

Taxonomic notes on chitons. 3¹. Notes on the genus *Callochiton* Gray, 1847 (Mollusca: Polyplacophora: Callochitonidae) from the Indian ocean.

ENRICO SCHWABE

Zoologische Staatssammlung Muenchen, Muenchhausenstrasse 21, D-81247 Muenchen, Germany;
Enrico.Schwabe@zsm.mwn.de

Abstract. The paper deals with three remarkable species of the genus *Callochiton* from the Indian Ocean. One of them, *Callochiton christamariae*, is described as new, based on a single specimen from Mauritius Island. Comments to *Callochiton levatus* are given, and a lectotype is designated. The species *Callochiton princeps* was rediscovered and a detailed redescription is given herein.

Kurzfassung. Taxonomische Notizen zu Käferschnecken. 3. Notizen zur Gattung *Callochiton* Gray, 1847 (Mollusca: Polyplacophora: Callochitonidae) aus dem Indischen Ozean. Die Arbeit behandelt drei bemerkenswerte Arten der Gattung *Callochiton* aus dem Indischen Ozean. Eine von ihnen, *Callochiton christamariae*, wird anhand eines einzelnen Individuums von Mauritius als neu beschrieben. Zu *Callochiton levatus* werden Kommentare gegeben und ein Lectotypus festgelegt. Die Art *Callochiton princeps* wurde wiederentdeckt, eine detaillierte Beschreibung wird vorgelegt.

Key words. Polyplacophora, Callochitonidae, *Callochiton*, taxonomy, new species, Mauritius.

Abbreviations

BMNH – British Museum of Natural History London, United Kingdom
ICZN – International Code of Zoological Nomenclature
MNHN – Museum National d'Histoire Naturelle Paris, France
SAMA – South Australian Museum Adelaide, Australia
ZSM – Zoologische Staatssammlung Muenchen, Germany

1. *Callochiton christamariae* sp. n. (Figs 1.1, 2.1–2.12)

Material:

The holotype 5.6 x 2.3 mm (is now disarticulated, the tegmentum was partly destroyed during the maceration) is deposited in Staatliche Naturhistorische Sammlung Dresden, Museum fuer Tierkunde (MTD 39837), leg. K. & Ch. Schniebs, 27.12.1997–08.01.1998.

Diagnosis: The animal is small, elongate, the length/width ratio 2.4, high elevated-dorsal elevation of valve IV 0.57, the ground colour is yellowish with wine red regions (Fig. 1.1). The tegmentum is finely granulated all over. The head valve, area lateralis of intermediate valves, and the postmucronal area show clearly visible radial rows of ocelli. The girdle is broad with inwardly directed conical, broad, blunt pointed spicules and long straight marginal spicules. The girdle is randomly beset with long slightly curved ringshaft needles. The major lateral tooth of the radula with tricuspid blade. The gills are holobranchial and abanal.

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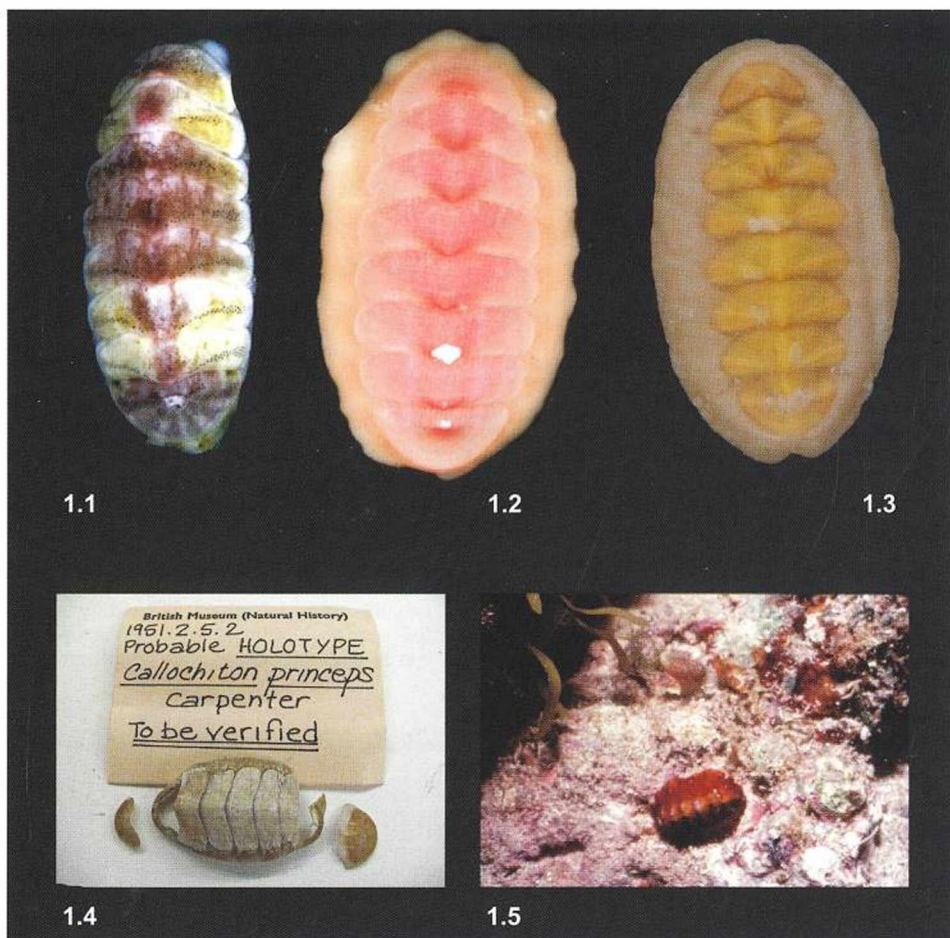


Plate 1: Fig. 1.1 *Callochiton christamariae* sp. n., holotype (MTD 39837), 5.6 x 2.3mm, dorsal view. Fig. 1.2 *Callochiton levatus* Kaas & Van Belle, 1998, lectotype (MNHN), 7.2 x 4.1mm, dorsal view. Fig. 1.3-1.5 *Callochiton princeps* Carpenter in Pilsbry, 1892; 1.3 Specimen from SAMA D19244, 17.2 x 10.3mm, dorsal view; 1.4 Probably the holotype (BMNH 1951.2.5.2), 32 x 19mm, dorsal view; 1.5 Same specimen as in 1.3, in living condition from off Fremantle (W-Australia), north of Mustone Rocks, where it was collected by K. Gowlett-Holmes, F. Wells, and C. Bryce on February 5th, 1993 on low reef, on rock under sand in 4–6m (SAMA photoindex PD0397, photograph by Karen L. Gowlett-Holmes).

Description: The general shell shape: The head valve is semicircular with a rather steep, straight anterior slope and a wide, V-shaped posterior margin, unnotched in the middle (Fig. 2.1). The intermediate valves are broadly rectangular, in general more than twice as wide as long (Fig. 2.3). Valve II is larger than the others. The front margin of jugum is anteriorly extend, resulting in slightly curved anterior margins of the pleural areas. The posterior margins of intermediate valves clearly concave on both sides of the beaked apices. The dorsum is slightly carinated, with straight side slopes. The lateral areas are clearly elevated. The tail valve is more than semicircular with having the slightly anteriorly directed, elevated mucro in the anterior third. The postmucronal area is rather steep, with a straight slope (Figs 2.5–2.6).

Tegmentum. The tegmentum is 150 μ m thick (Fig. 2.4), finely granulated all over, yellowish with wine red portions on the intermediate valves and the tail valve. The arrangement of granules is in quinquunx tending to become radially in the lateral areas and the anterior and marginal regions of the pleural areas. The head valve, lateral areas and postmucronal area have radial rows of clearly visible large ocelli measuring 10.75 μ m in diameter. The ocelli of the intermediate valves are situated in the anterior-most parts of the lateral areas and not distributed over the whole lateral areas. The radial rows of ocelli are arranged finger-like with no visible ocelli in between in the head valve and postmucronal area of tail valve. The head valve, lateral areas and tail valve show concentric growth marks. The pleural areas of the intermediate valves and the antemucronal area lack any sulci. Aesthete channels are clearly visible through the tegmentum layer. The fresh preserved specimen was covered by a thin periostracum. Subtegmentum layer very spongy.

Articulamentum. 95 μ m thick, white with tegmentum coloration shining through. Slit rays present in all valves. Incisions as follow:

Head valve:	18
Valve II:	3-3 (a fourth is not clearly indicated on the right side)
Valve III:	3-2
Valve IV:	1-1 (two clear visible slit rays, maybe the second slit is not developed)
Valve V:	2-2
Valve VI:	2-2 (a third, reduced slit is present on both sides)
Valve VII:	2-2
Valve VIII:	13

The teeth are broad, solid, and obtuse with somewhat thickened outer edges. Outside of the teeth basally spongy.

In the central part of the articulamentum are two bridges, which are thicker than the other portions of the inner layer. Hind part of the ventral side has the articulamentum reduced and a row of pores, which are clearly wider than those of the slit rays. The latter are indicated by radial rows of elongate holes which are 10-42 μ m long (Figs 2.2, 2.4).

The apophyses are rather wide, triangular to trapezoid in intermediate valves, and triangular in the tail valve. They are connected by a shallow U-shaped sinus. The tail valve has a small beak in the middle of the sinus.

Perinotum. It is wide in relation to body size, creamish with greenish-yellowish transverse bands. Dorsally it is covered with fusiform, short, and smooth spicules ranging from 106-125 μ m in length and 32-45 μ m in width (Figs 2.9 A-C). Basally they are squarish and clearly broader than their shaft. The girdle margin has straight, obtuse pointed spicules, ranging from 84 μ m x 17.6 μ m to 94 μ m x 16.5 μ m, slightly distorted on the upper end (Fig. 2.9 D). The dorsal girdle is randomly beset with small, slightly curved, smooth ringshaft needles (very hard to obtain), about 95 μ m x 9.5 μ m (Fig. 2.9 E).

The ventral girdle surface has very small, conical scales, smooth and obtuse. They measure about 44-52 μ m in length and about 12-16 μ m in width on their broad base (Fig. 2.8).

Radula. The radula measures approximately 1.2 mm in length, contains 37 rows of teeth, including 29 rows of mature teeth. The central tooth is short, tulip-shaped with a wing-shaped base and a parallel sided shaft (Figs 2.10-2.11). Its blade is shallow depressed in the middle. The first lateral tooth is hardly visible. The major lateral tooth has a broad tricuspid blade, central denticle larger than the other two. With exception of the outermost one all denticles are slender and sharp pointed. The outermost denticle is broader and more obtuse (Fig. 2.12). The major uncinial tooth has a spoon-like blade and a short shaft.

Mantle cavity. The ctenidia are arranged holobranchially and abanally with interspaces. There are 17 ctenidia on both sides.

Type locality: Mauritius, E coast c. 4 km north of Trou d'Eau Douce.

Habitat: Under pieces of corals in 0.5 m depth.

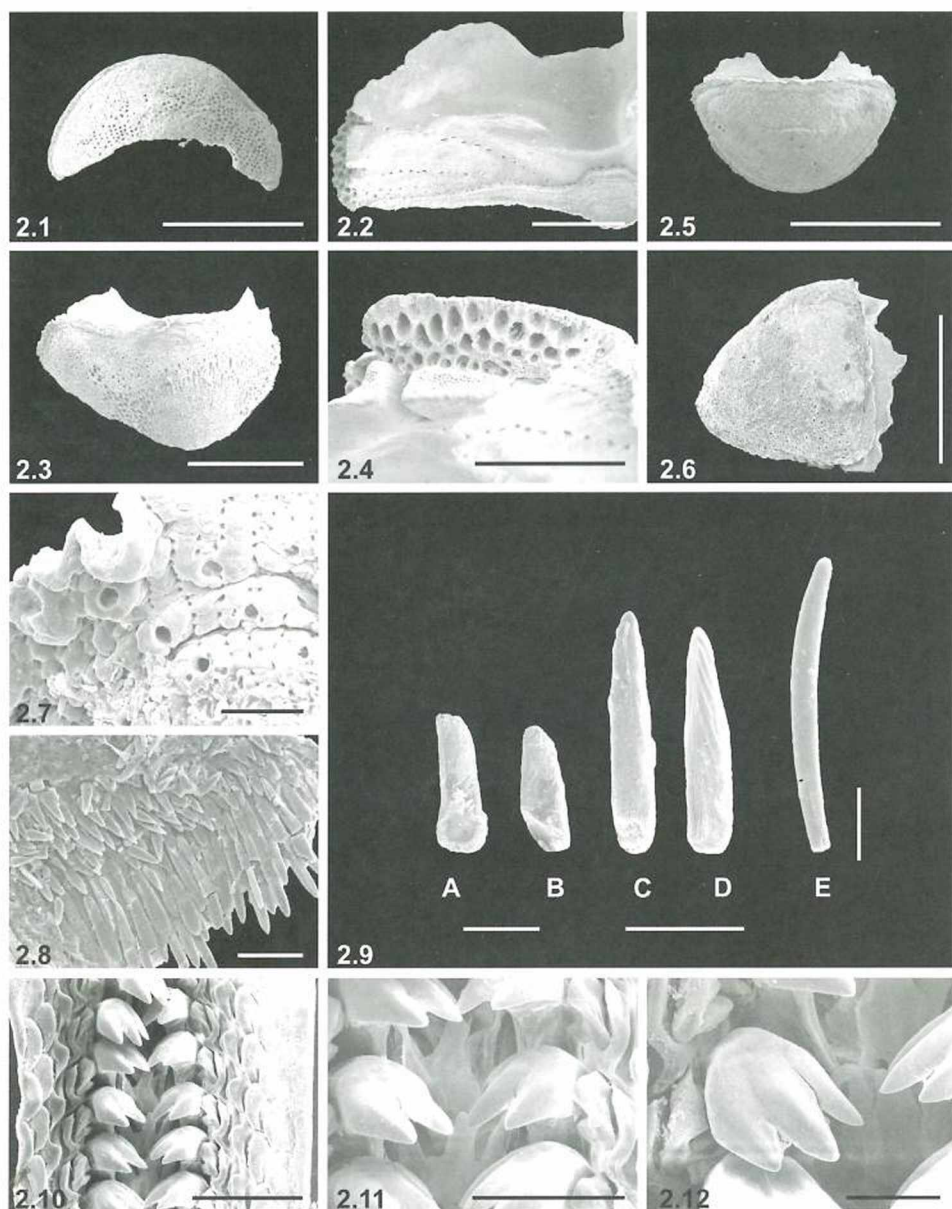


Plate 2: Figs 2.1-2.12 *Callochiton christamariae* sp. n., same specimen as in Fig. 1.1; 2.1 Head valve, dorsal view (scale bar: 1mm); 2.2 Valve II, ventral view showing slit rays (scale bar: 500µm); 2.3 Valve II, dorsal view (scale bar: 1mm); 2.4 Valve II, ventral marginal view to show the esthete channels (scale bar: 500µm); 2.5 Tail valve, dorsal view (scale bar: 1.0mm); 2.6 Tail valve, lateral view (scale bar: 1.0mm); 2.7 Tail valve, left anterior margin showing the arrangements of esthetes (scale bar: 500µm); 2.8 Ventro-marginal girdle scales (scale bar: 100µm); 2.9 Dorsal girdle elements, A and B spicules from mid-girdle, in dorsal (A) and lateral (B) view, respectively (scale bar: 100µm), C and D different marginal spicules (scale bar: 50µm), E isolated ringshaft needle (scale bar: 20µm); 2.10 Anterior (working) part of the radula (scale bar: 100µm); 2.11 Close-up of hardly visible central tooth (scale bar: 500µm); 2.12 Enlarged view of the tricuspid blade of the major lateral tooth (scale bar: 250µm).

Distribution: So far known from the type locality only.

Etymology: The species is named in honour of Mrs. Christa Maria Schniebs, mother of Mrs. Katrin Schniebs, who kindly provided the species.

Discussion: There is no other member of the genus *Callochiton* in the Indian Ocean, with such an extreme elongate outline as the new species. In no other species of *Callochiton* described so far, are the ocelli arranged as in *Callochiton christamariae*. In all other species, the ocelli occupy the whole head valve and the postmucronal area of the tail valve. These two features, together with the lack of sulci, make this species easy to identify. *Callochiton deshayesi* seems to be the closest related species, if only girdle elements are compared. In both species very broad (in relation to the length), short spicules occur and the ventral girdle side appears also close related. *C. christamariae* differs from *C. deshayesi* in its elongate body shape, the higher dorsal elevation, the shape of the tail valve and in the macroscopic ocelli, which are visible under high magnification only in *C. deshayesi*.

2. *Callochiton levatus* Kaas & Van Belle, 1998 (Fig. 1.2)

This species was first mentioned in KAAS and VAN BELLE's "Catalogue of living chitons (Mollusca, Polyplacophora) second, revised edition" (:109) referring to the specimens illustrated in KAAS & VAN BELLE (1985: 44, Fig. 18), in which *Callochiton vanninii* Ferreira, 1983, a species originally described from Somalia, is mentioned. Later (1986) in PIET KAAS's "Revision of the chitons (Mollusca: Polyplacophora) from the coral reefs of Tuléar, SW Madagascar, and of the Mascarene Islands" he figured the same species again. Together with the synonym list of KAAS & VAN BELLE (1985: 44, 46) the references to their new species reads as follows:

Callochiton platessa; Leloup, 1981: 15, Fig. 8 (non *Chiton platessa* of authors [non Gould, 1846] = *Callochiton crocinus* (Reeve, 1847)).

Callochiton vanninii; Kaas & Van Belle, 1985: 44, Fig. 18, map 7 (in part); Kaas, 1985: 327; 1986: 10, Fig. 6.

The description given by KAAS & VAN BELLE is very detailed and clearly shows the differences between their species and Ferreira's *Callochiton vanninii*, which are (1) the tegmen-sculptur is much finer than in *C. vanninii*, (2) the central tooth of the radula is much slender and tulip-shaped than in *C. vanninii*, where the blade of the central tooth is depressed in the middle, while it is pointed in *C. levatus*, (3) the blade of the major lateral tooth bears three denticles of different length – outermost the shortest, whereas the denticles of *C. vanninii* are of nearly the same size, (4) the different slit formula: 12–14/1–2/10–12 (in *C. levatus*), compared to 16/2–3/16 (in *C. vanninii*), (5) the different shapes of the tail valves: nearly oval with anteriorly directed, slightly elevated, postcentral mucro in *C. levatus*, nearly semicircular with backwards directed, not elevated postcentral mucro in *C. vanninii*, (6) the shape of apophyses in the tail valves: large wing-shaped, with a high sutural lamina with anteriorly directed beak in the middle in *C. levatus*, whereas those in *C. vanninii* are trapezoid with a deeply U-shaped jugal sinus.

Nothing is to be added to the detailed description of the species, except, that I can not confirm the lack of slit rays in the valves. They are present, but hardly visible. In addition I have to note that small specimens of this species from Chagos Archipelago, kindly provided for this study by Dr. Boris Sirenko (St. Petersburg) show clearer visible ocelli and have small sulci in pleural areas (similar to *Callochiton clausadea*, but the area lateralis lesser distinctly elevated).

The name of this species is rather old and dates back to the time, when Mr. P. Kaas has studied the different species of Polyplacophora for the monograph series.

One of the original labels in the series of MNHN reads (in PIET KAAS, hand): "Originally the species was described as *Callochiton levatus* n. sp., to be published in Mon. Living Chitons, 2, but just before the MS was sent to the printer's Ferreira's paper on the chitons

of Somalia was issued, in which our species was described as *C. vanninii* (Mon. zool. Ital., N.S. Suppl. 18(9): 249–297, 1983), so we had to withdraw our new name. Unfortunately we forgot to relabel the specimens. The one marked “holotype” is the specimen figured in the Monograph, vol. 2: p. 45 Fig. 18:1. (1985) P. KAAS”.

As in none of the papers reported above any types are designated, it is necessary to select a name-bearing type for nomenclatorial stability. The whole series would be a suitable syn-type series, would they all come from the same locality. Since this is not the case, and in accordance with Articles 73F and 74.6 of ICZN, the figured specimen is selected herewith as lectotype, so the other 75 specimens examined by KAAS & VAN BELLE (see 1985: 46), all property of the MNHN (now 4 were transferred to ZSM), become paralectotypes. After the type selection the type locality data are as follows:

Type locality: Madagascar, off Tuléar.

Habitat: Reef in a depth of 6–8 m, in caves.

Callochiton levatus is known so far from the following locations: S-Madagascar: off Tuléar; N-Madagascar: Leven Bank and Geyser Bank; Réunion Island; Maurice Island; Speakers Bank (5°03'S 72°15'2"E-Chagos Archipelago).

3. *Callochiton princeps* Carpenter in Pilsbry, 1892 (Figs 1.3–1.5, 3.1–3.9)

Callochiton princeps Carpenter in Pilsbry, 1892

Holotype: BMNH 1951.2.5.2 (marked as probable holotype) (Fig. 1.4).

Original diagnosis: “Shell large, very flat, oval; jugum angulate; red, streaked with paler and deeper. Posterior valve large, very flat, the median umbo inconspicuous. Lateral areas hardly defined; central valves rounded at the margins, sometimes (abnormally?) pectinated. Entire surface conspicuously but minutely granulated.

Interior: Posterior valve having 17, anterior 18, median valves 3 slits. Teeth elegantly radiately propped, curved outward, two or three lobed, sometimes striated. Eaves short, reddish, spongy. Inside light flesh colored. Sutural plates joined, broadly but slightly sinuated in the middle. Girdle normal. (Cpr.) Length 32.5, breadth 20 mill.; divergence 135°.

Habitat unknown. (Mus. Cum. No. 95)“ (PILSBRY 1892: p. 50).

The specimen in the BMNH was described by KAAS & VAN BELLE (1985: 67, Fig. 31).

Due to the kindness of Dr Thierry Laperousaz (SAMA), I received several *Callochitons* from the Indian Ocean. The sample also contains a single specimen from off Fremantle (W-Australia), North side of Mustone Rocks, where it was collected by K. Gowlett-Holmes, F. Wells & C. Bryce on February 5th 1993 on low reef, on rock under sand in 4–6 m depth (Fig. 1.5). Examination of the specimen and a careful comparison with the BMNH specimen leaves no doubt that both are conspecific.

A detailed redescription of the Australian specimen is given herein (based on a wet preserved, flat specimen measuring: 17.2 x 10.3 mm) (Fig. 1.3).

Description: The animal is moderately large, elongate (nearly twice as long as wide), the length/width ratio 1.7, highly elevated – dorsal elevation 0.34 (of valve II), the ground colour is bright orange to yellowish. The back is slightly carinated, the side slopes are straight. The tegmentum is finely granulated all over. The ocelli are hardly visible. The girdle is broad, posterior with a shallow notch with inwardly directed, slender, sharp pointed spicules and series of long, slightly curved ringshaft needles. The major lateral tooth of the radula has a tricuspid blade. The gills are holobranchial and abanal.

Tegmentum. The general surface appears smooth but it is microscopically fine granulated. The head valve, central areas of the intermediate valves, and postmucronal area have fine concentric growth marks.

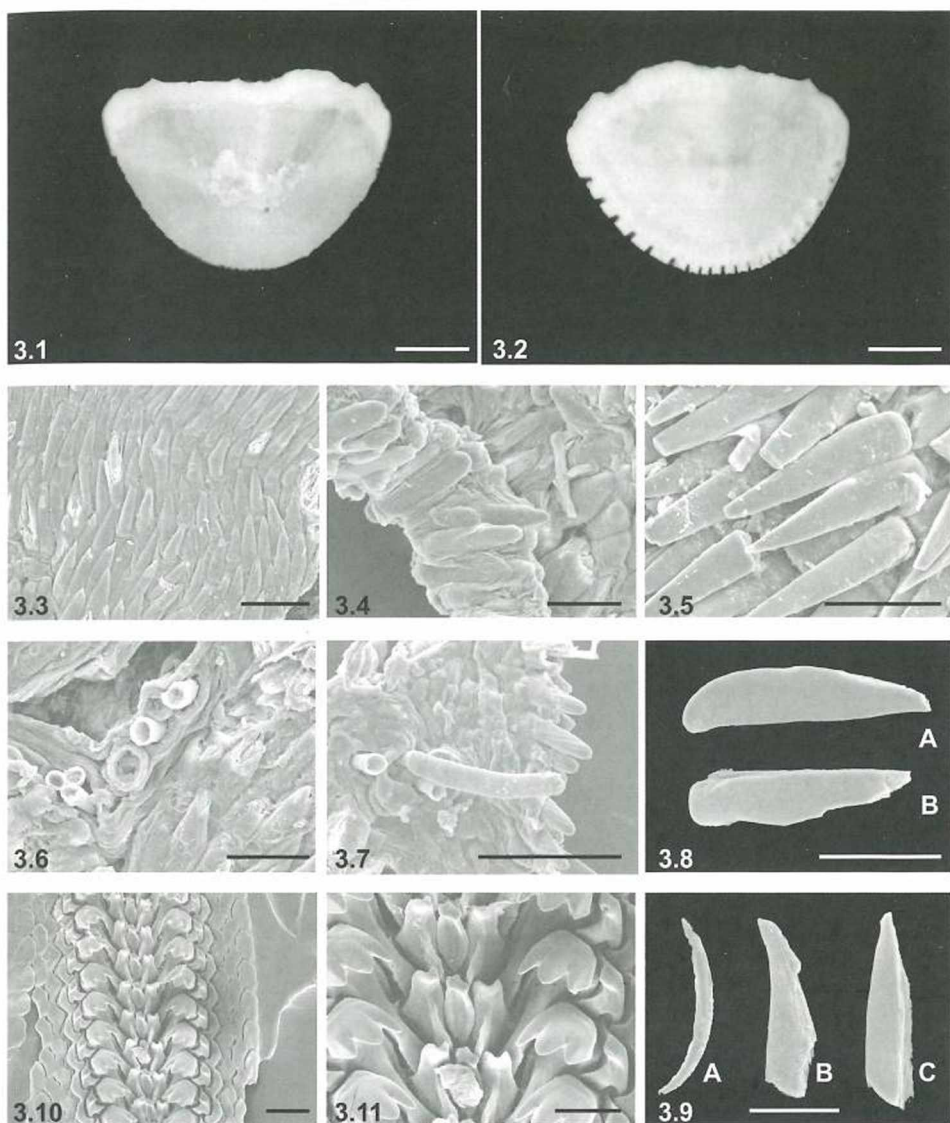


Plate 3: Figs 3.1-3.9 *Callochiton princeps* Carpenter in Pilsbry, 1892, same specimen as in Fig. 1.3; 3.1 Tail valve, dorsal view (scale bar: 1.0cm); 3.2 Tail valve, ventral view (scale bar: 1.0cm); 3.3 Dorsal girdle spicules *in situ* (scale bar: 100 μ m); 3.4 Margin of dorsal girdle (scale bar: 50 μ m); 3.5 Ventro-marginal girdle spicules (scale bar: 50 μ m); 3.6 Close-up of margin of dorsal girdle to show empty cups of ringshaft needle (scale bar: 50 μ m); 3.7 Ringshaft needle *in situ*, please note the radial arrangements of the ringshaft needles (scale bar: 100 μ m); 3.8 Dorsal girdle scales from the mid-girdle, lateral (A) and dorsal (B) view (scale bar: 100 μ m); 3.9 Dorsal girdle elements, isolated ringshaft needle (A) (scale bar: 100 μ m), B and C mid-girdle spicules from strips (scale bar: 50 μ m); 3.10 Anterior (working) part of the radula (scale bar: 100 μ m); 3.11 Close-up of radula to show details of the central tooth and the blade of the major lateral tooth (scale bar: 50 μ m).

The head valve is semicircular, posteriorly wide V-shaped and unnotched in the middle. The intermediate valves are wider than long (4th and 5th are the widest), the apex is slightly beaked, the back is slightly carinated. The lateral areas are not much elevated, but clearly indicated by a shallow depression along the diagonal ridge. The lateral areas are smooth with a shallow radial depression in the middle, resulting in two shallow radial ribs. With the exception of growth marks, central areas are unsculptured (but microgranulated), no traces of sulci are visible.

The tail valve is nearly round, as long as wide, with a central, forwardly directed, slightly elevated mucro (Figs 3.1–3.2). The postmucronal area is sculptured as the head valve, the antimucronal area, distinct by clear visible diagonal ridge depressions, is sculptured as the central areas. The head valve, lateral areas and postmucronal areas have numerous, small, black pigmented ocelli, hardly visible as the openings are directed sideways or terminalwards.

Articulamentum. White, translucent inner layer with short, broad apophyses connected by a jugal sinus, shallow notched in the middle. Slitformula: 19/3 (of valve II)/20. The slit rays are clearly visible in all valves. Teeth more or less broad, deep, and outside grooved.

Perinotum. The girdle is wide, dorsally covered with white, smooth, slender, sharp pointed spicules that measure 114–193 x 27.5–41 µm, giving the entire surface a coat-like appearance (Figs 3.3, 3.8–3.9). Among them there are additional small conical spicules 90 x 26 µm in size. In the sutural regions of valves I–II and VII–VIII, spicules of a different shape occur radially which are terminally directed. These are stouter, thicker, and of a different colour, and appear as bands on the girdle.

Along the marginal border of the girdle, series of 3–5 radially arranged, curved ringshaft needles (273 x 23 µm) are found, which are symmetrically and not randomly arranged as in other members of *Callochiton* (Figs 3.6–3.7, 3.9 A). Marginal fringe appears with small, torsed, and round topped spicules (53 x 14 µm). Ventral girdle side densely beset with smooth conical spicules (which look similar to the dorsal spicules!), measuring 93–100 x 22–23 µm (Fig. 3.5). Remarkable is the posteriormost part of the girdle, since it shows a shallow notch. Superficially, it appears to be a preparation artifact, but examination shows that there is no fold visible, so it should be regarded as a distinct feature.

Radula. The examined radula contains 45 rows of teeth, of which 34 are mineralized. The central tooth is tulip-shaped, short, with a broad shaft, and slightly depressed in middle. Blade broad, with a backwards directed single denticle. First lateral tooth longer than the central one, with broad shaft and wing-shaped extension in front, blade sharp-pointed with a shallow depression in the middle. The major lateral tooth with a tricuspid blade, inner denticle longest and more slender than the others. Middle denticle shorter and broader but clearly longer than the outer denticles. Shaft of major lateral tooth slender, with a sharp keel at the base. Major uncinial hammer-shaped, shorter than the major lateral tooth, which indicating, that this tooth is unable to support the blade (Figs 3.10–3.11).

Mantle cavity. Gills arranged holobranchial and abanal with interspaces. There are about 26 ctenidia on both sides.

Discussion: Based on the arrangement of the girdle elements of this species, I suggest to place it within the subgenus *Acutoplax* Cotton & Weeding, 1939, a taxon not generally accepted. VAN BELLE (1978) already pointed out that the arrangement of ringshaft needles in *Callochiton mayi* Torr, 1912 are unique and he mentioned that this condition justifies the inclusion in *Acutoplax*. Unfortunately, KAAS & VAN BELLE (1985) did not follow this suggestion in their revision of worldwide chitons.

As the examination of *Callochiton princeps* has shown, *Callochiton mayi* is no longer the sole species which exhibits this special feature, so the subgenus *Acutoplax* is not restricted to the Tasmanian and South Australian region (GOWLETT-HOLMES 2001), but extends also northwestwards close to Perth. A third undescribed species from New Zealand also belongs to this subgenus (pers. obs.).

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