

Cerithidea reidi, spec. nov., from Western Australia

by

RICHARD S. HOUBRICK

Department of Invertebrate Zoology, National Museum of Natural History,
Smithsonian Institution, Washington, D.C. 20560, U.S.A.

Abstract. *Cerithidea* (*Cerithidea*) ***reidi***, spec. nov. closely resembles *C. obtusa* (Lamarck) and, to a lesser degree, *C. anticipata* Iredale. Its distinctive radula has a very tiny, narrow rachidian tooth. The shell is the largest in the genus. The new species is endemic to Western Australia and lives above the water on the trunks of mangrove trees.

INTRODUCTION

DURING A REVIEW OF the Indo-Pacific species comprising the genus *Cerithidea* Swainson, 1840, it became apparent that there existed a large undescribed species, endemic to Western Australia, that is very similar in size and shape to *Cerithidea obtusa* (Lamarck, 1822) and similar in sculpture to the smaller *C. anticipata* Iredale, 1929. Some museum collections had referred the new species to *C. obtusa* because no modern taxonomic review of the Indo-Pacific *Cerithidea* species exists and the limits of intraspecific variation in *C. obtusa* were unknown. The purpose of the present paper is to analyze these taxa morphometrically and anatomically. This will provide a range of characters and a sufficient data base to recognize the new species as distinct from *C. obtusa* and to formulate a description of the new taxon that includes radula and some soft-part anatomy.

MATERIALS AND METHODS

Specimens were examined from the Western Australian Museum, Perth (WAM), The Australian Museum, Syd-

ney (AMS), and from the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM). Preserved snails were dissected using Methylene Blue solution under a Wild M-5 dissecting scope. Scanning electron micrographs of radulae were made on Cambridge Stereoscan 100 and Cambridge 250 Mark II Stereoscan scopes. For morphometric studies of shells, principal components and discriminant analyses were made using raw data from measurements of *Cerithidea reidi* ($n = 14$) and *C. obtusa* ($n = 14$). Variables included total shell length, width, aperture length, aperture width, number of whorls, number of nodes on penultimate whorl, and aperture length-shell length ratio.

The following abbreviations have been used in this paper: AMS = Australian Museum, Sydney; USNM = United States National Museum; WAM = Western Australian Museum.

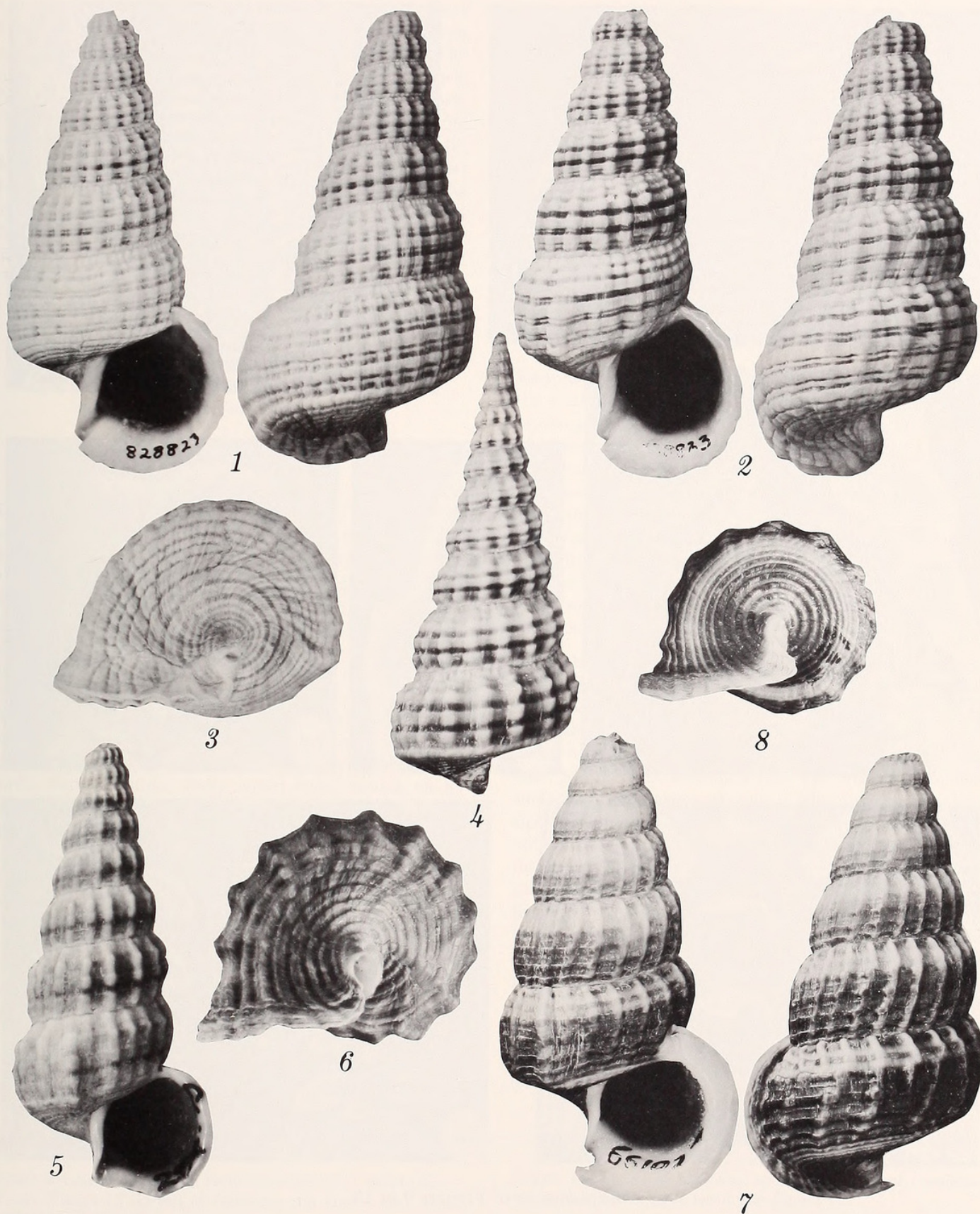
Material examined: Port Warrender, Admiralty Gulf (WAM 553-77, 72-83); near Yarrada, May River, W Kimberly (WAM 56-83); Buccaneer Archipelago (AMS c42225); Derby jetty, Derby (WAM 53-83, 64-83); Der-

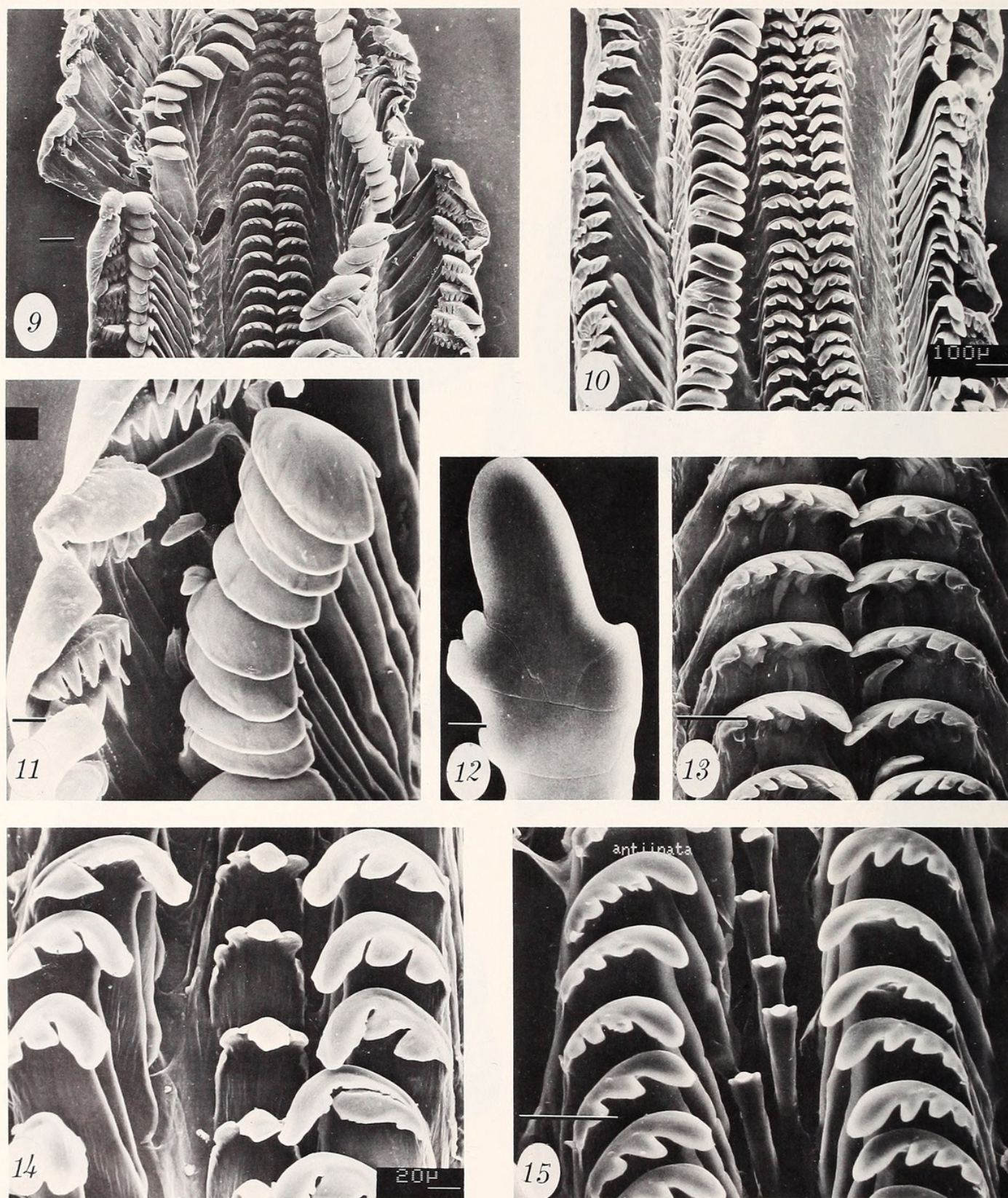
Explanation of Figures 1 to 8

Figures 1-4. *Cerithidea reidi*, spec. nov. All specimens from *Cerriops* trunks on salt pan near Willies Creek, N of Broome, Western Australia. Figures 1, 3, 4. Paratypes (USNM 828823), 54.1 mm, 53.5 mm, 24.8 mm. Figure 2. Holotype (WAM 3380-84) 53.6 mm. (Figure 4 is an immature, non-decollate specimen.)

Figures 5-6. *Cerithidea anticipata* Iredale, showing apertural view (31.9 mm) and enlarged anterior view, 12.3 mm; Prince Regent River Reserve, Western Australia (WAM 254-75).

Figures 7-8. *Cerithidea obtusa* (Lamarck) showing apertural (42.6 mm), dorsal (42.6 mm), and anterior (20.4 mm) views; NE corner of Palau Lumut, Port Swettenham, Malaysia (USNM 661023). Compare with *C. reidi* (Figures 1-4) for sculptural differences.





Explanation of Figures 9 to 15

Figures 9, 11–13. Radula of *Cerithidea reidi*, spec. nov., from Bay of Rest, Exmouth Gulf, Western Australia (WAM 2432-84). Figure 9. General view of radula of *C. reidi* with marginal

teeth spread back to reveal tiny rachidian teeth (bar = 100 μm). Figure 11. *Cerithidea reidi*, detail of marginal teeth. Note large lateral flange on outer marginal teeth (bar = 20 μm). Figure 12.

by (AMS c69288); Beagle Bay (AMS c108460); Cape Lambert (WAM 78-83); back of Dampier Creek on trunks and branches of mangroves, Broome (USNM 828818); near creek on salt pan on *Cerriops* trunks, Willies Creek, N of Broome (USNM 828823); Willies Creek, Broome (WAM 2431-84); Broome (AMS c68507, c69267, c78156, c51059, c108441, c108442, c106273, WAM 2435-84, 48-83); Finucane Id. Causeway, Port Hedland (AMS); Port Hedland (WAM 52-83, 271-33); NE of Dampier (WAM 2435-33, 62-83, 60-83); Dampier Salt, Dampier (WAM 2433-84); Barrow Id. (USNM 694228); Bay of Rest, Exmouth Gulf (WAM 2432-84); Gales Bay, Exmouth Gulf (WAM 2434-84).

DESCRIPTION

Family POTAMIDIDAE H. & A. Adams, 1854

Genus *Cerithidea* Swainson, 1840

Subgenus *Cerithidea* Swainson, 1840

Cerithidea reidi Houbrick, spec. nov.

(Figures 1-4, 9, 11-13)

Shell (Figures 1-4; Table 1): Shell large, of light structure, ranging in length from 51 to 61 mm and from 31 to 41 mm in width. Shell turreted and comprising about 6-7 decollate, inflated whorls. Early missing portion of shell comprising about 15 elongate tapering whorls. Whorls sculptured with 16-25 slightly curved axial ribs crossed by 5 spiral cords, the first 3 subsutural cords bearing nodules or beads at intersections creating cancellate pattern. Spiral cords separated by broad, brown, spiral grooves. The first subsutural spiral cord narrow and finely beaded. Early whorls inflated, angulate with thickened axial ribs and 2 spiral cords. Mid-whorls with 3 spiral cords. Suture distinct. Body whorl large, having on its base 6 or 7 major spiral cords and about 8 smaller spirals, the latter crossed by axial incised lines. Major varix opposite outer lip of aperture on base of body whorl. Aperture large, circular, over one-third the shell length, and with slightly flaring lip somewhat thickened along edge and extending into a flange at its base that slightly extends over the short anterior siphonal canal. Columella straight with thin columellar wash on parietal area of aperture. Anal canal a slight groove at posterior of aperture. Shell color flesh to tan with broad subsutural white band and 3 or 4 thin, brown, spiral bands per whorl. Spiral cords and beads white or very light tan. Aperture interior purple, outer lip and columella white.

Table 1

Shell statistics for *Cerithidea reidi*, spec. nov. (n = 14).

Character	Range	\bar{X}	SD	CV
Total length	51-61.3	54.80	3.04	5.55
Length of last two whorls	31.2-41.4	35.61	2.71	7.62
Shell width	22.6-27.8	24.81	1.40	5.66
Aperture length	18.1-22.4	20.77	1.43	6.89
Aperture width	14.8-19	17.18	1.33	7.76
Number of ribs	16-25	21.14	2.83	13.36
Aperture length/length	0.54-0.62	0.59	0.03	4.43

Operculum completely fills shell aperture and is thin, corneous, circular, and multispiral with central nucleus.

Radula (Figures 9, 11-13): Taenioglossate, one-seventh the shell length. Rachidian tooth very narrow, long, and tapering, becoming triangular and asymmetric at tip. Tip of rachidian tooth with one large central cusp having 2 tiny denticles on one side and 1 on the other. Lateral tooth with broad basal plate and broad cutting edge having long sharp inner cusp and 3 or 4 smaller outer denticles. Inner marginal tooth with spatulate tip and 2 tiny inner denticles. Outer marginal tooth with 5 or 6 smaller sharp denticles and large lateral flange extending the length of its outer side and partly covering outer marginal tooth on next row.

Animal: Preserved specimens tan to whitish. Foot large and with numerous longitudinal grooves on sole. Propodial mucus gland present. Head and snout broad; highly extensible, large snout divided by a median groove. Tentacles long and tapering with eye at outer peduncular base. Mantle edge smooth. Pallial eye present on under-surface of that portion of mantle edge forming inhalant siphon. Pallial eye larger than cephalic eyes, spherical with large lens and embedded in pitlike eye-cup lined interiorly with white pigment and surrounded on exterior surface by reddish and black pigment. Thin, straight ridge-like osphradium adjacent to ctenidium, becoming vermiform near inhalant siphon. Wide, shallow, rudimentary ctenidium extending length of mantle cavity. Each ctenidial filament thick and papillate at its origin but becoming very thin, tapering as it extends over the mantle roof. Pallial gonoducts open. Esophageal gland present.

Type locality: Willies Creek, N of Broome, near creek on salt pan on trunks of *Cerriops* mangroves.

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Detail of cusp formation on rachidian tooth of *C. reidi* (bar = 4 μ m). Figure 13. Detail of rachidian and lateral teeth of *C. reidi* (bar = 50 μ m).

Figure 10. General view of radula of *Cerithidea obtusa* (Lamarck) from Rayong, Thailand (USNM 777233).

Figure 14. Detail of rachidian and lateral teeth of *Cerithidea obtusa* (Lamarck), same locality as Figure 13.

Figure 15. Detail of rachidian and lateral teeth of *Cerithidea anticipata* Iredale, from Warrender, Admiralty Gulf, Western Australia (WAM) (bar = 50 μ m).

Table 2

Comparison of shell and radula characters among *Cerithidea obtusa*, *C. reidi*, spec. nov., and *C. anticipata*.

Character	<i>C. obtusa</i>	<i>C. reidi</i>	<i>C. anticipata</i>
Shell size	large (to 52 mm)	very large (to 61 mm)	small (to 44 mm)
Shell weight	thick, heavy	thin, light	thin, light
Shell color	dark brown	flesh color, tan	gray, brown
Aperture interior	light brown	purple	brown, tan
Outer lip	shelflike, thick	flaring, moderately thin	flaring, thin
Shell base	spiral sculpture only	spiral and axial sculpture	spiral and axial
Sculpture	no subsutural beads	spiral row of subsutural beads	subsutural beads usually absent
	axial ribs markedly sinuous	spiral cords weak or absent	prominent spiral cords
	axial ribs dominant	axial ribs less sinuous	axial ribs rarely sinuous
		axial ribs crossed by spiral	axial ribs dominant
		cords and incised lines	
Radula	wide rachidian, cusps	narrow rachidian, cusps	narrow rachidian, cusps
	symmetrical	asymmetrical	symmetrical
	narrow lateral, 3 or 4	broad lateral, 4 or 5 cusps	broad lateral, 3 or 4 cusps
	cusps		
	outer marginal with closely	outer marginal with well	well separated cusps
	fused cusps	separated cusps	rachidian narrow
	rachidian wide	rachidian very narrow	

Holotype (Figure 2): WAM 3380-84, length 53.6 mm, width 24.7 mm; 1 **paratype** AMS c144144; 10 **paratypes**, USNM 828823.

Etymology: Named for Dr. David Reid who first called my attention to this species.

DISCUSSION

Cerithidea reidi is undoubtedly the largest of all *Cerithidea* (*sensu lato*) species and is easily recognized by its thin shell, cancellate sculpture, purple aperture, and light color pattern. Other prominent distinguishing characters are the broad, spiral grooves that cross the axial ribs, the spiral row of subsutural beads, and the axial grooves on the shell base. Poor preservation of soft parts did not allow determination of the arrangement of the pallial gonoducts. The new species is allocated to the genus *Cerithidea* Swainson, 1840, subgenus *Cerithidea* as defined by HOUBRICK (1984: 16).

Although a common species in northwestern Australia, it has been previously cited in the literature as *Cerithidea obtusa*. Among Recent *Cerithidea* species, *C. obtusa* and *C. reidi* are the largest in shell size and look somewhat alike; consequently, they are the two species most likely to be confused. *Cerithidea reidi* differs from *C. obtusa* (Figures 7, 8), its closest morphological relative, by its larger, lighter, more tapering shell, a purple aperture, and in lacking the thick, shelflike edge of the outer apertural lip. *Cerithidea obtusa* has a brown colored shell with more highly inflated whorls that lack or have weak spiral cords. It possesses fewer axial ribs, and these are more sinuous and curved more strongly to the left than in *C. reidi*. In addition, *C. obtusa* lacks the subsutural row of beads and the

axial grooves on the base of the shell. The new species has a shorter radular ribbon and a much narrower rachidian tooth than does *C. obtusa*. The latter has a broad rachidian with a wide central cusp flanked by two denticles on each side; moreover, the lateral tooth is narrower than that of *C. reidi* and has a cutting edge of only three cusps that are spatulate rather than pointed (Figures 13, 14). The cusps on the outer marginal tooth are more closely fused in *C. obtusa* than in *C. reidi*. A summary and comparison of these characters is presented in Table 2.

To test the hypothesis that the shells differ between the two species, a discriminant analysis, using the shell data of *Cerithidea reidi* summarized in Table 1, was made. The discriminant variables are total length (TL), length of the last two whorls (L), aperture width (AW), and number of ribs on the penultimate whorl (R); total length is the most important variable and was the first step used in the analysis. Results show significant differences between *C. reidi* and *C. obtusa* (F-test: df = 4,23; F = 22.96; P = 0.01). The discriminant equation is: $0.423(TL) + 0.277(L) - 1.15(WA) + 0.096(R) - 13.324$. Comparison of the two species resulted in 100% of the specimens being correctly classified. *Cerithidea obtusa* does not appear to be sympatric with *C. reidi* in Western Australia. Indeed, the former species does not appear to be common in Australia, although there are some reliable records from Queensland. What has usually been called *C. obtusa* in Australia is probably either *C. anticipata* or *C. reidi*.

The only other species that may be confused with *Cerithidea reidi* is *C. anticipata* Iredale, 1929 (Figures 5, 6), formerly known as *C. kieneri* (Hombron & Jacquinot, 1852). *Cerithidea anticipata* (Figures 5, 6) is a much smaller narrower species, adult shells ranging from 28 to 44

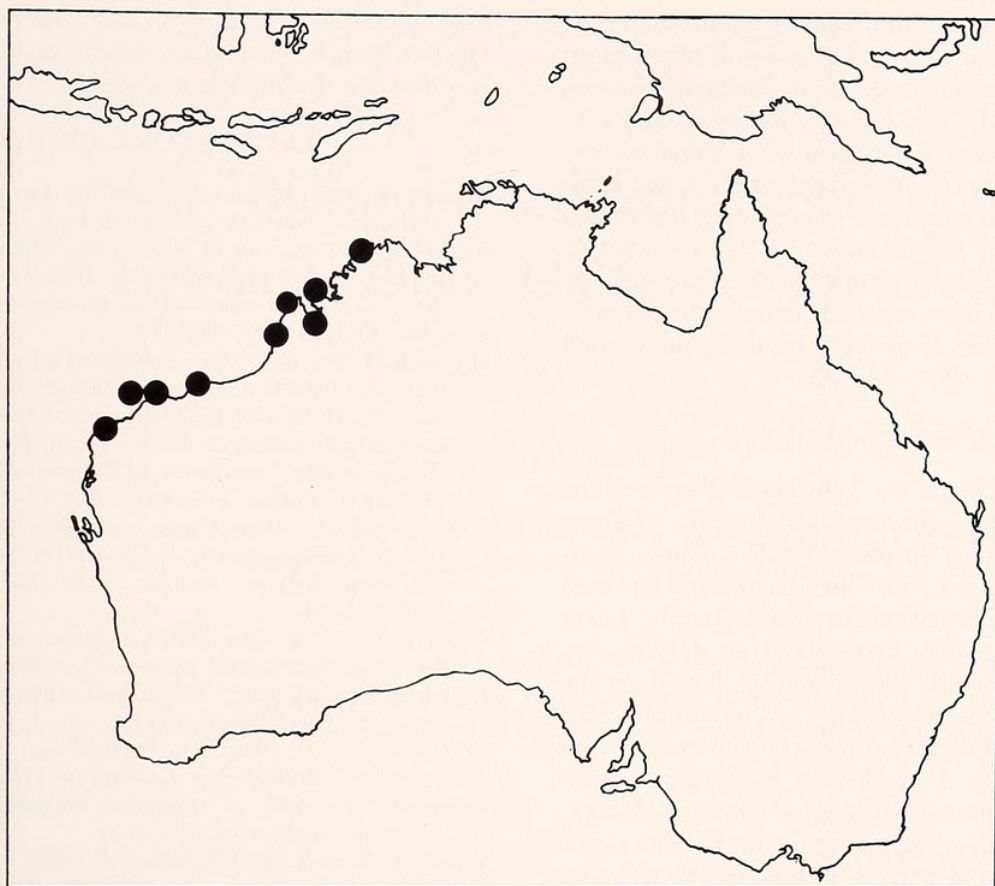


Figure 16

Geographic distribution of *Cerithidea reidi*, spec. nov.

mm in length, about one-half the size of *C. reidi*. The former has sculpture similar to *C. reidi* but the suture is more deeply impressed and the whorls more inflated. The aperture is never purple. In contrast to *C. reidi*, it either lacks or has weak spiral cords, incised lines, and subsutural beads. As the axial ribs are not as deeply crossed by the spiral sculptural elements, it is not as cancellate as *C. reidi*. The early whorls of *C. reidi* are more angulate anteriorly than in *C. anticipata*. Although adults are readily distinguished, juveniles and sub-adults of the two species are more difficult to separate. Young snails of *C. reidi* are normally more cancellate in sculpture and have a wider whorl angle. The radula of *C. anticipata* (Figure 15) has a narrow rachidian tooth with a cutting edge of one large central cusp flanked by a tiny denticle on each side. This differs from the rachidian tooth of *C. reidi*, which is narrower, has more irregular denticles, and is asymmetrical in cusp distribution (see Table 2 for comparisons).

Cerithidea anticipata occurs in mangrove forests in Queensland and extends north and across northern Australia to the Admiralty Gulf, where it overlaps slightly with *C. reidi*. Few specimens of *C. anticipata* have been seen from this region, but those examined are larger than specimens from northern Australia and Queensland and

are more similar to *C. reidi* in shell sculpture. These larger *C. anticipata*, while resembling *C. reidi*, never have a purple aperture and do not attain the large size of *C. reidi*. These two species are probably very closely related, as their radulae and shell sculptures are morphologically similar even though there is great size disparity.

The origins and distribution of *Cerithidea reidi* may be explained by vicarism due to the isolation of western Australia from the northern and eastern marine faunas by the Tertiary landbridge joining Australia and New Guinea (DOUTCH, 1972:1). Although I herein accord the new taxon specific recognition, future detailed studies using more extensive comparative material from the Northern Territory may reveal a subspecific relationship between *C. anticipata* and *C. reidi*.

Cerithidea reidi lives on the trunks of mangroves such as *Rhizophora*, *Ceriops*, and *Aegialitis*, and appears to be endemic to mangrove forests in Western Australia (Figure 16). It may also occur in Northern Territory but I have seen no records from this region. In the Admiralty Gulf, WELLS & SLACK-SMITH (1981:268) found this species (although cited as *C. obtusa*, their voucher lots show a mixture of *C. anticipata* and *C. reidi*) to be the most abundant mollusk in the upper two mangrove zones (*Ceriops* and

Aegialitis) where it lives on tree trunks from the mud level to 2 m above the mud surface and occurs in densities up to 1.65/m². *Cerithidea obtusa* occurs in similar habitats in northern Queensland, New Guinea, Indonesia and continental southeast Asia. It has also been found on wet mud banks and has been observed living around small pools dug by *Periophthalmus*, the mud skipper (BENTHEM JUTTING, 1956:434). PFLUGFELDER (1930) recorded *C. obtusa* on *Acanthus ilicifolius* at the edge of the mangrove zone and it has also been reported living on branches of *Rhizophora* and *Avicennia* about 1 m above the ground (BENTHEM JUTTING, 1956:434-435).

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