinate and the spiral striation is obsolete on its late sutural ramps.

Specimens from Solomon Is. (Pl. 30, Fig. 22) and Papua New Guinea with largely smooth last whorls are only provisionally assigned to *C. papuensis*, because they may be subadult specimens of *C. voluminalis*.

***Conus locumtenens* BLUMENBACH, 1791**

(Plate 30, Figures 23-30; Map 61)

- 1791 *Conus locumtenens* Blumenbach, Handb. Naturgesch., 4 ed.: 448
- 1792 *Conus acuminatus* Hwass in Bruguière, Encycl. Méth., 1: 688-689, no. 77
- 1798 *Cucullus vicarius* Röding, Mus. Bolten., 2: 45, no. 568/76
- 1807 *Conus substitutus* Link, Besch. Nat. Samml. Univ. Rostock, 3: 101
- 1833 *Conus insignis* Sowerby I, Conch. Ill.: Pt. 28, fig. 17
- 1865 *Conus multicaenatus* Sowerby II, Proc. Zool. Soc. London, 1865: 519, pl. 32 figs. 10, 11
- 1873 *Conus schech* "Jickeli" Weinkauff, Syst. Conch. Cab. Martini Chemnitz, 1. *Conus*: 229-230, pl. 37 figs. 9, 10
- 1895 *Conus coxianus* Sowerby III, Proc. malac. Soc. London, 1: 215, pl. 13 fig. 7
- 1942 *Conus viaderi* Fenaux, Bull. Inst. Océan. (Monaco), 814: 3 fig. 9

Types: *C. locumtenens*: No type exists; *C. acuminatus*: Lectotype ([Walls, 1979]), figured in Chemnitz (1798: Pl. 336 fig 3) (40 x 23 mm); Lectotype (Coomans et al., 1979), figured in Chemnitz (1788: Pl. 140 fig. 1297) (44 x 23 mm) (priority); Walls ([1979]), figured in Tableau (Pl. 336 fig. 3) (40 x 22 mm); *C. vicarius*: Lectotype (Kohn, 1975), figured in Knorr (1771: Pl. 24 fig. 4) (47 x 23 mm); *C. substitutus*: Lectotype (Kohn, 1981), figured in Martini (1773: Pl. 57 fig. 638) (31 x 19 mm); *C. insignis*: Lectotype (Kohn, 1992) figured in Sowerby (1833: Pt. 28, fig. 17) (38 x 20.5 mm); *C. multicaenatus*: Holotype in BMNH (29 x 17 mm); *C. schech*: Syntypes (35.5 x 20.5; 30.5 x 16; 23.5 x 11.5 mm) in ZMB; *C. coxianus*: Holotype in BMNH (39 x 21 mm); *C. viaderi*: Original figure 30 x 13 mm.

Type Localities: *C. locumtenens*: "im rothen Meer"; *C. acuminatus*: "the Red Sea coast of North Yemen" (Coomans et al., 1979); *C. schech*: "Das Rothe Meer, zu Massaua und Dahlak"; *C. coxianus*: "Bay of Zeyla, Somaliland"; *C. viaderi*: "I. Maurice."

Range: Central and S. Red Sea, Gulf of Aden and N. Somalia.

Description: Medium-sized to moderately large, moderately solid to solid. Last whorl usually conical; outline either almost straight or convex on adapical third. Shoulder angulate to slightly carinate. Spire of low to moderate height; stepped; outline concave to straight. Early postnuclear whorls appear weakly tuberculate. Teleoconch sutural ramps flat or concave toward shoulder; late ramps with 2-3 often weak spiral grooves changing to a varying number of weak to obsolete striae. Last whorl with variably broad, weak spiral ribbons, often posteriorly edged with a fine spiral rib, on basal third.

Ground colour white, occasionally tinged with blue. Last whorl with usually fine yellowish to blackish brown reticulation bordering white tents that vary widely in size. Reticulate pattern often concentrated in 2 or more darker spiral bands of variable width, solidity and colour. Within dark bands, reticulated lines may turn into wavy axial lines.

Postnuclear sutural ramps with reddish to blackish brown radial streaks and blotches that cross the outer margins. Aperture white, violet-brown deep within.

***C. locumtenens* Shell Morphometry**

L	35 - 66 mm
RW	0.10 - 0.40 (L 35-60 mm)
RD	0.57 - 0.69
PMD	0.85 - 0.91
RSH	0.10 - 0.20

Animal bright yellow, with a cream to light brown foot; siphon with red longitudinal lines and a white and a black band at the tip (Ehrenberg, 1828).

Radular teeth with 2 opposite adapical barbs and long serration, terminating in a cusp beyond the centre of the shaft (Kohn, unpubl. observ.).

Habitat and Habits: In 2-10 m; under seaweed, on sand and mud.

Discussion: *C. locumtenens* closely resembles *C. textile* and related species in colour pattern and is also similar to *C. amadis* and *C. hamanni*. For the distinctions from those species, see the Discussions of them.

The list of synonyms refers to intergrading colour forms.

***Conus virgo* LINNÉ, 1758**

(Plate 31, Figures 1-3; Plate 76, Figure 46; Plate 80, Fourth row, right; Map 61)

- 1758 *Conus virgo* Linné Syst. Nat., 10 ed., 1: 713, no. 253

Type: Lectotype (Kohn, 1963) figured in Rumphius (1705: Pl. 31 fig. E) (63 x 30 mm).

Type Locality: Not stated.

Range: Entire Indo-Pacific, except for Hawaii.

Description: Moderately large to large, solid to heavy. Last whorl conical; outline slightly convex at adapical fourth, straight below. Shoulder angulate. Spire low, outline slightly concave to slightly convex. Teleoconch sutural ramps almost flat to slightly concave; late ramps with 3 increasing to 5-6 spiral grooves, either paralleled by additional striae or replaced by numerous striae in latest whorls. Last whorl with weak to obsolete spiral ribs near base; widely spaced fine ribs and wrinkled threads between may extend to centre or beyond.

C. virgo Shell Morphometry

L	55 - 151 mm
RW	0.50 - 1.34 (L 55-134 mm)
RD	0.54 - 0.61
PMD	0.86 - 0.92
RSH	0.03 - 0.10

Colour white to yellow or orange; occasionally with darker orange collabral lines marking growth cessations (Pl. 31, Fig. 2). Base dark blue-violet. Larval whorls bright purple (eroded in adults). Aperture white, blue-violet at base.

Periostracum greenish brown to brown, thick, opaque, horny or with fine axial ridges.

Dorsum of foot white mottled with brown, with a cross-shaped, black transverse blotch on anterior part, a black blotch at opercular area, and a dotted brown pre-marginal line between; posterior end and anterior corners white; sometimes 4 short longitudinal rows of black dots on anterior central part. Edge of foot yellow to orange, sometimes continuing onto dorsum. Sole of foot cream mottled with brown, sometimes darker brown anteriorly. Rostrum and tentacles yellow or yellow dorsally and white ventrally. Garrett (1878) reports a black transverse band on the rostrum. Siphon white edged with yellow, with a black transverse band 1/3 the length from the tip and a brown band or dorsal group of brown dots at base (Pl. 76, Fig. 46; Pl. 80,

Fourth row, right) (Chaberman, pers. comm., 1981; Kohn, unpubl. observ.; Pearson unpubl. observ.; Fainzilber et al., 1992).

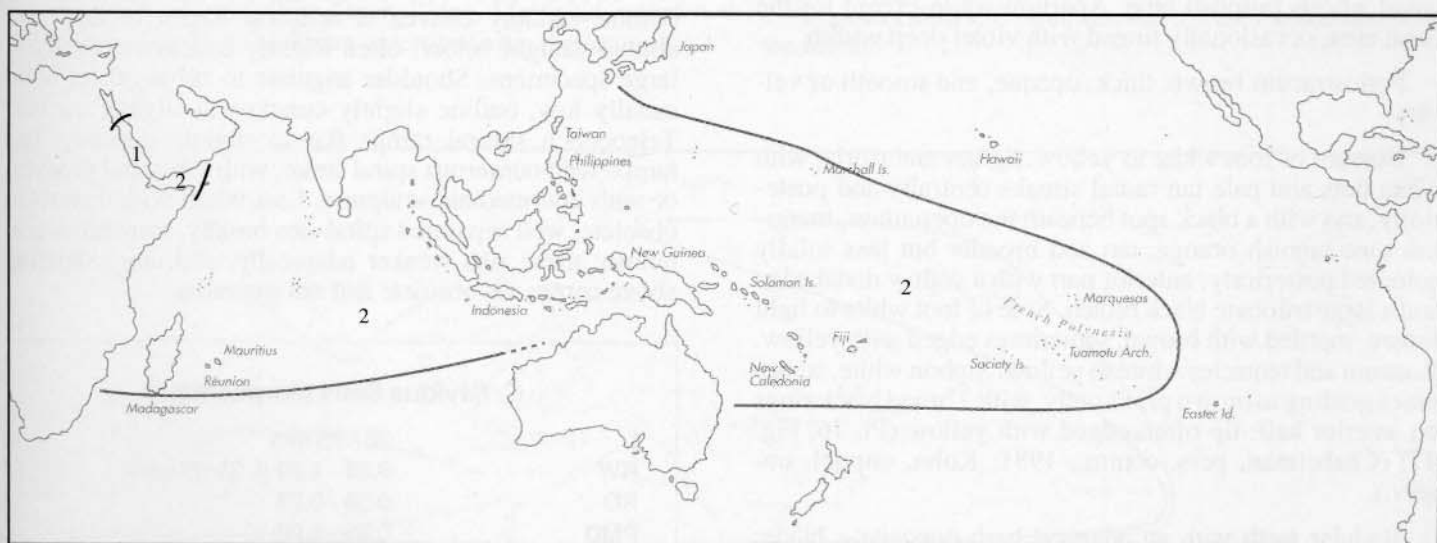
Radular teeth long and curved, with 2 opposite adapical barbs; serration extends more than halfway down the shaft, terminating in a backward-pointing cusp; base with a distinct spur (Bergh, 1895; Peile, 1939; Bandel, 1984; Kohn, unpubl. observ.).

Habitat and Habits: In 0.5-15 m; in sand and rubble on reef flats, sometimes amongst weed and beneath dead coral rocks. *C. virgo* feeds on terebellid and other polychaetes (Kohn, 1960; Kohn & Nybakken, 1975; Tirard, pers. comm., 1989; Grosch, pers. comm., 1989; Fainzilber et al., 1992).

C. virgo aggregates for mating and spawning. Egg capsules affixed in short rows to the underside of coral rocks by confluent basal plates, forming an irregular dense cluster. Oviposition observed in November, January and August, near the seaward edge of the reef in about 1.5 m of water (Sri Lanka and Seychelles; Kohn, 1961b). Capsules of varying outline and size, between 12-13 x 12-13 mm and 30-32 x 20-22 mm at the same locality. Number of eggs per capsule is 3,900-18,000, that of eggs per spawn mass 58,000-700,000. Egg diameter of 170-225 µm suggests a minimum pelagic period of 26-21 days (Kohn, 1961b; Perron & Kohn, 1985).

Discussion: For the distinction of *C. virgo* from the similar species *C. emaciatus*, *C. terebra*, and *C. coelinae*, see the Discussions of those species.

Map 61



1: *C. locumtenens* 2: *C. virgo*

***Conus emaciatus* REEVE, 1849**(Plate 31, Figures 4-6; Plate 76, Figure 47;
Map 62)1849 *Conus emaciatus* Reeve, Conch. Icon., 1, *Conus* suppl.: Pl. 5 sp. 248**Type:** Lectotype (Coomans et al., 1986) in BMNH (38 x 20.5 mm).**Type Locality:** "Philippine Islands."**Range:** Red Sea and Central Indian Ocean to Polynesia.**Description:** Moderately small to moderately large, moderately solid to solid. Last whorl conical; outline convex at adapical third, slightly concave at centre and straight below. Shoulder angulate to subangulate. Spire usually low, outline concave to convex. Teleoconch sutural ramps flat to slightly convex; late ramps with 3 increasing to 5 weak major spiral grooves, often turning into numerous striae on latest ramps. Last whorl with rather regularly spaced, often finely granulose spiral ribs with closely set spiral striae between, from base to adapical third.***C. emaciatus* Shell Morphometry**

L	30 - 69 mm
RW	0.17 - 0.61 g/mm
RD	0.56 - 0.62
PMD	0.89 - 0.94
RSH	0.03 - 0.14

Colour yellowish grey to orange and yellow. Last whorl often slightly paler near centre and at shoulder. Base and larval whorls purplish blue. Aperture white except for the basal area, occasionally tinged with violet deep within.

Periostracum brown, thick, opaque, and smooth or velvety.

Dorsum of foot white to yellow, lighter anteriorly, with white dots and pale tan radial streaks centrally and posteriorly, and with a black spot beneath the operculum; marginal zone tannish orange, tan and broader but less solidly coloured posteriorly; anterior part with a yellow distal edge and a large trilobate black blotch. Sole of foot white to light brown, mottled with brown, sometimes edged with yellow. Rostrum and tentacles white to yellow. Siphon white, sometimes grading to brown proximally, with 2 broad black rings on anterior half; tip often edged with yellow (Pl. 76, Fig. 47) (Chaberman, pers. comm., 1981; Kohn, unpubl. observ.).

Radular teeth with an adapical barb opposite a blade; serration ending in a prominent cusp; base with a prominent spur (Nybakken, 1990).

Habitat and Habits: On intertidal benches and shallow subtidal reef flats; inhabiting sand bottoms, bare limestone or beachrock, and dead coral heads and rocks. *C. emaciatus*

feeds on terebellid and other polychaetes (Kohn, 1968b; Kohn & Nybakken, 1975; Reichelt & Kohn, 1985; Sharabati, 1984).

Discussion: *C. emaciatus* is similar to *C. virgo*, which differs in its larger size (L 55-150 mm) and its more straight-sided last whorl with a weaker spiral sculpture. For the distinction from *C. flavidus* and *C. frigidus*, see the Discussions of those species.

***Conus flavidus* LAMARCK, 1810**(Plate 31, Figures 7-10; Plate 81, First row;
Map 62)1810 *Conus flavidus* Lamarck, Ann. Mus. Hist. Nat. Paris, 15: 265, no. 571860 *Conus neglectus* Pease, Proc. Zool. Soc. London, 1860: 398 (non *C. neglectus* A. Adams, 1854)1877 *Lithoconus peasei* Brazier, Proc. Linn. Soc. New South Wales, 1: 288 (nom. nov. for *C. neglectus* Pease)1933 *Conus erythraeozonatus* Barros e Cunha, Mem. Est. Mus. Zool. Univ. Coimbra, (1) 71: 108-110, no. 92**Types:** *C. flavidus*: Holotype in MHNG (63 x 36 mm); *C. neglectus*: no reference on type; *C. erythraeozonatus*: Lectotype (Coomans et al., 1986) in MZUC (32.5 x 19.5 mm).**Type Localities:** *C. flavidus*: "Guinée?"; "New Guinea", Wils, 1986; *L. peasei*: "Darnley Island, Torres Straits"; *C. neglectus*: "Sandwich Islands."**Range:** Entire Indo-Pacific.**Description:** Medium-sized to moderately large, moderately solid to moderately heavy. Last whorl conical to broadly conical, sometimes slightly ventricosely conical; outline variably convex at adapical fourth or third and almost straight below, often slightly concave centrally in large specimens. Shoulder angulate to subangulate. Spire usually low, outline slightly concave to slightly convex. Teleoconch sutural ramps flat to slightly concave; late ramps with numerous spiral striae, with 3-6 spiral grooves, or with intermediate sculpture. Last whorl with distinct to obsolete, well separated spiral ribs basally, sometimes granulose; these ribs weaker adapically, and any extending above centre are obsolete and not granulose.***C. flavidus* Shell Morphometry**

L	35 - 75 mm
RW	0.25 - 1.00 (L 35-65 mm)
RD	0.58 - 0.73
PMD	0.83 - 0.92
RSH	0.01 - 0.13

Colour light yellow to orange or pinkish brown, occasionally brownish green. Last whorl with paler or white

spiral bands at or closely below centre and at shoulder; shoulder band sometimes and central band seldom absent. Base purplish blue. Larval whorls change colour from white to purple during metamorphosis (Perron, 1981a). Postnuclear sutural ramps vary from white to colour of last whorl. Aperture purplish blue, with pale bands near centre and below shoulder.

Periostracum grey to brown, thick, opaque and rather smooth to fibrous, transversely ridged in subadult specimens (Kohn, 1959a; Cernohorsky, 1964; Estival, 1981).

Dorsum of foot mottled grey to brown, with white dots; median area lighter; anterior and posterior parts with a black medial transverse blotch. Anterior side of foot sometimes white to yellow. Sole of foot buff, mottled and streaked with brown and with a few scattered white dots. Rostrum yellow grading to yellowish brown dorsally, sometimes mottled with darker brown. Tentacles white, yellow, or yellowish brown, sometimes mottled with brown or black dorsally. Siphon grey to dull yellow, edged with yellow and often dotted with white, with a black band anterior to the centre and a grainy dark grey band posterior to it; proximal part may be mottled with black (Garrett, 1878; Kohn, 1959a & unpubl. observ.; Pearson, unpubl. observ.; Fainzilber et al., 1992) (Pl. 81, First row).

Radular teeth with an adapical barb opposite a blade; serration down to or beyond the centre of the shaft, terminating in a backward-pointing cusp; base with a distinct spur (Bergh, 1895; James, 1980). Bandel (1984) depicts a much shorter serration without a cusp.

Habitat and Habits: On intertidal benches and more frequently on shallow subtidal reef flats to about 20 m; ranging from inshore habitats to the reef rim and inhabiting sand-filled depressions, reef limestone or beachrock with or without algal turf, coral rubble with or without sand, and dead coral heads or rocks. *C. flavidus* feeds on sedentary polychaetes of the families Terebellidae, Maldanidae and Capitellidae, rarely consuming enteropneusts; diet composition varies with habitat and locality (Kohn, 1959b, 1968b; Leviten & Kohn, 1980; Reichelt & Kohn, 1985; Marsh, 1971; Fainzilber et al., 1992).

Egg capsules of 8.5-14 x 6.5-11 mm have a short stalk and are deposited in parallel rows under rocks on subtidal reef flats or near the reef crest. Egg diameter of 175-223 µm suggests a minimum pelagic period of 26-21 days. Larvae settled after a planktonic period of 23 days in Hawaii (Cernohorsky, 1964; Perron, 1981a-c; Perron & Kohn, 1985; Loch, pers. comm., 1987).

Discussion: *C. flavidus* is often very difficult to distinguish from *C. frigidus* and also resembles *C. emacius*. The latter species has a lighter shell with a generally narrower, more conical and less smooth last whorl; the largely white aperture distinguishes it clearly from *C. flavidus*. For distinctions from *C. frigidus*, see the Discussion of that species. *C. lividus* resembles *C. flavidus* in size, shape and colouration but is distinguished by its tuberculate postnuclear whorls.

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Conus frigidus REEVE, 1848

(Plate 31, Figures 11-15; Plate 81, Second row, left; Map 63)

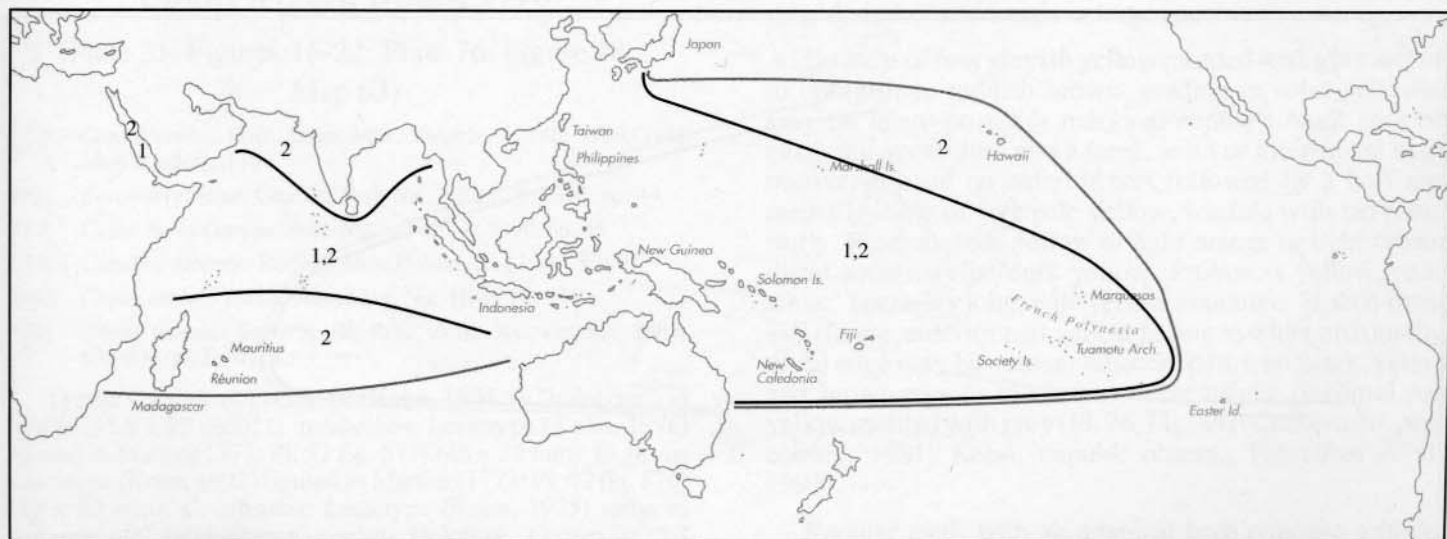
1848 *Conus frigidus* Reeve, Conch. Icon., 1, *Conus* suppl.: Pl. 3 sp. 284

1873 *Conus maltzanianus* Weinkauff, Syst. Conch. Cab. Martini Chemnitz, 4 (2), 1, *Conus*: 204-205, pl. 32 figs. 3-6

Types: *C. frigidus*: Type in BMNH (26 x 15 mm); *C. maltzanianus*: 2 syntypes in LMD (51 x 29 and 41.5 x 23 mm).

Type Localities: *C. maltzanianus*: "Tahiti und andere Südsee-Inseln."

Map 62



1: *C. emacius* 2: *C. flavidus*

Range: Tropical Central and W. Pacific except for Hawaii. We agree with Wils (1986) that records from Red Sea (and probably also from other localities in the Indian Ocean) refer to *C. flavidus*.

Description: Moderately small to medium-sized, moderately solid to solid. Last whorl conical or ventricosely conical to broadly conical; outline convex at adapical third to half, almost straight below. Shoulder angulate to subangulate. Spire of low to moderate height, outline straight to convex. Teleoconch sutural ramps usually flat; late ramps with 2-4 increasing to 4-5 distinct spiral grooves and additional striae. Last whorl usually with variably spaced, generally granulose spiral ribs from base to centre or shoulder; surface seldom smooth.

C. frigidus Shell Morphometry

L	28 - 56 mm
RW	0.18 - 0.40 (L 28-48)
RD	0.61 - 0.73
PMD	0.78 - 0.90
RSH	0.08 - 0.18

Colour olive to sometimes orangish or pinkish brown. Last whorl usually with a paler spiral band at or closely below centre and sometimes a second one at shoulder. Base purplish blue. Larval shell purple. Aperture purple, with paler bands near centre and below shoulder, often grading to pale blue deep within.

Periostracum yellowish to olivaceous brown, thick, opaque, with numerous axial ridges.

Dorsum of foot cream, pale yellow or tan, usually yellow anteriorly, often mottled with brown; anterior part usually with 3 black blotches in a clover-leaf arrangement, occasionally absent or fusing into a transverse band; posterior

end with a few black spots and sometimes with a black dorso-ventral blotch at each corner. Sides of foot yellow to orange, mottled with brown, sometimes with scattered white dots. Sole of foot pale yellow to orange, often mottled and streaked with brown to olive, sometimes with a few brown dots. Rostrum and tentacles pale yellow to orange, sometimes sparsely dotted with white. Siphon pale yellow to orange, darker toward tip, sometimes with a few white dots; a blackish brown to black band within anterior third and often a grainy grey second near centre (Pl. 81, Second row, left) (Kohn, unpubl. observ.; Chaberman, pers. comm., 1981; Pearson, unpubl. observ.). Observations by Kohn (unpubl.) from Indonesia and Okinawa suggest orange colour to be more prominent in subadults.

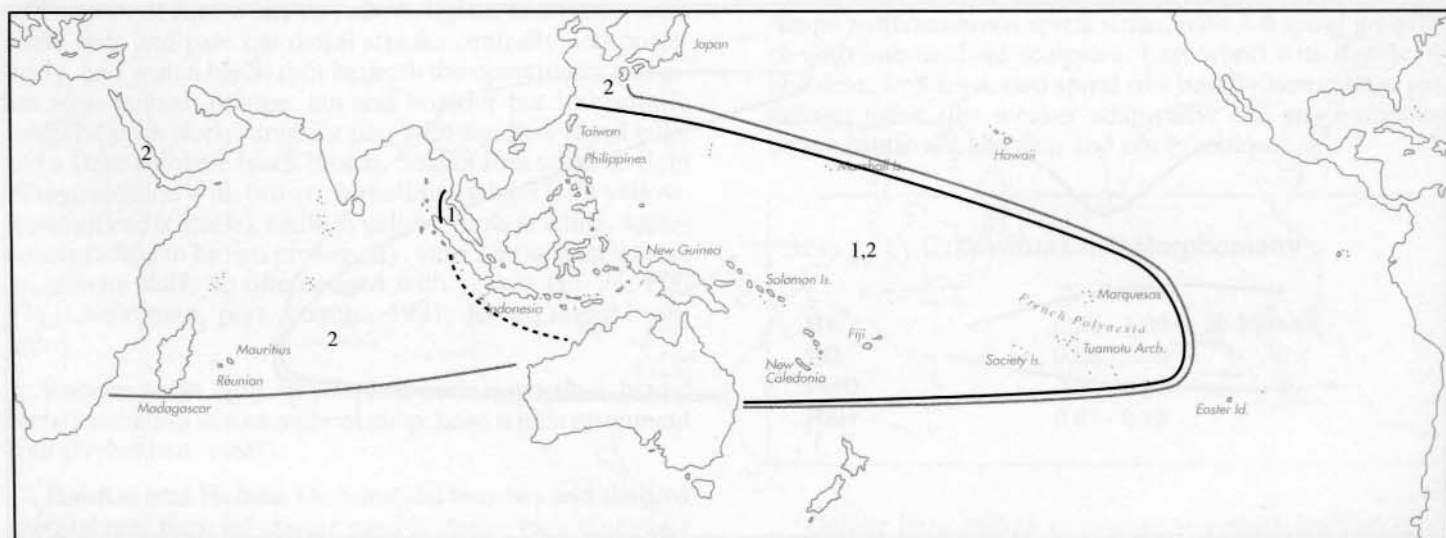
Radular teeth with an adapical barb opposite a blade; serration ending in a prominent cusp; base with a prominent spur (Nybakken, 1990).

Habitat and Habits: On intertidal benches and shallow subtidal reef flats to about 5 m; inhabiting bare beachrock or limestone, beachrock and limestone pavement with a thin layer of sand or with algal turf, sand-filled depressions, coral rubble with or without sand, and dead coral heads or rocks. *C. frigidus* feeds on sedentary polychaetes of the families Terebellidae and Capitellidae (Kohn & Nybakken, 1975; Leviten & Kohn, 1980; Reichelt & Kohn, 1985; Tirard, pers. comm., 1989).

Females oviposit on the underside of coral rocks. Egg diameter of 191 μ m suggests a minimum pelagic period of about 24 days (Perron & Kohn, 1985).

Discussion: *C. frigidus* is similar to *C. emaciatus* and sometimes can hardly be distinguished from *C. flavidus*. *C. emaciatus* attains somewhat larger size, has a narrower, more conical and less convex-sided last whorl (RD 0.56-0.62; PMD 0.89-0.94), a generally lower spire (RSH 0.03-0.14), and a largely white aperture; the colouration of its last whorl lacks greenish brown tones. *C. flavidus* also attains larger size, has a generally more conical, less convex-sided

Map 63



1: *C. frigidus* 2: *C. terebra*

and smoother last whorl with spiral ribs usually only on the basal half, a lower spire (RSH 0.01-0.13), and weaker spiral sculpture on its sutural ramps; its last whorl is typically yellow to orange brown and infrequently olive green; pale spiral bands are more often pronounced in *C. flavidus*. There are slight differences in animal colouration and ecology between *C. frigidus* and *C. flavidus*, where both these species occur sympatrically.

**Table of distinctions between
C. flavidus and *C. frigidus***

	<i>C. flavidus</i>	<i>C. frigidus</i>
Length	to 70 mm	to 54 mm
Last whorl form	usually conical or broadly conical; outline straight below adapical 1/4-1/3	usually conical to ventricosely conical; outline straight below adapical 1/3-1/2 (but PMD almost the same)
Last whorl sculpture	smooth, ribs sometimes to centre	more granulose; ribs sometimes to shoulder
Last whorl colour	yellow or orange rarely olive	olive, sometimes orangish or pinkish brown
RSH	0.01-0.13	0.09-0.18
Late sutural ramps	with or without spiral grooves; with many striae	with 4-5 distinct spiral grooves plus striae

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Conus terebra BORN, 1778

(Plate 31, Figures 16-22; Plate 76, Figure 48; Map 63)

- 1778 *Conus terebra* Born, Index Mus. Vindob., 1: 146; 1780: Test. Mus. Vindob.: 146
 1791 *Conus terebellum* Gmelin, Syst. Nat., 13 ed., 1: 3390, no. 44
 1791 *Conus fusus* Gmelin, Syst. Nat., 13 ed., 1: 3390, no. 45
 1798 *Cucullus albeolus* Röding, Mus. Bolten., 2: 47, no. 594/91*
 1843 *Conus coelebs* Hinds, Ann. Mag. Nat. Hist., 11: 256
 1881 *Conus thomasi* Sowerby III, Proc. Zool. Soc. London, 1881: 635-636, pl. 56 fig. 4

Types: *C. terebra*: Lectotype (Kohn, 1964, as "holotype") in NMW (55.5 x 25 mm); *C. terebellum*: Lectotype (Kohn, 1976) figured in Martini (1773: Pl. 52 fig. 577) (48 x 22 mm); *C. fusus*: Lectotype (Kohn, 1992) figured in Martini (1773: Pl. 52 fig. 576) (19 x 10 mm); *C. albeolus*: Lectotype (Kohn, 1975) same as lectotype of *C. terebellum*; *C. coelebs*: Holotype "12 lines" = 25.3 mm acc. Hinds; *C. thomasi*: Holotype in BMNH (72.5 x 36 mm).

Type Localities: *C. terebra*: "Fiji Islands" (Cernohorsky, 1964); *C. coelebs*: "Ambow, Feejee Islands"; *C. thomasi*: "Red Sea."

Range: *C. t. terebra*: E. Africa to Marquesas, Amami Is., and Australia; *C. t. thomasi*: Red Sea and Gulf of Aden.

Description: Medium-sized to large, moderately solid to solid. Last whorl conical, also narrowly conical in *C. t. terebra* (Pl. 31, Figs. 16-20); outline convex below shoulder, straight below, sometimes concave centrally. Shoulder rounded, sometimes rather indistinct from spire. Spire usually of moderate height, occasionally low; outline convex. Larval shell multispiral, maximum diameter about 0.8 mm. First 3-5 postnuclear whorls tuberculate. Teleoconch sutural ramps slightly convex to slightly concave, with 1 increasing to 3-4 wide spiral grooves and additional striae or with numerous striae. Last whorl with variably spaced and variably fine spiral ribs from base to shoulder, weaker in large specimens of *C. t. thomasi* (Pl. 31, Figs. 21, 22); interspaces may have spiral threads.

C. terebra Shell Morphometry

	<i>C. t. terebra</i>	<i>C. t. thomasi</i>
L	50 - 99 mm	35 - 89 mm
RW	0.23 - 0.61 g/mm	0.19 - 0.58 g/mm (L 35-75 mm)
RD	0.48 - 0.62	0.53 - 0.60
PMD	0.84 - 0.89	0.87 - 0.91
RSH	0.06 - 0.17	0.08 - 0.13

Ground colour white to bluish white. Last whorl with a broad spiral band on each side of centre, varying from violet-grey to yellowish brown. Base may be tinged with violet or yellow. Larval shell and adjacent 1-2 sutural ramps bluish violet. Late sutural ramps irregularly tinged with brown. Aperture white, sometimes pale blue to violet; anterior edge violet in specimens with a violet base.

Periostracum dark brown, thick, opaque, and axially ridged; darker and rough in large specimens.

Dorsum of foot greyish yellow mottled with grey and tan to orangish or reddish brown, grading to solid yellowish grey on latero-posterior marginal zones; a black spot beneath the operculum and a large, solid or interrupted black transverse band on anterior part followed by a buff area medially. Sole of foot pale yellow, washed with tan posteriorly. Rostrum pale yellow to light orange or light brown; distal zone may be dark yellow. Proboscis yellow; penis white. Tentacles long, pale yellow to orange. Siphon broad and flaring; anterior part yellow fading to white proximally, distal edge may be orange; adjacent part with black, yellow and broad grey to black transverse bands; proximal part yellow mottled with grey (Pl. 76, Fig. 48) (Chaberman, pers. comm., 1981; Kohn, unpubl. observ.; Fainzilber et al., 1992).

Radular teeth with an adapical barb opposite a blade; long serration extends beyond the centre of the shaft, termi-

nating in a backward-pointing cusp; base with a prominent spur (Peile, 1939; Kohn, unpubl. observ.). The tooth depicted by Bandel (1984) for *C. t. thomasi* (Port Sudan, Red Sea) differs in having a somewhat shorter serration.

Habitat and Habits: In 0.5-20 m on coral reef or lagoon pinnacles, in fine sand with or without sea-weed and coral rubble; reported from sheltered sites beneath coral rocks and from exposed rocky areas. *C. terebra* feeds on terebellid polychaetes (Kohn, 1960; Kohn & Nybakken, 1975; Chaberman, pers. comm., 1981; Sharabati, 1984; Tirard, pers. comm., 1989; Grosch, pers. comm., 1989; Fainzilber et al., 1992).

Discussion: *C. terebra* is similar to *C. virgo* and *C. emaciatus*. *C. virgo* attains larger size, is heavier in similarly sized specimens and generally has a lower spire; it is distinguished by the absence of spiral colour bands from its last whorl, its smoother surface and its angulate shoulder. *C. emaciatus* is a smaller species, has a usually more conical last whorl (PMD 0.89-0.94), a more angulate shoulder and a more uniform colouration.

We provisionally distinguish *C. terebra thomasi*, from the Red Sea and Gulf of Aden, as a subspecies based on the smoother last whorl with generally weak spiral ribs. *C. t. thomasi* intergrades with *C. t. terebra* in all shell characters. Fainzilber et al. (1992) favour the status of a form rather than that of a subspecies.

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Conus bondarevi RÖCKEL & G. RAYBAUDI MASSILIA, 1992

(Plate 31, Figures 23-25; Map 64)

1992 *Conus bondarevi* Röckel & G. Raybaudi Massilia, La Conchiglia 23 (264): 25-27, figs. 1-5, 9

Type: Holotype in SMNS (36 x 20.5 mm).

Type Locality: "off the northern coast of Somalia, Western Indian Ocean."

Range: N. Somalia.

Description: Moderately small to medium-sized, moderately solid. Last whorl conical to broadly conical; outline convex below shoulder, straight below. Shoulder angulate. Spire low, outline sigmoid to concave. Larval shell of about 2 whorls, maximum diameter 1.0-1.2 mm. First 2.5-4 postnuclear whorls weakly tuberculate, late whorls broadly carinate. Teleoconch sutural ramps flat, with 2 increasing to 3-4 spiral grooves; latest ramps may have additional spiral striae. Last whorl with distinct spiral ribs on basal fourth to third.

C. bondarevi Shell Morphometry

L	29 - 41 mm
RW	0.12 - 0.25 g/mm
RD	0.61 - 0.72
PMD	0.86 - 0.89
RSH	0.07 - 0.12

Ground colour white, sometimes suffused with pale orange or violet. Last whorl with a broad yellow, orange, red or brown spiral band on each side of centre, occasionally with a narrow third band below shoulder. Ground-colour zone sometimes narrow and obsolete at shoulder. Base white to orange. Larval whorls white or yellow, orange or violet. Postnuclear sutural ramps shaded and radially spotted with same colours as last whorl. Aperture white to pale purple, slightly translucent.

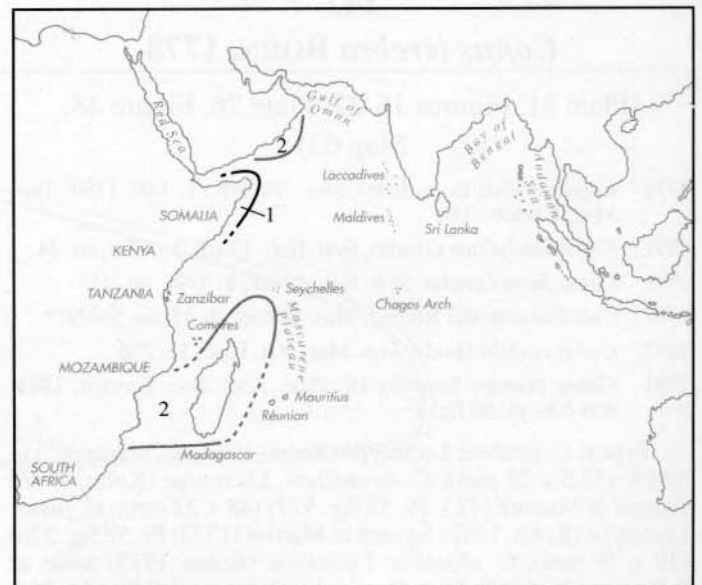
Habitat and Habits: Reported from about 150 m.

Discussion: *C. bondarevi* resembles *C. daucus* Hwass from the W. Atlantic in colour pattern and shape; for comparison, see the Discussion of *C. daucus* (Vol. II).

Sympatric *C. namocanus* attains larger size (L 40-100 mm), has a greenish yellow apex with 2.5-3 larval whorls and with tubercles only in the first 1-1.5 postnuclear whorls, its latest sutural ramps have an obsolete spiral sculpture and the outer margins are not carinate. The last whorl of *C. namocanus* is predominantly olive, and its pattern usually includes spiral lines and its aperture is bluish violet.

The syntypes of *C. incarnatus* (Appendix 1, no. 14; Pl. 71, Figs. 3-5) are larger than adult *C. bondarevi* (L 47-65 mm), have subangulate shoulders and generally higher spires, and their late sutural ramps bear twice as many spiral grooves but lack carinate outer margins.

Map 64



1: *C. bondarevi* 2: *C. martensi*

***Conus martensi* E. A. SMITH, 1884**

(Plate 32, Figures 1-6; Map 64)

1884 *Conus martensi* E. A. Smith, Rep. Zool. Coll. Alert: 488-489, pl. 44 fig. A1986 *Conus alconelli* da Motta, Publ. Ocas. Soc. Portuguese Malac., 7: 5-8, pl. 2 with figs.**Types:** *C. martensi*: Holotype in BMNH (24 x 13 mm); *C. alconelli*: Holotype in MHNG (61.5 x 29.5 mm).**Type Localities:** *C. martensi*: "Providence Reef, Mascarenes"; *C. alconelli*: "within a radius from Richard Bay, which is about 200 kms north of Durban, to Park Rynie, 60 kms south thereof, off the eastern coast of South Africa."**Range:** Natal, N.W. Madagascar, Providence Id. (Seychelles), and S. coast of Oman.**Description:** Medium-sized to moderately large, moderately solid to solid. Last whorl conical, outline convex at adapical fourth and straight below. Shoulder angulate. Spire of low to moderate height, outline straight to sigmoid or concave. Larval shell of about 3 whorls (Moolenbeek & Coomans, 1987), maximum diameter about 1 mm. Teleoconch sutural ramps flat, with 3 increasing to 4-6 spiral grooves; latest ramps may only have 3-4 grooves. Last whorl with weak or obsolete spiral ribs at base.***C. martensi* Shell Morphometry**

L	40 - 78 mm
RW	0.18 - 0.52 g/mm
RD	0.50 - 0.60
PMD	0.86 - 0.88
RSH	0.05 - 0.16

Colour yellow to orange. Last whorl often with 2 paler spiral bands, at centre and at shoulder. Larval whorls brown. Postnuclear sutural ramps white, suffused with colour tones of last whorl. Aperture white to pale yellow.

Periostracum light to olive brown, of varying thickness, opaque, and axially ridged.

Habitat and Habits: In 40-150 m. Specimens from Natal inhabit zone of sand and sponges along the inner continental shelf (Kilburn, pers. comm., 1989); specimens off Mahajanga, Madagascar on reef substrate with sponges (Schmidt, pers. comm., 1990).**Discussion:** *C. martensi* is similar to *C. berdulinus*. For the distinctions, see the Discussion of the latter species.The description given above is based on recently discovered material from Natal, Madagascar, and Oman. In 1986, da Motta described this species as *C. alconelli* (Pl. 32, Fig. 2), but one year later Moolenbeek & Coomans (1987) proposed that these shells were conspecific with *C. martensi*, previously known only from a dead-collected,

chipped subadult specimen (Pl. 32, Fig. 1). We tentatively accept this conclusion.

***Conus berdulinus* VEILLARD, 1972**

(Plate 32, Figures 7-13; Map 65)

1972 *Conus berdulinus* Veillard, Of Sea and Shore, 3 (Winter 1972): 176-177, text figs.**Type:** Holotype in MNHN (68.5 x 36.5 mm).**Type Locality:** "off the coast of Réunion, near the port of Pointe des Galets."**Range:** Natal to Mascarenes, Somalia, S. Oman and S. India.**Description:** Medium-sized to large, moderately solid to heavy. Last whorl conical to slightly ventricosely conical, outline convex at adapical fourth to third and straight below. Shoulder angulate to subangulate or almost rounded, usually with a fine carina. Spire low, outline concave to slightly convex or sigmoid. About first 5 postnuclear whorls weakly tuberculate. Teleoconch sutural ramps flat to slightly sigmoid, with 3-4 spiral grooves, changing to many striae in late whorls. Last whorl with obsolete spiral ribs at base.***C. berdulinus* Shell Morphometry**

L	48 - 100 mm
RW	0.26 - 1.0 g/mm (L 48-78 mm)
RD	0.51 - 0.59
PMD	0.83 - 0.90
RSH	0.05 - 0.10

Colour bluish violet or white shaded with violet or cream. Last whorl usually with a paler spiral band at centre; in shells from India and Oman, a weak to prominent, variably broad, violet to orange spiral band on each side of centre. Larval whorls white. Teleoconch spire tinged or radially streaked with pinkish orange or pinkish violet. Aperture white, pale violet or pale orange.

Periostracum dark red brown and opaque (specimens from Natal), light brown and thin (Coomans & Moolenbeek, 1982).

Animal reddish brown (Veillard, 1972). Radular teeth long and slender, with 2 opposite adapical barbs; long serration from end of anterior barb 2/3 the length down the shaft; basal spur absent (Rolán, pers. comm., 1992).

Habitat and Habits: In 40-140 m; holotype reported from muddy sand bottom.**Discussion:** *C. berdulinus* is most similar to *C. kintoki* and also resembles *C. coelinae* and *C. martensi*. The latter

species differs in its more angulate shoulder, more prominent spiral sculpture on the late sutural ramps, non-tuberculate postnuclear whorls, and yellow to orange colour. For comparison with *C. coelinae* and *C. kintoki*, see the Discussions of those species.

In shells from S. India (Pl. 31, Fig. 8), the last whorl has prominent spiral colour bands and a less convex adapical region than in those from Natal (Pl. 31, Figs. 10, 12) or Réunion. Specimens from Somalia (Pl. 31, Fig. 13) and the Kuria Muria Is. (Pl. 31, Fig. 11) are intermediate in colour pattern.

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Conus coelinae CROSSE, 1858

(Plate 32, Figures 14-20; Map 65)

1858 *Conus coelinae* Crosse, Rev. Mag. Zool., (2) 10: 81; 117-119, pl. 2 fig. 1

1943 *Conus spiceri* Bartsch & Rehder, Proc. Biol. Soc. Washington, 56: 87

1989 *Conus pseudocoelinae* Delsaerd, Gloria Maris, 28 (1): 5-7, 9 figs. 3-5

Types: *C. coelinae*: Holotype in IRSN (115 x 56 mm); *C. spiceri*: Holotype in USNM (67.5 x 41 mm); *C. pseudocoelinae*: Holotype in IRSN (58 x 31.5 mm).

Type Localities: *C. coelinae*: "Novam-Caledoniam"; *C. spiceri*: "Sand Island, Midway Island atoll, Hawaiian Islands"; *C. pseudocoelinae*: "New Caledonia."

Range: *C. c. coelinae*: New Caledonia, Loyalty Is., Queensland; probably also Solomon and Marshall Is. *C. c. spiceri*: Hawaii.

Description: Moderately large to large, solid to heavy. Last whorl conical; outline straight, except convex below shoulder. Shoulder angulate to sharply angulate. Spire usually low, outline slightly sigmoid. Teleoconch sutural ramps flat to sigmoid, with numerous often weak spiral striae in late whorls. Entire last whorl with rather closely spaced spiral threads, usually more prominent basally.

C. coelinae Shell Morphometry

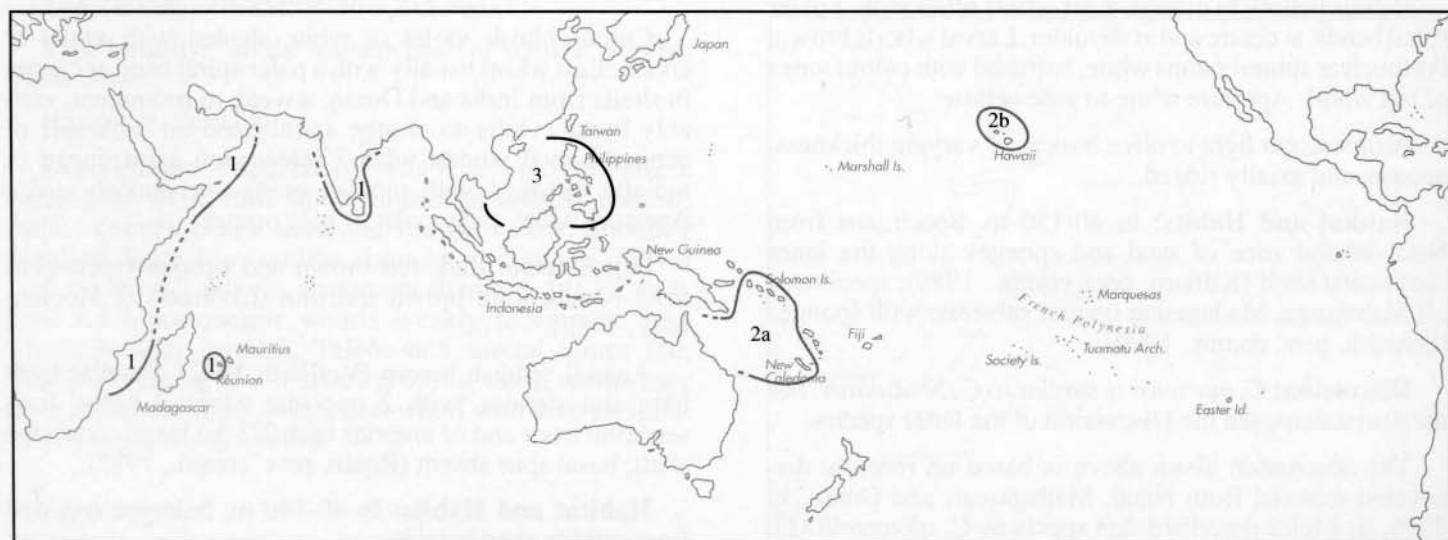
	<i>C. c. coelinae</i>	<i>C. c. spiceri</i>
L	60 - 128 mm	70 - 152 mm
RW	0.44 - 0.95 g/mm (L 60 - 90 mm)	1.08 - 1.27 g/mm (L 104 - 109 mm)
RD	0.53 - 0.63	0.55 - 0.60
PMD	0.87 - 0.92	0.92 - 0.94
RSH	0.05 - 0.13	0.01 - 0.09

Colour white, variably suffused with yellow. Last whorl occasionally with a paler spiral band at centre. Base violet or occasionally white in *C. c. coelinae* (Pl. 31, Figs. 14-16, 20), lemon yellow in *C. c. spiceri* (Pl. 37, Figs. 17-19). Larval whorls white. Aperture white.

Periostracum yellowish brown to brown, thick, opaque, and almost smooth.

In *C. c. spiceri*, sole of foot light brown, sides of foot uniform brown, and pedal gland tipped with yellow. Rostrum uniform brown dorsally. Siphon white, grading to grey dorso-laterally on proximal part, with a bright yellow tip followed by 2 black bands and a pale yellow band between. Radular teeth with 2 opposite adapical barbs; serration extends about 2/3 the length down the shaft, ter-

Map 65



1: *C. herdulinus* 2a: *C. coelinae coelinae* 2b: *C. coelinae spiceri* 3: *C. kintoki*

minating in a backward-pointing cusp; base with a prominent spur (Kohn, unpubl. observ.).

Habitat and Habits: Intertidal to about 55 m. *C. c. coelinae* on sand bottoms to about 35 m. *C. c. spiceri* in 2-55 m, preferring habitats in 12-20 m, in coarse sand with coral and coral rubble and beneath dead coral; sometimes encountered in habitats outside the reef. *C. c. spiceri* feeds on polychaetes (Kohn, 1962; Cross, 1967).

Discussion: *C. coelinae* is similar to *C. virgo*, *C. berdulinus*, and *C. kintoki*. *C. virgo* can be distinguished by the blue violet basal parts of its shell, purple larval whorls, and coarser spiral sculpture on the sutural ramps. *C. berdulinus* has a less angulate shoulder, smoother last whorl with violet, cream or orange shades, and a thin periostracum. For comparison with *C. kintoki*, see the Discussion of that species.

The two subspecies we characterize are geographically widely separated, yet their shells differ only in that *C. c. spiceri* attains larger maximum size and its base is lemon yellow, in contrast to the violet base of *C. c. coelinae*. We do not agree with Delsaerdt's (1989) statement that the holotype of *C. coelinae* represents a specimen of *C. c. spiceri* from Hawaii, because its base is white instead of lemon yellow. Specimens of *C. c. coelinae* with such uncoloured bases are known to occur in New Caledonia (Richard, pers. comm.).

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Conus kintoki HABE & KOSUGE, 1970

(Plate 32, Figures 21-24; Map 65)

- 1970 *Conus kintoki* Habe & Kosuge, Pacific Shell News, 2: 9, 1 fig.
1982 *Conus kintoki* Coomans & Moolenbeek, Bull. Zool. Mus. Univ. Amsterdam, 8 (15): 136-138, 134 fig. 4.

Types: *C. kintoki* Habe & Kosuge: Holotype in IMT (102 x 49.5 mm); Coomans & Moolenbeek: Holotype in ZMA (93.5 x 43 mm).

Type Localities: "South China Sea" (Habe & Kosuge); "Bogo, Cebu, Philippines" (Coomans & Moolenbeek).

Range: Philippines to South China Sea.

Description: Medium-sized to large, moderately solid to moderately heavy. Last whorl narrowly conical to conical; outline somewhat convex below shoulder, then straight. Shoulder angulate to sharply angulate. Spire low, outline usually sigmoid. Larval shell of about 3.5 whorls, maximum diameter about 1.0 mm. First 5-7 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly concave, with 2 increasing to 3-4 spiral grooves, changing into many striae in latest whorls. Last whorl with sometimes weak to obsolete, variably spaced, fine spiral ribs from base to shoulder, weaker in larger specimens, particularly above centre.

Colour yellowish orange to orange or violet; some of these tones may merge. Last whorl often with a paler spiral

band at or just below centre. Larval whorls white to orange cream. Early postnuclear sutural ramps white to light orange; late ramps match last whorl in colour shades. Aperture white, shaded with violet in smaller specimens.

C. kintoki Shell Morphometry

L	50 - 116 mm
RW	0.25 - 0.90 g/mm (L 50-106 mm)
RD	0.47 - 0.52
PMD	0.87 - 0.96
RSH	0.01 - 0.08

Periostracum brown, of varying thickness, opaque, smooth or with interlaced axial ridges.

Habitat and Habits: In 100-400 m.

Discussion: *C. kintoki* closely resembles *C. berdulinus*, which can be distinguished by its broader, somewhat more ventricose and smoother last whorl (RD 0.51-0.59; PMD 0.83-0.90), less angulate shoulder, and its only weakly tuberculate early postnuclear whorls. *C. coelinae* is heavier than *C. kintoki* specimens of similar size, has a broader last whorl (RD 0.53-0.63), and is yellowish white with a violet or yellow base.

The validity of the name *C. kintoki* Habe & Kosuge, formerly disputed, has been established by Emerson (1984).

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Conus generalis LINNÉ, 1767

(Plate 33, Figures 1-12; Plate 76, Figure 49; Map 66)

- 1767 *Conus generalis* Linné, Syst. Nat., 12 ed., 1: 1166, no. 293
1798 *Cucullus locumtenens* Röding, Mus. Bolten., 2: 45, no. 564/73
1798 *Cucullus ornatus* Röding, Mus. Bolten., 2: 44, no. 560/70
1849 *Conus spiculum* Reeve, Conch. Icon., 1, *Conus* suppl.: Pl. 7 sp. 266
1937 *Conus generalis* var. *pallida* Dautzenberg, Mém. Mus. Roy. Hist. Nat. Belgique, 2 (18): 120, pl. 2 fig. 8
1937 *Conus generalis* var. *regenfussi* Dautzenberg, Mém. Mus. Roy. Hist. Nat. Belgique, 2 (18): 120, pl. 2 fig. 6
1937 *Conus generalis* var. *subunicolor* Dautzenberg, Mém. Mus. Roy. Hist. Nat. Belgique, 2 (18): 120, pl. 2 fig. 7
1982 *Conus krabiensis* da Motta, Publ. Ocas. Soc. Portuguesa Malac., 1: 10-11, figs. 9a-c

Types: *C. generalis*: Lectotype (Kohn, 1963) in LSL (47 x 20 mm); *C. locumtenens*: Lectotype (Kohn, 1975) figured in Martini (1773: Pl. 58 fig. 645) (55 x 28 mm); *C. ornatus*: Lectotype (Kohn, 1975) figured in Chemnitz (1788: Pl. 140 fig. 1303) (43 x 20 mm); *C. spiculum*: 2 syntypes in BMNH (23 x 8 mm; 22 x 10 mm); *C. g.* var. *pallida*: Specimen figured in IRSN (55.5 x 25 mm); *C. g.* var. *regenfussi*: Specimen figured in IRSN (54.5 x 25.5

mm); *C. g. var. subunicolor*: Specimen figured in IRSN (57 x 28 mm); *C. krabiensis*: Holotype in MHNG (45 x 19.5 mm).

Type Localities: *C. generalis*: "India orientali"; *C. spiculum*: "Cagayan, Island of Mindanao, Philippines"; *C. g. var. pallida*, *C. g. var. regenfussi*, *C. g. var. subunicolor*: "Amboine"; *C. krabiensis*: "Raya Island, Phuket, S. W. Thailand."

Range: Central Indian Ocean (Maldives, S. India) and N. W. Australia to French Polynesia; Ryukyu Is. to Queensland; absent from Hawaii.

Description: Medium-sized to large, moderately solid to heavy. Last whorl conical to narrowly conical, outline straight except variably convex below shoulder. Shoulder angulate. Spire of low to moderate height; outline deeply concave, with a conoid apex of 6-10 postnuclear whorls projecting from an otherwise nearly flat spire. Larval shell of 3.5-4 whorls, maximum diameter 0.7-0.8 mm. First 3-5 postnuclear whorls distinctly tuberculate; tuberculation disappears within adjacent 1-2.5 whorls. Teleoconch sutural ramps flat to variably concave, with obsolete spiral striae. Last whorl with fine variably spaced spiral ribs at base, obsolete in large specimens.

C. generalis Shell Morphometry

L	50 - 104 mm
RW	0.10 - 1.25 g/mm (L 35-95 mm)
RD	0.46 - 0.61
PMD	0.85 - 0.95
RSH	0.05 - 0.21

Ground colour white, Indian Ocean specimens often variably suffused with orange to red. Last whorl with orangish brown to brownish black axial streaks, flames or zigzag markings from base to shoulder or shoulder ramp, varying from solid to highly divided. On each side of centre, a variably wide yellow, orange, brown or black, usually solid

spiral band overlies the axial markings; colour of bands may vary from light to dark within the same specimen; abapical band occasionally, adapical band rarely divided into 2 or 3 narrower spiral bands. Intervening ground-colour bands usually interspersed with brown to black axial markings. Dotted and dashed or sometimes solid brown spiral lines extend from base to shoulder; they vary in number and occasionally contain intermittent white markings. Base violet to brown or black. Larval whorls pink. Early postnuclear sutural ramps immaculate; late ramps with orangish to dark brown or black radial markings. Highly speckled shells intergrade with shells of largely uniform colouration; in W. Thailand, S. India, and the Maldives, uniformly coloured shells have an almost immaculate orangish or reddish tan last whorl and a very sparsely maculated spire (form *krabiensis*) (Pl. 33, Figs. 9, 10). Aperture white to bluish white, except for the base.

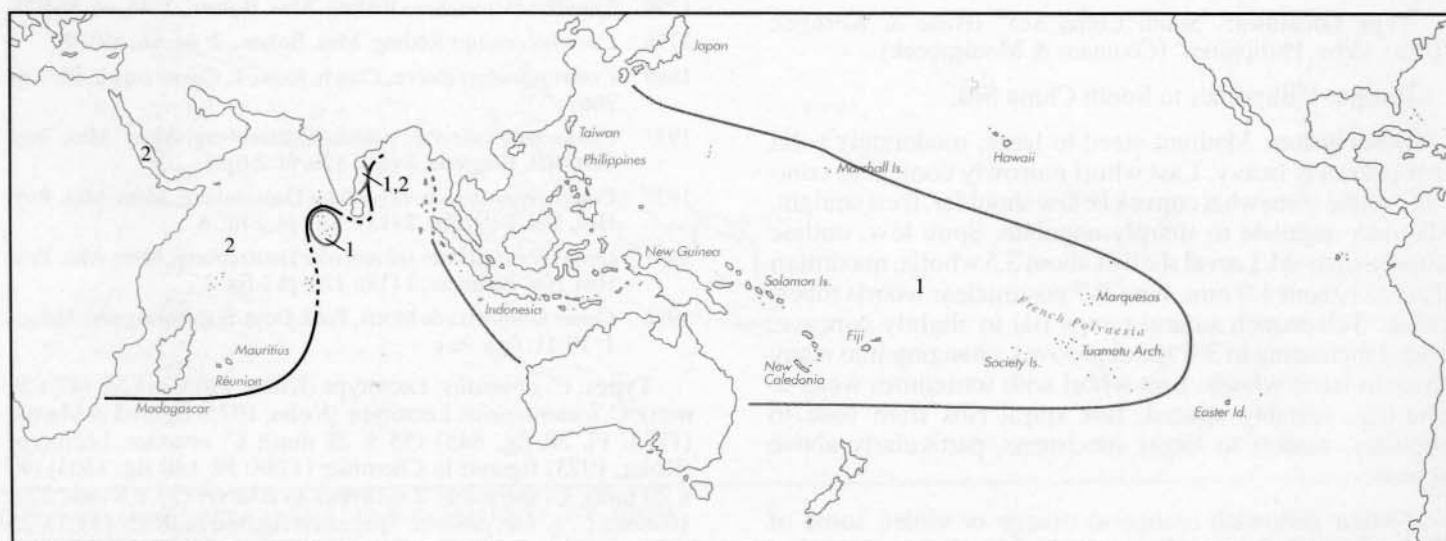
Periostracum yellowish brown to dark grey, thin to moderately thick, translucent to opaque, sometimes within the same specimen, and smooth or with fine axial ridges.

Foot yellowish grey; dorsum additionally washed with brown and dotted with white; marginal zones pale yellow; anterior part with a reddish brown median spot distally and brown dots in front of rostrum. Rostrum and tentacles yellow. Siphon pale yellowish grey, paler proximally, dotted with white and tipped with brown (Pl. 76, Fig. 49) (Chaberman, pers. comm., 1981).

Radular teeth with an adapical barb opposite a blade; pronounced serration on adapical half of the shaft; no basal spur (Kohn, unpubl. observ.).

Habitat and Habits: Intertidal to about 50 m, more common in subtidal habitats; in Philippines, dredged to 240 m (Guillot de Suduiraut, pers. comm., 1992); on coarse sand, muddy sand and coral rubble, often beneath dead coral. In W. Thailand, form *krabiensis* is reported from sand and rock bottoms in 12-30 m, in the Maldives from sand in 20-25 m. Similarly sized specimens of *C. generalis* have

Map 66



1: *C. generalis* 2: *C. maldivus*

been observed in aggregations (Cernohorsky, 1964; Estival, 1981; Richer de Forges & Estival, 1986; Chaberman, pers. comm., 1981; Tirard, pers. comm., 1989).

Discussion: *C. generalis* resembles *C. bayani*, *C. capreolus*, *C. monile*, and most closely *C. maldivus*. In spite of similar shape and sculpture, *C. capreolus* is so dissimilar in colour pattern as to exclude any confusion. *C. bayani* has a less solid shell (maximum RW 0.3), fewer larval whorls but usually more tuberculate postnuclear whorls and a carinate shoulder; the spiral colour bands of its last whorl are generally narrower, less solid and lighter in colour and the basal parts are white. For comparison with *C. maldivus* and *C. monile*, see the Discussions of those species.

The name *C. krabiensis* applies to small individuals whose shells are orange and almost immaculate (Pl. 33, Figs. 9, 10), and which range from the Maldives to W. Thailand and off N. W. Australia. However, they intergrade in size and colour pattern with typical *C. generalis*, and sometimes both types of pattern occur within a single specimen. Moreover, populations with small adults are also known from Sulu Sea, Molluccas, and E. New Britain. We therefore consider *C. krabiensis* a colour form of *C. generalis*.

C. spiculum (Pl. 33, Figs. 11, 12) was based on 2 juvenile specimens; Dautzenberg's varieties represent only colour forms: Var. *regenfussi* with narrow orange bands; var. *subunicolor* with broad brown bands, leaving a narrow white central band; var. *pallidula* with a pale colour.

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Conus maldivus HWASS in BRUGUIÈRE, 1792

(Plate 33, Figures 13-20; Map 66)

- 1792 *Conus maldivus* Hwass in Bruguière, Encycl. Méth. 1: 644-645, no. 42
 1798 *Cucullus filiosus* Röding, Mus. Bolten. 2: 44, no. 559/69
 1798 *Cucullus dux* Röding, Mus. Bolten. 2: 4, no. 561/71
 1863 *Conus planaxis* Deshayes, Cat. Moll. de l'Île Réunion: 134, pl. 13 figs. 11, 12
 1863 *Conus spirogloxus* Deshayes, Cat. Moll. de l'Île Réunion: 135, pl. 13 figs. 13, 14
 1933 *Conus generalis monteiroi* Barros e Cunha, Mem. Est. Mus. Zool. Univ. Coimbra (1) 71: 79-80

Types: *C. maldivus*: Lectotype (Kohn, 1968) in MHNG (63 x 31 mm); *C. filiosus*: Lectotype (Kohn, 1975) figured in Favanne & Favanne (1780: Pl. 15 fig. C) (49 x 30 mm); *C. dux*: Lectotype (Kohn, 1975) figured in Martini (1773: Pl. 58 fig. 648) (52 x 27 mm); *C. planaxis*: Holotype 18 x 9.5 mm, acc. Deshayes; *C. spirogloxus*: Holotype in MNHN (22 x 9 mm); *C. g. monteiroi*: 6 syntypes in MZUC (L 61; 61; 56; 55; 46; 46 mm).

Type Localities: *C. maldivus*: "les Isles Maldives;" *C. planaxis* and *C. spirogloxus*: "L'Île de la Réunion."

Range: Mozambique to Red Sea and to S. India; absent from Maldives.

Description: Medium-sized to large, solid to moderately heavy. Last whorl conical to narrowly conical, outline variably convex adapically and straight below. Shoulder angulate. Spire of low to moderate height, outline deeply concave to almost straight, with a conoid apex of about 7-8 postnuclear whorls projecting from an otherwise nearly flat spire. Maximum diameter of larval shell about 0.75 mm. First 7 postnuclear whorls weakly tuberculate. Teleoconch sutural ramps flat to concave, with obsolete spiral striae in late whorls. Last whorl with fine spiral ribs at base, obsolete in larger specimens.

C. maldivus Shell Morphometry

L	50 - 83 mm
RW	0.30 - 1.06 g/mm (L 50-80 mm)
RD	0.48 - 0.62
PMD	0.85 - 0.92
RSH	0.03 - 0.18

Ground colour white. Last whorl with 2 broad light to dark brown spiral bands, either solid or split into axial streaks, flames, blotches or bands, leaving ground-colour zones at shoulder, at or below centre and near base. White subshoulder band narrow, usually crossed by axial extensions of adapical colour band. White central band variable in width, almost immaculate to heavily maculated with extensions of colour bands, occasionally completely absent. White abapical zone broad or narrow, sparsely to heavily maculated with brown. Minutely dotted to largely solid brown spiral lines extend from base to shoulder but vary widely in number and arrangement; occasionally, spiral lines partly interrupted by white dots and sparse, small white tents. Base dark brown to violet-brown. Larval whorls pink. Early postnuclear sutural ramps immaculate; late ramps with curved brown radial markings. Aperture white.

Periostracum yellowish olive, thin to moderately thick, translucent to opaque, and smooth or with fine axial ridges.

Dorsum of foot pale yellow mottled with dark grey. Sole of foot pale orange, mottled with black, with less black posteriorly; anterior end red, followed by a black transverse band. Rostrum black with white spots. Tentacles grey with white spots. Siphon yellow, with a dark grey mottling distally or siphon black, grading to grey at anterior end, with white spots (Fainzilber et al., 1992; Kohn, unpubl. observ.).

Radular teeth with an adapical barb opposite a medium-sized blade; serration about twice as long as blade; no basal spur (Peile, 1939).

Habitat and Habits: Slightly subtidal to about 6 m on reefs and coastal flats, in sand, sandy gravel or rubble, sometimes beneath coral blocks among weed (Grosch, pers. comm., 1989; Stabenow, pers. comm., 1989; Lorenz, pers. comm., 1990).

Discussion: *C. maldivus* is very similar to *C. generalis* and cannot always be unequivocally separated from this species by conchological characters. The only reliable dif-

ference is in the colour pattern: In *C. generalis*, the basic pattern consists of 2 spiral colour bands that are usually solid and rarely split into axial fragments, and that cross underlying darker axial streaks or flames extending over the entire last whorl; the adapical ground-colour band is usually broader and the dark spiral lines rarely consist of minute dots or become solid.

C. maldivus occurs with *C. generalis* form *krabiensis* at Mandapam, S. India, without producing conchological intermediates (Röckel, 1989). We therefore consider them as separate species. For comparison between *C. maldivus* and *C. monile*, see the Discussion of the latter species. The shell of *C. bayani* has carinate shoulder; the last whorl is white at the anterior end and has spiral colour bands overlying axial pattern elements. The shells of *C. capreolus* are lighter than those of *C. maldivus*, the bases are white, late postnuclear whorls are carinate and lack radial markings, and darker spiral lines are absent from their last whorl.

C. planaxis and *C. spirogloxus* (Pl. 33, Fig. 20) refer to juvenile specimens assigned to *C. maldivus* mainly on account of their type localities.

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Conus monile HWASS in BRUGUIÈRE, 1792

(Plate 33, Figures 21-24; Map 67)

1792 *Conus monile* Hwass in Bruguière, Encycl. Méth., 1: 646-647, no. 45

1798 *Cucullus cereolus* Röding, Mus. Bolten., 2: 44, no. 557/67

Types: *C. monile*: Lectotype (Kohn, 1968) in MHNG (70 x 36 mm); *C. cereolus*: Lectotype (Kohn, 1975) figured in Chemnitz (1788: Pl. 140 fig. 1301) (52 x 25 mm).

Type Localities: *C. monile*: "l'Océan Asiatique."

Range: India and Sri Lanka to W. Thailand; probably also Gulf of Oman.

Description: Medium-sized to large, moderately solid to heavy. Last whorl conical, outline variably convex at adapical fourth to third and straight below. Shoulder angulate to carinate. Spire of low to moderate height, outline deeply concave with a projecting conical apex of 5-7 postnuclear whorls. Maximum diameter of larval shell about 0.9 mm. First 7-9 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to concave, with obsolete spiral striae. Last whorl with weak to obsolete spiral ribs at base.

C. monile Shell Morphometry

L	45 - 95 mm
RW	0.23 - 1.15 g/mm
RD	0.50 - 0.61
PMD	0.85 - 0.90
RSH	0.07 - 0.14

Ground colour white or cream. Last whorl suffused or spirally banded with pale orange or pink. Spiral rows of brown dots, dashes and variously shaped spots extend from base to shoulder but vary in number and arrangement, often concentrated at both sides of centre. Sometimes dark markings fuse into axial flames or blotches. Base pale orange or brown. Larval whorls greyish beige. Early postnuclear sutural ramps immaculate; late ramps with a varying number of brown radial markings. Aperture white.

Periostracum yellowish brown to olive-brown, rather thin, translucent to opaque, smooth or with fine axial ridges.

Radular teeth with an adapical barb opposite a blade; serration about twice as long as blade, ending in a prominent cusp; base with a distinct spur (Nybakken, 1990).

Habitat and Habits: Intertidal to about 20 m; on sand bottom with patches of clay and shell rubble (India; Kohn, 1978a).

Discussion: *C. monile* is similar in shape and sculpture to *C. capreolus*, *C. bayani*, *C. generalis*, and *C. maldivus*. *C. capreolus* is easily distinguished by the confluent, fawn axial streaks on its last whorl. *C. bayani* has a lighter shell with a white base and usually lacks pink bands; brown spiral bands overlie its axial pattern elements and the larval whorls are brown. *C. generalis* has a taller, projecting apex, fewer tuberculate postnuclear whorls, a violet to black base and a pattern of spiral colour bands overlying axial elements that extend over the entire last whorl. *C. maldivus* has a dark brown to violet-brown base and its pattern consists of continuous to highly divided brown spiral bands with axial extensions into adjacent ground-colour zones.

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Conus rufimaculosus MACPHERSON, 1959

(Plate 33, Figures 25, 26; Map 67)

1959 *Conus rufimaculosus* Macpherson, Mem. Natl. Mus. Victoria, 24: 54, pl. figs. 5, 5a-c

Type: Holotype in NMV (34 x 18.5 mm).

Type Locality: "Tweed Head, New South Wales."

Range: E. Australia from southern Queensland to northern New South Wales.

Description: Medium-sized, moderately solid to solid. Last whorl conical to ventricosely conical; outline slightly convex, generally straighter toward base. Shoulder broadly carinate. Spire low, outline concave to slightly sigmoid. Larval shell of 1.75-2.25 whorls, maximum diameter 1.1-1.2 mm. Teleoconch sutural ramps flat, grading to deeply concave in late whorls, with obsolete spiral striae adaxially. Last whorl with a few weak, variably spaced spiral grooves near base.

Ground colour white, often suffused with pink. Last whorl with light or red-brown triangular spots to axial streaks and flames, usually somewhat concentrated below

shoulder, at centre and above base, occasionally fusing into a partial network. Larval whorls white. Postnuclear sutural ramps with brown radial markings. Aperture pink, paler toward outer lip.

***C. rufimaculosus* Shell Morphometry**

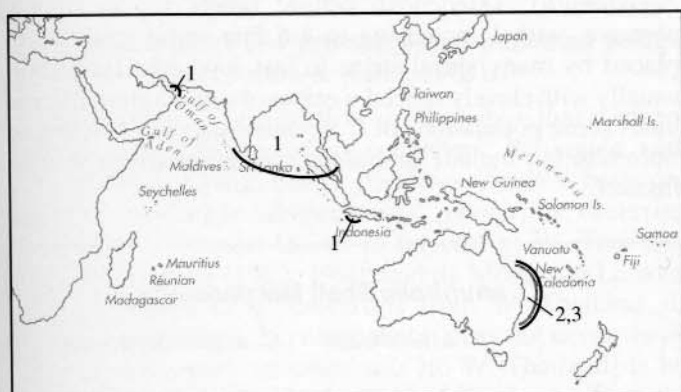
L	40 - 58 mm
RW	0.18 - 0.42 g/mm
RD	0.55 - 0.61
PMD	0.82 - 0.90
RSH	0.05 - 0.11

Periostracum straw-coloured, thin and translucent (Macpherson, 1959).

Habitat and Habits: In 18 to 60 m.

Discussion: *C. rufimaculosus* cannot be mistaken for any of its congeners from the Indian and Pacific Ocean.

Map 67



1: *C. monile* 2: *C. rufimaculosus* 3: *C. sculletti*

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***Conus sculletti* MARSH, 1962**

(Plate 33, Figures 27-29; Map 67)

1962 *Conus (Leptoconus) sculletti* Marsh, J. Malac. Soc. Australia, 6: 42, pl. 4 figs. 3, 4

Type: Holotype in AMS (39 x 19.5 mm).

Type Locality: "off Cape Moreton, South Queensland."

Range: S. Queensland to N. New South Wales.

Description: Medium-sized, moderately light to moderately solid. Last whorl conical, outline slightly concave. Shoulder sharply angulate to carinate. Spire low, outline concave to straight. Larval shell of 1.75-2.25 whorls, maximum diameter 1.4-1.5 mm. Teleoconch sutural ramps slightly concave, with pronounced radial threads and some-

times weak spiral striae adaxially. Last whorl sometimes with a few very weak spiral grooves near base.

***C. sculletti* Shell Morphometry**

L	38 - 49 mm
RW	0.08 - 0.16 g/mm (L 38-45 mm)
RD	0.50 - 0.58
PMD	0.95 - 1.00
RSH	0.06 - 0.12

Ground colour white, sometimes suffused with very pale violet or pink. Last whorl with brown spots and flecks and axial streaks and blotches, fusing into a variable number of spiral bands, usually on basal third, just above centre and on adapical third. Larval whorls grade from beige to brown. Postnuclear sutural ramps with irregularly arranged brown radial markings. Aperture cream, pink or brown.

Habitat and Habits: In 20-160 m.

Discussion: *C. sculletti* cannot be mistaken for any of its congeners.

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***Conus ammiralis* LINNÉ, 1758**

(Plate 34, Figures 1-11; Plate 81, Second row, right, Third row, left; Map 68)

- 1758 *Conus ammiralis* Linné, Syst. Nat., 10 ed., 1: 713, no. 257
- 1758 *Conus ammiralis summus* Linné, Syst. Nat., 10 ed., 1: 713, no. 257 β
- 1758 *Conus ammiralis ordinarius* Linné, Syst. Nat., 10 ed., 1: 714, no. 257 γ
- 1758 *Conus ammiralis occidentalis* Linné, Syst. Nat., 10 ed., 1: 714, no. 257 δ
- 1767 *Conus vicarius* Linné, Syst. Nat. 12 ed., 1: 1167, no. 299
- 1786 *Conus architalassus* [Lightfoot], Cat. Portland Mus.: 189, no. 4017
- 1791 *Conus ammiralis larvatus* Gmelin, Syst. Nat., 13 ed., 1: 3378
- 1791 *Conus ammiralis coronatus* Gmelin, Syst. Nat., 13 ed., 1: 3379 (non *C. coronatus* Gmelin, 1791)
- 1792 *Conus ammiralis archithalassus* Hwass in Bruguière, Encycl. Méth., 1: 659, no. 57 var. F
- 1792 *Conus ammiralis extraordinarius* Hwass in Bruguière, Encycl. Méth., 1: 659, no. 57 var. C
- 1792 *Conus ammiralis palinurus* Hwass in Bruguière, Encycl. Méth., 1: 659, no. 57 var. D
- 1792 *Conus ammiralis personatus* Hwass in Bruguière, Encycl. Méth., 1: 660, no. 57 var. H
- 1792 *Conus ammiralis polyzonus* Hwass in Bruguière, Encycl. Méth., 1: 659, no. 57 var. B
- 1798 *Cucullus equestris* Röding, Mus. Bolten., 2: 46, no. 578/[79] (non *C. equestris* Röding, 2: 38)
- 1798 *Cucullus petreus* Röding, Mus. Bolten., 2: 39, no. 485/15

- 1798 *Cucullus princeps* Röding, Mus. Bolten., 2: 45, no. 573/[79] (non *C. princeps* Linné, 1758)
- 1798 *Cucullus summus* Röding, Mus. Bolten., 2: 45, no. 572/[78] (non *C. a. summus* Linné)
- 1798 *Cucullus torquatus* Röding, Mus. Bolten., 2: 45, no. 577/[79] (non *C. torquatus* (Röding), 2: 38)
- 1810 *Conus vicarius* Lamarck, Ann. Mus. Hist. Nat. Paris, 15: 274 (non *C. vicarius* Linné, 1767, non *C. vicarius* (Röding, 1798))
- 1818 *Conus pseudocodonulli* Blainville, Dict. Sci. Nat., 10: 248
- 1822 *Conus ammiralis* var. *amboinensis* Donovan, Natur. Repos., 1: pl. 1 fig. 1
- 1829 *Conus blainvillii* Vignard, Descr. Côte Nouveau: 3-8, figs.
- 1930 *Leptoconus ammiralis temnes* Iredale, Mem. Queensland Mus., 10: 79-80
- 1937 *Conus ammiralis* var. *australis* "Lamarck" Dautzenberg, Mém. Mus. Roy. Hist. Nat. Belgique, 2 (18): 18-19 (non *C. australis* Holten, 1802)
- 1937 *Conus textile* var. *abbreviata* (nom. nov. for *C. vicarius* Lamarck) Dautzenberg, Mém. Mus. Roy. Hist. Nat. Belgique, 2 (18): 255-257
- 1937 *Conus ammiralis* var. *crebremaculata* Dautzenberg, Mém. Mus. Roy. Hist. Nat. Belgique, 2 (18): 19
- 1937 *Conus ammiralis* var. *donovani* Dautzenberg, Mém. Mus. Roy. Hist. Nat. Belgique, 2 (18): 20 (nom. nov. for *C. a. var. amboinensis* Donovan)
- 1987 *Conus hereditarius* da Motta, La Conchiglia, 19 (218-219): 27-28, figs.

Types: *C. ammiralis*: Lectotype (Kohn, 1963) in LSL (72 x 40 mm); *C. a. summus*: Lectotype (Kohn, 1992) figured in Rumphius (1705: Pl. 34 fig. B) (45 x 24 mm); *C. a. ordinarius*: Lectotype (Kohn, 1992) figured in Rumphius (1705: Pl. 34 fig. C) (78 x 40 mm); *C. a. occidentalis*: Lectotype (Kohn, 1992) figured in Rumphius (1705: Pl. 34 fig. D) (58 x 30 mm); *C. vicarius*: Lectotype (Kohn, 1964) figured in d'Argenville (1742: Pl. 15 fig. H) (55 x 25 mm); *C. architalassus*: Lectotype (Kohn, 1964) figured in d'Argenville (1757: Appendix, Pl. 1 fig. M) (48 x 24 mm); *C. a. larvatus*: Holotype figured in Martini (1773: Pl. 57 fig. 635a) (35 x 21 mm); *C. a. coronatus*: Lectotype (Walls, [1979]) figured in Martini (1773: vignette 26), same specimen as lectotype of *C. architalassus*; *C. a. archithalassus*: Lectotype (Kohn, 1968 as "holotype", (Walls, [1979]) in MHNG (42 x 21 mm); *C. a. extraordinarius*: Lectotype (Walls, [1979]) figured in Tableau (1798: Pl. 328 fig. 9) (50 x 25 mm); *C. a. personatus*: Lectotype (Kohn, 1968 as "holotype") in MHNG (38.5 x 21.5 mm); *C. princeps*: Lectotype (Kohn, 1975) figured in Knorr (1764: Pl. 8 fig. 2) (44 x 22 mm); *C. petreus*: Lectotype (Kohn, 1975) same as lectotype of *C. a. coronatus*; *C. princeps*: Lectotype (Kohn, 1975) figured in Knorr (1764: Pl. 8 fig. 2); *C. summus* (Röding): Lectotype (Kohn, 1975) figured in Chemnitz (1788: Pl. 141 fig. 1307) (44 x 24 mm); *C. torquatus*: Lectotype (Kohn, 1975) figured in Favanne & Favanne (1780: Pl. 17 fig. I⁴) (45 x 25 mm); *C. vicarius* Lamarck: Holotype in MHNG (45 x 24 mm); *C. a. var. amboinensis*: Lectotype (Coomans et al., 1980) figured in Donovan (1822: Pl. 1 fig. 1) (68 x 34 mm); *C. blainvillii*: Lectotype (Coomans et al., 1982) figured in Vignard (1829: figure) (63 x 31 mm); *L. a. temnes*: Holotype in AMS (64 x 22.5 mm); *C. a. var. australis*: Lectotype (Coomans et al., 1981) in IRSN (66 x 31 mm); *C. a. var. crebremaculata*: Lectotype ([Walls, 1979], Coomans et al., 1985a) figured in Chemnitz (1788: Pl. 141 fig. 1309) (65 x 37 mm); *C. a. var. donovani*: Holotype (Coomans et al., 1985b) figured in Donovan (1822, as *C. ammiralis* var. *amboinensis* β , pl. 1 fig. 2) (39 x 17 mm); *C. hereditarius*: Holotype in MHNG (34.5 x 23 mm).

Type Localities: *C. a. ammiralis*: "Moluccan Islands" (Coomans et al., 1980); *C. vicarius*: "Mers d'Asie?"; *C. a. var. amboinensis*: "Amboyna"; *C. blainvillii*: "les mers de la Chine"; "Conducia Bay, Mozambique" (Coomans et al., 1982); *L. a. temnes*: "North-west Isle, Capricorn Group"; *C. a. var. australis*: "Moluques"; *C. a. var. crebremaculata*: "Ostindische Meere" (Chemnitz); *C. a. var. donovani*: "Amboyna"; *C. hereditarius*: "Raya Island, off Phuket in the coast of Thailand, Andaman Sea."

Range: *C. a. ammiralis*: E. Thailand to N. W. Australia; Japan to Marshall Is., Fiji, New Caledonia to Queensland; *C. a. pseudocodonulli*: Mozambique to Kenya and Seychelles, a disjunct population in W. Thailand.

Description: Medium-sized to large, moderately solid to heavy; relative weight of similarly sized specimens may vary by 50%. Last whorl conical to ventricosely conical; outline variably convex at adapical fourth and almost straight below, sometimes slightly concave centrally. Shoulder angulate, smooth in *C. a. ammiralis* (Pl. 34, Figs. 1-7), except weakly tuberculate in specimens with granulate ribs on last whorl (form *architalassus*; Pl. 34, Fig. 6); shoulder prominently tuberculate in *C. a. pseudocodonulli* (Pl. 34, Figs. 8-11). Spire of low to moderate height, outline straight to concave. Maximum diameter of larval shell about 0.9 mm. About first 4 postnuclear whorls weakly tuberculate (*C. a. ammiralis*) or all whorls tuberculate (*C. a. pseudocodonulli*). Teleoconch sutural ramps flat to slightly concave, with 1 increasing to 4-6 fine spiral grooves, replaced by many spiral striae in last 3 whorls. Last whorl usually with closely spaced weak to obsolete spiral ribs near base; some populations of *C. a. ammiralis* (e.g. Moluccas; Solomon Is.) include granulate specimens (form *architalassus*).

C. ammiralis Shell Morphometry

	<i>C. a. ammiralis</i>	<i>C. a. pseudocodonulli</i>
L	50 - 97 mm	35 - 65 mm
RW	0.40 - 1.00 g/mm (L 50-84 mm)	0.15 - 0.35 g/mm
RD	0.51 - 0.66	0.57 - 0.66
PMD	0.81 - 0.92	0.74 - 0.88
RSH	0.10 - 0.18	0.12 - 0.20

Ground colour white. Last whorl with 2-6 variably broad pale orange to dark brown spiral bands, containing dark spiral as well as axial lines and interrupted by small to large white tents that may fuse to some extent. Below shoulder, at base and between colour bands, fine yellow to tan lines form a delicate network with fewer large white tents. Pattern occurs in varied designs. Larval whorls pink. Early postnuclear sutural ramps usually eroded, grading from pink to white, sometimes with brown dots at outer margins. Late ramps with light to dark brown radial blotches containing darker radial lines. Aperture white, occasionally orange-brown deep within.

Periostracum light brown, thin, translucent, and smooth.

Dorsum of foot white, mottled with brown and with a median black blotch at anterior end. Anterior edge of foot orange-red, posterior edge orange, sides black; black lateral bands across dorsum posteriorly. Sole of foot solid tan or white, mottled with brown; pedal mucus gland bordered by vermilion. Rostrum white grading to tan near tentacles; proboscis white, posteriorly yellow to orange-red anteriorly. Tentacles white, tipped with orange-red and with a black spot dorsally at base. Siphon white, orange-red distally, with a black band about 1/3 the length from the tip; proximal portion transversely mottled with brown, darker dorsally (Pearson, unpubl. observ.; Kohn, unpubl. observ.; Estival, unpubl. observ.).

Radular teeth with 2 adapical barbs and a long serration that ends in a cusp (Endean & Rudkin, 1965).

Habitat and Habits: *C. a. ammiralis* in 2-240 m, ranging as deep as 50-150 m in Queensland, 20-240 m in Philippines. Reported from fine to coarse sand and muddy sand, often beneath rocks and sometimes among algae. *C. a. pseudocedonulli* slightly subtidal to about 50 m, in similar habitats (da Motta, 1987; Grosch, pers. comm., 1989).

C. ammiralis is molluscivorous, known to feed on Strombidae. It is preyed upon by *C. marmoreus* (Endean & Rudkin, 1965; Loch, pers. comm., 1987).

Egg diameter of 331 μ m suggests a minimum pelagic period of 12 days (Perron & Kohn, 1985).

Discussion: *C. ammiralis* is so distinctive that it cannot be confused with any of its congeners. We agree with Coomans et al. (1982) that *C. pseudocedonulli* is best considered a geographic subspecies of *C. ammiralis*, occurring throughout the Indian Ocean as far east as W. Thailand. Although Richard (1982, 1990) and da Motta and Lenavat (1979) recorded *C. a. ammiralis* from W. Thailand, da Motta later (1987: p. 28) noted that it does not occur there: "The nearest colony of *ammiralis* [to W. Thailand] is located off Songklha inside the Gulf of Thailand." Thus the

Malayan Peninsula appears to be the distributional boundary between the two subspecies.

C. a. temnes (Pl. 34, Fig. 3) is based on East Australian shells from deeper water that cannot be separated by any constant difference. *C. architalassus* (Pl. 34, Fig. 6) (synonyms are *C. a. archithalassus* and *C. a. coronatus*) refers to granulose specimens of *C. a. ammiralis*. The variability of *C. ammiralis* in colour pattern explains the long list of synonyms.

C. hereditarius from W. Thailand agrees with *C. a. pseudocedonulli* from the W. Indian Ocean except for slightly smaller size. We therefore include this nominal species in *C. a. pseudocedonulli*.

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Conus thomae GMELIN, 1791

(Plate 34, Figures 12-15; Map 68)

1791 *Conus thomae* Gmelin, Syst. Nat., 13 ed., 1: 3394, no. 70

1792 *Conus omaicus* Hwass in Bruguière, Encycl. Méth., 1: 714-715, no. 111

1891 *Conus jousseaumei* Couturier, J. Conchyl. (Paris), 39: 212-214, pl. 4 fig. 1

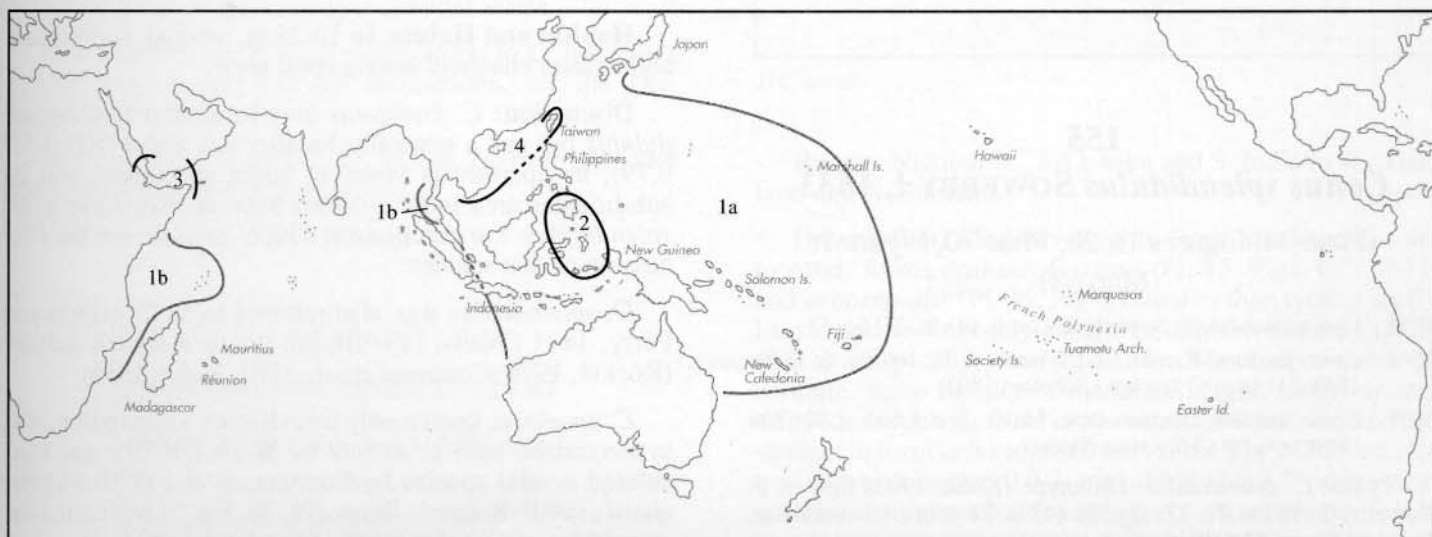
Types: *C. thomae*: Lectotype (Kohn, 1966) figured in Chemnitz (1788: Pl. 138 fig. 1331²) (66 x 35 mm); *C. omaicus*: Lectotype (Kohn, 1968 as "holotype", Walls, [1979]) in MNHG (64.5 x 30.5 mm); *C. jousseaumei*: Original figure 69 x 30 mm.

Type Localities: *C. thomae*: "in Mari Indico"; *C. omaicus*: "l'Isle d'Oma"; *C. jousseaumei*: "Ile d'Oma, dans l'Archipel des Moluques."

Range: Moluccas and southern parts of Philippines.

Description: Moderately large to large, moderately solid to solid. Last whorl conical, outline almost evenly straight or convex below shoulder. Shoulder angulate. Spire

Map 68



1a: *C. ammiralis ammiralis* 1b: *C. ammiralis pseudocedonulli* 2: *C. thomae* 3: *C. splendidulus* 4: *C. ciderryi*

of low to moderate height, outline nearly straight; late whorls often stepped. Larval shell of 2-2.25 whorls, maximum diameter 0.9-1 mm. About first 5 postnuclear whorls weakly tuberculate. Teleoconch sutural ramps flat to concave, with 2-3 very weak spiral grooves in early whorls. Last whorl with obsolete spiral ribs at base.

C. thomae Shell Morphometry

L	55 - 97 mm
RW	0.25 - 0.60 g/mm (L 55-85 mm)
RD	0.49 - 0.54
PMD	0.86 - 0.94
RSH	0.09 - 0.15

Ground colour white. Last whorl usually with 3 broad, solid or interrupted brown spiral bands, below shoulder, above centre and within basal third, and with numerous spiral rows of similarly coloured dots, spots and dashes from base to shoulder. Pattern may produce zones with a fine to coarse brown network; brown dashes sometimes alternate with white dots; brown blotches rarely axially instead of spirally arranged. Larval whorls light brown. Early postnuclear sutural ramps brown; late ramps white, with brown radial streaks and blotches that extend across outer margins. Aperture white.

Periostracum yellowish grey, thin, translucent, and smooth.

Habitat and Habits: In 150-250 m.

Discussion: *C. thomae* can only be confused with *C. thalassiarachus*; for the distinctions, see the Discussion of the latter species.

Although the holotype is lost, *C. jousseaumei* is generally considered as an exceptional variant of *C. thomae*. According to the original figure and description, it differs in its undulate later postnuclear whorls and its yellowish orange colour, with closely spaced darker spiral lines and a paler central band on the last whorl.

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Conus splendidulus SOWERBY I, 1833

(Plate 34, Figures 16-20; Plate 70, Figure 7; Map 68)

- 1833 *Conus splendidulus* Sowerby I, Conch. Ill.: Pt. 37, fig. 53
 1845 *Conus fasciatus* Kiener, Coq. Vivant., 2: Pl. 109 fig. 2; 1848-1849: 311 (non *C. fasciatus* Schröter, 1803)
 1937 *Conus anadema* Tomlin, Proc. Malac. Soc. London, 22: 206 (nom. nov. for *C. fasciatus* Kiener)

Types: *C. splendidulus*: Lectotype (Kohn, 1992) figured in Sowerby I (1833: Pt. 37, fig. 53) (43 x 24 mm); *C. anadema*: Original figure 42 x 20 mm.

Type Localities: *C. splendidulus*: "Indian Ocean" (Sowerby, 1858).

Range: Aden and N. Somalia.

Description: Medium-sized to moderately large, solid. Last whorl conical, outline almost straight. Shoulder angulate. Spire of low to moderate height, may be stepped in later whorls; outline concave to almost straight. Teleoconch sutural ramps flat to concave, occasionally with 3-5 weak spiral grooves in late whorls. Last whorl with a few obsolete spiral ribs at base.

C. splendidulus Shell Morphometry

L	48 - 70 mm
RW	0.30 - 0.78 g/mm
RD	0.58 - 0.68
PMD	0.85 - 0.96
RSH	0.09 - 0.20

Ground colour white. Last whorl with a variably broad light to dark brown spiral band on each side of centre and axial streaks or flames; a third often interrupted colour band may occur below shoulder. Coarse or fine darker spiral lines extend from base to shoulder, but vary in number and arrangement. Shells that have only axial flames intergrade with shells that have last whorl largely brown and only with spiral pattern elements. Somalian specimens (form *anadema*; Pl. 34, Figs. 19, 20) characterized by a yellowish brown to orange, predominantly spirally arranged pattern. Base yellowish brown to brown. Larval whorls beige to brown. Postnuclear sutural ramps with brown radial streaks and blotches that extend over outer margins. Aperture white.

Periostracum beige, thin, translucent, and smooth.

Radular teeth long and narrow, with a weak adapical barb opposite an obsolete blade; a long serration of spiny denticles extends down the shaft to about 1/4 the length above base.

Habitat and Habits: In 10-25 m, on mud, coral rubble and in sand channels among coral reefs.

Discussion: *C. fumigatus* may be similar to *C. splendidulus* but has a generally broader last whorl (RD 0.57-0.79), its aperture is violet in larger specimens, and its subshoulder area lacks a colour band as may occur in *C. splendidulus*. For comparison with *C. amadis*, see the Discussion of that species.

C. splendidulus was also referred to as *C. argillaceus* Perry, 1811 (Walls, [1979]), but this is a *nomen dubium* (Röckel, 1979; Coomans et al., 1981; Kohn, 1986).

C. anadema, known only from Kiener's illustration, was synonymized with *C. monile* by Walls ([1979]) and considered a valid species by Coomans et al. (1980) and Richard (1990). Kiener's figure (Pl. 70, Fig. 7) represents the population of *C. splendidulus* from Somalia.

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Conus ciderryi DA MOTTA, 1985

(Plate 34, Figures 22-25; Map 68)

1985 *Conus ciderryi* da Motta, Publ. Ocas. Soc. Portuguesa Malac., 4: 4-5, pl. 1 figs. 3a, b

Type: Holotype in MHNG (31 x 14.5 mm).

Type Locality: "Strait of Taiwan."

Range: Taiwan and Vietnam.

Description: Moderately small to medium-sized, moderately light to moderately solid. Last whorl conical, outline almost straight. Shoulder angulate, undulate or weakly tuberculate. Spire of low to moderate height, outline concave. Larval shell of 2-2.25 whorls, maximum diameter about 0.8 mm. First 4-5 postnuclear whorls tuberculate, following whorls undulate. Teleoconch sutural ramps flat, with 1-2 increasing to 2-5 spiral grooves, with additional striae in last whorls. Last whorl with rather widely spaced spiral grooves on basal half, more narrowly spaced near base.

C. ciderryi Shell Morphometry

L	30 - 42 mm
RW	0.08 - 0.12 g/mm
RD	0.50 - 0.63
PMD	0.95 - 0.97
RSH	0.08 - 0.24

Ground colour white, occasionally suffused with pale violet. Entire last whorl with spiral rows of alternating yellowish brown or pink and white bars, squarish spots and dots; an orangish violet spiral band or a spiral row of yellowish brown to brown flecks may occur on each side of centre. Larval whorls white. Postnuclear sutural ramps with yellowish to orangish brown radial streaks that extend over outer margins. Aperture white.

Habitat and Habits: Deeper subtidal zones.

Discussion: *C. ciderryi* is most similar to *C. inscriptus* and *C. moluccensis*. For the distinctions, see the Discussions of those species.

Specimens from Vietnam (Pl. 34, Fig. 24) have a broader last whorl and a dark-coloured base.

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Conus amadis GMELIN, 1791

(Plate 35, Figures 1-13, Map 69)

1791 *Conus amadis* Gmelin, Syst. Nat., 13 ed., 1: 3388, no. 32

1792 *Conus amadis* Hwass in Bruguière, Encycl. Méth., 1: 689-690, no. 78

1798 *Cucullus venustus* Röding, Mus. Bolten., 2: 47, no. 599/94

1937 *Conus amadis* var. *aurantia* "Lamarck" Dautzenberg, Mém. Mus. Roy. Hist. Nat. Belgique, 22 (18): 14-15

1937 *Conus amadis* var. *castaneofasciata* "Sowerby" Dautzenberg, Mém. Mus. Roy. Hist. Nat. Belgique, 2 (18): 15

1942 *Conus subacutus* Fenaux, Bull. Inst. Océan. (Monaco), 814: 4, fig. 10

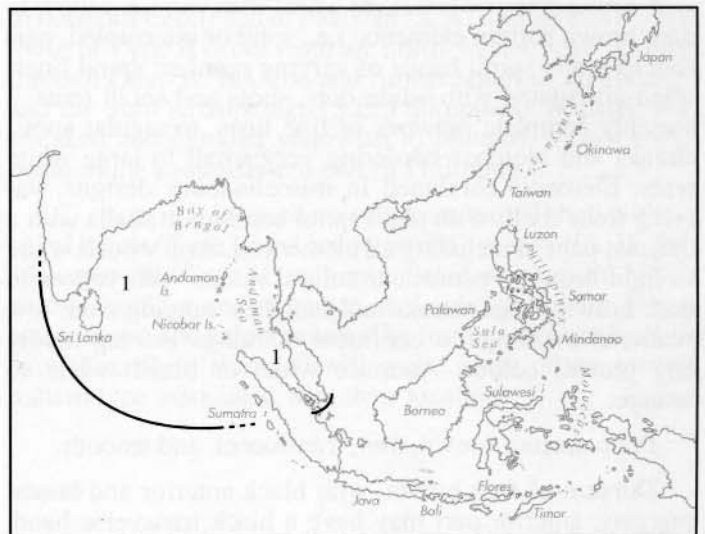
1978 *Conus arbornatalis* da Motta, Centre Thai Nat. Study: 7, 5, textfigs., Addenda

?1980 *Conus (Leptoconus) lozeti* Richard, Cahiers de l'Indo-Pacifique, 2 (1): 91-95, figs.

Types: *C. amadis* Gmelin: Lectotype (Kohn, 1966) in ZMUC (78 x 41 mm); *C. amadis* Hwass: Lectotype (Kohn, 1968) in MHNG (85 x 46 mm); *C. a.* var. *aurantia*: Lectotype (Coomans et al., 1981) figured in Knorr (1772: Pl. 5 fig. 3) (71 x 33 mm); *C. a.* var. *castaneofasciata*: Lectotype (Coomans et al., 1983) in MHNG (80 x 40.5 mm); *C. arbornatalis*: Holotype in MHNG (64 x 30 mm); *C. lozeti*: Holotype in MNHN (56 x 30 mm).

Type Localities: *C. amadis* Gmelin: "Rameswaram, India" (Coomans et al., 1980); *C. amadis* Hwass: "aux isles de Java et de Borneo"; *C. arbornatalis*: "off the coastal waters arching from Ranong S.W. Thailand toward Bangladesh in the Bay of Bengal"; *C. lozeti*: "Fort-Dauphin au sud-est de Madagascar."

Map 69



1: *C. amadis*

Range: Nicobar Is., Sri Lanka and S. India to W. Thailand and N. Sumatra.

Description: Medium-sized to large, moderately solid to solid; forms *castaneofasciata* (Pl. 35, Figs. 6, 7, 9-11) and *arbornatalis* (Pl. 35, Fig. 8) smaller than typical shells. Last whorl ventricosely conical or conical; outline slightly convex adapically, straight below. Shoulder angulate to carinate. Spire usually of moderate height, often variably stepped, to high in form *arbornatalis*; outline concave, to straight in form *arbornatalis*. Larval shell of 2-2.25 whorls, maximum diameter 0.9-1 mm. First 3.5-5.5 postnuclear whorls tuberculate, following whorls often carinate. Teleoconch sutural ramps concave, with 0 increasing to 5-6 spiral

grooves and additional striae in late whorls. Last whorl with distinct to obsolete punctate spiral grooves from base to centre or beyond, separated by ribs at base and by ribbons above.

***C. amadis* Shell Morphometry**

L	
- India	50 - 110 mm
- Andaman Sea	40 - 90 mm
- <i>C. lozeti</i>	56 mm
RW	
- India	0.25 - 0.66 g/mm
- Andaman Sea	0.10 - 0.24 g/mm (L 40-70 mm)
RD	
- India	0.54 - 0.70
- Andaman Sea	0.51 - 0.60
- <i>C. lozeti</i>	0.62
PMD	
- <i>C. lozeti</i>	0.78 - 0.90
RSH	
- form <i>arbornatalis</i>	up to 0.33
- <i>C. lozeti</i>	0.12

Ground colour white. Last whorl with various yellow to dark brown pattern elements: i.e., solid or interrupted, narrow to broad spiral bands of varying number; spiral lines, often articulated with white dots, spots and small tents; a variably complete network of fine lines, triangular spots, streaks and blotches bordering very small to large white tents. Elements combined in miscellaneous designs, varying from shells with plain spiral banding to shells with a delicate pattern including all elements. Larval whorls white to light brown. Postnuclear sutural ramps with yellow to dark brown radial streaks and blotches, ranging from few scattered markings to confluent markings leaving hardly any ground colour. Aperture white or bluish white to orange.

Periostracum brown, thin, translucent, and smooth.

Dorsum of foot brown, with black anterior and lateral margins; anterior part may have a black transverse band. Sole of foot reddish brown, with buff anterior and lateral edges. Siphon broad and flat, nearly white or reddish brown, with a grey transverse stripe near tip; some specimens have tan transverse lines (Kohn, 1978a & unpubl. observ.).

Radular teeth with 2 opposite adapical barbs and a fine, long serration that ends in a cusp, basal spur absent (Peile, 1939; Nybakken, 1990).

Habitat and Habits: Reported from intertidal mudflats to about 18 m, in sand (S. E. India: Satyamurti, 1952; Kohn, 1978a). Form *arbornatalis* in 70-110 m. *C. lozeti*: In 100-120 m on coral sand. *C. amadis* feeds on molluscs.

Discussion: *C. amadis* resembles *C. locumtenens*, *C. splendidulus*, and *C. thalassiararchus*. For comparison with the last species, see its Discussion. *C. locumtenens* is a somewhat smaller species without spiral grooves on post-

nuclear sutural ramps, with a reticulate colour pattern on the entire last whorl, without spiral lines and with brown or violet-brown deep within its aperture. *C. splendidulus* can be distinguished by its often heavier (RW to ca. 0.78) and less ventricose shell without pronounced spiral grooves on the sutural ramps. Its spire whorls are not carinate, its pattern lacks tents and the colour of its base is darker than that of the adjacent area.

C. arbornatalis is an ecological variant from deeper water than other forms, that has a higher spire. Dautzenberg's variety names apply to colour forms: var. *aurantia* to yellow shells and var. *castaneofasciata* to shells from the Andaman Sea that are brown except for 1-2 lighter, reticulated spiral bands, at centre and sometimes below shoulder. The latter shells differ from those from India and Sri Lanka by their smaller size, somewhat narrower last whorl, and by their generally more homogeneous colour pattern.

C. lozeti is known only from its holotype (Pl. 35, Figs. 12, 13). It differs from typical *C. amadis* mainly in the presence of a strong dentiform plate at the basal part of the columella. It has also a slightly lower spire, is shaded with rose on the last whorl and within the aperture, and its teleoconch sutural ramps lack spiral grooves. Because of the similarities to *C. amadis* in shell morphometry and pattern we cannot exclude that the type specimen of *C. lozeti* is an aberrant shell of the latter species. We therefore provisionally assign *C. lozeti* to *C. amadis*.

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***Conus thalassiararchus* SOWERBY I, 1834**

(Plate 35, Figs. 14-21, Map 70)

- 1834 *Conus thalassiararchus* Sowerby I, Conch. Ill.: Pt. 56, figs. 80, 85
- 1842 *Conus castrensis* Gould, Boston J. Nat. Hist., 4 (1): back cover; 1843: Proc. Boston Soc. Nat. Hist., 1: 138
- 1899 *Conus mariei* Jousseaume, Le Naturaliste, 21 (Sér. 2, année 13): 8, fig.
- 1972 *Conus thalassiararchus* var. *depriesteri* Wils et al., Fam. Conidae: 73, no. 121
- 1972 *Conus thalassiararchus* var. *azona* Wils et al., Fam. Conidae: 73, no. 123, pl. 13 fig. 2
- 1972 *Conus thalassiararchus* var. *elevata* Wils et al., Fam. Conidae: 73, no. 123, pl. 13 fig. 3
- 1979 *Conus (Lectoconus) thalassiararchus* forma *ikatt* Shikama, Sci. Rep. Yokosuka City Mus., 26: 4, pl. 1 figs. 11-12

Types: *C. thalassiararchus*: Lectotype (Kohn, 1992) figured in Sowerby (1834: Pt. 56 fig. 80) (41 x 21 mm); *C. castrensis*: Type 75 x 38 mm acc. Gould; lectotype (Johnson, 1964) in MCZ (42.5 x 23.5 mm); *C. mariei*: Holotype in MNHN (47 x 24 mm); *C. t.* var. *azona*: Specimen on which variety is based in ZMA (52 x 25 mm); *C. t.* var. *depriesteri*: Specimen on which variety is based in ZMA (64 x 35 mm); *C. t.* var. *elevata*: Specimen figured in ZMA 60 x 32 mm; *C. t. f. ikatt*: Original figure 59 x 31.5 mm.

Type Localities: *C. thalassiarthus*: "Luzon, Philippines" (Sowerby, 1857); *C. t.* var. *azona*: "Siasi-Sulu, zuidelijke Filippijnen"; *C. t.* var. *elevata*: "zuidelijk Cebu en N. W.-Negros op de Filippijnen"; *C. t.* f. *ikatt*: "Off Zamboanga, Mindanao Island, Philippines."

Range: Philippines; Mindoro Strait eastward to Sorsogon and southward to Sulu Archipelago.

Description: Medium-sized to large, moderately solid to moderately heavy. Last whorl conical, sometimes narrowly conical; outline variably convex at adapical fourth, straight below, sometimes concave centrally. Shoulder angulate, anal notch very deep. Spire of low to moderate height; outline almost straight with gradually rising whorls, to deeply concave, with a conoid apex projecting from an otherwise nearly flat spire. Larval shell of about 2.25 whorls, maximum diameter 0.8-0.9 mm. First 3-5 postnuclear whorls weakly tuberculate. Teleoconch sutural ramps flat to slightly concave, with a few weak to obsolete spiral grooves on middle ramps. Last whorl with weak spiral ribs at base.

C. thalassiarthus Shell Morphometry

L	45 - 115 mm
RW	0.20 - 0.95 (L 45-105 mm)
RD	0.47 - 0.63
PMD	0.87 - 0.97
RSH	0.02 - 0.15

Ground colour white to pinkish cream, sometimes suffused with blue in specimens with dark patterns. Last whorl with a generally reticulate but highly variable pattern of yellowish to blackish brown. Colour pattern variants can be grouped into 2 main types:

Type I (Pl. 35, Figs. 15, 17): Brown to blackish brown lines and triangular spots form an irregular coarse to fine and variably complete network, varying from heavily developed to isolated lines and spots. Spiral rows of similarly coloured dots and dashes may be present but vary in number and arrangement. Pattern elements may be concentrated in 2 spiral bands, above and below centre. Base white with overlying network, to solid bluish or blackish brown.

Type II (Pl. 35, Figs. 14, 16, 18-21): Shells with complete orange or yellowish brown network intergrade with shells with scattered axial lines and few to numerous spiral rows of dots. Pattern often concentrated in spiral bands; variably numerous yellow to light brown spiral lines and bands may also be present. In some specimens, reticulate pattern replaced by streaks, clouds and patches, either forming a coarse meshwork or fusing into confluent spiral zones. Base yellowish brown to dark bluish brown. Pl. 35, Fig. 18 shows a shell intermediate between these two types.

Larval whorls white to brown. Postnuclear sutural ramps with scattered to numerous radial lines, streaks or blotches.

Aperture white to bluish white or cream, varying within a population.

Periostracum olive, thin, translucent, and smooth except for radial ridges on sutural ramps.

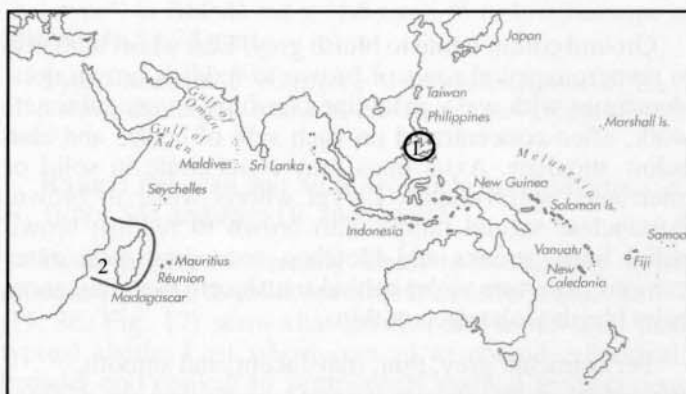
Habitat and Habits: Shallow water. Egg diameter of 602 μ m suggests benthic development (Perron & Kohn, 1985).

Discussion: *C. thalassiarthus* resembles *C. thomae* and some shells of *C. amadis*. *C. thomae* can be distinguished by its less deep anal notch, coarser spire pattern of large blotches, and by the primarily spiral arrangement of its last whorl pattern that has only sparse reticulated lines and no axial lines. Its last whorl is often narrower (RD 0.49-0.54). Its spire consistently has gradually rising whorls, a straight outline, and it may be stepped, while the spire of *C. thalassiarthus* predominantly has a projecting apex and a concave outline and is not stepped. The periostracum is distinctly thinner and more translucent in *C. thomae*. *C. amadis* has a generally broader and more ventricose last whorl, its spire is higher and has gradually rising whorls, and its sutural ramps bear distinct spiral grooves.

C. thalassiarthus exhibits a considerable variation in colour pattern that can be to some extent associated with the geographical occurrence: Shells of pattern Type I are known from the north-eastern parts of the range (Sorsogon to northern Cebu) and in Palawan (S.W. Philippines), while those of Type II occur from the north-western part (Coron) through Cuyo Is. to Cebu and further south to Zamboanga and the Sulu Archipelago (S.E. Philippines). In particular, streaked and clouded yellowish to orangish brown shells occur in the south-eastern part of Philippines.

C. castrensis is based on a dark-patterned shell without spiral bands (Type I); the holotype of *C. mariei* (Pl. 35, Fig. 14) represents Type II, with reticulated white spiral bands, below shoulder and at centre, and solid yellowish brown bands above and below centre. The forms described by Wils as well as form *ikatt* fall within the range of the general pattern type associated with their localities.

Map 70



1: *C. thalassiarthus* 2: *C. iodostoma*

***Conus iodostoma* REEVE, 1843**

(Plate 35, Figures 22-25; Map 70)

- 1843 *Conus iodostoma* Reeve, Proc. Zool. Soc. London, **11**: 170; Conch. Icon., **1**, *Conus*: Pl. 28 sp. 159
- 1845 *Conus rosaceus* Kiener, Coq. Vivant., **2**: Pl. 107 fig. 4; 1849: 265-266 (non *C. rosaceus* Dillwyn, 1817, non *C. rosaceus* Sowerby I, 1834)
- 1849 *Conus kieneri* Reeve, Conch. Icon., **1**: *Conus* suppl.: Pl. 9 sp. 282a
- 1876 *Conus superscriptus* Sowerby III, Proc. Zool. Soc. London, **1876**: 753, pl. 75 fig. 6
- 1913 *Conus hedgesi* Sowerby III, Ann. Mag. Nat. Hist., **11**: 558-559, pl. 9 fig. 4

Types: *C. iodostoma*: Holotype in BMNH (42 x 20 mm); *C. rosaceus*: Original figure 28 x 13 mm; *Conus kieneri*: Original figure 28 x 14 mm; *C. superscriptus*: Original figure 27 x 15 mm; *C. hedgesi*: Holotype in BMNH (32 x 16.5 mm).

Type Localities: *C. superscriptus*: "Madagascar."

Range: Mozambique and Madagascar.

Description: Moderately small to medium-sized, moderately light to moderately solid. Last whorl conical or ventricosely conical; outline convex at adapical third, less so or straight below; left side often slightly concave above base. Shoulder subangulate. Spire of moderate height, outline concave. Larval shell of 2-2.25 whorls, maximum diameter 0.8-1 mm. Teleoconch sutural ramps flat, with 2 increasing to 4-5 spiral grooves. Last whorl with rather widely spaced punctate spiral grooves from base to centre or slightly beyond; grooves wider and interstitial ribbons grading to ribs at anterior end.

***C. iodostoma* Shell Morphometry**

L	28 - 42 mm
RW	0.08 - 0.16 g/mm
RD	0.55 - 0.65
PMD	0.80 - 0.95
RSH	0.13 - 0.21

Ground colour white to bluish grey. Last whorl with few to numerous spiral rows of brown to reddish-brown dots; sometimes with wavy axial lines forming an irregular network, often concentrated on each side of centre and also below shoulder. Axial lines may concentrate in solid or interrupted spiral bands. Larval whorls white to brown. Postnuclear sutural ramps with brown to reddish brown radial lines, streaks and blotches, extending over outer margins. Aperture violet behind translucent marginal zone, paler bluish violet deep within.

Periostracum grey, thin, translucent, and smooth.

Habitat and Habits: Intertidal to 20 m or more; in sheltered bays on soft substratum (Grosch, pers. comm., 1989).

Discussion: *C. iodostoma* resembles *C. inscriptus*, *C. neptunus*, and light-coloured *C. lienardi*. The latter two species can be distinguished by their narrower last whorls ($RD < 0.55$), tuberculate early postnuclear whorls and angulate shoulders; *C. neptunus*, moreover, is a distinctly larger species. For the distinction from *C. inscriptus*, see the Discussion of that species.

***Conus nobilis* LINNÉ, 1758**

(Plate 36, Figures 1-11; Map 71)

- 1758 *Conus nobilis* Linné, Syst. Nat., 10 ed., **1**: 714, no. 259
- 1842 *Conus victor* Broderip, Proc. Zool. Soc. London, **1842**: 54-55
- 1982 *Conus skinneri* da Motta, Publ. Ocas. Soc. Portuguesa Malac., **1**: 8-10, figs. 8a, b
- 1991 *Eugeniconus friedae* da Motta, La Conchiglia, **22** (258): 12-15, text figs.
- 1993 *Conus nobilis renatae*: Cailliez, La Conchiglia, **25** (267): 51-54, text figs. 1, 4, 5, 8

Types: *C. nobilis*: Lectotype (Kohn, 1963, as "holotype"; Walls, [1979]) in LSL (41.5 x 20 mm); *C. victor*: Syntype in BMNH (32 x 16 mm); *C. skinneri*: Holotype in MHNG (50.5 x 26 mm); *E. friedae*: Holotype in MHNG (51.5 x 25.5 mm); *C. n. renatae*: Holotype in ZMA (40 x 21 mm).

Type Localities: *C. skinneri*: "off Nusa Tenggara on the east coast of Bali, Indonesia"; *E. friedae*: "Dutch Bay Piont, northwest of Colombo, Sri Lanka."; *C. n. renatae*: "Jolly Boy Isl. eastern beach, between Red Skin Isl. and the northern part of Rutland Isl. (Andaman Isl.)."

Range: Andaman and Nicobar Is., Sri Lanka, Sumatra and Java to N. Timor Sea.

Description: Moderately small to moderately large, moderately solid to solid; specimens of *C. n. victor* (Pl. 36, Figs. 7, 8) smaller than those of other subspecies. Last whorl conical, occasionally narrowly conical or approaching conoid-cylindrical; outline slightly convex at adapical fourth, straight below. Shoulder carinate. Spire low, outline variably concave to slightly sigmoid; apex may project from an otherwise almost flat spire. Larval shell of about 2 whorls; maximum diameter about 0.7-0.8 mm. Later postnuclear whorls carinate. Teleoconch sutural ramps flat, slightly concave in late whorls, with pronounced axial threads; 5 increasing to 10-14 equidistant and evenly fine spiral grooves on late ramps. Last whorl with variably spaced weak spiral grooves on basal third, separating ribs near anterior end and ribbons above.

Ground colour white. Last whorl with a variable yellowish to dark brown pattern of reticulations and spiral bands; variation associated with geographic distribution. Forms with an almost regular network and rather sparse brown spots to blotches intergrade with forms with sparsely interrupted to continuous brown spiral bands separating 3-4 zones where white tents concentrate, at base, centre and below shoulder. Brown areas with prominent spiral rows of alternating darker brown and white, mainly axial dashes and

dots. White markings range from very small tents to small blotches and are consistently edged with darker brown toward the outer lip. Base pale violet. Larval shell pale pink, darker pink posteriorly. Early teleoconch sutural ramps pink to orange. Late sutural ramps with yellowish to dark brown radial streaks and blotches coalescing with last whorl pattern and containing fine darker radial lines. Aperture white, suffused with pale violet or pale brown.

C. nobilis Shell Morphometry

L	30 - 71 mm
- <i>C. n. victor</i>	25 - 49 mm
- <i>C. n. friedae</i>	34 - 53 mm
RW	0.10 - 0.51 g/mm
RD	0.47 - 0.57
PMD	0.84 - 0.92
- <i>C. n. friedae</i>	0.84 - 0.86
RSH	0.01 - 0.12

Periostracum yellowish grey, very thin, translucent, smooth (*C. n. skinneri*).

In *C. n. skinneri*, dorsum of foot brown, grading to cream posteriorly; anterior part with cream radial streaks, central part with scattered cream spots, and posterior part with sparse brown radial markings. Rostrum and tentacles cream. Siphon with a brown base followed distally by narrow cream, broad black and broad cream transverse bands and a pink margin (R. Wittig-Skinner, pers. comm.).

Radular teeth with a laterally inflated adapical barb opposite a minute barb; serration central waist and basal spur present (Nybakken, 1990, as *C. victor*).

Habitat and Habits: In 1-20 m; on sand bottom with Foraminifera, where water is clear and with slight currents; also found on mud.

Discussion: *C. nobilis* is very similar to *C. cordigera* and *C. marchionatus*; for distinctions, see the Discussions of those species.

Several geographic forms of *C. nobilis* differing mainly in their colour patterns may be ranked as subspecies (Cailliez & Finet, pers. comm., 1992; Cailliez, 1993):

1. *C. n. nobilis* (Pl. 36, Figs. 1, 2) from Java and S.E. Sumatra; its colour pattern is yellowish to dark brown, has large white tents or blotches and sparse brown spots or flecks ranging from a rather regular network to concentrations of white markings adapically, centrally and basally.

2. *C. n. friedae* (Pl. 36, Figs. 10, 11) from Sri Lanka. Its last whorl colour pattern is a rather fine brown network bordering white dots to medium-sized tents that tend to be edged with darker brown toward the outer lip. The brown pattern concentrates in 3 spiral bands, near centre and in their abapical and adapical thirds. The bands often contain spiral rows of white dots alternating with dark brown dots and axial dashes.

3. *C. n. skinneri* (Pl. 36, Figs. 4-6) from Bali to Sumatra; its colour pattern is mid-brown to dark brown, with 3-4 spiral zones of fairly small and regularly arranged white tents and interrupted to solid brown spiral bands between; the spiral rows of alternating dark brown and white markings are rather continuous and as prominent as in *C. n. victor*. *C. n. skinneri* and *C. n. victor* differ in the morphology of both the penis and the radular sac (Cailliez & Finet, pers. comm., 1992). Slightly different shells labelled as coming from the Moluccas are preserved in old collections; they have broader spiral zones of white tents below the shoulder and at the centre.

4. *C. n. victor* (Pl. 36, Figs. 7, 8) is a somewhat smaller form from Komodo Id. to Lombok Id., Flores and N. Timor Sea; its colour pattern is light to orangish brown and includes a rather solid broad spiral band above and below centre with pronounced continuous spiral rows of alternating darker brown and white markings.

5. *C. n. renatae* (Pl. 36, Fig. 9) from the Andaman and Nicobar Is. shows a fairly regular light to dark brown network with rather large white tents or blotches and rather few brown blotches; the spiral rows of alternating darker brown and white markings are sparse and highly interrupted.

6. A single shell from N.W. Sumatra (Pl. 36, Fig. 3) has a mid-brown, regularly reticulated pattern with concentrations of brown triangular flecks within adapical as well as basal third; the spiral rows of alternating dark brown and white markings are prominent but highly interrupted.

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Conus cordigera SOWERBY II, 1866

(Plate 36, Figures 12-17; Map 71)

1866 *Conus cordigera* Sowerby II, Thes. Conch., 3, appendix: 329, no. 437, pl. 21 fig. 498 (as *C. nobilis*)

1984 *Conus bitleri* da Motta, La Conchiglia, 16 (178-179): 24, figs. 1a, b

Types: *C. cordigera*: Lectotype (Coomans et al., 1985a, as "holotype") in BMNH (62 x 31.5 mm); *C. bitleri*: Holotype in MHNG (41.5 x 25 mm).

Type Localities: *C. cordigera*: "Philippines, Moluccas, etc."; *C. bitleri*: "Baliungan Island in the Tawi Tawi group, Celebes Sea."

Range: Palawan and Sulu Archipelago (Philippines) to N. Timor Sea and Java (E. Indonesia).

Description: Moderately small to moderately large, moderately solid to solid; specimens described as *C. bitleri* (Pl. 36, Fig. 17) somewhat smaller and more solid than typical shells. Last whorl conical to conoid-cylindrical, broader and conical to ventricosely conical in specimens described as *C. bitleri*; outline convex at adapical fourth, less so or straight below. Shoulder angulate. Spire low, outline concave; apex may project from an otherwise flat

spire. Larval shell of about 2 whorls; maximum diameter 0.6-0.7 mm. First 4-6 postnuclear whorls weakly tuberculate. Teleoconch sutural ramps flat, slightly concave in late whorls, with prominent axial threads; 4-6 major spiral grooves on late ramps, sometimes weaker and often containing spiral threads in latest whorls. Last whorl with variably wide spiral grooves on basal third or somewhat beyond, separating ribs and ribbons.

***C. cordigera* Shell Morphometry**

L	35 - 72 mm
- form <i>bitleri</i>	30 - 43 mm
RW	0.13 - 0.42 g/mm (L 35-60 mm)
- form <i>bitleri</i>	0.22 - 0.32 g/mm (L 30-36 mm)
RD	0.50 - 0.58
- form <i>bitleri</i>	0.59 - 0.68
PMD	0.82 - 0.90
RSH	0.01 - 0.11
- form <i>bitleri</i>	0.05 - 0.13

Last whorl with a light yellowish brown to brown network of coarse lines and blotches, edging rather large white tents and flecks sometimes with darker outlining toward outer lip. Pattern often concentrates into adapical and abapical brown spiral bands. Shells with regularly reticulate pattern intergrade with shells with prominent spiral colour bands and with shells with a reduced network and large, often confluent white markings (described as *C. bitleri*; Pl. 36, Fig.17). Apex white. Later sutural ramps with radial lines, streaks or blotches coalescing with last whorl pattern and of the same colour. Aperture white.

Habitat and Habits: Intertidal to 20 m; on sand or mud.

Discussion: *C. cordigera* closely resembles *C. nobilis*. The latter species differs mainly in its non-tuberculate early and carinate later postnuclear whorls, and its coarse alter-

nating brown and white spiral lines within the larger solid brown areas of its last whorl. For comparison with *C. marchionatus*, see the Discussion of that species.

Whether specimens from the Sulu Archipelago, described as *C. bitleri*, represent a form of sympatric *C. cordigera* or a separate species, can only be decided on the basis of reliable data on their anatomy. In Balabac, Palawan, typical specimens of *C. cordigera* intergrade with specimens of *C. bitleri*.

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***Conus marchionatus* HINDS, 1843**

(Plate 36, Figures 18-20; Map 71)

- 1843 *Conus marchionatus* Hinds, Ann. Mag. Nat. Hist., **11**: 256
 1854 *Conus caelatus* A. Adams, Proc. Zool. Soc. London, **21**: 217
 1883 *Conus marchionatus* var. *eudoxus* "Melvill" Tryon, Man. Conch., **6**: 10, pl. 27 fig. 3

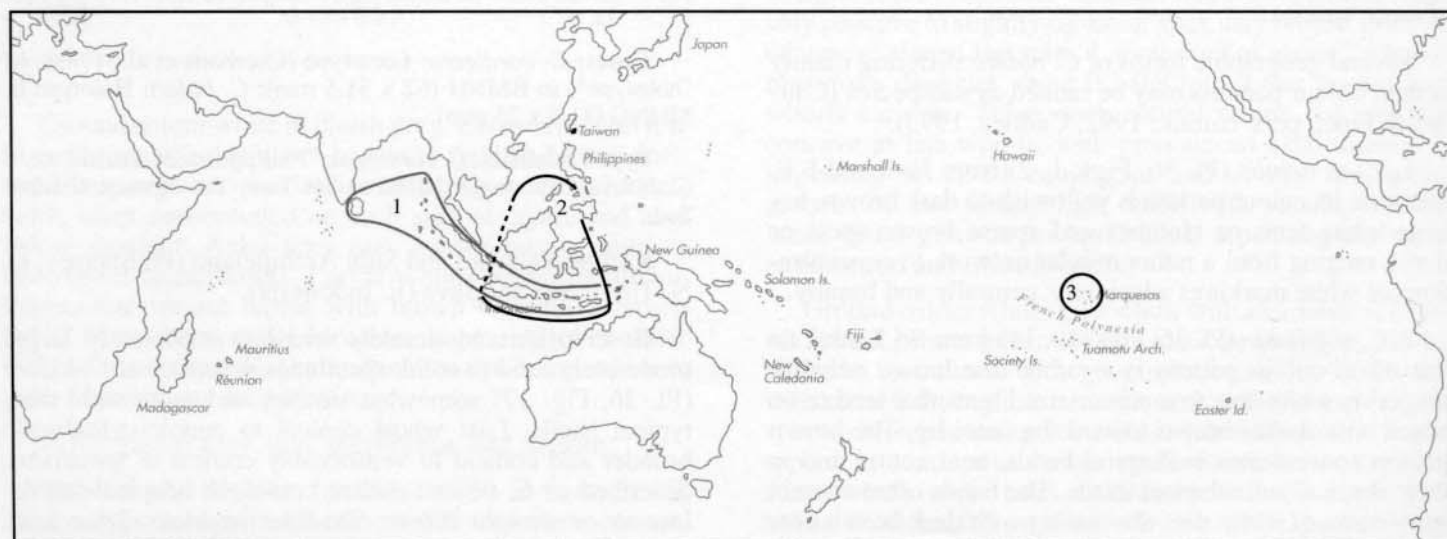
Types: *C. marchionatus*: Type "16 lines" (= 34 mm) acc. Hinds; *C. caelatus*: Lectotype (Coomans et al., 1983) in BMNH (12 x 6 mm); *C. m.* var. *eudoxus*: Holotype in NMWC (61 x 37 mm).

Type Localities: *C. marchionatus*: "Port Anna Maria, Nuhiviva, Marquesas"; *C. caelatus*: "Chinese Seas."

Range: Marquesas.

Description: Moderately small to moderately large, moderately solid to solid. Last whorl conical, outline variably convex at adapical third and straight below. Shoulder carinate. Spire low, outline concave. Larval shell of about 2.0-2.25 whorls; maximum diameter 0.7-0.9 mm. First 4-6 postnuclear whorls distinctly tuberculate, later whorls sharply angulate to carinate. Teleoconch sutural ramps flat, variably concave in late whorls, with strong axial threads; 3 increasing to 5 wide spiral grooves separated by raised

Map 71



1: *C. nobilis* 2: *C. cordigera* 3: *C. marchionatus*

ribs on late ramps; the grooves contain spiral threads in latest whorls. Last whorl with variably spaced weak spiral grooves on basal third, separating ribs basally and a few ribbons above.

C. marchionatus Shell Morphometry

L	25 - 68 mm
RW	0.10 - 0.65 g/mm
RD	0.60 - 0.67
PMD	0.88 - 0.90
RSH	0.02 - 0.12

Ground colour white. Last whorl with a rather regular network of reddish brown or sometimes yellow lines and triangular to rhomboid spots, edging larger sometimes confluent white tents and rhomboid flecks. Pattern may concentrate in 2 spiral bands, within adapical and abapical thirds. Apex white to violet, with white larval whorls. Late sutural ramps with reddish brown or yellow radial lines and streaks. Aperture white, sometimes suffused with pale violet.

Periostracum greyish yellow, very thin, translucent, smooth.

Habitat and Habits: In 12-40 m; on sand.

Discussion: *C. marchionatus* is very close to *C. cordigera*; both have been synonymized with *C. nobilis*. Typical shells of *C. cordigera* have narrower last whorls (RD 0.50-0.58), while shells of form *bitleri* have similarly broad but more ventricose last whorls (PMD 0.83-0.90). The shoulder is not carinate but angulate in *C. cordigera*, and its colour pattern yellowish brown to brown instead of primarily reddish brown. These differences as well as the widely disjunct ranges suggest separation at species level. A 2-million-year-old fossil from Fiji very similar to *C. cordigera* supports the close relationship (Kohn, unpubl. observ.).

C. nobilis differs from *C. marchionatus* in its narrower last whorl (RD 0.47-0.57), its non-tuberculate early postnuclear whorls, and its dark coloured base. It can also be distinguished by the very fine darker axial lines and the coarse alternating brown and white spiral lines within the colour zones of its last whorl.

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Conus jickelii WEINKAUFF, 1873

(Plate 36, Figures 21-28; Map 72)

?1798 *Cucullus quadratus* Röding, Mus. Bolten., 2: 42, no. 511/35

1873 *Conus jickelii* Weinkauff, Syst. Conch. Cab. Martini Chemnitz, 4 (2), 1, *Conus*: 206-207, pl. 32 figs. 11, 12

Types: *C. jickelii*: Lectotype (Röckel & Moolenbeek, 1992) in ZMB (50.5 x 27 mm); *C. quadratus*: Lectotype (Kohn, 1975) in ZMUC (33.5 x 17 mm).

Type Localities: *C. quadratus*: "Rothen Meere"; *C. jickelii*: "Dahlak."

Range: S. Red Sea and Gulf of Aden.

Description: Medium-sized and moderately solid. Last whorl conical to ventricosely conical; outline slightly to moderately convex at adapical fourth or third, usually straight below. Aperture somewhat wider at base than near shoulder. Shoulder angulate to subangulate. Spire of low to moderate height, outline concave. Larval shell of 2-2.25 whorls, maximum diameter 0.7-0.8 mm. Teleoconch sutural ramps flat to slightly concave adaxially, with 1 increasing to 3-4 major spiral grooves, containing spiral striae and threads that may produce 5-7 unequal grooves in last 2 whorls. Last whorl with variably wide spiral grooves near base, separating ribs anteriorly and a few ribbons posteriorly.

C. jickelii Shell Morphometry

L	35 - 51 mm
RW	0.15 - 0.25 g/mm
RD	0.58 - 0.64
PMD	0.83 - 0.89
RSH	0.09 - 0.16

Ground colour white to bluish grey. Entire last whorl with spiral rows of dark reddish or bluish brown dots, dashes, squarish spots and bars that fuse into flames and irregular blotches below shoulder and within adapical as well as abapical third. Larval whorls grey to brown; about 2 adjacent postnuclear sutural ramps brown. Late ramps with radial streaks, flames and blotches, matching last whorl pattern in colour. Aperture almost white to pale blue deep within, often with a yellow or brownish violet collabral band behind the translucent marginal zone.

Periostracum grey to brown, translucent, smooth.

Habitat and Habits: In 1-25 m.

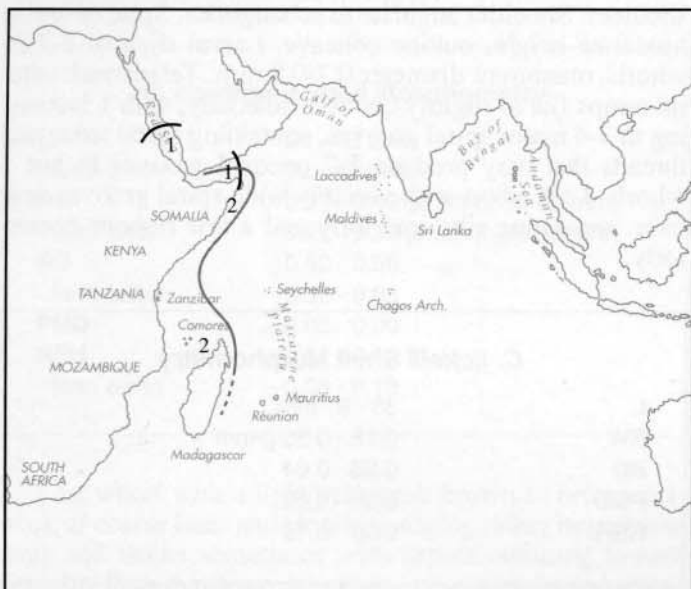
Discussion: *C. jickelii* resembles *C. angioiorum*, *C. erythraeensis*, *C. nigromaculatus*, and *C. inscriptus*; for the distinctions, see the Discussions of those species.

The form from Djibouti (Pl. 36, Figs. 22, 23, 25, 26) differs from the lectotype of *C. jickelii* (Pl. 36, Fig. 21) in its somewhat broader last whorl (RD 0.60-0.64 vs. 0.58), lower spire (RSH 0.09-0.13 vs. 0.16), and its angulate rather than subangulate shoulder.

C. quadratus (Pl. 36, Figs. 27, 28) refers to a single shell from the Arabian coast of the Red Sea ("Arabia Felix", Forsskål expedition 1761-1767) that cannot be separated from *C. jickelii* by shape, sculpture, colouration or pattern. It is smaller and might be a subadult. We provisionally assign it to *C. jickelii*. Although *C. quadratus* is the older name, there are still doubts whether both names apply to the same species or not. Moreover, the name *C. quadratus* cannot be applied to *C. jickelii* because it would be an unused senior synonym of that species. *C. jickelii* also

resembles the shells of an unnamed *Conus* population sympatric with typical *C. jickelii* in the Dahlak Archipelago (see Röckel & Moolenbeek, 1992); for the distinctions, see Appendix 2, no. 33 (Pl. 73, Figs. 19-21).

Map 72



1: *C. jickelii* 2: *C. angioiorum*

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Conus angioiorum RÖCKEL & MOOLENBEEK, 1992

(Plate 37, Figures 1-4; Map 72)

1992 *Conus angioiorum* Röckel & Moolenbeek, Acta Conchyl., 3: 46, pl. 5 figs. 12-18

Type: Holotype in SMNS (35 x 17.5 mm).

Type Locality: "Djibouti."

Range: Djibouti; probably Eritrea, Kenya and Madagascar.

Description: Moderately small to medium-sized, moderately solid. Last whorl ventricosely conical to conical; outline convex at adapical third, less so to straight below. Aperture somewhat wider at base than near shoulder. Shoulder subangulate to angulate. Spire of low to moderate height, outline concave. Larval shell of 1.75-2.25 whorls, maximum diameter about 0.8 mm. Teleoconch sutural ramps flat to slightly concave adaxially, with 0-1 increasing to 4-6 spiral grooves and additional spiral striae. Last whorl with variably wide spiral grooves basally, separating spiral ribs at base and ribbons above.

Ground colour white. Last whorl with variably arranged, well-separated spiral rows of rarely confluent brown dots and spots. Larval whorls white to beige. Postnuclear sutural

ramps with sparse brown radial markings. Aperture white, sometimes pale yellow.

C. angioiorum Shell Morphometry

L	26 - 45 mm
RW	0.11 - 0.20 (L 26-36 mm)
RD	0.56 - 0.64
PMD	0.79 - 0.87
RSH	0.09 - 0.17

Periostracum greyish brown, thin translucent, and smooth.

Habitat and Habits: To 30 m, on sand.

Discussion: *C. angioiorum* resembles *C. jickelii* from Djibouti. Shells of the latter attain somewhat larger size than sympatric *C. angioiorum*, have a pattern of larger, more confluent and darker brown markings, a yellow or brownish violet collabral band within the aperture, and a brown apex; their last whorls are less ventricose and more straight-sided. For comparison with *C. erythraeensis*, see the Discussion of that species.

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Conus erythraeensis REEVE, 1843

(Plate 37, Figures 5-19; Map 73)

- 1843 *Conus erythraeensis* Reeve, Conch. Icon., 1, *Conus*: Pl. 24 sp. 137
- 1843 *Conus piperatus* Reeve, Proc. Zool. Soc. London, 11: 175; 1844: Conch. Icon., 1, *Conus*: Pl. 43 sp. 230 (non *C. piperatus* Dillwyn, 1817)
- 1849 *Conus dillwynii* Reeve, Conch. Icon., 1, *Conus* suppl.: 2 (nom. nov. for *C. piperatus* Reeve)
- 1849 *Conus induratus* Reeve, Conch. Icon. 1, *Conus* suppl.: Pl. 7 sp. 268
- 1858 *Conus adustus* Sowerby II, Thes. Conch., 3: 25, no. 204, pl. 17 fig. 403
- 1858 *Conus hamilli* Crosse, Rev. Mag. Zool., (2) 10: 122 (nom. nov. for *C. piperatus* Reeve)
- 1860 *Conus couderti* Bernardi, J. Conchyl. (Paris), 8: 212, pl. 4 figs. 3, 4
- 1866 *Conus quadratomaculatus* Sowerby II, Thes. Conch., 3 suppl.: 328, pl. 27 (288) figs. 637, 638
- 1873 *Conus erythraeensis* Weinkauff, Syst. Conch. Cab. Martini Chemnitz, 4 (2), 1, *Conus*: 186-187, pl. 27 figs. 4-8

Types: *C. erythraeensis* Reeve: Lectotype (Coomans et al., 1986) in ZMUC (24.5 x 16.5 mm); *C. dillwynii*: Lectotype (Röckel & Moolenbeek, 1992) in BMNH (27.5 x 15 mm); *C. induratus*: Lectotype (Röckel & Moolenbeek, 1992) figured in Reeve (1849: Suppl., pl. 7 sp. 268) (21 x 10.5 mm); *C. adustus*: Lectotype (Coomans et al., 1979b) in BMNH (24 x 14 mm); *C. couderti*: Original figure 25 x 14 mm; *C. quadratomaculatus*: Holotype in BMNH (20.5 x 11.5 mm); *C. erythraeensis* Wein-

kauff: Lectotype (Röckel & Moolenbeek, 1992) figured in Wein-kauff (1873: Pl.27 fig. 5) (25 x 15 mm).

Type Localities: *C. induratus*: "Red Sea"; *C. adustus*: "Red Sea."

Range: Central and S. Red Sea; Aden to Kuria-Muria Is., Oman.

Description: Small to moderately small, usually moderately light to moderately solid; shells from Port Sudan somewhat lighter than shells from other localities. Last whorl conical to broadly or ventricosely conical; outline convex at adapical fourth to two-thirds, straight below; left side may be concave near base. Shoulder angulate. Spire low to high, outline concave to almost straight. Larval shell of about 2 whorls, maximum diameter 0.6-0.8 mm. Teleoconch sutural ramps flat to slightly concave adaxially, with 1-2 increasing to 3-4 or sometimes 5-6 spiral grooves. Last whorl with variably wide spiral grooves toward base; ribbons between narrow or grading to ribs at base.

C. erythraeensis Shell Morphometry

L	16 - 35 mm
RW	0.05 - 0.15 (L 16-31 mm)
RD	0.60 - 0.75
PMD	0.80 - 0.90
RSH	0.09 - 0.26

Ground colour white to bluish white. Last whorl with spiral rows of light reddish or dark brown dots, spots or bars that may fuse into flecks, axial blotches and spiral bands, below shoulder, within adapical and abapical third. Larval whorls white to brown; about 2 adjacent postnuclear sutural ramps of the same colour. Following sutural ramps variably maculated with light to dark brown radial streaks, spots or blotches. Aperture brown, white, violet or brownish violet, sometimes brown only deep within.

In the form from Massawa (see Discussion), radular teeth with an adapical barb opposite a blade; serration extending from the posterior end of the barb along the blade, with a cusp a short distance posterior to the row of denticles; shaft waisted centrally; base with a spur (Rolán & G. Raybaudi, in press). Very similar teeth were found in *C. erythraeensis* from Port Sudan (Bandel, 1984).

Habitat and Habits: Shallow water, to about 15 m. Shells from the Arabian coast from Jeddah to N. Yemen "in very quiet shallow lagoons, in sand and amongst eel-grass roots" (Sharabati, 1984).

Discussion: *C. erythraeensis* is similar to *C. jickelii*, *C. angioiorum*, and *C. nigromaculatus*. *C. jickelii* grows larger (50 mm vs. 35 mm), has a generally narrower last whorl, (RD 0.58-0.64), and a generally lower spire (RSH 0.09-0.16); its spiral rows of brown markings are arranged in groups rather than evenly distributed over the last whorl,

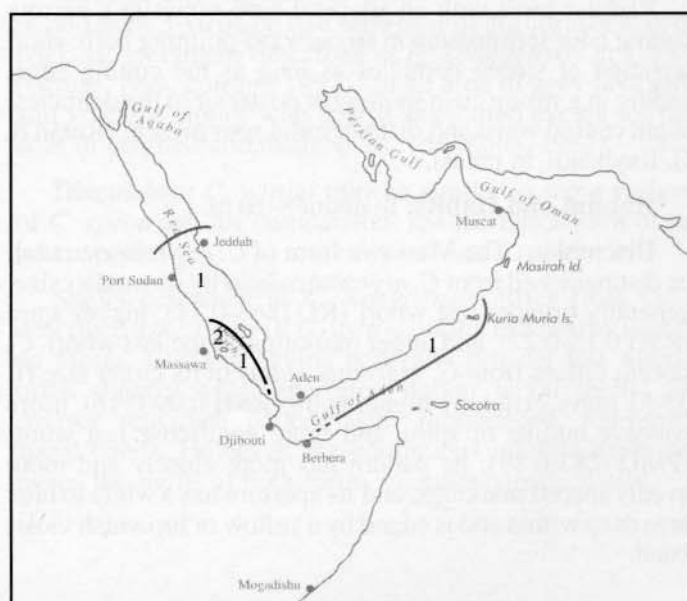
and the markings are larger. *C. angioiorum* also attains larger size and has a generally narrower last whorl (RD 0.56-0.64), its shoulder is subangulate, and the spiral rows of brown markings on its last whorl are also arranged in groups rather than being evenly distributed. For comparison with *C. nigromaculatus*, see the Discussion of that species.

Shells almost identical to the lectotype of *C. erythraeensis* (Pl. 37, Fig. 5) occur along the coast of Eritrea and in the Dahlak Archipelago (Pl. 37, Figs. 8, 9). *C. adustus* (Pl. 37, fig. 7), *C. couderti*, and *C. quadratomaculatus* (Pl. 37, Fig. 6) refer to colour variants probably from this area. *C. induratus* as represented by Reeve's original figure (Pl. 37, Fig. 13) is nearly identical to a local form of *C. erythraeensis* from Port Sudan (Pl. 37, Fig. 14); shells of this form are somewhat less solid than those of the other forms and have a pale blue ground colour.

Shells described as *C. dillwynii* (Pl. 37, Figs. 16, 17) may belong to a *C. erythraeensis* population living from Jeddah southwards to Yemen (Pl. 37, Figs. 18, 19); they differ from the type specimens of *C. dillwynii* only in a slightly more concave spire outline, slightly more convex outline of the last whorl and somewhat more pronounced spiral grooves on the sutural ramps. Specimens attain adult length of 24-35 mm (types of *C. dillwynii*: 27-31 mm; range of *C. erythraeensis*: 16-29 mm) and cannot be separated from *C. erythraeensis* at the species level.

Unnamed local forms of *C. erythraeensis* are known from Aden and from Massawa, Eritrea (Pl. 37, Figs. 11, 12). Shells from the former area have somewhat narrower last whorls than those of the typical Eritrean form (RD 0.63-0.67 vs. 0.65-0.75), while specimens from Massawa reach only 16-24 mm in length (vs. 20-28 mm in typical Eritrean form), have beige to brown apices, and their apertures are white or light brown deep within. Shell morphometry (RD 0.63-0.71; PMD 0.85-0.89; RSH 0.13-0.22), sculpture and colour pattern favour their inclusion in *C. erythraeensis*.

Map 73



1: *C. erythraeensis* 2: *C. nigromaculatus*

***Conus nigromaculatus* RÖCKEL &
MOOLENBEEK, 1992**

(Plate 37, Figures 20-23; Map 73)

1992 *Conus nigromaculatus* Röckel & Moolenbeek, Acta Conchyl., 3: 46-47, pl. 5 figs. 19-25

Type: Holotype in SMNS (32 x 18 mm).

Type Locality: "Ras Andade, Dahlak Archipelago."

Range: Eritrea and Dahlak Archipelago.

Description: Moderately small, moderately light to moderately solid. Last whorl conical; outline slightly convex at adapical fourth, straight below; left side may be slightly concave toward base. Shoulder angulate. Spire low, outline straight or slightly concave. Teleoconch sutural ramps flat to slightly concave, with 3-6 shallow but wide spiral grooves in late whorls. Last whorl with a few variably wide spiral grooves abapically, separating ribs at base and ribbons above.

Ground colour white. Last whorl with spiral rows of widely spaced, blackish brown squarish or circular spots that are sometimes confluent. Postnuclear sutural ramps with widely spaced dark brown radial markings. Aperture white, usually yellow to orange deep within.

***C. nigromaculatus* Shell Morphometry:**

L	28 - 35 mm
RW	0.07 - 0.13 g/mm
RD	0.59 - 0.66
PMD	0.88 - 0.91
RSH	0.07 - 0.10

Periostracum pale grey, thin, translucent, and smooth.

Radular teeth with an adapical barb opposite a narrow cutting edge terminating in an outward-pointing barb; short serration of strong denticles as long as the cutting edge, ending in a strong cusp somewhat posterior to the denticles; slight central waist and distinct basal spur present (Rolán & G. Raybaudi, in press).

Habitat and Habits: In about 8-10 m.

Discussion: The Massawa form of *C. erythraeensis* can be distinguished from *C. nigromaculatus* by its smaller size, generally broader last whorl (RD 0.63-0.71), higher spire (RSH 0.13-0.22), and larger markings on the last whorl. *C. jickelii* differs from *C. nigromaculatus* in its larger size (L 35-51 mm), generally higher spire (RSH 0.09-0.16), more concave outline of spire, and more ventricose last whorl (PMD 0.83-0.89); its pattern has more closely and more evenly spaced markings, and its aperture has a white to blue area deep within and is edged by a yellow or brownish violet band.

***Conus blanfordianus* CROSSE, 1867**

(Plate 37, Figures 24-29; Map 74)

1867 *Conus blanfordianus* Crosse, J. Conchyl. (Paris), 15: 66-68, pl. 2 fig. 1

Type: Original figure 36 x 19 mm.

Type Locality: Not stated.

Range: Philippines and Papua New Guinea.

Description: Light-coloured form (see Discussion) moderately small, moderately light to moderately solid. Last whorl conoid-cylindrical to ventricosely conical; outline convex at adapical third, less so below; left side convex near base. Aperture wider below centre than near shoulder. Shoulder angulate to subangulate. Spire of low to moderate height, outline deeply concave. Teleoconch sutural ramps flat, with 1-2 increasing to 4 wide spiral grooves. Last whorl with axially striate spiral grooves from base to centre; intervening ribbons grade to ribs near base.

Dark-coloured form (see Discussion) medium sized and moderately solid. Last whorl more conical than in other form. Shoulder angulate. Spire of moderate height; outline concave, with late spire whorls more raised than in light-coloured form. Larval shell of 2 or more whorls, maximum diameter about 0.8 mm. Teleoconch sutural ramps with 1 increasing to 6-8 spiral grooves; ribs between variably broad. Last whorl with spiral grooves to centre or shoulder; intervening ribbons grade to ribs below shoulder.

***C. blanfordianus* Shell Morphometry**

	Light-coloured form	Dark-coloured form
L	26 - 34 mm	35 - 50 mm
RW	0.07 - 0.13 g/mm	0.11 - 0.20 g/mm
RD	0.58 - 0.63	0.56 - 0.61
PMD	0.75 - 0.77	0.79 - 0.83
RSH	0.08 - 0.16	0.13 - 0.17

Ground colour white. In light-coloured shells, last whorl with about 15 spiral rows of brown spots that may fuse axially; markings somewhat concentrated below shoulder, and on each side of centre. Larval whorls and adjacent postnuclear sutural ramps white. Following ramps with brown radial markings. Aperture white.

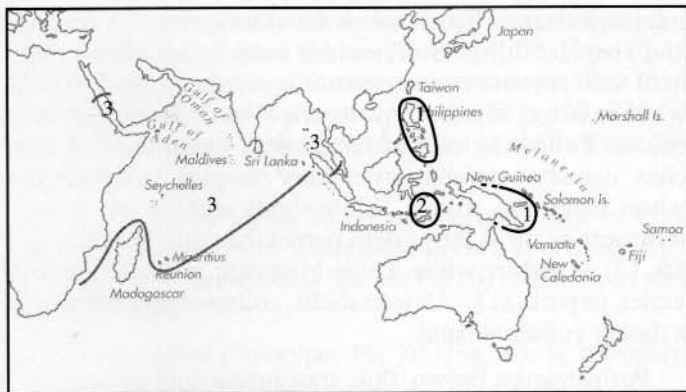
In dark-coloured shells, spiral rows consists of larger dark brown spots and bars; markings sparse within a spiral band below centre. Additional fine brown dots and axial dashes on subcentral band and sometimes at shoulder. Larval whorls and adjacent postnuclear sutural ramps white to light brown. Radial markings on following ramps large and dark brown. Aperture white, becoming orange deep within in large specimens.

Habitat and Habits: Reported from 20- 100 m.

Discussion: *C. blanfordianus* resembles *C. collisus*, *C. spectrum*, and *C. jickelii*. The latter species has a more conical last whorl (PMD 0.83-0.89) and its aperture is narrower, of more uniform width. For comparison with *C. collisus* and *C. spectrum*, see the Discussions of those species.

The holotype of *C. blanfordianus* is lost. The specimen figured by Coomans et al. (1982) does not appear to be conspecific with the specimen depicted by Crosse. Two groups of shells correspond to Crosse's original figure (Pl. 37, Fig. 29): Moderately small and light shells from Papua New Guinea and Philippines (Pl. 37, Figs. 26-28) and medium sized shells with darker and coarser pattern from Philippines (Pl. 37, Figs. 24, 25). Which of these forms is more similar to the type of *C. blanfordianus* cannot be unequivocally decided by the original figure. It is uncertain as well, whether both forms belong to the same species or not. The smaller shells are in better accordance with Crosse's original description; therefore, we assign the larger shells only provisionally to *C. blanfordianus*. The latter shells are very similar to *C. zapatosensis*; for comparison, see the discussion of the latter species.

Map 74



1: *C. blanfordianus* 2: *C. wittigi* 3: *C. inscriptus*

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Conus wittigi WALLS, 1977

(Plate 37, Figures 30-33; Map 74)

1977 *Conus wittigi* Walls, The Pariah, 1: 1, 3 (figs.)

1984 *Conus kongaensis* da Motta, La Conchiglia, 16 (182-183): 8-9, text figs.

Types: *C. wittigi*: Holotype in DMNH (32 x 15 mm); *C. kongaensis*: Holotype in MHNG (36.5 x 19.5 mm).

Type Localities: *C. wittigi*: "Lesser Sunda Islands north of Timor"; *C. kongaensis*: "Easternmost island called Konga off Laran Tuka, S. E. Flores in Banda Sea, Indonesia."

Range: Lesser Sunda Islands, N. of Timor; Flores.

Description: Moderately small to medium-sized, generally moderately light. Last whorl ventricosely conical to conoid-cylindrical; outline slightly convex at adapical two-thirds, straight below; left side may be sigmoid. Aperture wider at base than near shoulder. Shoulder angulate. Spire of low to moderate height, outline concave. Larval shell of 2.25-2.5 whorls, maximum diameter 0.8-0.9 mm. Teleoconch sutural ramps flat, with 1 increasing to 3-4 major spiral grooves. Basal third to half of last whorl with wide spiral grooves at base and narrow grooves above; ribbons between grade to ribs at anterior end.

C. wittigi Shell Morphometry

L	26 - 42 mm
RW	0.08 - 0.13 g/mm
RD	0.56 - 0.62
PMD	0.80 - 0.86
RSH	0.07 - 0.17

Ground colour white. Last whorl with yellow to red-brown reticulated lines, edging variably sized white tents and blotches. Pattern fuses into very interrupted to solid spiral bands of varying width above and below centre. Within colour bands, axially arranged dark lines, sometimes with a few spiral rows of alternating brown and white tents. Shells with a rather fine network that is only slightly concentrated on each side of centre (described as *C. wittigi*) (Pl. 37, Figs. 30, 31) intergrade with shells with a coarse brown network and broad rather solid brown spiral bands (described as *C. kongaensis*) (Pl. 37, Figs. 32, 33). Larval whorls beige. Postnuclear sutural ramps with orange to brown radial lines and blotches. Aperture white; in specimens described as *C. kongaensis*, aperture sometimes brown deep within.

Habitat and Habits: In shallow water; *C. wittigi* reported from 3-10 m, on fine sand near living coral or in coral pockets; specimens described as *C. kongaensis* "in 1-3 m" (Ormas, pers. comm., 1992) "in an area of grey lava sand and volcanic stones with sparse vegetation except for patches of eelgrass and mangroves" (da Motta, 1984).

Discussion: *C. wittigi* may be similar to some variants of *C. spectrum*; for comparison, see the Discussion of the latter species.

Shells described as *C. kongaensis* differ from those described as *C. wittigi* ("*C. wittigi* occurs in a nearby island" da Motta, 1984) in having generally broader last whorls, often slightly wider apertures, darker larval shells, and coarser reticulate pattern with pronounced, red-brown spiral bands. However, the continuous intergradation between the shells of both forms suggests conspecificity.

***Conus inscriptus* REEVE, 1843**

(Plate 38, Figures 1-21; Plate 70, Fig. 6; Map 74)

- 1843 *Conus inscriptus* Reeve, Conch. Icon., 1, *Conus*: Pl. 29 sp. 164
- 1858 *Conus keatii* Sowerby II, Thes. Conch., 3: 34 no 298, pl. 20 (206) fig. 479
- 1870 *Conus planiliratus* Sowerby III, Proc. Zool. Soc. London, 1870: 255, pl. 22 fig. 1 (non *C. planiliratus* Sowerby II, 1850)
- 1870 *Conus tegulatus* Sowerby III, Proc. Zool. Soc. London, 1870: 256, pl. 22 fig. 12
- 1877 *Conus cuneiformis* E. A. Smith, J. Conchol. (London), 1: 202-204, text fig.
- 1891 *Conus adenensis* E. A. Smith, Proc. Zool. Soc. London, 1891: 401-402, pl. 33 fig. 1
- 1921 *Conus maculospira* Pilsbry & Johnson, Proc. Acad. Nat. Sci. Philadelphia, 73: 329-330 (nom. nov. for *C. planiliratus* Sowerby III, 1870)
- 1942 *Conus cavailloni* Fenaux, Bull. Inst. Océan. (Monaco), 814: 4 fig. 12
- 1977 *Conus* (s.s.) *keatiformis* Shikama & Oishi, in Shikama, Sci. Rep. Yokohama Natl. Univ., 2 (24): 19-20, pl. 4 figs. 1a, b, pl. 5 fig. 7
- 1985 *Conus maculospira bangladeshianus* da Motta, Publ. Ocas. Soc. Portuguesa Malac., 4: 6-7, pl. 1 figs. 5a, b, 6a, b
- 1989 *Conus inscriptus* forma *meridionalis* G. Raybaudi, Argonauta, 5 (5-6): 62-66, figs. 61-64

Types: *C. inscriptus*: 3 syntypes in BMNH (34.5 x 18; 32.5 x 17; 29 x 14.5 mm); *C. keatii*: 2 syntypes in BMNH (48.5 x 22; 46 x 22 mm); *C. planiliratus*: Type in BMNH (41 x 20 mm); *C. tegulatus*: Holotype in BMNH (19 x 9 mm); *C. cuneiformis*: Lectotype (Coomans et al., 1985a) in BMNH (25 x 14 mm); *C. adenensis*: Lectotype (Coomans et al., 1979) in BMNH (48 x 21.5 mm); *C. cavailloni*: Original figure 47.5 x 18.5 mm; *C. keatiformis*: Holotype in KPM (46 x 24 mm); *C. m. bangladeshianus*: Holotype in MHNG (43 x 23 mm).

Type Localities: *C. keatii*: "Seychelles"; *C. adenensis*: "Aden"; *C. tegulatus*: "China Seas"; *C. cavailloni*: "Bermudes"; *C. keatiformis*: "East China Sea"; *C. m. bangladeshianus*: "off the coast of Bangladesh in the Bay of Bengal, Indian Ocean"; *C. i. f. meridionalis*: "Somaliland, from the Mogadishu area."

Range: Indian Ocean, from Natal to Red Sea and to W. Thailand.

Description: Medium-sized to moderately large, usually moderately solid to solid; shells from Mascarenes, Aden and Red Sea smaller than those from other areas. Last whorl ventricosely conical to conical; outline convex at adapical fourth to half, usually straight below; left side sometimes concave near base and convex at adapical two-thirds. Shoulder angulate to subangulate. Spire of low to moderate height, highest in shells from Somalia to Mozambique; outline concave to straight, most frequently straight and sometimes with stepped whorls in E. African shells (e.g., Pl. 38, Fig. 12). In specimens from Mozambique, larval shell of about 3 whorls, maximum diameter 0.7-0.8 mm; in specimens from W. Thailand, larval shell of about 1.75 whorls, maximum diameter also 0.7-0.8 mm. First 2-4 postnuclear whorls weakly to distinctly tuberculate, sometimes only first whorl with obsolete tuberculation. Teleoconch sutural ramps flat to moderately concave, with 1 increasing to 3-8 spiral grooves, often additional spiral

striae in latest whorls; on shoulder ramp, spiral sculpture sometimes consists of 13-15 fine and nearly equal spiral grooves. Last whorl with widely spaced, weak to pronounced spiral grooves separated by ribbons on basal third to two-thirds; anteriorly, grooves are wide, often contain spiral threads or fine ribs, and are separated by narrow ribbons or ribs; in E. African specimens, ribbons may have fine to coarse granules at adapical edge.

***C. inscriptus* Shell Morphometry**

L	40 - 74 mm 32 - 44 mm (Mascarenes, Aden, Red Sea)
RW	0.09 - 0.44 g/mm (L 32-74 mm)
RD	0.51 - 0.68 (India) 0.55 - 0.64 (Andaman Sea) 0.52 - 0.63 (W. Indian Ocean)
PMD	0.79 - 0.90
RSH	0.10 - 0.15 (India, W. Thailand, Mauritius, Réunion) 0.10 - 0.23 (Somalia to Mozambique)

Ground colour white to beige or pale orange. Last whorl with spiral rows of brown or orange dots, spots, bars or axial streaks, fusing into axial flames and blotches and forming interrupted spiral bands below shoulder and within adapical and abapical thirds. Subshoulder band usually less prominent than anterior bands, sometimes absent. Larval whorls white to beige, adjacent 2 postnuclear sutural ramps of same colour. Following sutural ramps with radial lines to blotches, usually extending over outer margins, matching last whorl pattern in colour. White shells without any pattern remnants occur in the eastern part of the range (Pl. 38, Figs. 16, 17). Aperture white, beige to orange, pinkish or bluish violet, or pink; in E. African shells, coloured area often with a darker collabral band.

Periostracum brown, thin, translucent, and smooth.

Radular teeth with 3 adapical barbs (Peile, 1939).

Habitat and Habits: In 5-85 m, most frequently reported from 40-80 m, sometimes as deep as 150 m.

Discussion: *C. inscriptus* resembles *C. jickelii*, which is of similar size in its southern populations. The latter species can be distinguished by its non-tuberculate early postnuclear whorls and consistently brown first 2 teleoconch sutural ramps; sympatric *C. inscriptus* specimens also differ in their light or yellowish brown rather than dark reddish or bluish brown colour pattern and more sculptured last whorl. *C. iodostoma* differs in the bluish grey ground colour of its last whorl, and its spiral rows consist of small tan to reddish brown dots rather than orange brown dots and larger markings. The aperture of *C. iodostoma* has a paler rather than a darker peripheral band. *C. ciderryi* has a more conical last whorl (PMD 0.95-0.97), stronger tuberculate early and undulate late whorls. For comparison with *C. collisus* and *C. stramineus*, see the Discussions of the latter species.

C. adenensis refers to E. African *C. inscriptus*, ranging from Natal as far north as Somalia (Pl. 38, Figs. 11-13). It is characterized by a somewhat higher spire (RSH 0.13-0.23), a comparatively narrow last whorl (RD 0.52-0.59), and a pink or orange aperture that grades to violet toward southern E. Africa. Richard (1990) considered *C. adenensis* a valid species. In our opinion, the differences are not sufficient to merit distinction at the species level, and we provisionally consider *C. i. adenensis* a subspecies occurring along the East African coast.

C. keatii is known from 2 type specimens from Seychelles (Pl. 38, Figs. 14, 15), which closely resemble *C. i. adenensis* in morphometry and colouration. Recently, more shells of this form have been found in Seychelles.

In the Aden and Dahlak area, a variant of *C. inscriptus* (Pl. 38, Figs. 2, 3) has a consistently conical last whorl (RD 0.56-0.59; PMD 0.85-0.90), smaller size (to 44 mm) and may have a spire lower than that of E. African specimens.

C. planiliratus and *C. maculospira* (Pl. 38, Figs. 9, 10) refer to shells from Burma and W. Thailand with a rather ventricose and prominently sculptured last whorl, a paucispiral larval shell, and a white aperture (Pl. 38, Fig. 10), while *C. m. bangladeshianus* (Pl. 38, Fig. 4) has a brownish orange ground colour and an orange aperture. These forms intergrade with one another and with *C. inscriptus* in S. India (Pl. 38, Figs. 5, 7, 8) and in the Andaman Sea.

Almost completely white shells of *C. inscriptus* from India were described as *C. cuneiformis* (Pl. 38, Figs. 16-18). Yellow or orange specimens occur occasionally. *C. inscriptus* from the Mascarenes (Pl. 38, Figs. 20, 21) falls within the range of variation observed in shells from other regions.

C. cavailloni seems to be an aberrant form of *C. inscriptus*; *C. inscriptus* f. *meridionalis* is a synonym of *C. i. adenensis*; *C. keatiformis* (Pl. 38, Fig. 6) is similar to shells from S. India.

C. tegulatus (holotype: Pl. 70, Fig. 6), is probably a juvenile of *C. inscriptus*.

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Conus lynceus SOWERBY II, 1858

(Plate 38, Figures 22-25; Map 75)

1858 *Conus lynceus* Sowerby II, Thes. Conch., 3: 33 no. 287, pl. 19 fig. 469

Type: Holotype in BMNH (69 x 27 mm).

Type Locality: "Moluccas."

Range: Taiwan, Philippines, Java, Solomon Is., Queensland, and W. Thailand; probably Moluccas.

Description: Medium-sized to large, moderately solid to solid. Last whorl ventricosely conical; outline convex at apical third, less so or straight below. Shoulder angulate to subangulate. Spire usually of moderate height, outline

concave to nearly straight. Larval shell of 3 or more whorls, maximum diameter about 0.8 mm. First 2-4 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to slightly concave, with 0-1 increasing to 7, sometimes to 11 spiral grooves that contain spiral threads in latest whorls. Last whorl usually almost smooth; in subadult and some adult shells, rather widely spaced weak spiral grooves below or to shoulder, with variably broad ribbons between.

C. lynceus Shell Morphometry

L	50 - 89 mm
RW	0.15 - 0.70 g/mm
RD	0.50 - 0.58
PMD	0.75 - 0.86
RSH	0.11 - 0.18

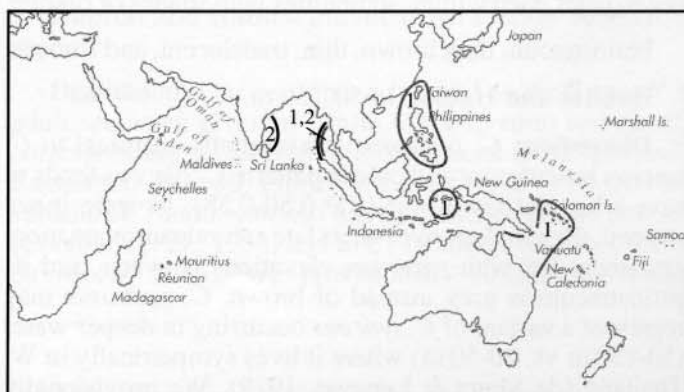
Ground colour white to pale grey or beige, sometimes with pale bluish violet axial streaks. Last whorl with spiral rows of yellowish to reddish or dark brown dots, bars, and flecks, generally fusing into 2-3 interrupted or almost solid spiral bands, on each side of centre and sometimes below shoulder. Some shells have spiral rows replaced by distinct to obsolete, narrow light brown bands, also concentrated into 2-3 broader bands. Larval whorls white to brown. In shells with usual last whorl pattern, postnuclear sutural ramps with brown to reddish or dark brown radial markings. Aperture white, violet to orange, paler deep within.

Periostracum grey, very thin, translucent, smooth.

Habitat and Habits: In 20-50 m.

Discussion: *C. lynceus* is very similar to *C. pretiosus*; for comparison, see the Discussion of the latter species. Some variants of *C. inscriptus* also closely resemble *C. lynceus*; they differ in a more prominent spiral sculpture of the last whorl and a brown instead of grey periostracum. In W. Thailand where both species occur sympatrically, *C. inscriptus* is smaller (L 40-56 mm), tends to have a somewhat less ventricose and broader last whorl (PMD 0.79-0.86; RD 0.55-0.64), and its aperture is white to beige rather than violet.

Map 75



1: *C. lynceus* 2: *C. pretiosus*

***Conus pretiosus* NEVILL & NEVILL, 1874**

(Plate 38, Figures 26-29; Map 75)

- 1874 *Conus pretiosus* Nevill & Nevill, J. Asiatic. Soc. Bengal, **43** (2): 22
 1978 *Conus phuketensis* da Motta, Centre Thai Nat. Study, 4, 2 (figs.), Addenda

Types: *C. pretiosus*: Holotype in ZSI (59.5 x 24 mm); *C. phuketensis*: Holotype in MHNG (81 x 33 mm).

Type Localities: *C. pretiosus*: "Andamans"; *C. phuketensis*: "off the coastal waters from Phuket Island S. W. Thailand westward toward the Andaman Islands in the Andaman Sea."

Range: S. E. India to W. Thailand.

Description: Moderately large to large, moderately solid to solid. Last whorl ventricosely conical, outline convex adapically and straight below. Shoulder angulate. Spire usually of moderate height, stepped, outline almost straight. Larval shell of about 3.5 whorls, maximum diameter about 0.7 mm. First 2-4 postnuclear whorls tuberculate. Teleoconch sutural ramps flat to concave, with 0-1 increasing to 3-7 spiral grooves; additional spiral threads and striae on latest ramps. Last whorl almost smooth or with widely spaced weak spiral grooves abapically and ribbons between.

***C. pretiosus* Shell Morphometry**

L	60 - 95 mm
RW	0.20 - 0.49 g/mm
RD	0.47 - 0.55
PMD	0.75 - 0.84
RSH	0.10 - 0.21

Ground colour white to cream. Last whorl sometimes with narrow cream to yellowish brown spiral bands from base to shoulder. Overlying spiral rows of variously sized and shaped, brown to dark brown markings fuse into variably prominent interrupted spiral bands, below shoulder, just above centre and within abapical third. Larval whorls white to pale brown. Postnuclear sutural ramps white or cream with brown radial streaks and blotches. Aperture violet, paler deep within, sometimes with shades of orange.

Periostracum dark brown, thin, translucent, and smooth.

Habitat and Habits: In 50-150 m.

Discussion: *C. pretiosus* is essentially identical to *C. lynceus* in sculpture and colour pattern. *C. lynceus* tends to have a broader last whorl (RD 0.50-0.58); its spire is not stepped, the spiral grooves on its late sutural ramps are more prominent but with narrower elevations between, and its periostracum is grey instead of brown. *C. pretiosus* may represent a variant of *C. lynceus* occurring in deeper water (50-150 m vs. 20-50 m) where it lives sympatrically in W. Thailand (da Motta & Lenavat, 1979). We provisionally consider *C. pretiosus* a separate species.

***Conus collisus* REEVE, 1849**

(Plate 39, Figures 1-14; Map 76)

- 1845 *Conus nissus* "Chemnitz" Kiener, Coq. Vivant., **2**: Pl. 59 fig. 4; 1848: 217-218 (non *C. nissus* Dillwyn, 1817)
 1849 *Conus collisus* Reeve, Conch. Icon., **1**: *Conus* suppl.: Pl. 8 sp. 273
 1849 *Conus kieneri* Reeve, Conch. Icon., **1**: *Conus* suppl.: Pl. 9 sp. 282 b (non *C. kieneri* Reeve, sp. 282 a)
 1854 *Conus stigmaticus* A. Adams, Proc. Zool. Soc. London, **1853**: 119
 1865 *Conus straturatus* Sowerby II, Proc. Zool. Soc. London, **1865**: 518, pl. 32 fig. 14

Types: *C. nissus*: Original figure 35 x 17.5 mm; *C. collisus*: Lectotype (Walls, [1979]) figured in Reeve (1849: *Conus* suppl.: Pl. 8, sp. 273) (41 x 20 mm); *C. kieneri*: Original figure 282b (29.5 x 15 mm); *C. stigmaticus*: 3 syntypes in BMNH (46.5 x 22.5; 46 x 22.5; 45 x 24 mm); *C. straturatus*: 3 syntypes in BMNH (34 x 17.5; 32 x 16.5; 29 x 14 mm).

Type Localities: *C. nissus*: "Madagascar"; *C. collisus*: "Phuket, Thailand" (Coomans et al., 1985a); *C. stigmaticus*: "New Caledonia"; *C. straturatus*: "Borneo."

Range: S. India, Andaman Sea, Malaysia, and Indonesia to Philippines; probably also in Solomon Is. and Madagascar.

Description: Medium-sized to moderately large, moderately solid; form *straturatus* (Pl. 39, Figs. 13, 14) smaller. Last whorl ventricosely conical to conical; outline convex adapically, less so or straight below; left side usually slightly concave near base. Shoulder angulate to subangulate. Spire of low to moderate height, outline concave. Larval shell of 2-2.5 whorls, maximum diameter 0.7-0.8 mm. Teleoconch sutural ramps flat to slightly concave, with 2 increasing to 3-8 spiral grooves that contain additional spiral striae and threads in latest whorls. Last whorl with widely spaced spiral grooves on basal third to half, to shoulder in subadult specimens and in adults of some populations; broad interstitial ribbons split into ribs toward base.

***C. collisus* Shell Morphometry**

L	35 - 60 mm
- form <i>straturatus</i>	29 - 34 mm
RW	0.10 - 0.24 (L 30-52 mm)
RD	0.53 - 0.60
PMD	0.80 - 0.90
RSH	0.09 - 0.18
- form <i>straturatus</i>	0.09 - 0.12

Ground colour white. Last whorl with axially and spirally confluent yellowish brown to brown spots and flecks, forming interrupted to continuous spiral bands below shoulder, above centre and within abapical third. Remaining areas sparsely to heavily maculated with spiral rows of brown dots and dashes. Base white to pale brown, sometimes dark violet. Apex white to brown, sometimes grading

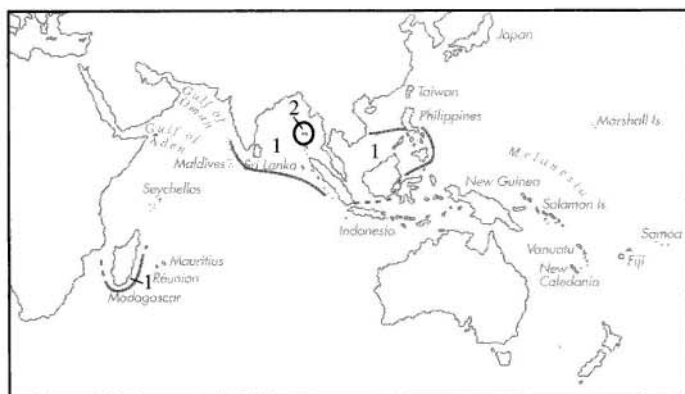
from white to brown. Late sutural ramps with yellowish brown to dark brown radial streaks and blotches. Aperture white, purple or violet.

Habitat and Habits: In 50-100 m.

Discussion: *C. inscriptus* differs from *C. collisus* primarily in its last whorl colour pattern of regular spiral rows of brown or orange dots, spots, bars or axial streaks, rather than a more irregular pattern of axially and spirally confluent brown spots and flecks. The first 2-4 postnuclear teleoconch whorls of *C. inscriptus* are weakly to strongly tuberculate rather than smooth as in *C. collisus*. *C. blanfordianus* differs from *C. collisus* in its rather conoid-cylindrical last whorl (PMD 0.76-0.83 vs. 0.80-0.90) with an aperture that is markedly wider at the base than near the shoulder, and its last whorl pattern with about 15 rows of brown spots and bars. *C. collisus* is also similar to *C. andamanensis*, *C. subulatus*, *C. broderipii*, *C. sertacinctus* and *C. stramineus*; for distinctions from those species, see their Discussions.

C. collisus is remarkably variable in shape and colouration, even within the same area. Specimens agreeing with the descriptions of *C. nisus* and *C. kieneri* (Pl. 39, Figs. 10-12) have a rather conical last whorl and rather dark violet aperture; this form occurs in W. Thailand and probably in Madagascar. *C. stigmaticus* (Pl. 39, Fig. 9) corresponds so closely with *C. collisus* that it must be considered as a synonym. *C. straturatus* (Pl. 39, Figs. 13, 14) was described from 3 shells somewhat smaller than those of adult *C. collisus* but otherwise corresponding closely with the latter. The pattern of their last whorls consists of brown flecks forming a spiral band below shoulder, above centre and within basal third; dashed and dotted darker brown spiral lines overlying these bands.

Map 76



1: *C. collisus* 2: *C. andamanensis*

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Conus andamanensis E. A. SMITH, 1878

(Plate 39, Figures 15-20; Map 76)

1878 *Conus andamanensis* E. A. Smith, Proc. Zool. Soc. London, 1878: 804-805, pl. 50 figs. 1, 1a

Types: 2 syntypes in BMNH (22 x 11; 20.5 x 9.5 mm); figured syntype (1a) 31 x 15 mm acc. Smith.

Type Locality: "Off Port Blair, Andaman Islands."

Range: Andaman Sea.

Description: Moderately small, moderately light. Last whorl conical, ventricosely conical or conoid-cylindrical, outline slightly convex; left side slightly concave at base. Aperture wider at base than near shoulder. Shoulder subangulate to rounded. Spire of low to moderate height, outline concave. Larval shell of about 2.5 whorls, maximum diameter about 0.8 mm. Teleoconch sutural ramps nearly flat to slightly convex, with 2 increasing to 3 rather weak spiral grooves; late ramps either with obsolete spiral sculpture or 2-3 spiral grooves. Basal third to half of last whorl with widely spaced punctate spiral grooves and ribbons between; ribbons may grade to ribs at anterior end.

C. andamanensis Shell Morphometry

L	26 - 31 mm
RW	0.07 - 0.13 g/mm
RD	0.54 - 0.60
PMD	0.77 - 0.87
RSH	0.10 - 0.16

Ground colour white to bluish grey, may be suffused with pink. Last whorl with variably numerous, orangish to dark reddish brown dots, spots, spiral bars and small axial markings, irregularly scattered and sometimes additionally arranged in 2-3 spiral rows, on each side of central third and sometimes also below shoulder. Larval whorls white to beige. Late sutural ramps with orangish to dark reddish brown radial lines or streaks. Aperture white, may be orangish brown or violet-brown deep within.

Periostracum greyish brown, thin, translucent, smooth.

Habitat and Habits: Intertidal and shallow subtidal; in sand.

Discussion: Our description is based on the figure of an adult specimen given by Smith (31 x 15 mm) and closely corresponding shells from old collections in MNHN, coll. Salming, and coll. Filmer; the 2 syntypes in BMNH are subadult. *C. andamanensis* has been assigned to *C. collisus* (Coomans et al., 1980) and to *C. subulatus* (Walls, [1979]; da Motta, 1986). We provisionally consider *C. anda-*

manensis a valid species (cf. Richard, 1990). *C. collisus* has a more angulate shoulder and its aperture is narrower; it also differs in more pronounced spiral grooves on its late sutural ramps, stronger spiral ribs and ribbons on its last whorl, and a last whorl pattern with larger and confluent markings as well as dotted or dashed spiral lines, and irregularly scattered markings are absent. For comparison with *C. subulatus* and *C. broderipii*, see the Discussions of the latter species.

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Conus subulatus KIENER, 1845

(Plate 39, Figures 21-25; Map 77)

1845 *Conus subulatus* Kiener, Coq. Vivant., 2: Pl. 70 fig. 2; 1849: 243-244

Type: Original figure 35 x 15 mm.

Type Locality: Not stated.

Range: Philippines and Solomon Is.

Description: Moderately small to medium-sized, moderately light to moderately solid. Last whorl ventricosely conical, conoid-cylindrical or conical; outline convex adapically, less so or straight below; left side concave at base. Shoulder angulate. Spire of moderate height, outline concave. Larval shell of 2.5-2.75 whorls, maximum diameter about 0.7 mm. Teleoconch sutural ramps flat to slightly concave, with 3-4 spiral grooves in late whorls. Last whorl with spiral grooves from base to centre or beyond, separating ribs on basal third and ribbons above.

C. subulatus Shell Morphometry

L	30 - 38 mm
RW	0.06 - 0.13 g/mm
RD	0.51 - 0.54
PMD	0.75 - 0.86
RSH	0.13 - 0.17

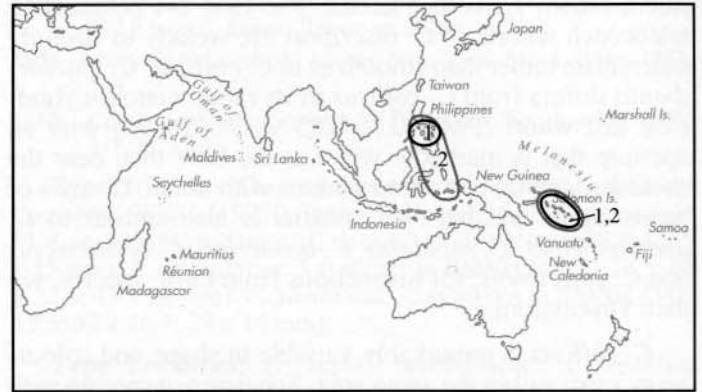
Ground colour grey, variably shaded with pale brown. Last whorl with an interrupted spiral band of brown bars, spots, flecks or flames below shoulder and on each side of centre, often underlain by pale brown; bands variably complete and brown markings may be widely separated or axially confluent. Apex brown. Late sutural ramps with light to dark brown radial markings. Aperture violet.

Habitat and Habits: Shallow water.

Discussion: *C. subulatus* has often been confused with *C. collisus*, *C. andamanensis*, and *C. sertacinctus*. *C. collisus* has a generally broader and more conical last whorl (RD 0.53-0.60; PMD 0.80-0.90), and a less angulate shoulder; its ground colour is white and its last whorl pattern includes spiral rows of dots and dashes. *C. andamanensis*

also has a broader last whorl (RD 0.55-0.60) and a less angulate shoulder; its aperture is wider basally, the spiral sculpture of its last whorl is more uniform, and its apex white to beige but not brown. For comparison with *C. sertacinctus*, see the Discussion of that species.

Map 77



1: *C. subulatus* 2: *C. broderipii*

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Conus broderipii REEVE, 1843

(Plate 39, Figures 26-32; Map 77)

1843 *Conus broderipii* Reeve, Proc. Zool. Soc. London, 11: 179; 1844: Conch. Icon., 1, *Conus*: Pl. 46 sp. 254

Type: Type in BMNH (27.5 x 15.5 mm).

Type Locality: "Moluccas" (Coomans et al., 1982).

Range: Moluccas; shells doubtful in assignment to *C. broderipii* (see Discussion) in Philippines, East New Britain, and Solomon Is.

Description: Moderately small, moderately light. Last whorl ventricosely conical to sometimes conoid-cylindrical; outline convex adapically, less so to straight below. Aperture wider at base than near shoulder. Shoulder angulate to sometimes subangulate. Spire low, outline concave. Teleoconch sutural ramps flat, with 1 increasing to 2-3 major spiral grooves; on last ramp, spiral sculpture may be weak or include 2 additional minor spiral grooves. Last whorl with broad spiral ribbons below centre, narrow or replaced by ribs within basal third.

Specimens from Solomon Is. (Pl. 39, Fig. 29) matching typical *C. broderipii* in shell morphology except for larger size and higher weight.

Specimens from Philippines (Pl. 39, Figs. 30-32) and E. New Britain moderately small to medium-sized, moderately solid; relative weight of similarly-sized specimens may vary by 50%. Last whorl sometimes narrower than in typical *C. broderipii*, occasionally ovate; left side may be sigmoid. Aperture almost uniformly wide in small adults, becoming wider at base during growth. Shoulder angulate

to rounded. Spire of low to moderate height, outline concave to slightly sigmoid. Larval shell of 2-2.25 whorls, maximum diameter 0.8-1 mm. Teleoconch sutural ramps flat to slightly convex, with 0-1 increasing to 2-6 spiral grooves (sometimes 3 major and 3 minor grooves); spiral sculpture may be variably weak in latest whorls. Last whorl with spiral ribbons on basal half or third, split into narrow ribbons or ribs toward base; ribs may be few (1-2) to numerous (20), restricted to anterior end or extending across basal third.

***C. broderipii* Shell Morphometry**

	typical <i>C. broderipii</i>	Solomon Is.	Philippines
L	27 - 33 mm	38 mm	30 - 41 mm
RW	0.06 - 0.10 g/mm	0.18 g/mm	0.10 - 0.20 g/mm
RD	0.58 - 0.63	0.60	0.53 - 0.65
PMD	0.75 - 0.78	0.75	0.74 - 0.83
RSH	0.05 - 0.12	0.08	0.09 - 0.16

Ground colour white. Last whorl with spirally aligned light to reddish brown dots, spots and bars concentrated or fused into 3 spiral bands, below shoulder, above centre and within basal third. Pattern elements may also fuse into axial streaks or occasionally form a loose meshwork. Basal part of columella and siphonal fasciole generally immaculate. Larval whorls white to pale grey. Teleoconch spire with radial streaks and blotches matching last whorl pattern in colour. Aperture violet to light purple, with or without a darker collabral band.

In specimens from Solomon Is., last whorl with 3 brownish beige spiral bands, below shoulder, above centre and within basal third; dotted to solid brown spiral lines extending from base to shoulder. Brown spots and flecks concentrated above, between and below the both adapical beige bands. Late sutural ramps with beige to brown radial markings; middle ramps with brown dots at outer margins.

In specimens from Philippines and E. New Britain, last whorl with spirally aligned light to dark brown flecks, axial streaks and flames below shoulder and on each side of centre; markings tend to fuse axially as well as spirally; spiral arrangement may be emphasized by interrupted to continuous brownish beige underlying bands. Dotted or dashed darker brown spiral lines may occur from base to shoulder, usually restricted to spiral colour bands. Shells with a mainly axial arrangement of last whorl pattern intergrade with shells with solid spiral bands and dotted spiral lines. Larval whorls white. Early postnuclear sutural ramps white or beige, immaculate. Following sutural ramps with radial markings matching last whorl pattern in colour and intensity. Aperture rose to orange or violet, usually demarcated from white marginal zone by an orange-brown collabral band.

Periostracum olive-grey, thin, translucent, smooth.

Habitat and Habits: No information on typical *C. broderipii* and specimens from Solomon Is.; specimens from Philippines and E. New Britain in shallow-subtidal zone to about 20 m.

Discussion: *C. broderipii* is similar to *C. collisus*, *C. andamanensis*, *C. sertacinctus* and *C. spectrum*. *C. collisus* has a more conical last whorl (PMD 0.80-0.90) with a generally more angulate shoulder; the typical form of *C. collisus* is distinguished from *C. broderipii* also by its larger size (L to 60 mm). *C. andamanensis* differs mainly in the weaker spiral sculpture on its late sutural ramps, the uniform spiral sculpture of its last whorl consisting of rather equally broad ribbons basally, and in the less convex outline of its last whorl. For comparison with *C. sertacinctus* and *C. spectrum*, see the Discussions of the latter species.

The description of typical *C. broderipii* is based on the holotype (Pl. 39, Fig. 26) and closely corresponding shells preserved in BMNH, ZMA, and MNHN (Pl. 39, Figs. 27, 28). All these shells are reported from Moluccas (except for the specimen in MNHN, whose locality "Andaman" may be erroneous). The specimens from Solomon Is. (Pl. 39, Fig. 29) are very close to typical *C. broderipii* in shell shape and sculpture, while its colour pattern is closer to the dark form of *C. sertacinctus*. The populations from Philippines (Sulu Sea to Manila Bay) were considered conspecific with typical *C. broderipii* (Pl. 39, Figs. 30-32) by Coomans et al. (1982), although the differences in shell morphology and colour pattern do not support this suggestion. We only provisionally retain the taxonomic placement suggested by Coomans et al. Morphologically identical shells are known from E. New Britain (Rabaul area).

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***Conus scalptus* REEVE, 1843**

(Plate 40, Figs. 1-3; Map 78)

1843 *Conus scalptus* Reeve, Conch. Icon., 1, *Conus*: Pl. 37 sp. 203; Proc. Zool. Soc. London, 11: 172

Types: 3 syntypes in BMNH (27 x 13.5; 27 x 14; 28.5 x 15 mm).

Type Locality: Not stated.

Range: Sulu Sea (S. Philippines), Papua New Guinea.

Description: Small to moderately small, light to moderately light. Last whorl ventricosely conical, outline convex, less so basally. Aperture somewhat wider at base than near shoulder. Shoulder subangulate to rounded. Spire of moderate height, outline concave to sigmoid. Larval shell probably of about 2 whorls, maximum diameter 0.7-0.8 mm. Teleoconch sutural ramps flat to slightly convex, with 1-2 increasing to 3-4 spiral grooves. Last whorl with spiral grooves on basal third to half; ribbons between grading to ribs anteriorly and weak in large specimens.

C. scalptus Shell Morphometry

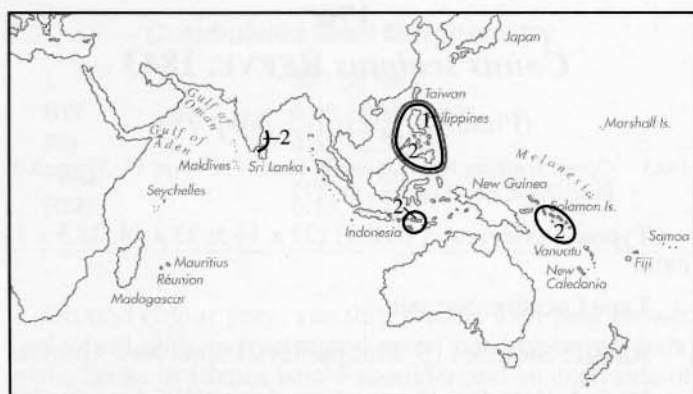
L	22 - 28 mm
RW	0.05 - 0.09 g/mm
RD	0.54 - 0.64
PMD	0.76 - 0.85
RSH	0.12 - 0.18

Ground colour white. Last whorl with rather closely spaced, yellowish or reddish brown, interrupted and continuous spiral lines from base almost to shoulder and with sparse scattered small markings of the same colour. Spiral pattern underlain by pale tan or orangish brown spiral bands on adapical half and within basal third. Larval whorls grey. Late sutural ramps with yellowish or reddish brown radial streaks or blotches. Aperture white.

Habitat and Habits: To about 20 m.

Discussion: In the past, *C. scalptus* has been confused with similarly patterned *C. mucronatus* (e.g. Walls, [1979]); for the distinctions, see the Discussion of the latter species. *C. scalptus* is also similar and may be closely related to *C. subulatus*, *C. broderipii*, and *C. sertacinctus*. *C. broderipii* has a larger shell, its aperture is not white, its spire is lower; its colour pattern includes 3 pronounced spiral bands of rather large markings absent in *C. scalptus*. *C. subulatus* has a narrower last whorl (RD 0.51-0.54) and an interrupted band of larger brown markings but lacks continuous brown spiral lines. For comparison with *C. sertacinctus*, see the Discussion of that species.

Map 78



1: *C. scalptus* 2: *C. sertacinctus*

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Conus sertacinctus RÖCKEL, 1986

(Plate 40, Figures 4-13; Map 78)

- 1986 *Conus sertacinctus* Röckel, Arch. Moll., **116** (4/6): 225-231, pl. 1 figs. 1, 2
- 1993 *Conus solomonensis* Delsaerd, Gloria Maris, **31** (4, 5): 65-72, text figs.

Types: *C. sertacinctus*: Holotype in SMF (31 x 15.5 mm); *C. solomonensis*: Holotype in BMNH (29.5 x 14.5 mm).

Type Localities: *C. sertacinctus*: "Salomonen: Marau, Guadalcanal"; *C. solomonensis*: "Reef off Kakambone, West of Honiara, Guadalcanal, Solomon Islands."

Range: Solomon Is., E. New Britain, Philippines, and S. India; local forms provisionally assigned to *C. sertacinctus* are known from Batangas Bay (Central Philippines), E. Flores (Indonesia), and from Marshall Is.

Description: Moderately small to medium-sized, moderately light to moderately solid. Last whorl ventricosely conical, sometimes slightly ovate; outline convex adapically, less so to straight below; left side occasionally slightly concave near base. Aperture wider at base than near shoulder. Shoulder subangulate to rounded, rarely angulate. Spire of low to moderate height, outline concave to sigmoid. Larval shell of 2-2.25 whorls, maximum diameter 0.8-1 mm. Teleoconch sutural ramps flat, often slightly convex in late whorls, with 0-1 increasing to 2-5 spiral grooves; grooves may be weaker on latest ramps. Last whorl with spiral ribbons on basal third to half; ribbons often distinctly narrower or sometimes replaced by ribs at anterior end.

In shells from Flores (Pl. 40, Figs. 10, 11), last whorl occasionally approaching conoid-cylindrical, with an almost straight right side centrally. Last whorl with spiral ribbons on basal half to sometimes two-thirds, split into narrow ribbons and/or ribs on anterior third. Shell morphology otherwise corresponding with that of typical form.

In shells from Batangas Bay (Pl. 40, Fig. 12), last whorl ventricosely conical or conoid-cylindrical; left side usually concave basally and right side often almost straight centrally. Shoulder subangulate. Teleoconch sutural ramps flat, with 0-1 increasing to 3-5 spiral grooves or 3 major and 3 minor grooves; grooves weak to obsolete in latest whorls. Last whorl with spiral ribbons below centre, narrower or split into narrow ribbons and ribs anteriorly. Shell morphology otherwise matching that of typical form.

C. sertacinctus Shell Morphometry

	Solomon Is.	Flores	Batangas Bay
L	25 - 40 mm	27 - 33 mm	30 - 38 mm
RW	0.06 - 0.16 g/mm	0.06 - 0.10 g/mm	0.06 - 0.20 g/mm
RD	0.53 - 0.64	0.54 - 0.61	0.53 - 0.60
PMD	0.74 - 0.84	0.80 - 0.83	0.76 - 0.84
RSH	0.08 - 0.19	0.14 - 0.16	0.11 - 0.16

In typical form (Pl. 40, Figs. 4, 5), ground colour white. Last whorl with 4 spiral bands of axially aligned brown spots and lines, below shoulder, on both sides of centre and at base; central bands broader and usually emphasized by pale beige underlying bands. Distinctly banded shells intergrade with immaculate shells. Larval whorls white to beige. Postnuclear sutural ramps with pale brown dots at outer margins and sparse light brown to brown radial lines and