

The genus *Rhyssoplax* Thiele in the New Zealand Region (Mollusca: Polyplacophora)

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Abstract The New Zealand Recent species of *Rhyssoplax* Thiele 1893 recognised here are: *R. canaliculata* (Quoy & Gaimard 1835) (= *Chiton insculptus* A. Adams 1852); *R. aerea* (Reeve, 1847) (= *Chiton huttoni* Suter, 1906, syn. nov., *Chiton clavatus* Suter, 1907, syn. nov., *Chiton suteri* Iredale, 1910, syn. nov., *Rhyssoplax oliveri* Mestayer, 1921); and *R. stangeri* (Reeve, 1847). *R. coryphea* (Hedley & Hull, 1912) from Norfolk Island and *R. exasperata* (Iredale, 1914) from the Kermadec Islands are reillustrated and compared with the New Zealand species.

Keywords taxonomy; molluscs; *Rhyssoplax*; Kermadec Islands; Norfolk Island; Chitonidae

INTRODUCTION

Initial work during this study tended to support Beu's conclusion (1977: p. 46), that only one highly variable species of *Rhyssoplax* Thiele existed in New Zealand. Beu's conclusion was based on the apparent complete intergradation of shell characters in the material he studied. Study of girdle elements, however, revealed consistent differences that proved to be correlated to a large degree with differences in shell characters, thus confirming that three species were represented. The validity of the use of girdle characters in separating the species was tested by study of *Rhyssoplax* species from the Kermadec and Norfolk Islands, which are illustrated.

Three New Zealand Recent species are recognised: *R. canaliculata* Quoy & Gaimard; *R. aerea* Reeve; and *R. stangeri* Reeve. *R. stangeri* is the most weakly differentiated and is often confused with each of the others and with some of their synonyms that are still used in literature. Although Reeve's original descriptions of *R. stangeri*, and the subsequent observations of Iredale & Hull (1932: pp. 148–149) are accurate, neither adequately define the species. Accordingly, this species is fully redescribed.

The radulae of *Rhyssoplax* species reviewed here are extremely similar and appear to exhibit no species specific characters. To avoid needless repetition, the radula of *R. canaliculata* alone is described.

TEXT CONVENTIONS

The following abbreviations identify the repositories of material examined: AMS — Australian Museum (Sydney); BMNH — British Museum (Natural History) London; CM — Canterbury Museum (Christchurch); MNHN — Museum National D'Histoire Naturelle (Paris); NMNZ — National Museum of New Zealand (Wellington); NZGS — New Zealand Geological Survey (Lower Hutt). Letters and numbers preceding locality data identify station numbers.

SYSTEMATICS

Class POLYPLACOPHORA GRAY, 1821
Order NEOLORICATA Berghenayn, 1955
Family Chitonidae Rafinesque, 1815
Genus *Rhyssoplax* Thiele, 1893

Rhyssoplax Thiele, 1893: p.368. Type species (ICZN opinion 951) *Chiton affinis* Issel, 1869, Gulf of Suez. For synonymy see Van Belle (1983: p.124).

Remarks. Van Belle (1983: p.124) regards *Rhyssoplax* as a subgenus of *Chiton* (Linnaeus 1758) and his diagnosis is adequate. Although the weightings given to criteria that define *Rhyssoplax* are subjective to some degree, *Rhyssoplax* species as

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here interpreted form a large natural group, with a worldwide distribution, distinct from other species of *Chiton*. Interpretation of *Rhyssoplax* as a subgenus of *Chiton* detracts from the differences between the group of species that can be assigned to it and other species of *Chiton* sensu lato which clearly cannot. *Rhyssoplax* is here regarded as a genus.

***Rhyssoplax canaliculata* (Quoy & Gaimard, 1835)**
(Fig. 1A–G, 4A, D)

Chiton canaliculatus Quoy & Gaimard, 1835: pp. 394–395, pl.75, fig. 37–42; Deshayes, 1836: 502; Pilsbry, 1892: p.177, pl.36, fig. 4–6; Suter, 1913: p.37, Atlas (1915), pl.2 fig. 16; pl.4, fig. 10.

Chiton (Lophyrus) canaliculatus. Hutton, 1872: p.176.

Chiton insculptus A. Adams, 1852: p.91, pl.16, fig. 4.

Chiton (Lepidopleurus) canaliculatus. von Martens, 1873: p.36.

Lepidopleurus canaliculatus. Hutton, 1880: p.112.

Chiton canalicatus [sic] von Wissel, 1904: p.655, pl.2, fig. 59–62 (in part).

Rhyssoplax canaliculata. Iredale, 1914: p.426; Finlay, 1927: p.334; Iredale & Hull, 1932: p.147, pl.9, fig. 12–13; Beu, 1977: p.45 (in part); Powell, 1979: p.28, pl.6, fig. 5.

Rhyssoplax (Chiton) canaliculatus. Ashby, 1922: p.579.

Chiton (Rhyssoplax) canaliculatus. Ashby, 1929: p.369.

Anthochiton canaliculatus. Dell, 1951: p.12; Graham, 1962: p.58; Morton & Miller, 1973: p.580, fig. 220 (2).

NOT *Rhyssoplax canaliculata*. Odhner, 1924: p.9 (non Quoy & Gaimard = *Rhyssoplax aerea* Reeve, 1847).

Type data. *Chiton canaliculatus* Quoy & Gaimard, 1835. **Lectotype** (here selected from two partially disarticulated syntypes) comprising 7 valves, dried animal, no girdle elements, MNHN (not registered), NEW ZEALAND; *Chiton insculptus* A. Adams, 1852. **Lectotype** (here selected from five syntypes), intact specimen c. 27 × 16 mm (incl. girdle), BMNH.1951.1.26.3, NEW ZEALAND.

Description. (Fig. 1A–G). Shell generally narrower than for other New Zealand *Rhyssoplax* species, the valves strongly arched. Valve sculpture comprises longitudinal, narrow ribs with accompanying wider interspaces over the pleural and dorsal areas; lateral

areas elevated, sculptured with smooth, pustulose ribs. Valve colour is almost invariably, predominantly pink. Usually a stripe is present along either side of the jugum, and most commonly this varies from black to grey, although may be present as a yellow or orange stripe. Mucro antemedian. Gill line holobranchial.

Girdle (Fig. 1E–G). Dorsal girdle surface usually uniformly pale pink to reddish, occasionally yellowish or rendered tomentose by additional pale or black bands. Dorsal scales highly polished, imbricating, broadly triangular in outline; sculptured with weak to obsolete, widely spaced, longitudinal striae. Interstices almost completely smooth. Scale tops with a few localised, raised granules; margins with smaller, spaced granules and minutely shagreened areas.

Marginal fringe comprising spicules and stalked elements. Spicules short, ovate in cross-section, widest at base; tips smooth, rounded. Spicules sculptured with smooth, spaced, diverging threads. Stalked elements cigar-shaped, smooth, inserted sporadically among groups of spicules.

Ventral girdle scales narrowly rectangular, rounded at ends, basal surface with weak, concave depression. Scales arranged in longitudinal, overlapping rows.

Radula (Fig. 2A,D), with the formula 6–2–1–2–6. Central tooth relatively long and narrow, with small, rounded, posteriorly recurved tip. Lateral I longer than central, lamelliform with slightly inwardly produced apical portion. Lateral II (major lateral) entire, broadly ovate; anterior face of tip with a small, rounded boss. Posterior face concave, except for a small flattened area at tip. Lateral II shaft with inwardly projecting nodular part. Marginals I, II very small with raised cutting edges. Marginal III (major marginal) spatulate, with smooth edge. Marginals IV, V, VI flat lying; marginal IV with inwardly directed, hooked tip; marginal V narrowly rhomboid; marginal VI broadly rhomboid.

Material examined. 416 specimens and loose valves, all NMNZ. BS905, 33°57.4'S; 172°19.4'E, 128–123 m, King Bank, NE of Three Kings Islands, (valves); BS768, 37°33.1'S; 178°49.5'E, Ranfurly Bank, East Cape, 94–89 m, (1); BS835, 37°36.4'S; 178°51.5'E, Ranfurly Bank, East Cape, 55–59 m, (2); BS679, 37°35.8'S; 178°52.7'E to 37°35.6'S; 178°52.3'E, Ranfurly Bank, East Cape, 49 m, (28); BS678, 37°36.3'S; 178°53.1'E, East Cape, 74 m, (1); BS159, 39°36'S; 177°03'E, Hawke Bay, 10–11 m, (2); BS160, 39°36'S; 177°05'E, Hawke Bay, 12–13 m, (2); BS150, 39°13.5'S; 177°10.5'E, Hawke Bay, 27 m, (2); BS490 30°57'S; 174°13'E, off Waitotara

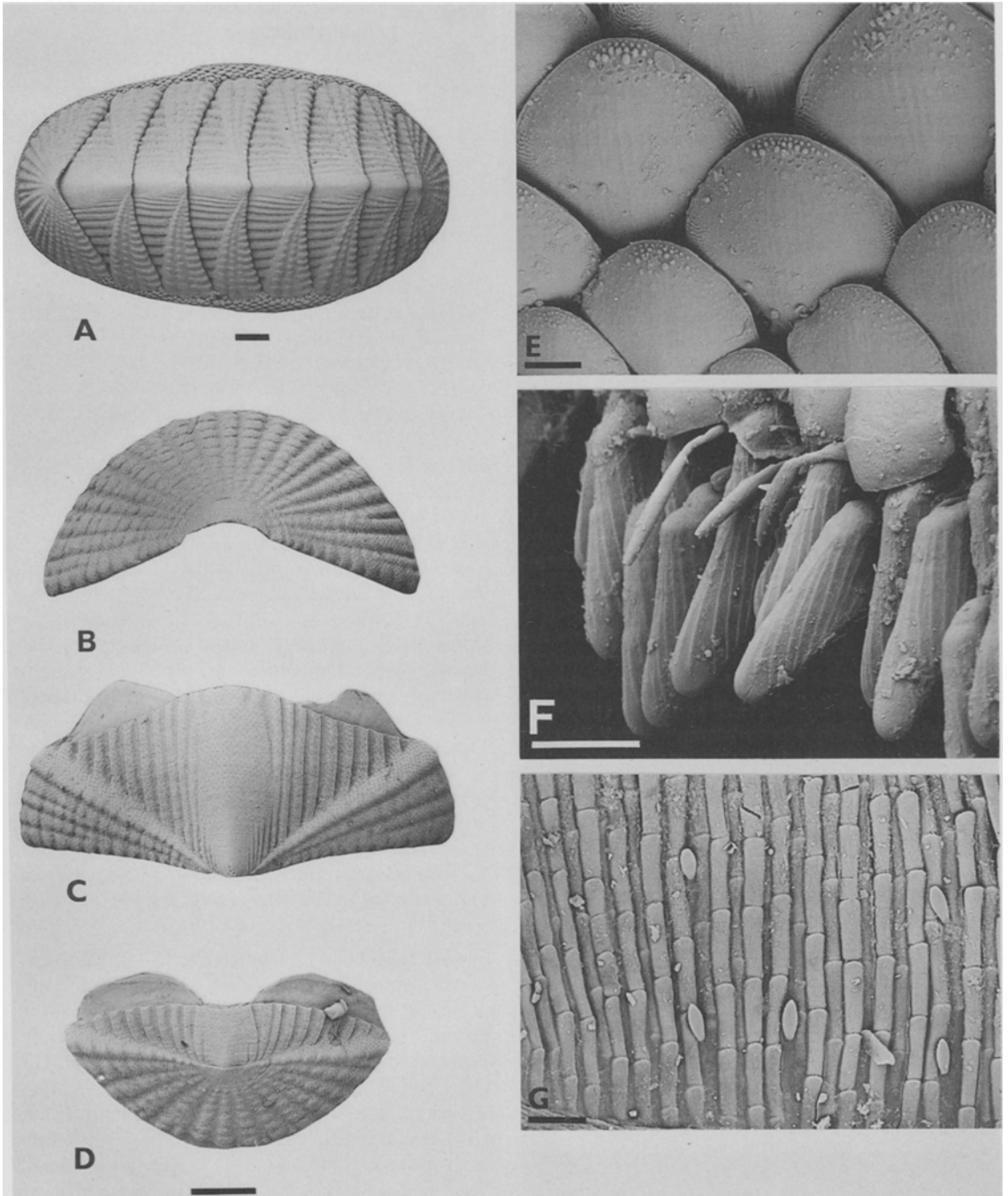


Fig. 1 *Rhyssoplax canaliculata*. (A) whole specimen, NMNZ M.87465; (B–D) dorsal aspect of head, intermediate and tail valves; (E–G) dorsal, marginal and ventral girdle elements. (A–D) bars = 1.0 mm; (E–G) bars = 50 μ .

River mouth 33–35 m, (13); BS485, 40°09'S; 174°54'E, off Wangaehu River mouth, 55–57 m, (38); Puponga, Nelson, 5–10 m, (1); Totaranui, Nelson, (1); French Pass, Marlborough, (5); Queen Charlotte Sound, 5 m, (valves); Chatham Islands, (2); Awarua Bay, Westland, (5); Oamaru, 27–118 m, (13); Portobello, 5–7 m (2); Puysegur Pt, (1); Dusky Sound, 33–35 m, (1); BS588, 46°7.1'S; 166°44'E, Preservation Inlet, 5–10 m, (1); Foveaux Strait, 18–55 m, (298).

Distribution. (Fig. 5). *R. canaliculata* occurs throughout New Zealand, between c. 34°S and 47°S latitudes, living from extreme low tide to as deep as 118 m. It seldom occurs with other species of *Rhyssoflex*. *R. canaliculata* is common off the South Island especially in Foveaux Strait and is the dominant *Rhyssoflex* species on South Island shell beds. The species is less common in the North Island, and based on material examined here, not collected north of East Cape. However, single valves collected off the Three Kings Islands appear to represent this species.

Marshall (1981: p.498) discussed the occurrence of otherwise typically southern algae and molluscs at the Three Kings Islands which persist there because of the local upwelling of cold water. *R. canaliculata* can fairly confidently be added to this list.

Examination of material relating to Odhner's (1924: p.9) records of *R. canaliculata* from Wellington Harbour and Carnley Harbour (Auckland Islands), refer to specimens of *R. stangeri* and *R. aerea*, respectively.

Remarks. The predominantly pink coloration renders this the most distinctive of the New Zealand *Rhyssoflex* species. *R. canaliculata* is well characterised by the highly polished, very weakly sculptured, broadly triangular dorsal girdle scales, the typically longitudinally grooved jugum, the pleural area sculpture of raised eave-like ribs with comparatively broader interspaces, and the sharply raised lateral areas and steeply arched valves.

Rhyssoflex aerea (Reeve, 1847)

(Fig. 2A–G)

Chiton aereus Reeve, 1847 (species 36), pl.7, fig. 36, ("Detail of sculpture") fig 36; Pilsbry, 1893: p.179, pl.36, fig. 96–97; Suter, 1913: p.36, Atlas (1915), pl.2, fig. 15, pl.4, fig. 9.

Chiton sinclairi. Hutton, 1873: p.47 (non Gray, 1843).

Chiton (Leptochiton) cereus [sic] von Martens, 1873: p.37.

Chiton (Leptochiton) aereus. E. A. Smith, 1874: p.4, pl.1, fig. 9.

Chiton siculoideus. (Carpenter MS) E. A. Smith, 1891: p.392 (non Angus, 1878).

Chiton stangeri. Suter, 1897: p.196; 1913: p.40, Atlas (1915), pl.2, fig. 9, pl.4, fig. 13 (non Reeve, 1847).

Chiton sp. Hamilton, 1905: p.36.

Chiton huttoni Suter, 1905: p.70 (nomen nudum); 1906: p.320, pl.18, fig. 1–6; 1913: pp.38–39, Atlas (1915) pl.2, fig. 17, pl.4, fig. 12.

Chiton clavatus Suter, 1907: p.296, fig. 3; 1913: p.38, pl.4, fig. 11.

Chiton suteri Iredale, 1910: p.102; 1914: p.426.

Rhyssoflex aerea. Iredale, 1914: p.426; Iredale & Hull, 1932: p.140, (text fig.); Powell, 1979: p.28.

Rhyssoflex huttoni. Iredale, 1914: p.426; Iredale & Hull, 1932: p.146, pl.9, fig. 8–9.

Rhyssoflex suteri. Iredale & Hull, 1932: p.141, pl.8, fig. 28–29; Powell, 1979: p.28.

Rhyssoflex oliveri Mestayer, 1921: p.179, pl.38, fig. 9–11; Finlay, 1927: p.334.

Anthochiton aereus. Dell, 1951: p.12, fig. 8; Powell, 1955: p.134; Graham, 1962: p.58; Morton & Miller, 1973: p.96, fig. 34 (5).

Anthochiton suteri. Dell, 1951: p.12, fig. 9; Boreham, 1959: p.74.

Anthochiton clavatus. Boreham, 1959: p.74.

Anthochiton huttoni. Boreham, 1959: p.74.

Rhyssoflex canaliculata. Beu, 1977: p.45 (in part, non Quoy & Gaimard, 1835).

Rhyssoflex aerea aerea. Powell, 1979: p.27, pl.6, fig. 4.

Rhyssoflex aerea huttoni. Powell, 1979: p.27.

NOT *Chiton aereus*. Suter, 1897: p.195, (non Reeve = *Chiton quoyi limnosa* Suter, 1905).

NOT *Rhyssoflex huttoni*. Odhner, 1924: p.9, (non Suter = *Chiton pelliserpentis* Quoy & Gaimard, 1835).

Type data. *Chiton aereus* Reeve, 1847: Holotype, valves and girdle intact, dried, c. 38×20 mm (incl. girdle), BMNH 1986034, NEW ZEALAND; *Chiton huttoni* Suter, 1906: Holotype, valves and girdle intact, dried, 29×16.5 mm (incl. girdle), NZGS TM.1240, Dunedin, NEW ZEALAND; *Chiton clavatus* Suter, 1907: Lectotype (Boreham, 1959: p.74), partially disarticulated, dried, c. 11.5×6 mm (incl. girdle), NZGS TM.1239, Rangitoto Island, NEW ZEALAND; *Chiton suteri* Iredale, 1910:

Holotype, valves and girdle intact, dried, c. 12×8 mm (incl. girdle), NZGS TM.1241, Lyttleton, NEW ZEALAND; *Rhyssoflex oliveri* Mestayer, 1921:

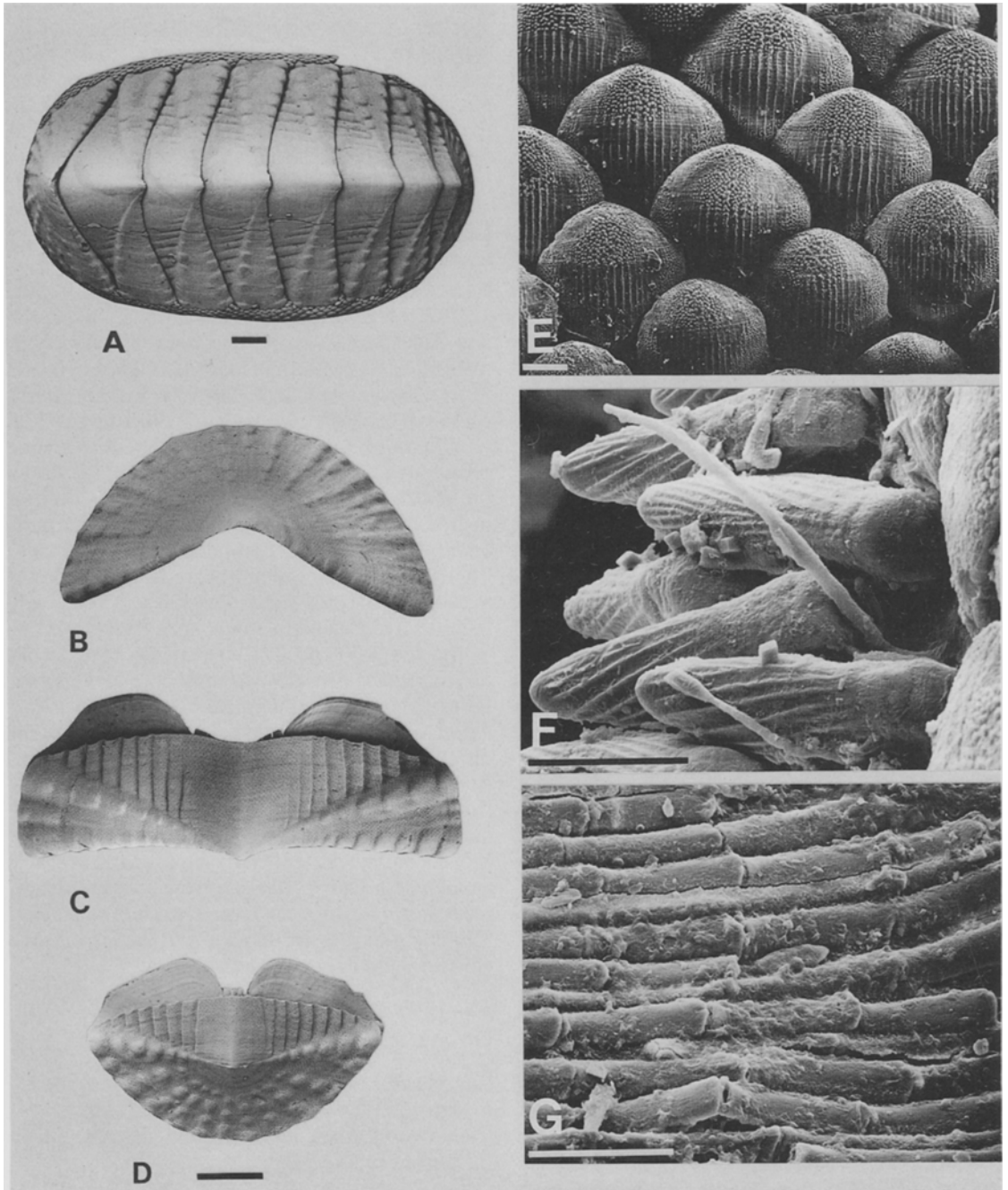


Fig. 2 *Rhyssoplax aerea*. (A) whole specimen, NMNZ M.87466; (B–D) dorsal aspect of head, intermediate and tail valves; (E–G) dorsal, marginal and ventral girdle elements. (B–D) bar = 1.0 mm; (E) bar = 100 μ ; (F–G) bars = 50 μ .

Holotype, valves and girdle intact, dried, c. 10×7 mm (incl. girdle), NMNZ M.1150, Lyall Bay, NEW ZEALAND.

Description. (Fig. 2A–G). Shell reaches larger sizes than for other New Zealand *Rhyssoplax* species and is generally broader in relation to length. Valve sculpture comprises broad, smooth ribs that cover the pleural areas, but that frequently do not extend the pleural areas full length, and accompanying narrower interspaces (furrows). Ribs characteristically do not extend onto the jugum. Lateral areas sculptured with radiating, completely smooth to smooth pustulose ribs. Shell colour ranges from dark to light green and mauve, with specimens frequently displaying completely red, orange, or white coloration. Specimens may also develop randomly scattered black patches on some valves. Mucro antemedian. Gill line holobranchial.

Girdle (Fig. 2E–G). Coloured the same as tementum, variable, often uniform, occasionally with patches of lighter or darker shading. Dorsal girdle scales dull; imbricating, semi-quadrate in outline with broadly rounded tips. Scales sculptured with comparatively widely spaced, strong, longitudinal threads. Interstices with weak, wavy striae that produce a reticulate pattern. Longitudinal threads weakly granulose at their intersection with concentric striae. Scale tips with crowded, raised beads; much smaller granules are developed about the scale margins. Scale margins prominently shagreened.

Marginal fringe and ventral elements as in *R. canaliculata*.

Material examined. 239 specimens, all NMNZ, all low tidal (submerged) unless otherwise specified. Great Island, Three Kings Islands, (?depth), (1); Tapeka Pt, Bay of Islands, 2–4 m, (19); Oke Bay, Bay of Islands, (?depth), (1); Whangarei, (1); Waitemata Harbour, (?depth), (2); Rangitoto Island, (9); Great Barrier Island, (5); Mokohinau Islands, 15 m, (2); Motutapu Island, (3); Bay of Plenty, (1); Tekaha, 1–15 m, (5); Waihou Bay, 2–6 m, (16); East Cape, (3); Lottin Pt, (2); Gisborne, (1); Hawke Bay, 0–12 m, (18); Kapiti Island, (1); Wellington Region, (93); Totaranui, Nelson, 5–6 m, (2); Pelorus Sound, (1); Arapawa Island, Queen Charlotte Sound (?depth), (3); Banks Peninsula, (2); Lyttelton Harbour, (7); Port Levy, 0–8 m, (4); Timaru, (5); Moreaki, (1); Shag Pt, (9); Stewart Island, (3); Auckland Islands, (?depth), (3); Campbell Island, (1).

Distribution. (Fig. 5). *R. aerea* occurs throughout New Zealand from c. 35°S to at least 52°S latitude. Though locally not uncommon, this is the most infrequently encountered New Zealand *Rhyssoplax* species. Usually collected at extreme low tide, the species ranges to 15 m. *R. aerea* is consistently associated with a rocky habitat and has not been obtained in dredgings from sublittoral shell substrata, the typical habitat of the two other New Zealand *Rhyssoplax* species. *R. aerea* appears to have a more even distribution than either *R. canaliculata* or *R. stangeri*. In central and northern North Island localities, on rocky substrata, it frequently occurs in association with *R. stangeri*.

Remarks. As the synonymy shows, *R. aerea* Reeve, 1847 has been the most taxonomically subdivided of any of the New Zealand *Rhyssoplax* species. Type material of *Chiton huttoni* Suter and *Chiton clavatus* Suter, *Chiton suteri* Iredale and *Rhyssoplax oliveri* Mestayer is conspecific with that of *R. aerea*.

Chiton clavatus, *Chiton suteri*, and *Rhyssoplax oliveri* are all based on small specimens of *R. aerea* on which the sculpture is developed to varying degrees, ranging from an almost smooth shell in *R. oliveri* to a prominently sculptured one in *C. suteri*. Their dorsal girdle characters are identical. *Chiton huttoni* is based on a larger specimen with a relatively flat dorsal angle and intensely sculptured shell.

Powell (1979; pp. 27–28) treated *R. aerea aerea* and *R. aerea huttoni* as two subspecies of *R. aerea*, but there is complete intergradation between the two extremes and there are no sustainable regional differences. Accordingly his view is unjustifiable.

R. aerea is separated from *R. canaliculata* and *R. stangeri* by the dull, coarsely sculptured, semi-quadrate dorsal girdle scales, the comparatively broader outline of the shell (generally narrower in *R. canaliculata* and *R. stangeri*), the smooth jugum, pleural area furrows that typically do not extend the full length of the pleural area, and the less clearly defined sculpture on the lateral areas.

Rhyssoplax stangeri (Reeve 1847)

Fig. (3A–G)

Chiton stangeri Reeve, 1847: (species 150), pl.22, fig. 150 ("Detail of sculpture", fig. 150).

Chiton (Lophyrus) stangeri. von Martens, 1873: p.36.

Chiton canalicatus [sic] von Wissel, 1904: p.655, pl.21, fig. 59–62 (in part, not Quoy & Gaimard, 1835).

Chiton canaliculatus. Iredale, 1910: p.102.

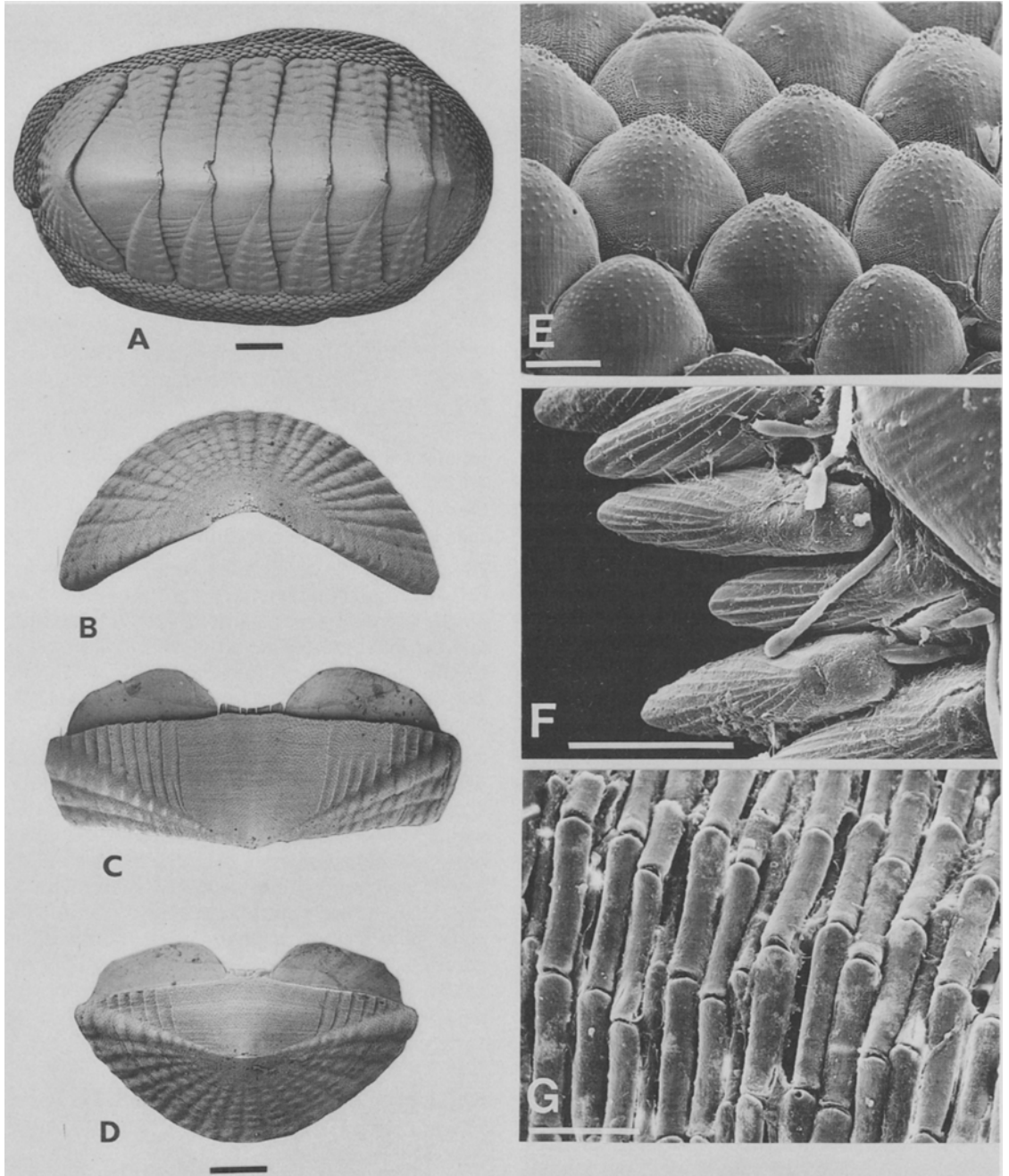


Fig. 3 *Rhysoplax stangeri*. (A) whole specimen, NMNZ M.87467; (B–D) dorsal aspect of head, intermediate and tail valves; (E–G) dorsal, marginal and ventral girdle elements. (A–D) bar = 1.0 mm; (E) bar = 100 μ ; (F–G) bars = 50 μ .

Rhysoplax stangeri. Iredale & Hull, 1932: p.148, pl.9, fig. 10–11.; Powell, 1979: p.28, pl.13, fig. 6; Walsby & Morton, 1982: p.10 (text fig).

Anthochiton stangeri. Dell, 1951: p.12.

Rhysoplax canaliculata. Beu, 1977: p.45, (in part, not Quoy & Gaimard, 1835).

NOT *Chiton stangeri*. Suter, 1913: p.1081, (non Reeve = *Chiton suteri* Iredale, 1910).

Type data. *Chiton stangeri* Reeve, 1847. Holotype, valves and girdle intact, slightly curled, 14.5×9 mm. BMNH, Tasman Bay, NEW ZEALAND.

Description. (Fig. 3A–G). Reeve's (1847) description is inadequate, and although the observations of Iredale & Hull (1932: pp. 148–149) are accurate, a more detailed description is offered here.

Shell up to 25 mm long, ovate, slightly wider posteriorly. Valves moderately to steeply arched, beaked. Mucro slightly antemedian with concave posterior face. Gill line holobranchial.

Tegmentum (Fig. 3A–D). Coloration highly variable; green, brown, yellow, white, red, or orange, either uniformly or in striped or mottled patterns. Valve I, lateral areas, and post mucronal area sculptured with radial series of quadrate, flattened pustules. Pleural areas sculptured with longitudinal ribs that typically extend the length of the pleural area, but, may terminate before the anterior margin of the valve; ribs occasionally developed to the jugum; jugum always smooth. Ribs broader than interspaces. Valve eaves short, solid.

Articulamentum. White, polished, often with the jugal coloration of the tegmentum present at the valve apex. Insertion plates well developed, slit formula 8–9/1/9–12; slits with corresponding rays. Teeth strongly pectinate and externally lamellate. Sutural lamellae sub-rectangular, separated by a well developed, denticulate jugal plate.

Girdle (Fig. 3E–G). Coloured as tegmentum, in many specimens frequently irregularly tomentose. Dorsal scales moderately polished (semi-glossed), imbricating, ovate to broadly mitriform, with rounded tips, Scales sculptured with weak, closely spaced, longitudinal ribs and very weak, wavy, intersecting concentric striae. Sculpture very weak on dorsal half of each scale, comprising widely spaced, granular elements that increase in size and density towards the tip; margins and basal half strongly shagreened.

Marginal fringe and ventral elements as in *R. canaliculata* Quoy & Gaimard.

Material examined. 253 specimens, all NMNZ, all low tidal unless specified otherwise. BS871,

34°49.6'S; 173°15'E, off Rangaunu Bay, Northland, 23 m, (33); BS257, 35°16'S; 174°11.5'E, Bay of Islands, 7 m (2); Bay of Islands, 7–12 m, (35 and valves); Whangarei Harbour, 9–20 m, (60); Goat Island, Leigh, 5–18 m (8); Cape Rodney, 10–15 m, (28); Kawau Island, 12–16 m, (6); Great Barrier Island, (?depth), (3); North Auckland, (1); Manukau Harbour, (6); BS737, 37°40.4'S; 176°23.3'E to 37°40.7'S; 176°24.5'E, off Motiti Island, 44 m, (1); BS745, 37°18.3'S; 176°16.7'E to 37°18'S; 176°16.8'E, Mayor Island, 29–34 m, (1); Waihou Bay, Bay of Plenty, 2–5 m, (5); Tekaha, Bay of Plenty, 0–15 m, (9); Cape Runaway, 15–18 m, (2); BS769, 37°33.2'S; 178°50.3'E; Ranfurly Bank, East Cape, 76–71 m, (3); Oanui, South Taranaki, (?depth), (1); Hawke Bay, 30 m, (2); Pania Reef, Napier, 15 m, (2); Bare Island, Hawke Bay, 6–12 m, (10); BS534, 40°42'S; 172°11'E; Kahurangi Shoals, NW Nelson, 40 m, (1); Totaranui, NW Nelson, (?depth), (4); Golden Bay, Nelson, (?depth), (8); BS515, 41°05'S; 174°05'E, Forsyth Bay, Marlborough Sounds, 9–18 m, (1); Queen Charlotte Sound, (valves); BS588, 46°7.1'S; 166°44'E, Preservation Inlet, 5–10 m, (3); Dusky Sound, (2); Foveaux Strait, (?depth), (2); Stewart Island, various localities, 4–28 m, (14).

Distribution. *R. stangeri* has similar regional and bathymetric distributions to those of *R. canaliculata*, but the former is more common off the North Island, and the latter off the South Island. *R. stangeri* is equally abundant on subtidal shell and rocky substrata, whereas by contrast *R. canaliculata* occurs almost exclusively on subtidal shell substrata.

Remarks. On the basis of description alone and without reference to type material, both *Chiton suteri* and *Chiton clavatus* could easily be confused with *R. stangeri*. Both of these however are synonyms of *R. aerea* (see above).

R. stangeri is most closely related to *R. canaliculata*, but differs from that species in the different shape and sculpture of the dorsal girdle elements, the tegmental sculpture, especially the almost consistently smooth jugal area, in having ribs as wide or wider than interspaces, and in the enormous variety of coloration.

Rhysoplax coryphea (Hedley & Hull, 1912)

(Fig. 4C,F)

Chiton corypheus Hedley & Hull, 1912: p.277, pl.7, fig. 6a–c.

Rhysoplax coryphea. Iredale & Hull, 1932: p.145, pl.9, fig. 17–20.

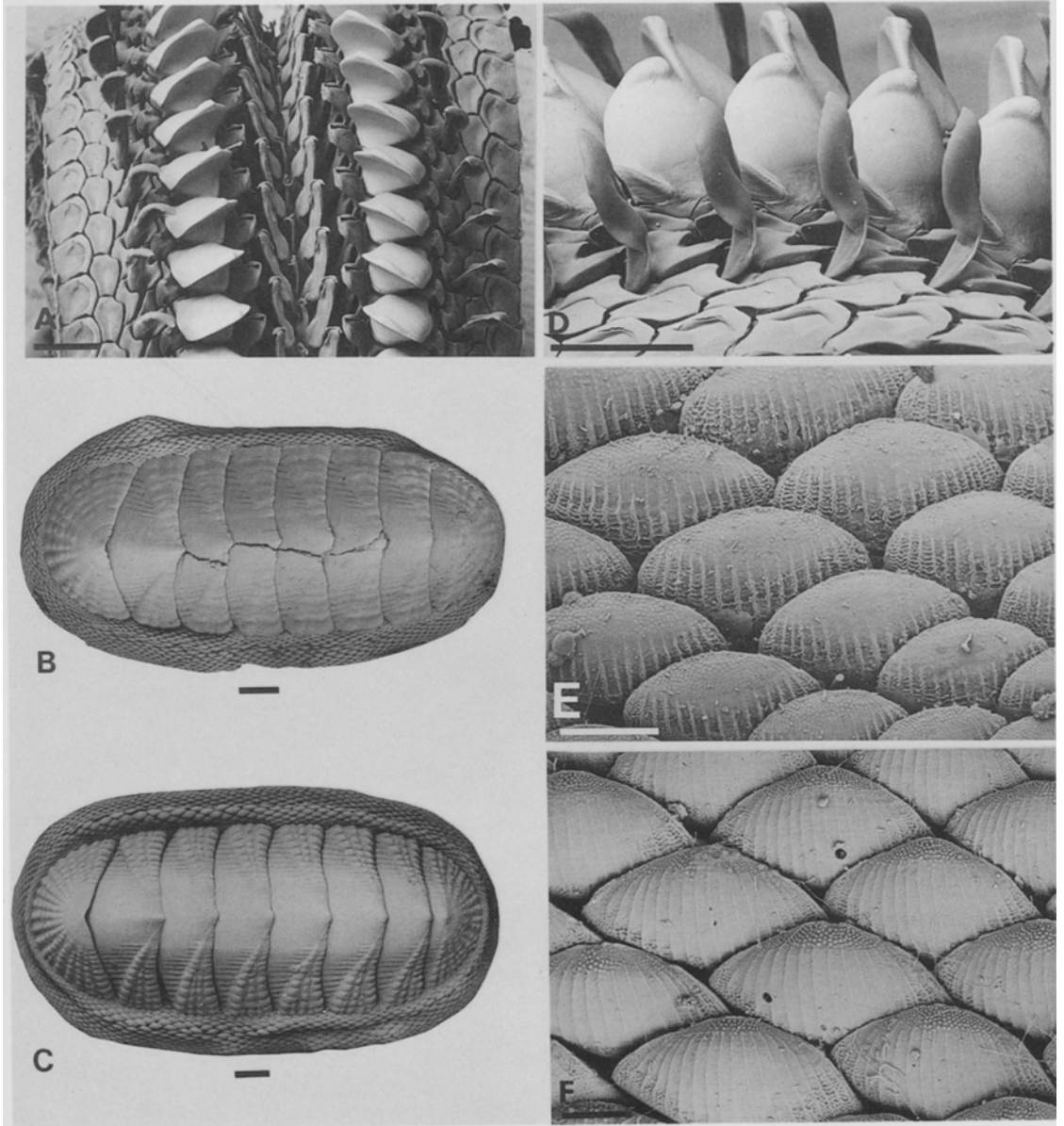


Fig. 4 (A,D) *Rhyssoplax canaliculata*, radula; (B,E) *Rhyssoplax exasperata*, NMNZ M.17060, whole specimen and dorsal girdle elements; (C,F) *Rhyssoplax coryphea*, NMNZ M.17061, whole specimen and dorsal girdle elements. (A,D) bars = 200 μ ; (B,C) bars = 1.0 mm; (E,F) bars = 100 μ .

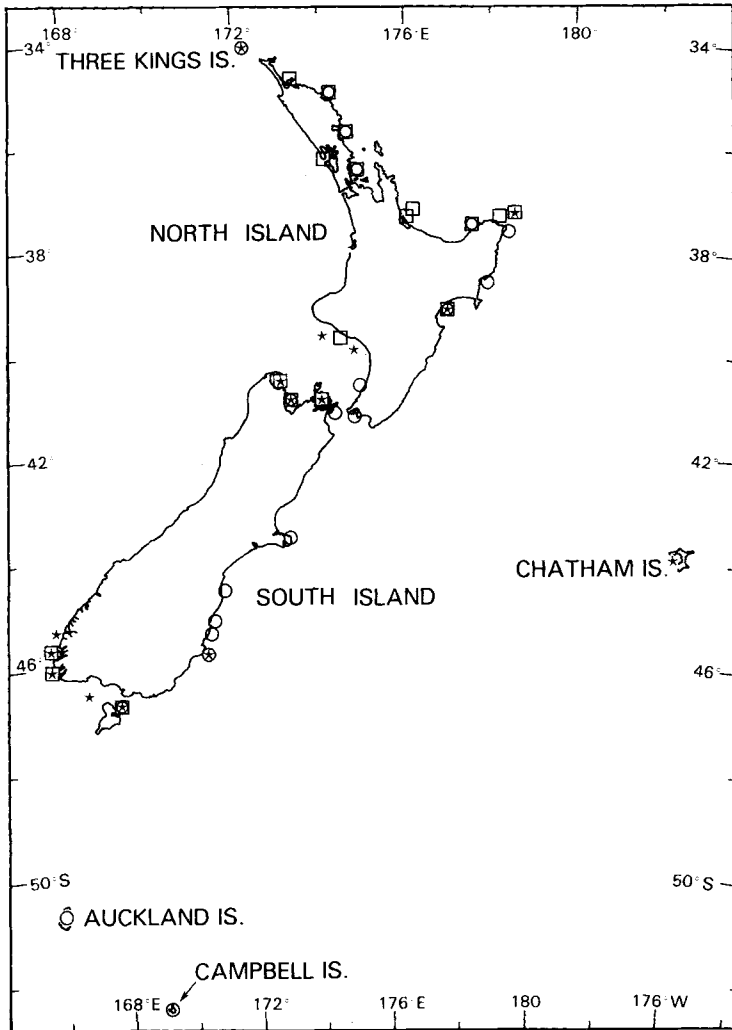


Fig. 5 Generalised distribution of New Zealand *Rhyssoplax* species based on NMNZ material. *R. canaliculata* (★); *R. aerea* (○); *R. stangeri* (□).

Type data. Holotype, dried, valves and girdle intact, c.18×9 mm (incl. girdle), AMS C.33115, NORFOLK ISLAND.

Material examined. 9 specimens in 2 lots (NMNZ M.17061), M.33750), Norfolk Island.

Distribution. Norfolk Island, "...on the undersurface of loose stones in pools on the coral reef; on the underside of and in the interstices between large basalt boulders or on the surface of rocks in pot-holes" (Hedley & Hull 1912: p.277).

Remarks. The original description characterises the material examined. This species resembles *R. stangeri* from New Zealand in general appearance,

but is easily separated by the different characters of the dorsal girdle elements (Fig. 4F). These include a broader, more obtusely triangular outline of the dorsal girdle scales, and particularly the scale sculpture that comprises well defined, sharply raised ribs with accompanying broad interspaces and raised, crowded nodules that are confined to the scales apex.

***Rhyssoplax exasperata* Iredale, 1914**

(Fig. 4B,E)

Rhyssoplax exasperata Iredale, 1914: p.41, pl.2, fig. 13; Iredale & Hull, 1932: p.144, pl.9, fig. 14.

Rhyssoplax corypheus exasperata. Oliver, 1914: p.588.

Type data. Holotype, Valves and girdle intact, c. 18.5×10.0 mm. CM M.5499, Sunday (= Raoul) Island, Kermadec Islands.

Material examined. 10 specimens in 3 lots (NMNZ M.17057, M.17059, M.17060), Raoul Island, Kermadec Islands.

Distribution. Kermadec Islands, "...on the underside of clean, smooth stones below low tides" (Iredale & Hull 1932: p.145).

Remarks. *R. exasperata* closely resembles *R. aerea*, though none of the specimens examined attain the size of most specimens of *R. aerea*. *R. exasperata* differs from *R. aerea* primarily in the sculpture of the dorsal girdle elements of each species (Fig. 4E). As with the previous species, both *R. aerea* and *R. exasperata* are separable on girdle morphology. Differences include a more quadrate outline of the dorsal girdle scales, and scale characters, most notably the ribs, are much coarser. Comparison of similarly-sized specimens suggested a narrower shell for *R. exasperata*.

R. exasperata and *R. coryphea* are easily separated on girdle element morphology, and are not as closely related as Oliver (1914) suggested. *R. exasperata* is separated from *R. coryphea* by its less well defined tegmental sculpture, particularly the more weakly differentiated pleural area ribs and furrows. The dorsal girdle scales of *R. exasperata* are more quadrate in outline rather than triangular, the ribs are comparatively thicker and coarser and rib interspaces are generally more heavily shagreened, especially on the margins where the ribs are connected by interstitial, wavy, thread-like processes. These are less prominent in *R. coryphea*.

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