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## STUDIES ON CONIDAE (MOLLUSCA, GASTROPODA) 3. SYSTEMATICS AND DISTRIBUTION OF SOME AUSTRALIAN SPECIES, INCLUDING TWO NEW TAXA

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### ABSTRACT

*Conus clarus* Smith is redescribed and considered a valid species from the south coast of West Australia to Victoria. A lectotype of *C. segravei* Gatliff is designated, it is a junior synonym of *C. clarus*. The holotype of *C. kenyoae* Brazier is studied and considered a juvenile specimen of *C. distans* Hwass. Specimens known as "*C. lizardensis*" and "*C. tegulatus*" from the coast between Dampier and Onslow in N.W. Australia are described as *C. dampierensis* nov. spec., a light colour forma is found on offshore islands. *C. reductaspiralis* Walls, originally a subspecies of *C. nielsenae* Marsh, is redescribed and considered a valid species; the distribution is from Cape Leveque to North West Cape, possibly further south.

The species complex of *C. lischkeanus* Weinkauff is studied, the nominate subspecies ranges from S. Japan to Taiwan. A lectotype of *C. kermadecensis* Iredale is designated; the collections of several museums contain false type material. *C. kermadecensis* is considered a subspecies of *C. lischkeanus* from eastern Australia, New Caledonia, northern New Zealand and the Kermadecs. These W. Pacific taxa are living offshore in deeper water, and their shells have a white aperture. The populations from some areas in the Indian Ocean live intertidally, the shells have a violet aperture. Those from West Australia are described as *C. lischkeanus tropicensis* nov. subsp.; this name may tentatively be applied to the populations from the coast of Oman; identical shells are reported in the literature from Mozambique to Natal.

### INTRODUCTION

During his stay in Australia from 1975 to 1980, the second author collected and investigated the marine mollusks of that continent. Independently, at the Zoological Museum of Amsterdam, some Australian Conidae were studied, which were obtained from recent collecting and borrowed from several museums. The authors

have combined the results of their research in the present publication, concerning the taxonomic status of some nominal species of *Conus*, occurring on the coast of western and southern Australia.

### TAXONOMY

*Conus clarus* E. A. Smith, 1881  
figs. 1-2, map 1

Nos. 1 and 2 were published in Bull. Zool. Mus. vol. 8 (15, 17), 1982.

*C. clarus* Smith, 1881, Anns Mag. nat. Hist. (5) 8: 442; Cotton, 1945: 264; Walls, 1979: 217; Röckel, 1980: nr.

143; Kendrick & Ryland, 1981: 3, fig. 1 (holotype); Abbott & Dance, 1982: 261, ill.; Coomans et al., 1985: 234, figs. 476 (holotype), 477. — *C. segravei*, Cotton, 1945: 263; Macpherson & Gabriel, 1962: 237, fig. 274; Marsh, 1964: 120, pl. 17 fig. 9; Turnbull, 1970: 8, pl. 2 fig. 7; Wilson & Gillett, 1971: 148, pl. 99 fig. 9; Coleman, 1975: 196, no. 550; Kaicher, 1976-1977: no. 1134; Wilson & Gillett, 1979: 248, pl. 60 fig. 9; Wells, 1980: 246; Eisenberg, 1981: 144, pl. 126 fig. 13.

**Type material.** The holotype is present in BMNH (no. 81.11.8.1), the measurements are 26.7 × 14.0 mm (fig. 1). It is a dead collected and faded specimen, missing the protoconch. The shell was not figured with the original description.

**Type locality.** "West Australia".

**Material examined.** In addition to the holotype we have studied specimens from Victoria (Point Leo) present in ZMA; from W. Australia (Denmark, Albany) and S. Australia (Point Brown and Streaky Bay, west of Kangaroo Island) in coll. Filmer. The collection of J. Elsen contains specimens from Fowlers Bay in S. Australia.

**Redescription.** Shell relatively light in weight, average size of mature specimens from 30 to 40 mm, maximum to 50 mm. Spire medium to high, with 8 or 9 whorls, which are often stepped and marked by spiral cords; suture generally somewhat undulate; protoconch high. Shoulder acute, with a carinate ridge. Body whorl slightly convex with a vague constriction near the base; surface smooth and polished, although fine spiral lines may be observed; spiral cords at the base. Aperture broadish, outer lip very thin and sharp, sloping steeply below the shoulder but otherwise straight.

Colour of the body whorl generally pale pink, occasionally fleshy white, rarely yellowish; the ground colouring is overlaid by tan to pale orange-brown clouds, which cluster to form two broad but vague spiral bands, the paler zones may contain tiny tan-brown dots spirally aligned. The spire is cream to pale pink with rather variable tan-brown radial bars. Interior of aperture cream at the edge, turning to deep rose pink within, but liable to fade considerably in

older specimens; sometimes orange in darker coloured shells, and barely coloured at all in very pale ones.

The operculum, measured from two shells of 45 and 37 mm in length, were respectively 7.7 and 4.9 mm. The periostracum is reported to be light brown. According to Coleman (1975: 196) this species is a fish eater and therefore potentially toxic.

**Distribution.** *C. clarus* ranges from Cape Leeuwin (W. Australia) to Western Port Bay in Victoria (map 1). It is uncommon and inhabits relatively deeper water (30-80 m), probably living in sand.

**Discussion.** *Conus clarus* is a valid species. The name has been incorrectly applied in the literature to white shells from central and northern West Australia; presently these specimens are identified as the white forma of *C. reducta-spiralis* Walls, also discussed in this paper (fig. 10).

*C. clarus* is distinguished from *C. anemone* Lamarck, 1810, by the lack of spiral threads on the body whorl, straighter sides and the carinate shoulder ridge.

Smith compared *C. clarus* to *C. cyanostoma* A. Adams, 1854; the latter has a smaller shell with strong spiral grooves on the body whorl and a violet aperture (vide Coomans c.s., 1985: 286, figs. 450, 547-548), it is found off Queensland and northern New South Wales.

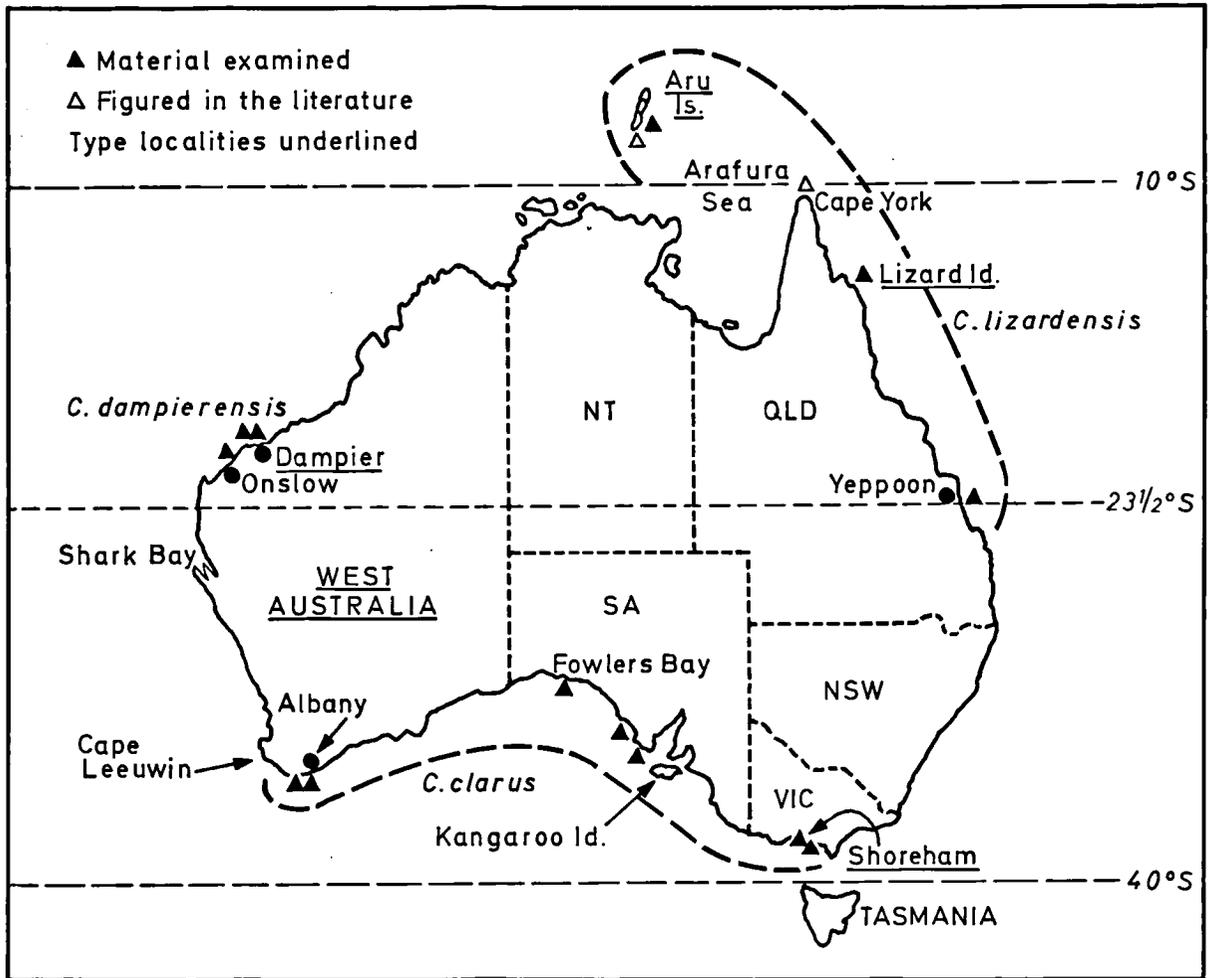
*Conus segravei* Gatliff, discussed below, is a junior synonym of *C. clarus*.

### ***Conus segravei* Gatliff, 1891**

fig. 2

Vict. Nat. 7: 179, figs. 2-3

**Type material.** Gatliff described and figured one specimen, which is lodged in the National Museum of Victoria (no. F 491, 71132) at Melbourne; the measurements are 33.0 × 16.8 mm (fig. 2). In addition he mentioned four more specimens in the collection of Mr. Segrave, the present whereabouts of those shells is unknown. These five specimens must be considered syntypes, from which we herewith designate the shell described and figured by Gatliff as lectotype of *Conus segravei*.



Map 1. Distribution of *Conus clarus* (incl. *C. segravei*), *C. dampierensis* nov. spec., and *C. lizardensis* (incl. *C. sibogae*).

Type locality. "Shoreham, Western Port, Victoria", Australia (map 1).

Discussion. For a long time *C. segravei* has been mentioned as a valid species (Macpherson & Gabriel, 1962: 237, fig. 274; Wilson & Gillett, 1971: 148, pl. 99 fig. 9; 1979: 248, pl. 60 fig. 9). Cotton (1945: 263) had indicated a close relation between *C. anemone* Lamarck and *C. segravei*, both placed by him in the genus *Floraconus* Iredale, 1930. Cotton stated that *segravei* "may be the deeper water form of *anemone*".

In recent literature (Walls, 1979: 331; Kendrick & Ryland, 1981: 3; Abbott & Dance, 1982: 261) *C. segravei* has been mentioned as a junior synonym of *C. clarus* Smith, 1881. We have studied the type specimens of both nominal

species, and after comparing these to a number of recently obtained shells from several localities, we also concluded that they are conspecific. Thus *C. clarus* is a valid species, and *C. segravei* becomes a junior synonym.

Da Motta (1980: 1) considered the holotype of *C. fusiformis* Lamarck, 1810, conspecific with *C. segravei*, and therefore the valid name for the species. However, *C. fusiformis* Lamarck (vide Coomans c.s., 1981: fig. 150) belongs to the *C. anemone* complex. In addition the name is not available, being a junior homonym of *C. fusiformis* Fischer, 1807, whereas its nomen novum *C. attractus* Tomlin, 1937, is of younger date than *C. clarus*.

**Conus kenyonae** Brazier, 1896

fig. 19

Proc. Linn. Soc. N.S.W. 21: 346

Type material. The holotype is in the South Australian Museum (no. D 14194) at Adelaide, the measurements are 41.9 × 23.2 mm. The shell was not figured with the original description.

Type locality. "Shark's Bay, W.A."

Discussion. The name *Conus kenyonae* has been applied incorrectly to shells occurring on the coast of central West Australia, which are described in the present publication as a subspecies of *C. lischkeanus*. We have studied the type specimen of *C. kenyonae*, it is considered a juvenile specimen of *C. distans* Hwass, 1792, recognizable by the grooves on the shell.

*Conus kenyonae* var. *arrowsmithensis* Brazier, 1896 (vide Coomans c.s., 1981: 22, fig. 134), and *C. waterhousae* Brazier, 1896, are also juvenile shells of *C. distans*, which species occurs commonly throughout the Indo-Pacific.

**Conus dampierensis** Filmer & Coomans, nov. spec.

figs. 5-7, map 1

*Conus lizardensis*, Turnbull, 1970: 8, pl. 2 figs. 5-6; Hansen, 1974a: 4. — *Conus* spec., Turnbull, 1973: 6-7, figs. 1-4, 6-7. — *C. tegulatus*, Hansen, 1974: 5; Kaicher, 1976-1977: no. 1125; *C. tegulatus* "second type", Walls, 1979: 888. — *C. lemniscatus*, Wells, 1980: 246.

Type material. Holotype in ZMA (Moll. no. 385004), measurements 32.5 × 18.3 mm (fig. 5). Five paratypes: 29.5 × 16.6 mm (fig. 6) with periostracum and operculum (ZMA Moll. no. 385005); 35.7 × 20.0 mm, 29.8 × 16.2 mm and 27.7 × 14.9 mm (in coll. Filmer); 33.0 × 17.2 mm (deposited in West Australian Museum, Perth).

Type locality. Back Beach, Dampier, West Australia; on muddy sand, exposed at low tide. Collected August 1978.

Description. Shell obconic. Spire medium in height, concave in outline, with nine whorls; protoconch fleshy white and sharp; postnuclear whorls beaded and raised, with an acute periphery; later whorls with a series of strong

and even spiral cords which are vaguely beaded and tend to fade out on the exterior edge; sutures indented and regular. Shoulder angulate and broad. Body whorl very slightly convex, sides tapered rather strongly, base of columella slightly crimped; texture shiny with deep cut punctate spiral grooves which are closeknit at the base and become less pronounced and well separated above the middle, very fine axial lines and stronger rather regular growth lines cross the grooves. Aperture broad squarely angled at the shoulder, outer lip thin but firm, vaguely crenulate and rather straight.

Ground colour white with a creamy tone; spire strongly and evenly marked with light chocolate brown radially aligned streaks and bars which extend over the shoulder and then tend to break up forming the first of three white zones crossed by irregular axial squares and bars; these three zones are separated by two broad bands of more solid brown. A few small brown spots are present in the paler zones, and the base is white. Interior of aperture white with bluish tinges and small brown spots near the outer lip.

The periostracum is thin and yellowish brown, partly transparent and contains very fine hairs on the spire whorls. The operculum is small (4½ mm in the paratype) and crescent shaped.

Variability. Mature specimens vary in size from 25 to 35 mm. The shape and texture are consistent, but the spire varies from low to medium in height, the spiral grooves on the body whorl may vary in strength. The colouring ranges from rather dark chocolate brown to pale yellowish tan. The spire has 8 to 10 postnuclear whorls. In fresh collected specimens the aperture is often rich blue.

The specimens from Rosemary Island are smaller (about 25 mm) and very pale in colour (fig. 7), this local population is considered a distinct forma of *C. dampierensis*.

Animal. Turnbull (1973: 7) reports that after preservation the foot is dull grey, closely spotted with black, and that the proboscis and siphon are black; the radula teeth are ½ mm in length, and the tooth structure suggests that the

species is vermivorous, which is consistent with its habitat on muddy sand. Hansen (1974: 5) mentioned that the live animal has a pale cream foot.

**Habitat.** The species appears to be confined to shallow water, frequently being exposed at low tide, on sand or muddy sand, often near weeds. The paler forma at Rosemary Island lives on cleaner sand which is found on offshore islands.

**Distribution.** At present the species is known from a restricted range in West Australia (map 1), from Point Samson just north of Dampier, and southwards about 160 km to the area of Mardie; and on the offshore islands. The most southerly locality is Weld Island, some 65 km north of Onslow (specimens studied in coll. J. Elsen). The majority of specimens comes from the flat sandy beaches near Dampier.

**Discussion.** The first records of this species were in the 1970's, at that time tentatively identified as either *Conus tegulatus* or *C. lizardensis*. The holotype of *C. tegulatus* Sowerby III, 1870, is present in BMNH, the measurements are 19.2 × 9.1 mm; it is a juvenile or subadult shell, with type locality China Seas. *C. tegulatus* is distinct from *C. dampierensis* by being much narrower at the shoulder, more convex sided, and strongly corded from base to shoulder. *C. tegulatus* is not known from Australian waters.

*Conus lizardensis* Crosse, 1865, is more elongate and slender, length to 45 mm, the body whorl is strongly corded from shoulder to base; the pattern of brown maculations is less regular. The holotype, a subadult shell, is present in BMNH, it measures 18.0 × 8.4 mm, type locality Lizard Island. The species ranges in Australia from the Capricorn Channel (Yepoon) northward to the Arafura Sea (map 1), in subtidal water (30-60 m). A specimen from north of Cape York in 25 fms is figured by Cernohorsky (1978: pl. 46 fig. 5). We have examined specimens from Cape Moreton (coll. ZMA) and the Capricorn Channel (coll. J. Elsen).

*Conus sibogae* Schepman, 1913, originally described as a variety of *C. mucronatus* Reeve, may be considered a junior synonym of *C.*

*lizardensis*. We have studied the holotype of *C. sibogae* (fig. 3), measurements 25.9 × 12.7 mm, from the Aru Islands (depth 57 m) in Indonesia. The shell is preserved in ZMA (Moll. no. 313008).

### ***Conus reductaspiralis* Walls, 1979** figs. 9-11, map 2

*C. nielsenae reductaspiralis* Walls, 1979a, Pariah 5: 5-6, ill. — *C. nielsenae*, Walls, 1979: 496 below right (paratype of *reductaspiralis*). — *C. gilvus*, Marsh, 1964: 28, pl. 3 fig. 11; Whitehead, 1967: 9; Turnbull, 1970: 12, figs. 2-5; Singleton, 1979: 249-250, ill.; Wells, 1980: 246. — *C. clarus*, Marsh, 1964: 57, pl. 6 fig. 5; Turnbull, 1970: 12, fig. 1; Wilson & Gillett, 1971: 148, pl. 99 figs. 2, 2a; 1979: 247, pl. 60 figs. 2, 2a; Hinton, 1972: 68, pl. 33 figs. 18-20; 1977: 75 figs. 2, 2a; Kaicher, 1976-1977: no. 1413; Wells, 1980: 246; Eisenberg, 1981: 135, pl. 117 fig. 19.

**Type material.** The holotype is present in the Delaware Museum of Natural History (no. 122119), the dimensions are 33.4 × 18.3 mm. Although paratypes were not designated, two specimens mentioned by Walls may be considered paratypes. The white shell, figured together with the holotype, was donated to ZMA (Moll. no. 379001), the measurements are 33.1 × 18.5 mm (fig. 10). The second paratype is figured by Walls (1979: 496 below right), length 33.6 mm (present in the Morrison Galleries); it has a similar colour pattern to the holotype (cf. fig. 9).

**Type locality.** "Australia, Western Australia, Geraldton". This locality is doubted by the present authors, since no reliable records of *C. reductaspiralis* exist south of North West Cape. Mr. J. F. Singleton, a knowledgeable local collector, informed us (in litt.) that the species is not found at Geraldton.

The localities of the paratypes are Point Samson and Cape Keraudren (map 2).

**Material examined.** In addition to one paratype, ZMA has specimens from Exmouth, Thevenard Island, Regnard Bay, Roebourne, Port Hedland, Cape Keraudren, and Broome. The Filmer collection has a similar range of specimens, in addition to material from Point Samson and Malus Island (Dampier Ar-

chipelago). All these localities are situated in West Australia (map 2).

Redescription. Walls (1979a: 5) originally described *C. reductaspiralis* as a subspecies of *C. nielsenae* Marsh, 1962, and for that reason he only gave a short diagnosis. A more detailed description follows.

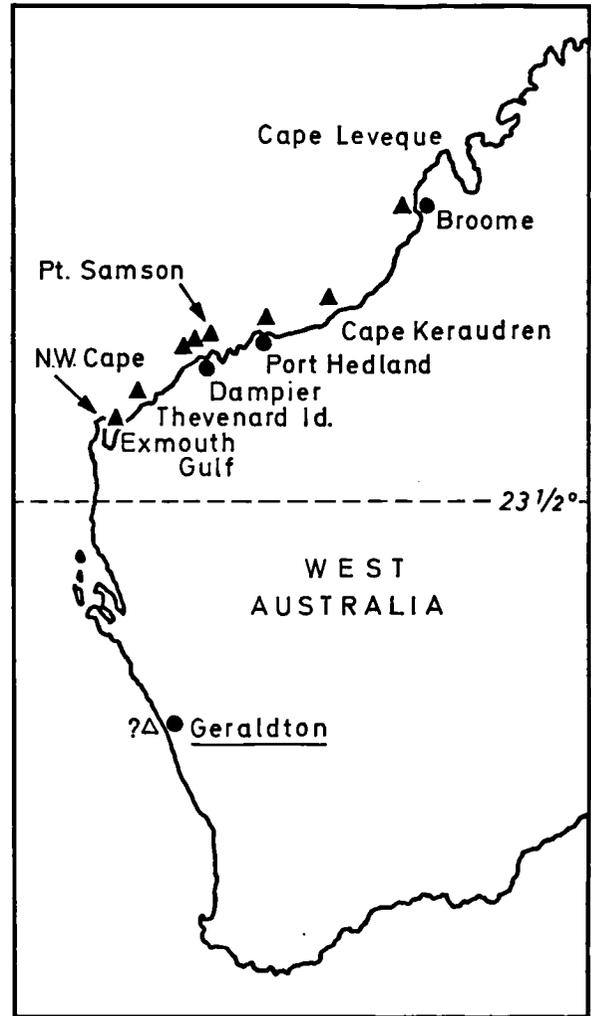
The size of mature specimens is usually from 30 to 45 mm in length and 18 to 25 mm in width, very occasionally specimens of over 50 mm are found; the shell is heavy. Spire low to flat, early whorls more raised, concave, nine flat to barely concave whorls with exterior side slightly raised, whorls contain numerous curved radial lines and occasionally one or rarely more vague spiral cords which are slightly wavy, sutures uneven and irregular, often the outer whorls are very unevenly stepped especially in old larger specimens, protoconch mammillate and opaque. It is very unusual to find a mature specimen with the protoconch intact, generally the spire is badly eroded, frequently worm eaten and usually chalky.

Body whorl straight to slightly convex especially towards the shoulders, shiny, with generally vague uneven spiral striae and irregular axial lines, axial growth marks and irregularities are frequently present, the spiral striae become stronger cords and more close knit towards the base; shoulder abrupt often uneven, body outline obconic, older specimens having very broad shoulders. The base of the columella is slightly crimped. Erosion of the polished outer surface is often apparent in older specimens.

The aperture is on the narrow side and hardly increases in width towards the base, it is not curved in at the shoulder but sharply angled. The outer lip is rather straight with some curving back at both ends, the lip is thin, sharp and rather fragile.

The periostracum is thin, almost transparent and straw coloured, with slightly tufted spiral rings. The operculum is rather small, elongate and ovate. According to Whitehead (1967: 9) the animal is cream coloured, flecked with brownish grey.

Variability in shell colour. The ground



Map 2. Distribution of *Conus reductaspiralis*.

colour is white, and some specimens remain pure white. Occasionally yellow specimens occur, and very rarely the shell has a pinkish flush. More commonly the shell has a brownish red stain at the base, in addition fine brown to tan spiral lines are present on the body whorl; the number of these lines varies from many to few, this being the reason for the name "*reducta spiralis*".

The spire is white, or may have tan to brown radial bars of irregular frequency. The interior of the aperture is white, the darker patterned specimens may have a pale bluish tinge.

The holotype and one of the paratypes belong to the common spirally ornamented form (fig.

9), the paratype in ZMA represents the white form (fig. 10).

**Habitat.** In shallow water, probably down to 20 metres and often found at low tides. Commonly living in colonies, on sand which may be quite muddy and usually near reefs or rocks. Although mainly nocturnal it can be found exposed and active in bright sunshine, especially on the incoming tide.

**Distribution.** From Cape Leveque to North West Cape, West Australia (map 2). Reports from southward are unsubstantiated, for this reason the type locality "Geraldton" is doubted. Extension north of Cape Leveque is possible, as this area is relatively inaccessible and rarely visited. In addition to the localities of the material studied, specimens are known to us in several Australian collections from Cape Leveque, Roebuck Bay, False Cape Creek, Lagrange Bay, Cape Jaubert, Cape Lambert, Dampier, Dampier Archipelago (Malus, Anchor, Angel, and Rosemary Islands), Cape Preston, Onslow, and North West Cape.

**Discussion.** The present authors have compared material of *Conus nielsenae* and *C. reductaspiralis*, and we are convinced that the conchological and ecological differences are sufficient to establish *C. reductaspiralis* as a distinct and valid species.

*C. nielsenae* (fig. 8) is about the same length, but the shell is rather fragile and much lighter in weight; the shape is more slender, body whorl concave in the middle, shoulder sharp, the spire low. The base never is stained, inside of the aperture pinkish. The periostracum lacks tufts and is transparent. The species lives in clean sand in rather deep water (30-100 m), off Queensland, New South Wales and the Kermadec Islands. The holotype of *C. nielsenae* measures 49.2 × 28.1 mm; type locality is north east of Cape Bowling Green, near Townsville, Queensland, dredged in 17 fathoms.

*Conus typhon* Kilburn, 1975 (fig. 4), which bears a resemblance to *C. reductaspiralis*, is much lighter in weight and more slender in shape, the body whorl lacks spiral striae; the radial lines on the spire whorls are much weaker; there is no basal stain and there are usually two broad

colour bands on the body whorl. The species is known from Mozambique to eastern Transkei, offshore in 10-40 m depth.

Before *C. reductaspiralis* was described, specimens were assigned to *C. gilvus* Reeve, 1849 (see synonymy). Walls (1979: 328, 511) correctly identified and figured *C. gilvus*, which species does not occur in Australian waters. It is known from the Solomon Islands and New Guinea, hence the type locality ("Saldanha Bay, South Africa") is considered erroneous.

Shells of the white forma of *C. reductaspiralis* (fig. 10) were sometimes assigned in the literature (see synonymy) to *C. clarus*, which species is discussed above.

Specimens of the intermediate form of *C. reductaspiralis*, having a white shell with a brown base (fig. 11), are similar to *C. albicans* Sowerby, 1857, from Indonesia. However, the latter has a coronated shoulder (vide Coomans c.s., 1979: 95, figs. 44, 49).

#### THE *CONUS LISCHKEANUS* COMPLEX

In five separate areas of the Indo-Pacific zoogeographical province, all situated about the Tropics of Cancer and Capricorn (map 3), some closely related Conidae are living. Although specimens from two areas have been described as distinct species, the present authors consider these to belong to one single species complex.

(1) Southern Japan to Taiwan, offshore in 50-100 m depth (map 3).

*Conus lischkeanus* Weinkauff, 1875 (fig. 12) System. Conch.-Cab. Martini und Chemnitz 4(2): 311, pl. 56 figs. 2-3

**Type.** The holotype is in the Loebbecke Museum, Dusseldorf, West Germany; the dimensions are 52 × 32 mm.

**Type locality.** "Japan - Insel Kiusiu", ex coll. Loebbecke.

**Material examined.** Specimens in ZMA from Japan, Kii Channel, Wakayama Pref., dredged 30-40 m (leg. T. Ninomiya); in RMNH from Kii (Suido, and Kusui, Nada-

cho, Wakayama, 30-50 fath.); in coll. Filmer from Kusui.

Remarks. *Conus lischkeanus* was discussed by Röckel (1976: 12; 1979: 7; 1982: nr. 311), who had traced the type specimen. Kuroda c.s. (1971: 239, pl. 59 fig. 5) reported "*Rhizoconus*" *lischkeanus* from Sagami Bay, and mentioned as distribution the Japanese islands Kyushu (type locality), Honshu and Shikoku, on sandy bottom of 60-100 m deep. Specimens from Taiwan were figured by Walls (1979: 392 above right).

The nomenclatorial status of *Conus okamotoi* Kuroda & Itô, 1961, is discussed by Marshall (1981: 494); he concluded that it is a nomen nudum. The shells figured by Kuroda & Itô (1961: 251, 267, pl. 17 figs. 11-12) may be considered a colour form of *C. lischkeanus* (fig. 13). A locality for *okamotoi* was not mentioned, but the publication refers to shells of southern Kii, Japan.

The specimen figured by Azuma (1973: 16, pl. 1 fig. 3) as "*Rhizoconus coffeae*" can be identified as *C. lischkeanus*. This shell, its radula and operculum were compared by Azuma to *Rhizo-*

*conus yoshioi* (type locality Kirime-zaki, Kii Peninsula, 20-30 fms), and concluded to be distinct species. A specimen of *Conus yoshioi* (Azuma, 1973) in ZMA, dredged in Kii Channel at 50 m, also confirmed that this species is not conspecific to *C. lischkeanus*. *Conus coffeae* Gmelin, 1791, is a nomen dubium (Kohn, 1966: 83; Coomans c.s., 1983: 70-71, fig. 314).

(2) Kermadec Islands, northern New Zealand, Norfolk Island, New Caledonia, Queensland and New South Wales, and possibly Papua New Guinea; in depths of 30-200 m (map 3).

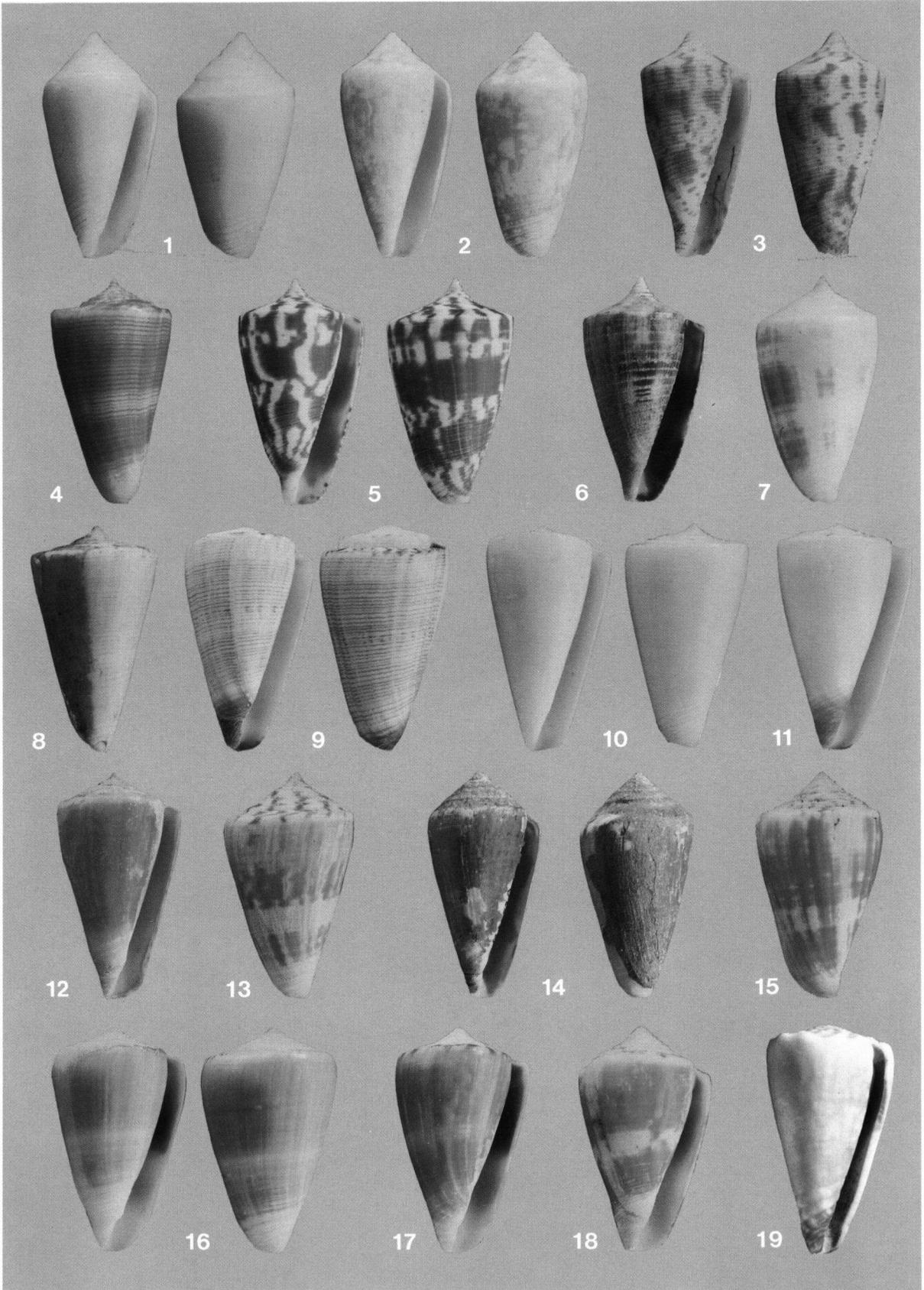
*Conus kermadecensis* Iredale, 1912 (figs. 14-15)

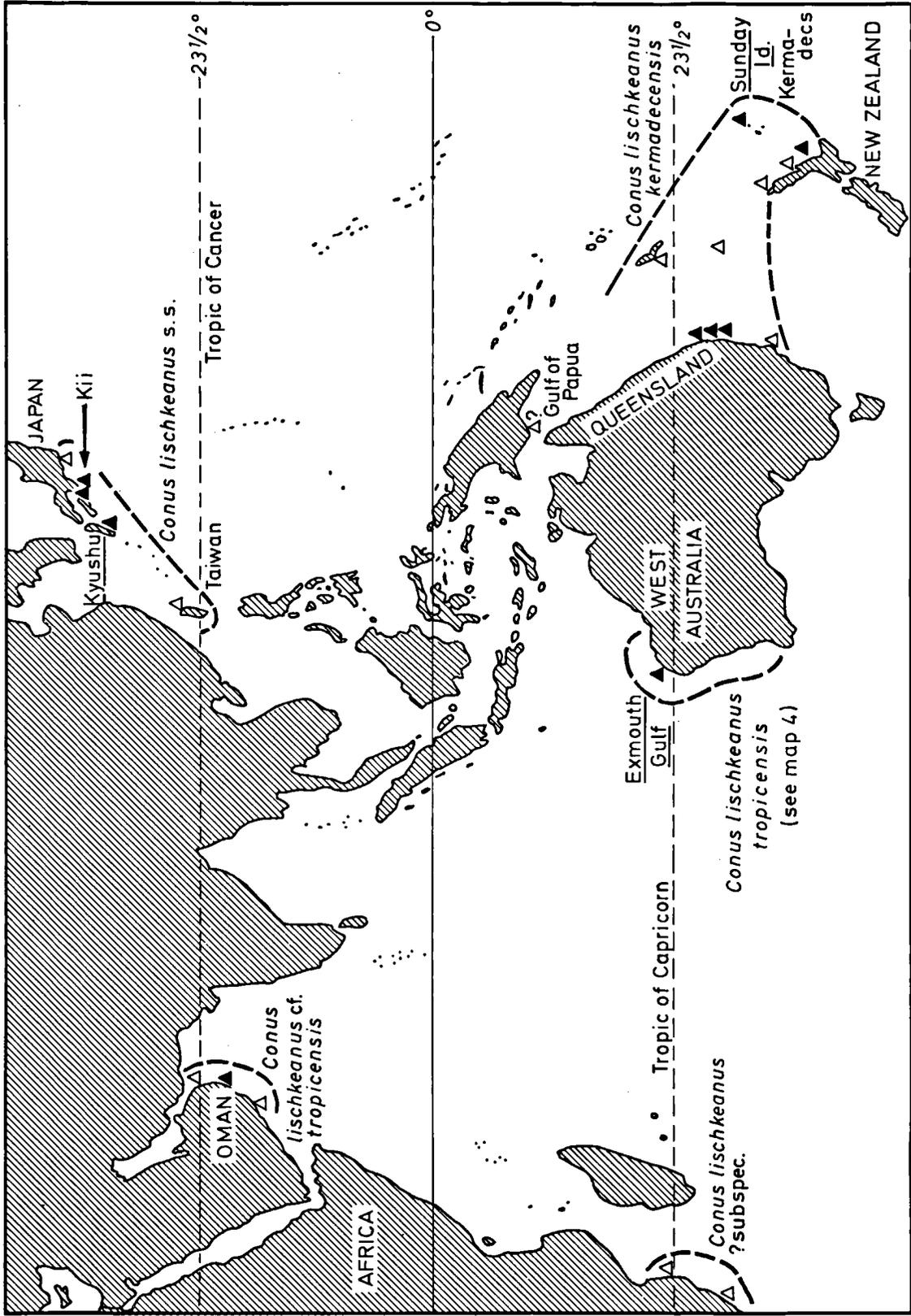
Proc. Malac. Soc. Lond. 10: 227, pl. 9 figs. 15-16

Type material. The two figured syntypes are present in the Canterbury Museum at Christchurch, New Zealand (no. M 3459A and B), the measurements are respectively 47.2 × 24.1 (Iredale fig. 15) and 43.5 × 26.0 mm (Iredale fig. 16). In the original description

- Fig. 1. *Conus clarus* Smith; holotype, length 26.7 mm, from West Australia (BMNH).  
Fig. 2. *C. clarus*, holotype of *C. segravei* Gatliff; length 33.0 mm, from Shoreham (Natn. Mus. Victoria).  
Fig. 3. *C. lizardensis* Crosse, holotype of *C. sibogae* Schepman; length 25.9 mm, from Aru Islands (ZMA, Siboga Exp. stat. 274).  
Fig. 4. *C. typhon* Kilburn; length 30.2 mm, from off Beira (RMNH).  
Fig. 5. *C. dampierensis* nov. spec.; holotype, length 32.5 mm, from Dampier (ZMA, leg. Filmer).  
Fig. 6. *C. dampierensis*; paratype with periostracum, length 29.5 mm, from Dampier (ZMA, leg. Filmer).  
Fig. 7. *C. dampierensis*; light coloured form, length 25.8 mm, from Rosemary Island (ZMA, leg. Filmer).  
Fig. 8. *C. nielsenae* Marsh; periostracum partly removed, length 49.7 mm, from off Cape Bowling Green (ZMA, leg. Marsh).  
Fig. 9. *C. reductaspiralis* Walls; with spiral lines and basal stain, length 34.4 mm, from Cape Keraudren (ZMA, leg. Singleton).  
Fig. 10. *C. reductaspiralis*; paratype, shell white, length 33.1 mm, from Point Samson (ZMA, don. Walls).  
Fig. 11. *C. reductaspiralis*; with brown basal stain, length 33.5 mm, from south of Broome (ZMA, don. Walls).  
Fig. 12. *C. lischkeanus* Weinkauff; length 43.0 mm, from Kusui (RMNH).  
Fig. 13. *C. lischkeanus* forma *okamotoi* Kuroda & Itô, length 41.3 mm, from Kusui (RMNH).  
Fig. 14. *C. lischkeanus kermadecensis*, lectotype of *C. kermadecensis* Iredale; length 47.2 mm, from Sunday Island (Canterbury Mus.).  
Fig. 15. *C. lischkeanus kermadecensis*; length 48.0 mm, from off Cape Moreton (ZMA, leg. Marsh).  
Fig. 16. *C. lischkeanus tropicensis* nov. subspecies; holotype, length 44.1 mm, from Exmouth Gulf (ZMA, leg. Singleton).  
Fig. 17. *C. lischkeanus tropicensis*; length 36.8 mm, from Dirk Hartog Island (ZMA, leg. Singleton).  
Fig. 18. *C. lischkeanus* cf. *tropicensis*; length 32.6 mm, from Masirah Island, Oman (ZMA, leg. D. Bosch).  
Fig. 19. *C. distans* Hwass, juvenile, holotype of *C. kenyonae* Brazier; length 41.9 mm, from Shark Bay (SAM).

Photographs by L. A. van der Laan (ZMA).





Map 3. Distribution of the *Conus lischkeanus* complex in five area's of the Indo-Pacific.

three specimens are mentioned, of 55 × 29, 42 × 25 and 31 × 18 mm. We must therefore conclude that Iredale did not measure his shells accurately. The largest specimen is herewith designated lectotype of *C. kermadecensis* (fig. 14). According to Iredale (: 228) one paratype should be present in the Australian Museum at Sydney, but the specimen could not be traced in 1981 (Ian Loch, in litt.).

Several museum collections contain specimens of *C. kermadecensis* with the information "paratype" or "cotype": one in RMNH, Leiden (40.9 × 24.9 mm); one in AMNH, New York (Richards & Old, 1969: 31); one in SAM, Adelaide (no. D 6169, 43.2 × 23.5 mm, ex coll. Kenyon); two in BMNH, London (no. 1911.11.2.109-10, measurements 47.6 × 29.3 and 42.0 × 24.1 mm, ex coll. MacAndrew); and one in IRScNB, Brussels (49.5 × 26.1 mm, ex coll. Dautzenberg). The last mentioned specimens were bought by MacAndrew and Dautzenberg from Preston, but according to Dance (1966: 223-224) H. B. Preston was a shell dealer who "realized the market value of type specimens". It is possible that more of these false types were obtained from Preston.

Type locality. "Sunday Island, Kermadec Group".

Material examined. In addition to the type material we have studied more specimens from Raoul (= Sunday) Island, and from White Island, New Zealand, in 59-73 m (present in Natl. Mus. New Zealand). Specimens from Queensland (Cape Moreton in 80-100 fms, and Southport, 80 fms) in ZMA (fig. 15), from Caloundra (coll. Filmer), and off Southport, 30 fms (RMNH).

Remarks. Originally *Conus kermadecensis* was only known from the Kermadec Islands. In recent years the species was reported from New Zealand (Alexander, 1972; Cernohorsky, 1976: 3, fig. 1; Powell, 1972: 250-251, fig. 1; 1979: 245, pl. 47 fig. 14; Marshall, 1981: 493-494, figs. 1, 3). Queensland records are mentioned by Rippingale & McMichael (1961: 147, pl. 20, fig. 27), Marsh (1964: 65-66, pl. 8 fig. 7) and Walls (1979: 392, 615). Coleman (1975: 49, fig. 117) mentioned the species from Cronulla, New

South Wales, "living at the base of sea cliffs on reefs in 26 meters". Recently it was recorded from New Caledonia by Estival (1981: 82, 124, fig. 55). Hinton (1972: 70) states that *C. kermadecensis* occurs in the Gulf of Papua, but we have been unable to verify exact locality data from Papua New Guinea.

In recent literature (Marshall, 1981: 491; Röckel, 1982: nr. 311) *Conus lischkeanus* from Japan and *C. kermadecensis* from the Queensland - New Zealand area are considered conspecific. The only distinctive character we have found is the weight of the shell: at the same shell-length the specimens of *C. kermadecensis* are heavier. In addition the shells of *C. lischkeanus* from Japan are more tapered. Because of this, and the disjunct ranges (map 3), we prefer to consider the Queensland and New Zealand populations as a subspecies: *C. lischkeanus kermadecensis*.

(3) West Australia, in shallow water (maps 3 and 4).

Shells from the Dampierian subprovince, resembling *C. kermadecensis*, were mentioned in the literature as "*C. kenyonae*", discussed above. From material studied we must conclude that these West Australian shells represent a new subspecies in the *C. lischkeanus* complex, it is described below.

(4) Oman, at low tide level (map 3).

Oliver (1980: 11, ill.) and Bosch & Bosch (1982: 128, ill.) recorded "*Conus kermadecensis*" from the coast of Oman (Muscat, Dhofar, and Masirah Island). We are not able to distinguish these shells (fig. 18) from those of West Australia.

(5) Mozambique and South Africa, in shallow water (map 3).

Specimens belonging to the *C. lischkeanus* complex are mentioned in recent literature (Walls, 1979: 392 ill., 615; Röckel, 1982: nr. 311, with ill.) from the Natal-Mozambique coast of Africa. However, the species is not discussed in the literature on the local fauna of the area (Kensley, 1973: 204-213; Richards, 1981: 74-75; Kilburn & Rippey, 1982: 118-122, 127).

Table I. Type material of *Conus lischkeanus tropicensis* subsp. nov.

	length in mm	width in mm	operculum in mm	locality	collector	deposited in
Holotype (fig. 16)	44.3	26.7		Exmouth Gulf, east side of	J. F. Singleton Nov. 1982	ZMA (385006)
Paratype 1	28.8	16.6		North West Cape		ZMA (385007)
2	50.6	30.2		Exmouth Gulf, in shallow water	Mrs. L. M. Figgis 1968	ZMA (385008)
3	46.3	27.9	7			
4	41.3	26.3	6			
5	37.2	22.3				
6	35.6	21.2				
7	32.3	19.2	4½			
8	29.0	16.6				
9	42.2	25.0				WAM
10	46.0	27.9		Exmouth Gulf		coll.
11	62.3	36.4				Filmer
12	51.0	29.9				
13	49.8	28.7				

We have not yet studied or seen specimens of the complex from Africa, therefore we are not able to give an opinion. Walls (1979: 614-615) stated that these shells do have a violet aperture and are found in shallow water, which indicates that they are similar to those from West Australia and Oman.

We may conclude that the *Conus lischkeanus* complex consists of two main groups: the populations of the W. Pacific (living in deeper water, shell characterized by a white aperture); and those from the Indian Ocean (in shallow water, shell with a violet aperture).

***Conus lischkeanus tropicensis* Coomans & Filmer, subsp. nov.**  
figs. 16-17, map 4

*C. kenyanae*, Marsh, 1964: pl. 12 fig. 13; Turnbull, 1970: 14, pl. 4 figs. 1-3; Wells, 1980: 246. — *C. kermadecensis* "from West Australia", Walls, 1979: 393.

Type material. See Table I.

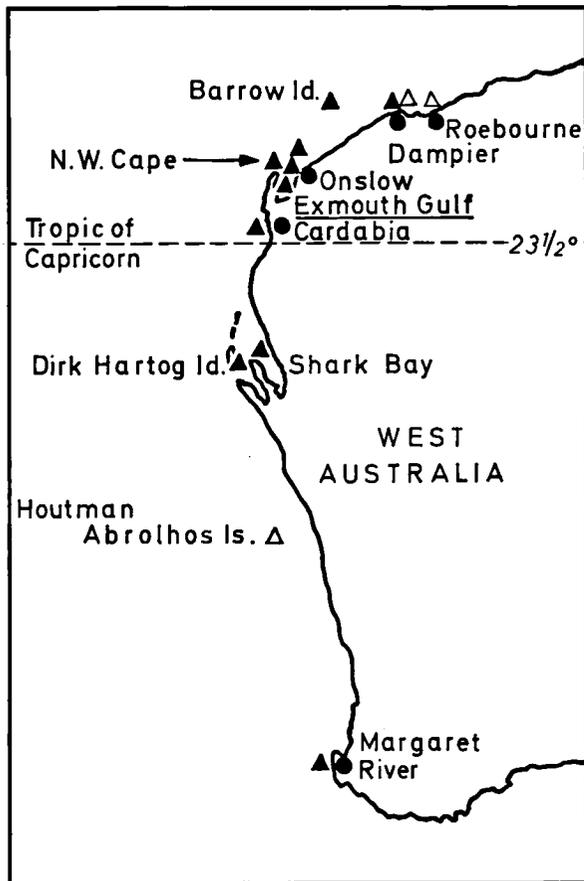
Type locality. West Australia, Exmouth

Gulf, east side of North West Cape, in sand near reef.

Additional material examined. Next to the type material, ZMA has specimens from Dampier, Barrow Island, Shark Bay, and Dirk Hartog Id. The collection Filmer contains specimens from Thevenard Id, Onslow, N.W. Cape, Cardabia, Shark Bay, Dirk Hartog Id, and Margaret River.

According to Dr. Fred E. Wells (in litt.) the West Australian Museum possesses specimens from Roebourne, Dampier Archipelago, Mangrove Bay in Exmouth Gulf, Vlaming Head, and Houtman Abrolhos. All these localities are situated in West Australia (map 4).

Description. Shell obconic, thick and heavy, of medium size. Spire medium to low, straight or slightly concave, the ten whorls are barely concave, with one spiral cord and numerous fine curved axial growth lines, sutures irregular; early whorls vaguely beaded, protoconch often eroded and missing. Shoulder rounded. Sides of body whorl convex just below



Map 4. Distribution of *Conus lischkeanus tropicensis* nov subsp.

the shoulder, then straight until slightly compressed above the base; body whorl shiny but not glossy, with vague irregular spiral lines and some axial growth lines; three vague spiral cords at the base. Aperture rather narrow and straight, slightly wider at the base; outer lip not thin but sharpish.

Colour white with pale tan evenly spread, except at the shoulder and base where irregular growth marks disturb the pattern. The spire whorls are white with indistinct orange-tan blotches, apex tinged purple-brown. Inside of aperture with two violet zones, the upper being darker.

Periostracum brownish yellow to reddish. The operculum is elongate oval.

Variability. Mainly in colouring which varies from almost white specimens with very

few tan markings to rather well marked darker specimens; the basal cords may be stronger and more numerous and are very occasionally nodulose. Many shells lose their shine and become chalky and eroded, it is rare to find specimens without severe erosion of the spire. The spire height varies only slightly. Sometimes fine brown spots are present in the paler zones, the blotches on the spire whorls are often darker than the colouring on the body whorl.

Habitat. Shallow water, in muddy sand patches near shelving reefs.

Distribution. The West Australian populations of *Conus lischkeanus tropicensis* are known from Roebourne to Margaret River (map 4).

Discussion. The subspecies *tropicensis* differs from *C. lischkeanus*, including subspec. *ker-madecensis*, by its heavier shell and stouter shape, lower spire, rounder shoulders and less obvious bands. The colouring is less pronounced and the aperture is violet instead of white. As already stated the habitat is shallow as opposed to deeper water.

We have studied specimens from Masirah Island, Oman (fig. 18), identified as "*C. kermadecensis*" in Bosch & Bosch (1982: 128, ill.), present in ZMA, leg. Dr. D. Bosch. The conchological characters of these shells are identical to those described above as subspecies *tropicensis* from West Australia. Provisionally we will include these populations from Oman as *C. lischkeanus* cf. *tropicensis*. They are collected at low tide level, in sand, under rocks.

Etymology. The name *tropicensis* is derived from the "Tropic" of Capricorn and of Cancer, because the populations have an antitropical distribution around the  $23\frac{1}{2}^{\circ}$  north and south latitudes (map 3).

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