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## CHITONS (MOLLUSCA: POLYPLACOPHORA) PROCURED BIJ THE FRENCH BENTHÉDI-EXPÉDITION, 1977, AND THE MD 32-RÉUNION-EXPÉDITION, 1982, IN THE SOUTHWESTERN INDIAN OCEAN.

by

**PIET KAAS**

Kaas, P.: Chitons (Mollusca: Polyplacophora) procured by the French Benthédi-Expédition, 1977, and the MD 32-Réunion-Expédition, 1982, in the southwestern Indian Ocean.

Zool. Med. Leiden 58 (26), 31-xii-1985: 321-340, figs. 1-55, maps. A, B. — ISSN 0024-0672.

Key words: Polyplacophora; new species; new records; Indian Ocean.

The late Eugène Leloup examined samples from five stations of the Benthédi-Expédition, 1977, in the North of the Mozambique Channel, containing four species of chitons, two of which proved to be new to science. The material here discussed, coming from eighteen Benthédi-stations, proved to contain fourteen species, among which the four previously reported by Leloup (1981), and two hitherto unknown, here described as *Leptochiton (Leptochiton) gloriosus* spec. nov. and *Ischnochiton (Ischnochiton) crassus* spec. nov.

The Réunion material came from nine stations and contains five species of chitons, two of which are new, viz. *Leptochiton (Leptochiton) kurnilatus* spec. nov. and *Ischnochiton (Stenosemus) vitreolus* spec. nov.

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### RESUMÉ

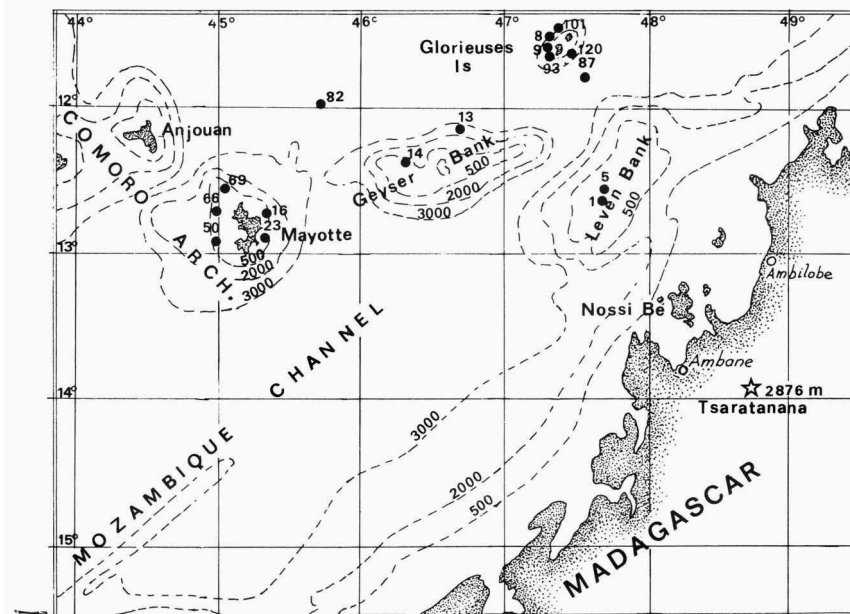
De la Campagne-Benthédi, 1977, dans le Nord du Canal du Mozambique, Eugène Leloup (1981) a examiné des échantillons provenant de cinq stations, comprenant quatre espèces de chitons, dont deux nouvelles. Le matériel discuté ici provient de dix-huit stations et comprend quatorze espèces, soit les quatre espèces rapportées par Leloup et deux nouvelles, décrites ici comme *Leptochiton (Leptochiton) gloriosus* spec. nov. et *Ischnochiton (Ischnochiton) crassus* spec. nov.

Le matériel de la Campagne-MD 32-Réunion, 1982, provient de neuf stations et comprend cinq espèces, dont deux sont nouvelles: *Leptochiton (Leptochiton) kurnilatus* spec. nov. et *Ischnochiton (Stenosemus) vitreolus* spec. nov.

## INTRODUCTION

Dr. Philippe Bouchet, curator of marine Mollusca at the Muséum National d'Histoire Naturelle, Laboratoire de Malacologie, Paris, sent me of late a number of samples of small Polyplacophora in alcohol, procured by him during the French Benthédi-Expédition, 1977, carried out under the direction of Dr. B. Thomassin, investigating the area at the northern entrance of the Mozambique Channel, and by the MD 32-Réunion-Expédition, 1982, carrying out dredgings and trawling from the MS "Marion Dufresne" on the submerged slopes around the island, the molluscan material collected on board by Dr. B. Métivier, Dr. A. Warén and Dr. Ph. Bouchet, subsequently sorted at the Centre de Tri d'Océanographie Biologique (CENTOB), Brest, under the supervision of Dr. Michel Segonzac.

Part of the Benthédi material had been studied and reported upon by the late Dr. Eugène Leloup of the Institut Royal des Sciences Naturelles de Belgique, Brussels (Leloup, 1981). The newly sorted samples contain, apart from the four species previously reported by Leloup, several others, which are recorded here for the first time from this region, two of them being new to science. The material from the MD 32-Réunion-Expédition, 1982, proved to contain two further species new to science.



A. Map of the northern part of the Mozambique Channel, showing stations of the Benthédi-Expédition, 1977, mentioned in this paper.

All specimens studied, including the holotypes of new species, with exception of a few duplicates, are kept in the collection of the Muséum National d'Histoire Naturelle, Paris.

A. CHITONS COLLECTED BY THE BENTHEDI-EXPEDITION, 1977

The material consists of eighteen samples in alcohol, containing fourteen species, four of them having been reported previously by Leloup (1981). They are listed in systematic order.

Order Neoloricata  
Suborder Lepidopleurina  
Leptochitonidae  
Leptochiton Gray, 1847

**Leptochiton (Leptochiton) spec. 1**

Material. — Benthédi-Expédition, 1977, sta. 8, W. of the Glorieuses Is, 11°29.2'S 47°18.2'E, 250 m, 1 specimen, c. 2 mm long, rolled up, damaged.

This may be a new species, but the unique specimen is too severely damaged to allow disarticulation.

**Leptochiton (Leptochiton) spec. 2**

Material. — Benthédi-Expédition, 1977, sta. 5, W. Leven Bank, 12°32'S 47°40.2'E, 150-35 m, 1 specimen, c. 2 mm long, rolled up.

This species may also prove to be new, but I hesitate to disarticulate it.

**Leptochiton (Leptochiton) benthedi (Leloup, 1981)**  
(figs. 1-2)

*Lepidopleurus benthedi* Leloup, 1981:2, figs. 2-3, pl. 1 fig. 5.  
*Leptochiton (L.) benthedi*; Kaas & Van Belle, 1985:128, fig. 57, map 45.

Material. — Benthédi-Expédition, 1977, sta. 13, NE Geysers Bank, 12°12.7'S 46°40.8'E, 2300 m, 1 specimen (syntype), det. E. Leloup; Sta. 82, between Mayotte and N. Geysers Bank, 11°59.8'S 45°42.6'E, 3450 m, 1 specimen (syntype), det. E. Leloup; Sta. 87, SE of the Glorieuses

Is, 3716 m, 11°44'S 47°35'E, 9 specimens, very small, rolled up: 7 specimens of which one disarticulated, slides of perinotum and radula, MNHN, 2 specimens RMNH K5036.

Observations. — The species has been described and figured by Leloup and by Kaas & Van Belle, except for the radula, which has not been previously examined. Leloup reported two more, larger but damaged, specimens from the same station.

After isolation of the radula from one of the specimens, the following details proved to be of importance:

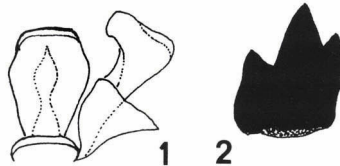
Central tooth somewhat longer than wide, widest directly behind the narrow, flat blade; first laterals elongate, narrowly triangular, distally abruptly widening interiorly, in the lower half with an exterior wing-like process; major laterals with a tridentate blade, the denticles rather sharply pointed, the central one longest, the exterior one shortest.

***Leptochiton (Leptochiton) gloriosus* spec. nov.**

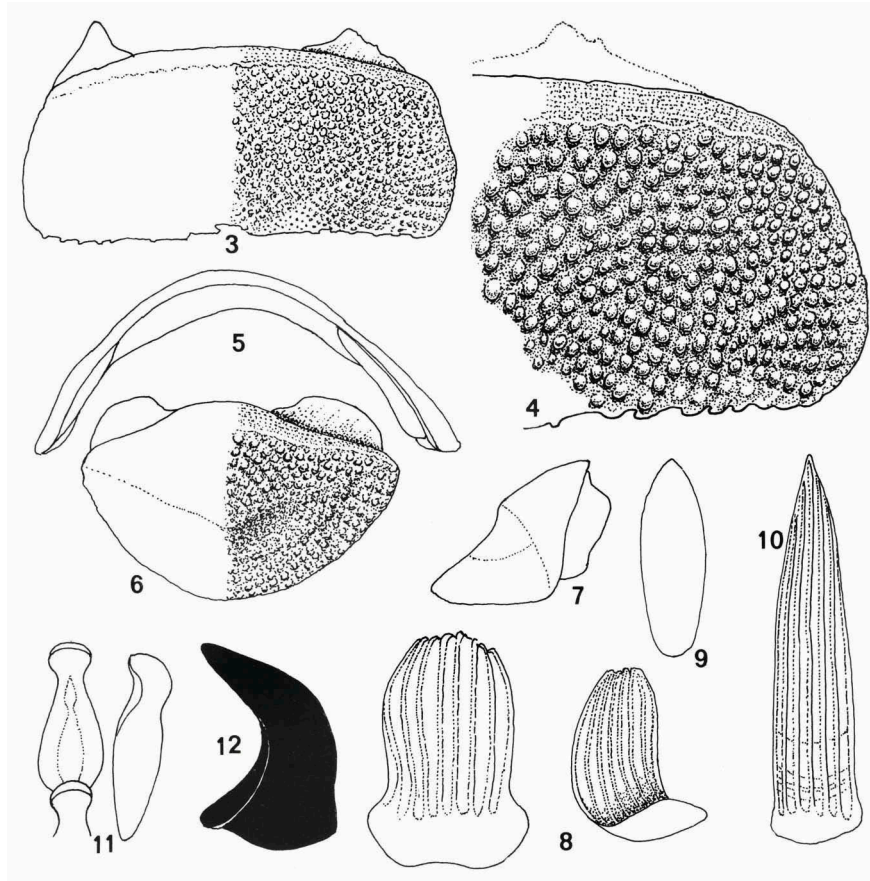
(figs. 3-12)

Material. — Benthédi-Expédition, 1977: SW Grande Glorieuse, sta. 93 DS, 480-550 m, 11°32.3'S 47°16.4'E, P. Bouchet coll., 2 specimens in alcohol: c. 7 × 4 mm, rolled up, damaged, only valves VI-VIII complete, holotype, now disarticulated; c. 2 mm long, rolled up, also damaged, paratype, MNHN; do., SE Glorieuses, sta. 120 DS, 335-390 m, 11°30'S 47°24.7'E, 1 specimen in alcohol, c. 3 mm long, rolled up, P. Bouchet coll., paratype, MNHN.

Diagnosis. — Animal small, c. 7 × 4 mm, oval in outline, moderately elevated (dorsal elevation 0.43), back roundly arched. Valves rectangular, side margins somewhat truncated, anterior and posterior margins almost straight, apices not projecting, tegmentum roughly granulose in quincunx. Colour dirty white. Girdle rather narrow, clothed with oval, ribbed, bent scales.



Figs. 1-2. *Leptochiton (Leptochiton) benthedi* (Leloup, 1981), specimen from Benthédi-Expédition, 1977, sta. CH 87, 3716 m, 11°44'S 47°35'E, c. 2.5 mm long, disarticulated, slides of radula and perinotum. 1, central and first lateral radula teeth, × 500; 2, blade of major lateral radula tooth, × 500.



Figs. 3-12. *Leptochiton (Leptochiton) gloriosus* spec. nov., specimen from Benthédi-Expédition, 1977, sta. 93 DS, SW Grande Glorieuse, 11°32.3'S 47°16.4'E, 480-550 m (holotype, disarticulated, slides of perinotum and radula). 3, valve VI, dorsal view,  $\times 20$ ; 4, do, part of right half, dorsal view,  $\times 40$ ; 5, do, camera lucida sketch, rostral view,  $\times 20$ ; 6, valve VIII, dorsal view,  $\times 20$ ; 7, do, camera lucida sketch, lateral view,  $\times 20$ ; 8, dorsal girdle scales,  $\times 400$ ; 9, ventral scale,  $\times 400$ ; 10, marginal spicule,  $\times 400$ ; 11, central and first lateral radula teeth,  $\times 400$ ; 12, head of major lateral tooth,  $\times 400$ .

Description. — Head valve semicircular, anterior slope slightly convex, posterior margin widely reverse-V-shaped; intermediate valves rectangular, c. twice as broad as long, only valve II relatively longer; anterior and posterior margins of III-VII almost straight to slightly convex, side margins weakly rounded, somewhat truncated, apices inconspicuous. Posterior valve rather short, length: width ratio 0.60, anterior margin somewhat produced in the middle, convex, mucro small, only slightly protruding, not swollen, behind

the centre, at about 70% of the length of the valve. Posterior slope only slightly concave directly behind the mucro.

Tegmentum relatively roughly granulose, the granules round to slightly oval, well raised and separated, arranged in a rather regular quincuncial pattern all over the valves, except for a smooth strip along the anterior margins of the valves II-VIII, which in natural position of the animal are covered by the preceding valves. The granules are dentating the posterior margins of the intermediate valves.

Articulamentum thin, white, glossy, with somewhat thickened ridges corresponding to the diagonal lines. Apophyses broadly triangular, wide apart, in II-VII, somewhat trapezoid in VIII, jugal sinus in all valves wide, convex.

Girdle densely clothed with thin, bent, transparent, blunt scales, somewhat longer than wide, the longest accompanying the margins of the valves, invariably ornamented with 6-8 narrow riblets, c.  $80 \times 45 \mu\text{m}$  on mid-girdle. Ventral scales torpedo-shaped, smooth, thin, flat, imbricating, arranged in radiating rows,  $68 \times 22 \mu\text{m}$  on mid-girdle, smaller towards inner, larger towards outer margin. There is a marginal fringe of elongate conical, sharply pointed, longitudinally ribbed spicules,  $135 \mu\text{m}$  long,  $28 \mu\text{m}$  thick at the base.

Radula with a slender skittle-shaped central tooth, bearing a very narrow, rounded blade. First laterals of almost similar shape, without a blade. Major lateral teeth with a strong, unicuspid blade, very broad at the base.

Gills merobranchial, adanal without interspace; c. 10 ctenidia on either side.

Distribution. — After *L. benthedi* (Leloup, 1981) this is a second species from the vicinity of the Glorieuses Is at the northern entrance of the Mozambique Channel, where it occurs in depths from 335 to 550 m. *L. benthedi* is found much deeper, at c. 3700 m.

Etymology. — In reference to the type locality, the Iles Glorienses.

Observations. — There are two more species of *Leptochiton* known with a rounded back and quincuncial granulation, viz. the cosmopolitan *L. alveolus* (Lovén, 1846) and the S. African *L. permodestus* Kaas, 1985 (Kaas, 1985: 303). From the former it differs in its relatively much coarser granulation, from the latter in the shape of the girdle spicules, which are blunt in *gloriosus*, acutely pointed in *permodestus*.

Suborder Ischnochitonina  
Ischnochitonidae  
Callochitoninae  
Callochiton Gray, 1847

**Callochiton spec.**

Material. — Benthédi-Expédition, 1977, sta. 50, Mayotte, Boueni reef, 12°54.5'S 44°58.5'E, 32 m, 1 specimen, 3.5 × 2.4 mm, pale orange, end plates and lateral areas with many relatively large, black ocelli. Tail valve with mucro anterior. Shell plates still weak and elastic. Too young to identify.

**Callochiton vanninii** Ferreira, 1983

*Callochiton platessa*; Leloup, 1981: 15, fig. 8 [non *Chiton platessa* Gould, 1846, nec *Levicoplax platessa*; Iredale & Hull, 1925 = *Callochiton crocinus* (Reeve, 1847)].

*Callochiton vanninii* Ferreira, 1983: 259, figs. 11-19.

Material. — Benthédi-Expédition, 1977, sta. 5, W. Leven Bank, 12°32'S 47°40.2'E, 150-35 m, 1 specimen, det. "*C. platessa* Gould" by E. Leloup; sta. 14, W. Geysier Bank, 12°22'S 46°23'E, 20-5 m, 1 specimen, det. "*C. platessa* Gould" by E. Leloup; sta. 1, Leven Bank, 12°34.1'S 47°40.2'E, 42 m, 1 specimen, somewhat curled up, det. "*C. platessa* Gould" by E. Leloup.

A common species on the coral reefs off Tuléar, Madagascar, and off the Mascarene Is. Ferreira described it from Gesira, Somalia.

Ischnochitoninae  
Ischnochiton Gray, 1847

**Ischnochiton (Ischnochiton) indianus** Leloup, 1981

*Ischnochiton (Radsiaella) indianus* Leloup, 1981: 2, fig. 1, pl. 1 figs. 1-4.

Material. — Benthédi-Expédition, 1977, sta. DR 5, western Banc du Leven, 150-35 m, 120°32'S 47°40.2'E, 1 specimen 5.3 × 2.8 mm, bright red with small white dots along the posterior margins of the valves and a central triangular white segment on the postmucronal area of the tail valve; sta. 23, Mayotte, Ilot Vatou, 6 m, 120°46.2'S 45°15.5'E, 2 specimens, the largest 3.9 × 2.5 mm, beige with small brown spots.

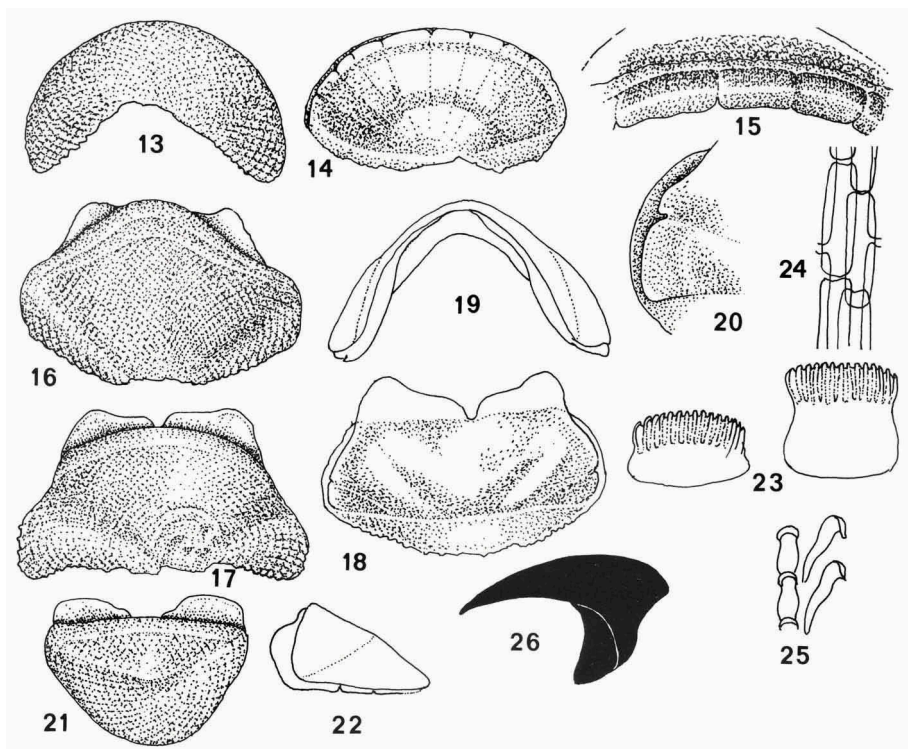
Observations. — The sample from sta. DR 5, contains a second specimen, very small, white, rolled up, much damaged, unidentifiable. The subgenus *Radsiaella* Pilsbry, 1896, to which Leloup attributed *I. indianus*, has been synonymized with *Ischnochiton* s. str. (Kaas, 1979: 856).

***Ischnochiton (Ischnochiton) crassus* spec. nov.**

(figs. 13-26)

**Material.** — Benthédi-Expédition, 1977, W of the Glorieuses Is, sta. 8, 250 m, 11°29.2'S 47°18.2'E, 1 specimen in alcohol, 3.4 × 2.8 mm, curled up, estimated length c. 5 mm, now disarticulated, holotype.

**Diagnosis.** — Animal small, up to 5 mm long, elongate oval, highly elevated, subcarinated, side slopes convex, lateral areas strongly raised, rounded at the sides, the valves rather thick, solid. Mucro of tail valve central, not projecting. Tegmentum evenly granulose all over, the granules roundish, closely set, arranged in quincunx, somewhat dentating the posterior margins



Figs. 13-26. *Ischnochiton (Ischnochiton) crassus* spec. nov., specimen from Benthédi-Expédition, 1977, sta. 8 DR, W of the Glorieuses Is, 250 m, 11°29.2'S 47°18.2'E (holotype, now disarticulated, slides of perinotum and radula). 13, valve I, dorsal view, × 20; 14, do, ventral view, × 20; 15, do, dorso-rostral view of insertion teeth, × 40; 16, valve II, dorsal view, × 20; 17, valve IV, dorsal view, × 20; 18, do, ventral view, × 20; 19, do, rostral view, × 20; 20, left margin of valve IV, ventral view, × 40; 21, valve VIII, dorsal view, × 20; 22, do, lateral view, × 20; 23, dorsal girdle scales, × 200; 24, ventral scales, × 200; 25, central and first lateral radula teeth, × 800; 26, cusp of major lateral radula tooth, × 800.



of valves I-VII. Insertion teeth short, blunt; dentition 8-1-6. Colour white. Girdle densely clothed with imbricating rectangular to square scales, bearing 14-16 sharp riblets on the distal half. Marginal fringe absent.

Description. — Head valve semicircular, elevated, posterior margin widely reverse-V-shaped, slightly crenulated by the tegmental granulation. Intermediate valves relatively rather narrow (length:width ratio 0.65 in valve II, 0.48 in IV, the apices worn away), highly elevated, subcarinated, the side slopes distinctly convex, anterior margin strongly convex in valve II, lesser in III-VIII, curved inwardly towards the rounded sides; posterior margin almost straight, not beaked, apices eroded. Lateral areas rather narrow, strongly raised, somewhat swollen, separated from the central area by diagonal depressions. Tail valve half elliptical, less elevated than the preceding valves, with a central, not raised mucro; posterior slope straight.

Tegmental sculpture consisting of rounded to squarish, well-raised pustules crowded together, arranged in a quincuncial pattern all over the valves.

Articulamentum white, thick, rather strongly callous along the posterior margins and on the inside of the diagonal lines. Insertion plates short, thick, the edges blunt, with 8 narrow and short slits in the head valve, 1-1 in the intermediate valves and c. 6 in the tail valve, the central ones hardly perceptible. Slit-rays rather indistinct. Eaves solid. Apophyses short, broad, sinuous in the intermediate valves, narrowing and drawing near to each other in the centre, enclosing a deep and narrow jugal sinus.

Girdle moderately wide, yellowish white, closely paved with imbricating, rectangular to square, slightly bent scales, relatively longer towards the inner, shorter towards the outer margin, the largest c.  $80 \times 80 \mu\text{m}$ , invariably with 14-16 sharp, narrow, parallel riblets on the distal half, pectinating the outer margin. Ventral scales thin, flat, narrowly rectangular, c. 4 times as long as wide, relatively shorter towards the outer, longer towards the inner margin, c.  $75 \times 20 \mu\text{m}$  on mid-girdle, arranged in radiating, mutually imbricating rows. There is no spiculate marginal fringe.

Radula about one third of the length of the animal, with more than 80 rows of mature teeth, very close together. Central tooth about twice as long as wide, proximally slightly widening, with a narrow, rounded blade. First laterals longer than the central teeth, narrow at the base, widening and somewhat flexuous distally, ending in a narrow, outwardly bent blade. Major lateral teeth bearing a very sharply pointed, narrow cusp, like a crow's beak, c.  $32 \mu\text{m}$  long.

Etymology. — From the Latin adjective *crassus*, meaning thick, in reference to the strong valves.

Gills holobranchial, abanal.

Observations. — *I crassus* does not resemble any other member of the genus. It is easily recognizable by its relatively heavy valves, strongly raised lateral areas and its quincuncial, well pronounced tegmental granulation.

Callistoplacinae  
Callistochiton Dall, 1879

**Callistochiton barnardi** Leloup, 1981

*Callistochiton (Callistassecla) barnardi* Leloup, 1981b: 10, fig. 4, pl. 1 fig. 7.

Material. — Benthédi-Expédition, 1977, sta. 1, Leven Bank, 12°34.1'S 47°40.2'E, 42 m., 1 specimen, dry, det. E. Leloup; sta. 9, NNW of Grande Glorieuse Id., 11°31.1'S 47°18.3'E, 15-10 m., 1 specimen, det. E. Leloup.

Chitonidae  
Chitoninae  
Chiton Linnaeus, 1758

**Chiton (Chiton) kaasi** (Leloup, 1981)

*Callistochiton kaasi* Leloup, 1981b: 11, fig. 5, pl. 1 fig. 6.

Material. — Benthédi-Expédition, 1977, sta. 16, Mayotte, 12°45.2'S 45°16.7'E, 8-3 m, 3 specimens, det. "*Chiton barnardi* Ashby" by E. Leloup.

**Chiton (Tegulaplex) hululensis** (E.A. Smith, 1903)

*Ischnochiton hululensis* E.A. Smith, 1903: 619, pl. 36 figs. 3-6.

*Chiton (Tegulapax) hululensis*; Kaas, 1979: 806, pl. 2 figs. 11-19 (bibliography and synonymy).

Material. — Benthédi-Expédition, 1977, sta. 1, Leven Bank, 12°34.1'S 47°40.2'E, 42 m., 1 specimen, rolled up, det. "*Chiton platei* Thiele" by E. Leloup.

Toniciinae  
Tonicia Gray, 1847

**Tonicia (Lucilina) carnosa** Kaas, 1979

*Tonicia (Lucilina) carnosa* Kaas, 1979: 869, pl. 3 figs. 1-10.  
*Tonica indica* Leloup, 1981: 40, fig. 22, pl. 2 fig. 7, pl. 3 fig. 1.

Material. — Benthédi-Expédition, 1977, sta. 69, Mayotte, NE Northern Reef, 12°31.2'S 45°01.8'E, 200-50 m, 1 specimen det. "*Tonica indica* Leloup" by E. Leloup.

Suborder Acanthochitonina  
Acanthochitonidae  
Acanthochitona Gray, 1821

**Acanthochitona curvisetosa** Leloup, 1960

*Acanthochiton curvisetosus* Leloup, 1960: 29, fig. 1, pl. 2 fig. 2; 1981: 1.

Material. — Benthédi-Expédition, 1977, sta. 101 DS, NW Glorieuses Is, Ile du Lys, 26 m, 11°25.75'S 47°19.5'E, 1 specimen, identified by Leloup (1981: 1).

Cryptoconchus Burrow, 1815

**Cryptoconchus burrowi** (Nierstrasz, 1905)

*Acanthochites (Cryptoconchus) burrowi* Nierstrasz, 1905: 68, pl. 1 fig. 22, pl. 5 figs. 124-129.  
*Cryptoconchus porosus*; Leloup, 1981: 1 (non *Cryptoconchus porosus* Burrow, 1815, a Neozelanic species).

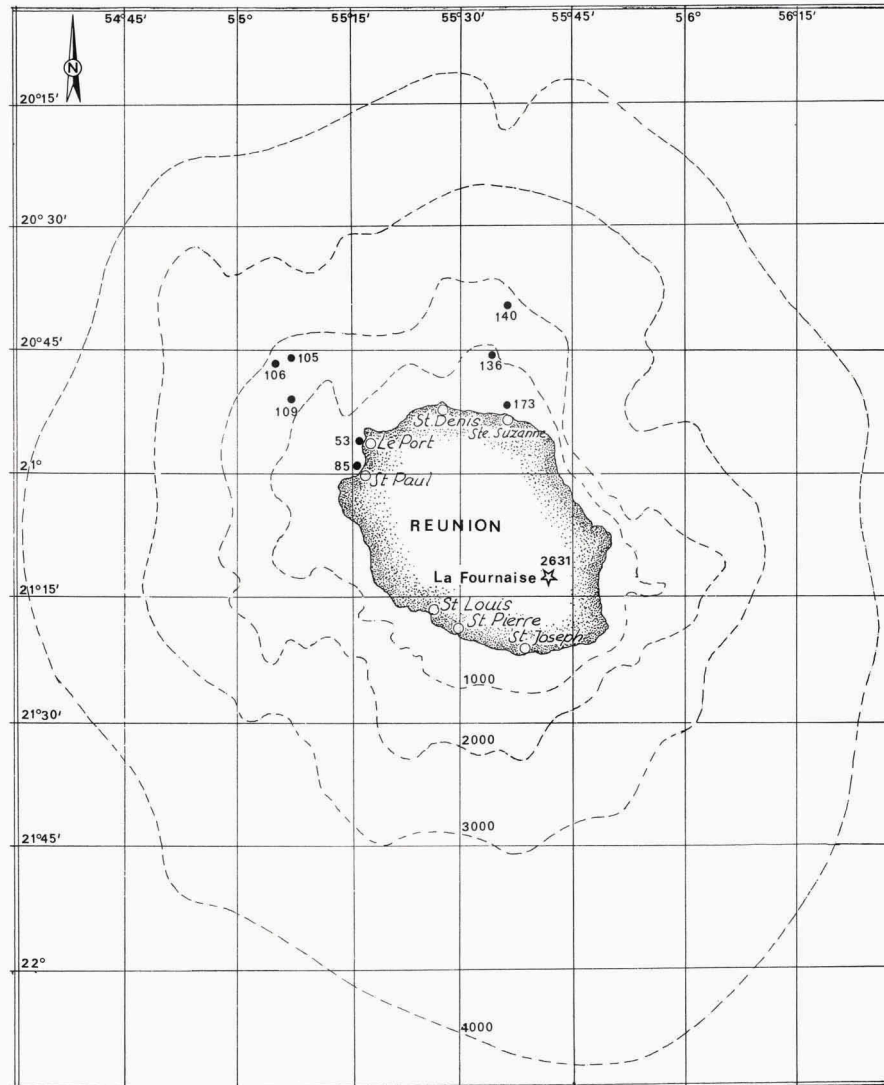
Material. — Benthédi-Expédition, 1977, sta. 66 S, Mayotte, M'Sanga Tsohole reef, 5 m, 12°41.85'S 44°58.7'E, 1 specimen, white, 9.1 × 4.5 mm, erroneously identified by Leloup as *C. porosus* Burrow, 1815. More details will be given in a forthcoming paper in Thélys, 1986.

Cryptoplacidae  
Choneplax Dall, 1882

**Choneplax indica** Odhner, 1919

*Choneplax indicus* Odhner, 1919: 40, pl. 3 figs. 44-45.

Material. — Benthédi-Expédition, 1977, sta. 1, Leven Bank, 12°34.1'S 47°40.2'E, 42 m., 3 specimens, juvenile, curled up.



B. Map of la Réunion, showing stations of the MD 32-Réunion-Expédition mentioned in this paper.

*Cryptoplax* de Blainville, 1818*Cryptoplax sykesi* Thiele, 1909

*Cryptoplax sykesi* Thiele, 1909: 53, pl. 6 figs. 83-86.

Material. — Benthédi-Expédition, 1977, sta. 14, W. of Geyser Bank, 12°22'S 46°43'E, 20-5 m, 1 specimen, juvenile, curled up.

## B. CHITONS COLLECTED BY THE MD 32-RÉUNION, EXPÉDITION, 1982

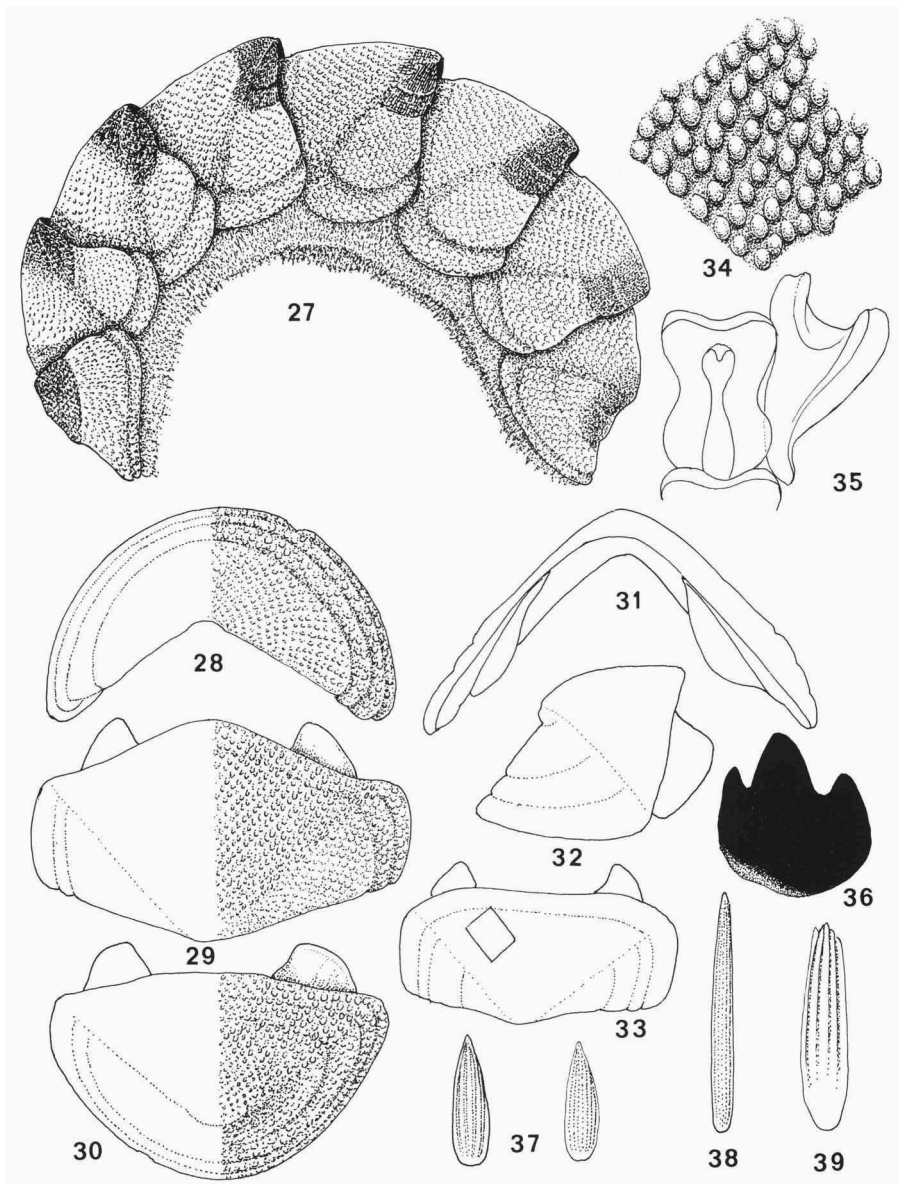
The material was collected during the MS-32 cruise, 1982, organized by the Terres Australes et Antarctique Françaises, Paris; chief Alain Guille, MNHN. It consists of samples from nine stations (see map), containing five species of chitons, two of which are new.

Order Neoloricata  
Suborder Lepidopleurina  
Leptochitonidae  
Leptochiton Gray, 1847

**Leptochiton (*Leptochiton*) kurnilatus spec. nov.**  
(figs. 27-39)

Material. — MD 32-Réunion-Expédition, 1982, sta. CP 140, 1612-1690 m, 20°41'S 55°38'E, 4 specimens on pieces of wood: 9.2 × 5.5 mm, curled up, estimated length when stretched c. 12.5 mm (holotype) and 3 small paratypes; sta. CP 105, 1740-1850 m, 20°47'S 55°04'E, c. 10 specimens, all partly disarticulated, soft parts wanting, the largest c. 8 mm long (paratypes), 8 in MNHN, 2 RMNH K5085; do, same station, 9 very small specimens, rolled up (paratypes), 8 in MNHN, 1 VB 2935a; Sta. DS 109, 1050-1240 m, 20°52.3'S 55°06.3'E, 1 specimen, very small, rolled up (paratype); Sta. DS 106, 1710-1730 m, 20°47.5'S 55°04.5'E, 2 specimens, very small, rolled up (paratypes); Sta. DS 173, 270 m, 20°51.5'S 55°36.8'E, 1 specimen, very small, rolled up (paratype).

Diagnosis. — Animal elongate, more than twice as long as wide, elevated (dorsal elevation 0.57), carinated, side slopes only little convex, nearly straight, lateral areas hardly raised; valves not beaked, the apices hardly projecting. Tegmentum granulate all over, the granules oval, well raised, arranged in quincunx. Colour white, sometimes the apical part of the valves black by foreign deposits. Girdle narrow, clothed with elongate, coarsely ribbed scales; a marginal fringe of elongate needles is present. Major lateral radula tooth with a tricuspid blade.



Figs. 27-39. *Leptochiton (Leptochiton) kurnilatus* spec. nov.: 27, specimen from MD 32-Réunion-Expédition, 1982, sta. CP 140, 1612-1690 m, 20°41'S, 55°38'E, holotype; 28-39, do, sta. CP 105, 1740-1850 m, 20°47'S 55°04'E, disarticulated paratype, slides of perinotum and radula. 27, whole animal, lateral view,  $\times 9$ ; 28, valve I, dorsal view,  $\times 13$ ; 29, valve II, dorsal view,  $\times 13$ ; 30, valve VIII, dorsal view,  $\times 13$ ; 31, camera lucida sketch of valve II, rostral view,  $\times 13$ ; 32, do, valve VIII, lateral view,  $\times 13$ ; 33, do, valve IV, dorsal view,  $\times 9$ ; 34, tegmental sculpture on central area of valve IV (the square in fig. 33),  $\times 37.5$ ; 35, central and first lateral radula teeth,  $\times 37.5$ ; 36, head of major lateral tooth,  $\times 37.5$ ; 37, ventral girdle scales,  $\times 187.5$ ; 38 marginal spicule,  $\times 187.5$ ; 39, dorsal girdle scale,  $\times 187.5$ .

Description. — Head valve a little more than semicircular, anterior slope steep, straight, posterior margin widely reverse-V-shaped, marked with 1-4 sharp growth lines close to the outer margin. Intermediate valves broadly rectangular, the anterior and posterior margins almost straight, the sides more or less truncated; only in valve II the anterior margin is produced forward in the middle. Apices hardly protruding, lateral areas weakly raised, also with 1-4 growth lines. Tail valve semicircular (length-width ratio 0.62), mucro somewhat swollen, posterior, at about three quarters of the length of the valve, posterior slope steep, straight, postmucronal area with 1-4 growth lines.

Tegmentum fairly regularly granulate in quincunx, the granules oval, a little convex, well separated, average size c.  $100 \times 80 \mu\text{m}$ .

Articulamentum thin, white, the tegmental sculpture showing through. Apophyses small, somewhat triangular, wide apart; jugal sinus wide, straight, except in valve II where it is convex.

Girdle rather narrow, dorsally densely covered with elongate scales, more than four times longer than broad, with 4-6 strong longitudinal riblets, average size c.  $144 \times 32 \mu\text{m}$ . Ventral scales lanceolate, flat, with 4 or 5 fine riblets,  $92 \times 28 \mu\text{m}$  on mid-girdle, shorter near inner, longer towards outer margin. There is a marginal fringe of slender, elongate, bluntly pointed, finely longitudinally grooved needles, up to  $168 \times 16 \mu\text{m}$ .

Radula with a relatively broad central tooth, pinched in the middle, with a narrow blade, slightly bent inward in the middle. First lateral teeth triangular, distally bifurcating, without a blade; major lateral tooth with a short tridentate blade, the denticles blunt, the central one largest.

Gills merobranchial, adanal without interspace; six ctenidia on either side.

Distribution. — Only known from the type material, collected off the northern coast of the Isle of Réunion, in depths varying from 270 to 1850 m.

Etymology. — From the Greek *cyrnel*, meaning kernel, in reference to the granulated appearance of the valves.

Observations. — This is another species of *Leptochiton* with a quincuncial granulation of the tegmentum all over the valves. It differs from *L. alveolus* (Lovén, 1846) in having the valves carinated, more or less as in *L. belknapi* Dall, 1878, whilst *alveolus* has the back rounded. From both *kurnilatus* differs in the girdle covering and in the possession of a tricuspid blade on the major lateral radula teeth (unicuspid in *alveolus* and *belknapi*). In *L. benthedii* (Leloup, 1981) from the Is. Glorieuses at the northern entrance of the Mozambique Channel, c. 3700 m, the valves are subcarinated, the side slopes almost straight, the major lateral radula tooth with a tridentate blade, but the granulation is much finer and less pronounced than in *kurnilatus*. In *L. permodestus* Kaas, 1985, from off Transkei, South Africa, c. 400 m (Kaas, 1985:

303), the valves have the back evenly rounded, the granulation is much the same as in *kurnilatus*, but the major lateral tooth has a unicuspid blade and the girdle elements are also of a different shape. Finally *L. gloriosus* Kaas, spec. nov., also from the Is. Glorieuses, though collected less deep than *bentledi*, c. 500 m, displays the same pattern of granulation; the valves have the back also evenly rounded, but the major lateral radula tooth bears a unicuspid head with a broad and heavy base.

Suborder Ischnochitonina  
Ischnochitonidae  
Callochitoninae  
Callochiton Gray, 1847

**Callochiton deshayesi** Thiele, 1909

*Chiton sanguineus* Deshayes, 1863: 40, pl. 6 figs. 4-7 (non *Chiton sanguineus* Reeve, 1847).  
*Callochiton deshayesi* Thiele, 1909: 7, nom. nov. pro *Chiton sanguineus* Deshayes, 1863, non Reeve, 1847; Ferreira, 1983: 262, fig. 20.

Material. — MD 32-Réunion-Expédition, 1982: sta. Pl 53, off Le Port, 0-10 m, 20°55.5'S 55°17.6'E, 3 specimens, a little rolled up, 5.5 × 4 mm, 4.2 × 3.5 mm and 2 × 1.5 mm.

Ischnochitoninae  
Ischnochiton Gray, 1847

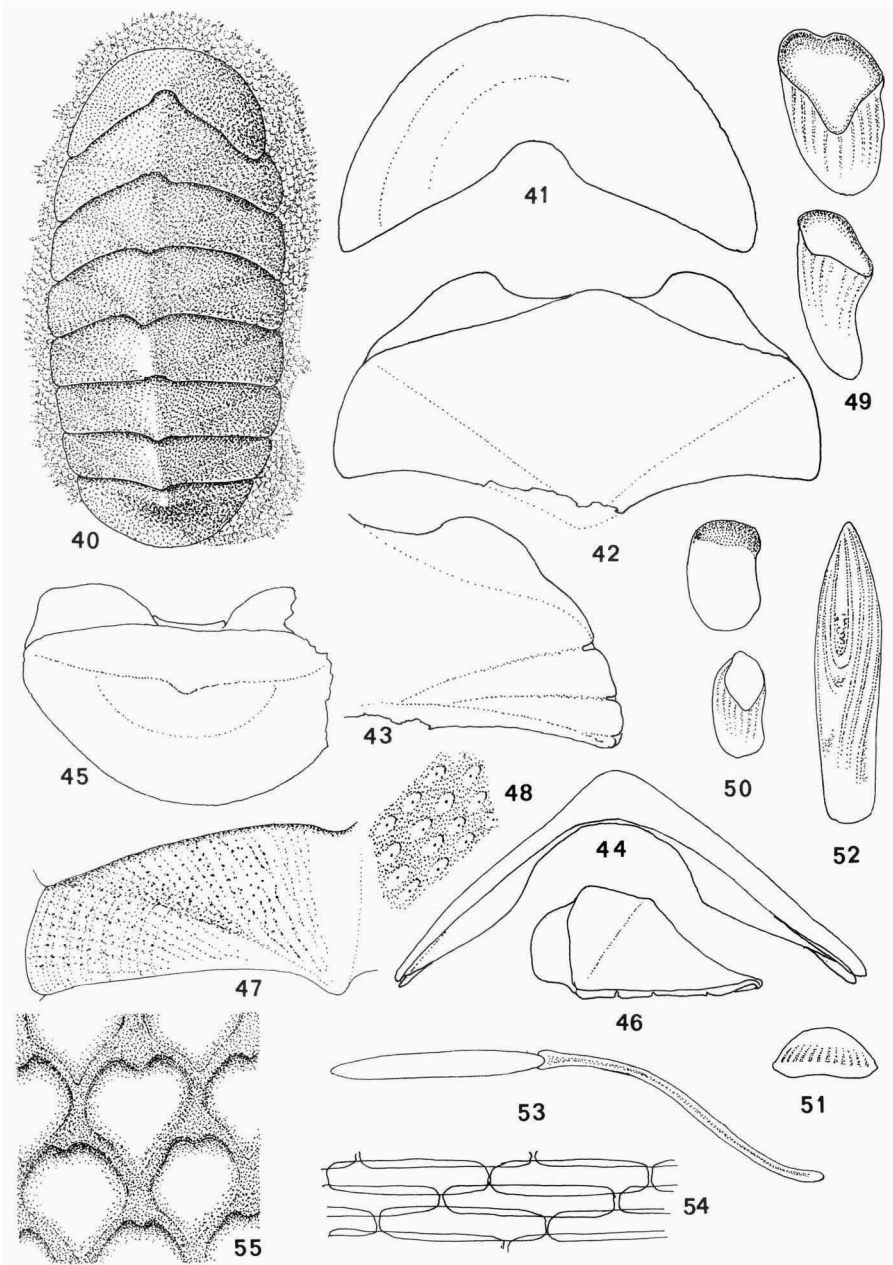
**Ischnochiton (Stenosemus) vitreolus**, spec. nov.  
(figs. 40-55)

Material. — MD 32-Réunion-Expédition, 1982: sta. DC 136, 915-922 m, small stones with Cirripedia, 20°46.3'S 55°35.9'E, 1 specimen, 8.6 × 4.4 mm (holotype), now disarticulated, slides of perinotum.

Diagnosis. — Animal small, 8.6 × 4.4 mm, elongate oval, rather elevated (dorsal elevation 0.43), carinated, side slopes straight, the valves very thin and brittle, vitreous, beaked, tegmentum almost smooth, white. Girdle moderately wide, paved with juxtaposed slightly bent, conical spicules, embedded in the cuticula, only the heart-shaped heads sticking out.

Description. — Head valve semicircular, posterior margin widely, reverse-V-shaped, the apex with a rounded notch. Lateral areas of intermediate valves





Figs. 40-55. *Ischnochiton (Stenosemus) vitreolus* spec. nov., specimen from MD 32-Réunion-Expédition, 1982, sta. DC 136, 915-922 m, 20°46'S 55°36'E (holotype, disarticulated, slide of perinotum). 40, whole animal, dorsal view,  $\times 9$ ; 41-46, camera lucida sketches,  $\times 18.75$ : 41, valve I, dorsal view; 42, valve II, dorsal view; 43, do, ventral view of left half; 44, do, rostral view; 45, valve VIII, dorsal view; 46, do, lateral view; 47, left half of valve IV in situ, dorsal view,  $\times 18.75$ ; 48, tegmental surface on right half of central area,  $\times 60$ ; 49-51, dorsal girdle spicules,  $\times 94$ ; 52, marginal spicule,  $\times 375$ ; 53, stalked dorsal spicule,  $\times 375$ ; 54, ventral scales,  $\times 187.5$ ; 55, dorsal aspect of girdle,  $\times 94$ .

hardly raised; valve II longer than the others, posterior margin straight, only the apex slightly protruding, anterior margin produced in the middle in valve II, almost straight to slightly convex in III-VII. Tegmental sculpture consisting of microscopical, hardly elevated, oval granules, white against a greyish background, each with a clearly visible macropore, arranged in wavy series radiating from the apices. There are no visible lines of growth. Tail valve much shorter than wide (length: width ratio 0.57) about one third of a circle, anterior margin straight to a little concave, mucro anterior at about one third of the length of the valve, small, pointed, but not projecting, posterior slope only slightly but regularly concave; postmucronal area separated from the antimucronal area by a little elevated ridge.

Articulamentum very thin, translucent, with somewhat stronger ridges corresponding with the diagonal lines. Head valve with 6 inequidistant slits, valve II with 2-2 slits, the other intermediate valves with only one slit on either side, tail valve with 8 slits; slit-rays distinct, finely porous in all valves, the insertion teeth short, somewhat crenulated at the edges. Apophyses wide, broadly triangular to trapezoid, tending to unite at the jugal sinus, which is convex in valve II, straight to slightly concave in III-VIII. In the tail valve a narrow, unslit jugal plate exists.

Girdle moderately wide, paved with juxtaposed, slightly bent, conical spicules, with a longitudinally grooved basal part, embedded in the cuticula, and a somewhat convex, heart-shaped top, sticking out, varying in size from  $136 \times 90 \mu\text{m}$  to  $240 \times 160 \mu\text{m}$ . Among them, arranged without order, but always close to the outer margin, long, hollow, chitinous hairs are found, distally bearing a smooth, white, calcareous spicule, measuring  $80 \times 10 \mu\text{m}$ . There is a marginal fringe of relatively stout, longitudinally grooved spicules, distally tapering to a blunt point, up to  $110 \times 24 \mu\text{m}$ . Ventral side of the girdle covered with radiating rows of thin, flat, rectangular scales,  $120 \times 28 \mu\text{m}$  on mid-girdle, shorter towards the inner, longer towards the outer margin, the rows somewhat imbricating.

Unfortunately the radula got lost during preparation.

Etymology, — From the Latin *vitrum*, meaning made of glass, in reference to the transparency of the valves.

Gills merobranchial, abanal, with 10 ctenidia on both sides.

Observation. — *I. (S.) vitreolus* is easily recognizable from other members of the group by its thin and brittle valves, the absence of any macrosculpture on the tegmentum, and its typical, heart-shaped girdle spicules.

Suborder Acanthochitonina  
Acanthochitonidae  
Acanthochitona Gray, 1821

**Acanthochitona penicillata** (Deshayes, 1863)

*Chiton penicillatus* Deshayes, 1863: 41, pl. 6 figs. 8-10.

*Acanthochiton penicillatus*; Leloup, 1952: 9, fig. 4, pl. 1 fig. 3, pl. 2 fig. 5.

Material. — MD 32-Réunion-Expédition, 1982: sta. Pl 53, off Le Port, 0-10 m, 20°55.5'S 55°17.6'E, 1 specimen, rolled up, c. 8 mm long.

Cryptoplacidae  
Choneplax Dall, 1882

**Choneplax indica** Odhner, 1919

*Choneplax indicus* Odhner, 1919: 40, pl. 3 figs. 44-45.

Material. — MD 32-Réunion-Expédition, 1982: sta. DC 85, off Saint-Paul, 58-70 m, sand with organic waste, many blocks of volcanic rock and coral debris, 20°59.5'S 55°15.1'E, 1 specimen, c. 4 mm long.

Abbreviations

- K Private collection of the author (now in RMNH).  
MNHN Muséum National d'Histoire Naturelle, Laboratoire de Malacologie, Paris.  
RMNH Rijksmuseum van Natuurlijke Historie, Leiden.  
VB Private collection of Mr. R.A. van Belle, Sint-Niklaas, Belgium.

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Topline of title on p.321: for "bij" read "by".