

Lorentz Spengler's descriptions of chitons (Mollusca: Polyplacophora)

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The present paper deals with an important Danish paper on the Polyplacophora, published in 1797 by Lorentz Spengler: *Udførlig Beskrivelse over det mangeskallede Konkylie-Slaegt, af Linnaeus kaldet Chiton; med endeel nye Arter og Varieteter*. -Skrivter af Naturhistorie-Selskabet, 4e Bind, 1e Hefte, VI: 62-103, Tab. VI (Kiöbenhavn). In order to make this historical paper accessible to students of the group, a translation (by Dr J. Knudsen, with the assistance of the late Mrs A. Volsoe) of the original 18th century Danish text into modern English is here presented. A considerable part of the material in the "Museo Spengleriano", on which Spengler based his descriptions, is still extant, being held now in the Zoological Museum, University of Copenhagen. The translated description of every species and/or variety is followed by annotations in a smaller font (by P. Kaas) on the available specimens, including a discussion on their current taxonomic status. Spengler described 27 species and 10 varieties of chitons. He introduced 16 new taxa, of which 6 names are still valid.

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Introduction

(J. Knudsen)

Lorentz Spengler (1720-1807) was born in Schaffhausen, Switzerland, and was trained as a turner. After a short stay in London he came to Copenhagen in 1743, where he obtained an appointment as a turner at the Royal Court. At that time turnery was a fashionable hobby and part of Spengler's job was to teach the art to members of the Royal family. Spengler should also execute turnery for the Royal collection.

Spengler was an extremely skilled craftsman; many of his works, mostly made of ivory, still exist and can be seen in several museums in Copenhagen (for instance, the Museum of Royal Treasures at Rosenborg Castle). Spengler was also an expert in manufacturing dentures, a craft which at that time was kept secret. Soon, Spengler had engaged a staff, trained a number of apprentices, and had become rather wealthy. He founded a collection of art and natural objects and acquired a great knowledge of art, and particularly of shells. In 1771 Spengler was appointed leader of the Royal collection ("Kunstammer") and he turned out to be very competent.

Soon after his arrival in Copenhagen Spengler began to collect shells. Many specimens were acquired from the Danish tropical colonies: West Indies: Virgin Islands (St. Thomas, St. Croix); Ghana: Christiansborg; India: the Nicobares and Tranquebar. He also bought shells from his numerous correspondents throughout western Eu-



Lorentz Spengler (1720-1807).

rope. From British conchologists he acquired shells brought to England by the expeditions of James Cook to the Pacific (between 1768 and 1779).

From 1775 on Spengler published about 40 papers, by far the majority on shells, particularly bivalves. Two of his papers deal with the genus *Lepas* (gooseneck barnacles), cirriped crustaceans, which at that time were ranked among the molluscs. His papers mostly deal with descriptions of new species. The descriptions are very detailed and precise and in many cases - but far from all - accompanied by exact drawings. Most of the papers were published in Danish and are therefore not accessible to foreigners. However, his efforts were greatly appreciated by his fellow conchologists all over Europe and he was elected a member of several learned societies, including the Royal Danish Academy of Sciences and Letters.

Spengler was a close friend of Johann Hieronymus Chemnitz; and he corresponded with numerous naturalists abroad, including Linnaeus, whom he consulted on several occasions on problems relating to shells.

In 1804 Spengler sold his collection to the newly established "Royal Natural History Museum", a public museum which in 1864 was amalgamated with the Zoological Museum of the University of Copenhagen. Most of the specimens of Spengler's collections are still extant and with its numerous types of species described by Chemnitz in the "Neues systematisches Conchyliencabinet" (rejected as not being strictly binominal by the International Commission on Zoological Nomenclature) and by Spengler himself, it forms one of the scientifically most valuable parts of the shell collection of the museum.

Bibliographic notes on Spengler are to be found in the following papers:

Gosch, C.C.A., 1873-78. Udsigt over Danmarks zoologiske Literatur, I and III.— Köbenhavn.

Gouk, P.M., 1983. The Union of Arts and Sciences in the Eighteenth Century: Lorenz Spengler (1720-1807), Artistic Turner and Natural Scientist.— *Annals of Science* 40: 411-436.

Mörch, O.A.L., 1870. Uebersicht der von Lorentz Spengler beschriebenen Conchylien.— *Malakozoologische Blätter* 17: 99-124.

[62]* Detailed description of the genus of multivalve shells by Linnaeus called *Chiton*; with a number of new species and varieties.

L. Spengler (Read on 28th February 1794)

I must keep my promise which I gave in one of my previous papers (Naturh. Selsk. Skrift. 3 (1): 16., viz. to describe the first genus of the multivalve shells which Linné included in his *Systema Naturae* under the name: *Chiton*. Already some years ago I finished this paper on which I have today the honour to read before this honoured Society, with the exception of some new species determined for an annotated catalogue of my collection [63] of shells. The copper plates were already made. However, I soon realized that such a catalogue would be a time-consuming work and far

*Numbers in bold refer to the pages in the original publication.

too comprehensive if all genera should be described in this way. I therefore put it away, finding that it would be more reasonable to publish it in a journal.

The genus *Chiton* belongs to the most peculiar animals in conchology, both as regards their external shape, which much resembles a boat turned upside down, and as regards their structure, since they generally consist of eight, semicircular, saddle-shaped, hard-shelled ribs which on the outside are ornamented with patterns and varying, beautiful colours, but on the inside are either white or vividly crimson or light green. The ribs or plates overlap as the tiles of a house; they are connected outwards by a leathery band, and on the outside, below on the margin, by a broader or narrower girdle, which in some specimens are set with scales as in a snake skin, in others with small spines. I have described in detail the peculiar structure of this hitherto very little known animal, both as regards the shell and the inhabitant and portrayed all its parts in the first volume of *Beschäftigung der Berlinischen Naturforschender Freunde* from p. 315 to p. 331 in my paper on occasion of the Icelandic "Dowsing bear" (Oskabiörn) of which drawings are found in tab. 7, fig. L.M.N. of these Chitons. The reverend Mr Chemnitz, comprehensively and instructively, has collected all [64] that older and more recent authors have reported about this peculiar genus and published it in the eighth and tenth volumes of *Neues Systematisches Conchylien-Cabinet*. Therefore, I shall not mention what was previously stated of these shells, but only describe in detail all the Chitons which I have in my collection, in which, I am sure, very few species are missing. I flatter myself that I have not undertaken a quite futile task, particularly when I may obtain the approval of lovers of Natural Science.

First genus of the multivalve shells.

Chiton

The characteristics of this genus are:

The circumference of the shell is elongate round, the back is vaulted, inside it is hollowed as in *Patella*, as that it resembles a boat turned upside down. The hard-shelled part generally consists of eight, very seldom six or seven, transverse valves, which - as the tiles of a house, or the rings on the back of the crayfish - overlap the following valve with one margin so that the foremost valve is on top. The valves are enclosed by a fleshy girdle on the sides.

According to Linné, the animal is not a *Doris* but a *Limax*, which, as a [65] rule, is shaped like the animal in *Patella*, except that the animal which inhabits the Chitons has neither eyes nor tentacles.

For order's sake in the descriptions I divide this genus into two groups:

- A. Those which have striped valves.
- B. Those which have smooth valves.

Note. By striped Chitons I understand all those whose valves have visible stripes, no matter whether they run transversely or longitudinally. By smooth Chitons I understand those which are either indistinctly striped or provided with small tubercles, or are quite smooth.

No. 1. *Chiton tuberculatus*

Linné, Syst. Nat. No. 2 testa septemvalvi corpore squamoso.
Chemnitz, Tom. 8. Vignette 16. A.

This seven-valved *Chiton* is almost round in its circumference, it is not very vaulted and without a sharp back; the posterior and anterior valves are densely set with small tubercles. The other five valves have posteriorly, on both sides, an elevated pyramidal triangular figure, whose foot turns downward, and its tip towards the centre. This triangular figure is provided with six elevated stripes which are crossed by small tubercles. The rest of the shell is smooth. Its colour is beautifully light yellow with black spots transversally. In the middle of the back, and on either [66] side of it, these spots form two straight rows. The fleshy or leathery girdle is set with small elliptical scales which are alternately white or grey; above they are vaulted, with their broadest part placed longitudinally. The ground colour of the differently coloured coat of this *Chiton* is blue-green, and when the animal has been removed, the inside of the shell has the same colour. This *Chiton* I received from St. Croix and St. Thomas in the West Indies. Although it is commonly found there, it is seldom obtained with the coat on and with its natural vivid colours. As a rule it has eight valves, seldom seven, and very seldom six.

Note.— Since Linné uses as characteristics the tubercles or warts in *Chiton tuberculatus*, which appear on the fleshy girdle, he thereby shows that all the small scales which cover the girdle have been torn off in the specimen which he had before him, since the impressions of these elliptical scales leave such small tubercles. This annotation is infal-

libly correct, since Linné just thinks of this girdle which encloses the hard valves when he described the body. All Chitons have only two kinds of covering on this girdle: either small scales or short spines. The first leave flattened impressions when removed, the others show deeper impressions, where the spines have been placed, and Linné used these in characterizing *Chiton punctatus*.

The collection contains two curled specimens, the dried weak parts still present, approximately 4 cm long when stretched, both more or less eroded to the effect that the alternating dark and light spots along the posterior margin of the valves are hardly or not visible. Clearly discernible are the blackish bands accompanying the jugum on both sides. The slightly smaller specimen is 7-valved ("mit 7 Schilder" Spengler wrote on the label). Mörch (1870: 110) ascertained the species to be a variety of the next (= *Chiton squamosus* Linnaeus, 1764).

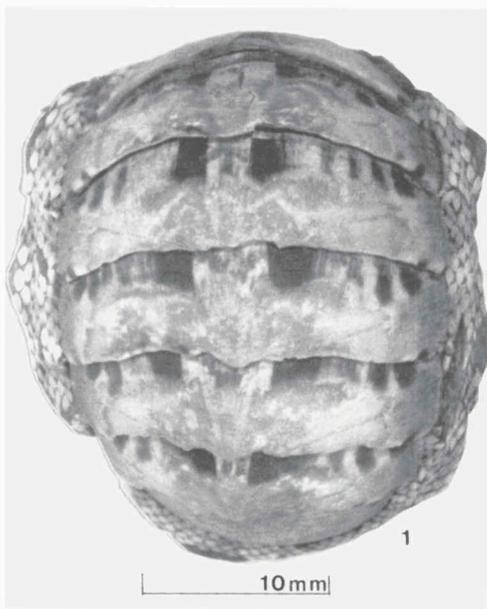


Fig. 1. *Chiton tuberculatus*; Spengler, 1797 (non Linnaeus, 1758). The seven-valved specimen from the two specimens present (= *Chiton squamosus* Linnaeus, 1764).

[67] No. 2. *Chiton squamosus*

Linné, Syst. Nat. No. 5 testa octovalvi semistriata oblonga, valvulae primae margo posterior integer, corpore squamoso.

The circumference of this extremely beautiful *Chiton* has a very long, almost tapering, oval shape. It is not very vaulted, but still has a sharp back. As in the preceding *Chiton*, the first and the last valves -like the six others- with pyramidal triangular figures and elevated stripes are set with delicate elevated tubercles which are arranged in the most beautiful regular order, forming a net which looks as if it was pricked with a needle. The rest of this *Chiton* is quite smooth. The girdle is provided with white and bluish-grey scales, which are almost round and strongly vaulted. The colour of this *Chiton* is light yellow, but this colour is visible in a few places only, since all the areas which are set with tubercles have a bluish colour; the smooth areas are provided with transversely running blackish spots which are somewhat darker towards the back.

The main characteristic of this *Chiton*, as also stated by Linné, is a smooth edge



behind the pyramidal triangular figures. At the first seven valves the edge is provided with three black spots. On the inside the [68] valves are beautifully green. That this *Chiton* is actually Linné's *Chiton squamosus* is evident from his description in Mus. L. U. to which he refers. Thus it is not reasonable that the specimen described by von Born (Tab. 1, fig. 1) and Chemnitz (Tome 8, fig. 788) is the true *squamosus*, since it is not semi-striped and does not possess the black spots on the hindmost edge as stated by Linné. The home of this beautiful *Chiton* is the West Indies. Tabl. 6, fig. 2.

Of this species also two specimens are present in the collection, the larger one stretched, 5 cm long, the other slightly curled, approximately 3 cm long when stretched. Both are in possession of the dried soft parts and most of the girdle scales. The pleurae of the smooth central areas are longitudinally striped, alternating blackish and yellowish. Also the narrow, smooth posterior margins of the valves exhibit the black and yellow spots by which *C. squamosus* is characterized. The lateral areas are finely radiately ribbed, the riblets granulose.

Fig. 2. *Chiton squamosus* Linnaeus, 1764. One of two specimens.

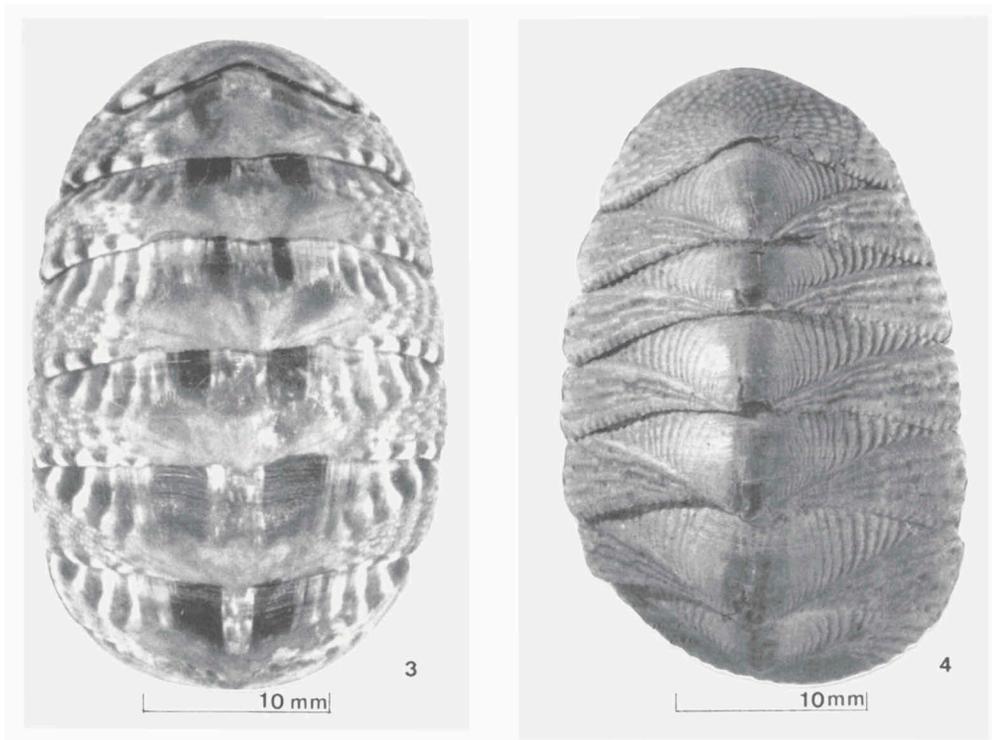


Fig. 3. *Chiton tigris* Spengler, 1797. Lectotype, designated herein; = *Chiton squamosus* Linnaeus, 1764.

Fig. 4a. *Chiton undatus* Spengler, 1797. Lectotype, designated herein; = *Chiton tuberculatus* Linnaeus, 1758 (seven-valved).

No. 3 *Chiton tigris*

Testa octovalvi, lata, valvula prima postite emarginata, simillima praecedenti, corpore squamoso. Chemnitz, Tom. 8. Fig. 792. 793.

This *Chiton*, which is called tiger on account of its yellow colour striped with black, is very similar to *Chiton tuberculatus* (No. 1), however with the difference that this has seven valves, while the present one has eight. It also occurs around St. Croix and St. Thomas, where it is not rare.

The two slightly curled syntypes in the collection, respectively 4 and 3 cm long, the largest cleaned inside, the tegmentum varnished, hardly differ from the foregoing *C. squamosus*, but for the more or less undulating dark and light longitudinal stripes on the pleurae of the central areas. The largest is here designated lectotype. *C. tigris* is a synonym of *C. squamosus*. It is the *Chiton scaber variegatus* of Chemnitz, to which Spengler refers.

No. 4. *Chiton undatus*

Testa octovalvi, carinata, medio striis undatis, ad latera angulis tuberculatis, corpore squamoso. Von Born Index Mus. Caes., Tab. i. f. 1. Berliner Beschäftigungen, 1 Band, Tab. 7. f. L. M. Chemnitz, Tom. 8. f. 788-791.

[69] This undulated *Chiton* is one of the most remarkable and largest members of this genus. Its whole structure is strong, and each separate part is distinct, the different formations of the valves are arranged in a beautiful order and distinctly separated from each other. Its circumference is elongate oval. It is strongly vaulted and has a sharp dorsal ridge. Both terminal valves, as well as the pyramidal triangular figures, are densely set with elongate, strongly raised tubercles. The remaining part of the six valves is elaborately provided with undulating longitudinal stripes. The colour of this *Chiton* is green, with black spots on the broad part of the sharp ridge. The girdle is very broad and covered with round strongly vaulted scales which are alternately black or white.

I have expressed doubt as to the preceding species No. 2 and set forth reasons for my opinion that this *Chiton* cannot be Linnaeus' *squamosus*, which it is considered to be by some conchologists. It is found near St. Croix and St. Thomas in the West Indies. I have in my collection large specimens of this species, 114 mm long and 51 mm broad.

A variety of *Chiton undatus*

Chemnitz, Tom. 10, Fig. 1690.

This *Chiton* has only seven valves. It is seldom to find an exception in [70] the great quantity of eight-shelled Chitons. Perhaps all the specimens which have less than eight valves, are true malformations. This specimen is 51 mm long and 27 mm broad. It is well preserved and ornamented with a girdle covered with scales. From the same locality as the foregoing specimen.

It is to be pitied that no syntype specimens of *Chiton undatus* are left in the collection, although there must have been several, at least one of them of 11.4 cm long and 5.1 cm broad. From Spengler's description it is quite clear that he had specimens of *Chiton tuberculatus* Linnaeus, 1758, before him; moreover no other West Indian species of the genus *Chiton* grow that large.

As to the variety, this seven-valved specimen is still present in the collection. It is curled in the posterior part, the girdle, now deprived of its scales, folded under. In the living state it may have attained a length of little more than 4 cm, including the girdle. In all respects it is a typical *C. tuberculatus*: all seven valves look absolutely normal. In this connection Spengler's statement that "perhaps all the specimens which have less than eight valves, are true malformations" is truly remarkable, for in those days the number of valves in chitons was considered to be a specific character.

No. 5. *Chiton viridis*

Testa octovalvi, valvulis ad latera angulis striato punctatus, corpore squamoso.

Although by first sight this *Chiton* seems to be formed like the preceding one, a closer examination reveals so many distinctive features in all its parts that there can be no doubt that it is a separate and new species. Its exterior circumference is elongate and narrow, the animal is highly vaulted but has a flat back. It has the appearance of a cylinder which is cut through longitudinally. The six pyramidal triangular figures on the sides are distinctly elevated from the rest of the shell and at the lower



Fig. 5. *Chiton viridis* Spengler, 1797. Lectotype, designated herein.

3.7 cm. The largest one (estimated length in a fresh, stretched state about 4.5 cm) is here designated the lectotype.

It is the *Chiton squamosus denticularis* of Chemnitz, 1788: 373, pl 173 f. 1689, and probably also the *Chiton squamosus testa septem-valvi striata* of Chemnitz, 1788: 374, pl. 173 f. 1690. Afterwards it has been described by various authors, under several names, such as *Chiton tessellatus* Wood, 1815 (probably), *Chiton foveolatus* Sowerby II, 1840, and also Reeve, 1847, *Chiton costatus* C.B. Adams, 1845, *Chiton (Lophurus) excavatus* Shuttleworth, 1853, *Chiton (Lophurus) gemmulatus* Shuttleworth, 1853, and *Chaetopleura reesi* Salisbury, 1953.

No. 6. *Chiton angulatus*

Testa octovalvi, carinata valvulis antice striis rectis longitudinalibus, corpore squamoso.

The circumference of this *Chiton* is an elongate and narrow oval. It is not vaulted, as in most members of this genus, but forms two straight sides towards the sharp back. Both the small round terminal shells as well as the pyramidal triangular figures on the sides of the six intermediate valves are very finely striped downwards longitudinally, and these stripes are cut transversally by circular rings. The remaining part of the shells is beautifully provided with longitudinal stripes and divided by fine grains, which cannot be seen distinctly without a magnifying glass. [72] The pyramidal triangular figures are rounded in a circle downwards, where they project from the girdle, which is completely devoid of scales. The hard-shelled part of this *Chiton*

margin bent somewhat outward over the girdle. These figures have, in addition, four round grooves formed by five elevated tuberculate strongly conspicuous stripes. The stripe placed at the anterior margin is twice as broad as the four others and furthermore provided with small teeth. Behind the last [71] tooth towards the smooth part of the shell a round hollow depression is seen, furnished with elevated stripes running across. The rest is quite smooth. Like the triangular figures the small terminal shells are provided with tuberculate stripes. It should further be pointed out that the scales on the broad girdle are hardly half as big as in the other *Chitons*, although they have the same proportions and are arranged in a similar way. The colour of this *Chiton* is green, in some places it is yellow which gives it a beautiful appearance. It occurs in the West Indies. Table 6, fig. 5.

There are five syntypes present in the collection, all more or less curled up, varying in length (in curled up state) from 1.2 to



Fig. 6. *Chiton angulatus* Spengler, 1797. Lectotype, designated by R. C. Bullock, 1972; = *Chaetopleura angulata* (Spengler, 1797) (fide Kaas & Van Belle, 1987).

is light grey, black spots are scattered here and there on the back. The very thick, fleshy girdle, which together with the dried animal almost fills out the shell, is opaque yellow. This *Chiton* occurs in America.

There are two syntypes present, both strongly curled up, the largest one yellowish brown, the other milky white. Although Spengler's description is somewhat cryptic in a way, it becomes clear from the syntypes that he had the species before him that for a long time had been recognized as *Chaetopleura fulva* (Wood, 1815) from the western coast of the Iberian Peninsula as well as from the eastern coast of Latin America. Mörch (1870: 111, no. 6) referring to the light coloured syntype, thought the habitat ("America") incorrect, but established that it should be a light-coloured variety of the next species ("*Chiton ferrugineus*" from the Mediterranean Sea), identical with *Chiton fulvus* Wood, 1815 and also with Chemnitz's "*Chiton candidatus Gaditanus*" (1788: 374, Tab. 173 f. 1691,) and with *Chiton lusitanicus* Tilesius, 1802. R.C. Bullock (1972), who studied the Spengler material of this and the following species, confirmed Mörch's conclusions and also my consideration (Kaas, 1954) that the origin of the present species was the eastern coast of South America from where it might have

been transported by Spanish or Portuguese merchant vessels to Iberian coasts, due to the animal's ability to climb anchor chains rather rapidly (de Rochebrune, 1891). The conspecificity of *Typhlochiton felipponei* Dall, 1921, and *Stereochiton felipponei* Dall, 1927, with the present species has been shown by Bullock (l.c.), who in the same paper designated the light coloured specimen as the lectotype of *C. angulatus*. Kaas & Van Belle (1980: 8) restored the name *Chaetopleura angulata* (Spengler, 1797) as the valid one, to replace *Chaetopleura fulva* (Wood, 1815).

No. 7. *Chiton ferrugineus*

Testa octovalvi, oblonga, longitudinaliter striata, carinata, intus alba, corpore squamato. Valvulis striis transversis albis elevatis, punctatis, in medio postice angulatis, subaculeatis. Triangulis valvularum lateralibus acutissimis, trilineis albis radiatis. Valvula anterior & posterior lineis albis radiata.

The circumference of this rust-coloured *Chiton* is elongate oval. Its outer shape is that of a triangle, since both lateral walls rise in a straight line as in the preceding species; hereby the back becomes rather sharp, and each of the six intermediate valves gets a forward directed point. The pyramidal triangular figures are very narrow and strongly elevated, and they are longitudinally striped. These elevated stripes are crossed by [73] circular grooves and are rounded at the lower margin. On the remaining part of the six valves are found elevated and white spotted longitudinal



Fig. 7. *Chiton ferrugineus* Spengler, 1797. Lectotype, designated by R.C. Bullock, 1972; = *Chaetopleura angulata* (Spengler, 1797).

stripes on a light brown background. Both the small terminal valves have almost indistinct transversal stripes which are crossed by fine grooves in the curvature.

The colour of this *Chiton* is a dark reddish-brown or rusty, except the above-mentioned white spotted stripes. On the inside the valves are white. The girdle is narrow and devoid of scales. The edge of the valves on which the girdle is stretched bears on the anterior valve 16 incisions or teeth, on the posterior 12, and on each of all six valves two teeth on both sides. The home of this *Chiton* is the Mediterranean. As far as I know, it is a new species.

There are two curled syntypes present in the collection, the larger one, cleaned inside, measuring ca. 4.5 cm when stretched, the smaller one, with dried soft parts present, at best 2 cm, the tegmentum of both varnished. Undoubtedly *C. ferrugineus* is conspecific with the former, hence another synonym of *Chaetopleura angulata* (Spengler, 1797) (fide Bullock, 1972, who designated the larger syntype as the lectotype).

No. 8a. *Chiton olivaceus*

Testa octovalvi: oblonga carinata, valvulis transversim: triangulis longitudinaliter profunde striatis: striis concoloribus, corpore laevi.

In all probability the present *Chiton*, like the preceding one, is a new species. It is very long in relation to its breadth, consequently its circumference is a very long oval. It is very flattened, and the back is rather sharp. The lateral walls run in a straight line downwards from the back. In all eight valves the ornamentations are of a definite shape, all [74] of them are distinctly marked and divided in the most beautiful proportions. The pyramidal triangular figures on the six intermediate valves are very broad here and have five elevated rounded folds (elongate tubercles) in upward longitudinal direction. The remaining part which in this *Chiton* is much narrower than in the others - due to the above mentioned great breadth of the triangular patterns - is provided with grooves towards the sharp back, at equal distance according to the length of the animal so that the smooth interspaces look like the steps of a staircase. The posterior portion of both terminal valves is densely set with straight fine stripes. Half the anterior portion is equally finely striated, on the remaining half some of the sharp back and the step-like pattern are still visible. The girdle is thin and narrow without scales. The colour of this *Chiton* is a beautiful light brown, without mixture of other colours. On the inside the valves are of a pale green colour. The



Fig. 8b. *Chiton olivaceus*, var. *b* Spengler, 1797; = *Chiton (Rhyssoplax) olivaceus* Spengler, 1797.

folded under. As to the white lateral areas: they are present in the valves II (= valve VII sensu Spengler) and VI (= valve III sensu Spengler). Spengler wrongly took the head valve for the posterior one. It is a typical specimen of *Chiton olivaceus*, which is very variable in colour pattern.

largest specimen in my possession is 32 mm long and 16 mm broad. It is found off the coast of North Africa. Table 6, fig. 8 a.

It is most regrettable that the type series of *Chiton olivaceus* is no longer present in the collection.

Variety b of Fig. 8.

This difference exists in the fact that in the middle of the back there is a sharp edge which was more rounded in the preceding variety. The pyramidal triangular figures are here somewhat broader and strongly vaulted at the lower margin, for which reason the hollowed interspace is smaller. The [75] transverse stripes are not so numerous, nor are they equally deeply incised; but first and foremost the colour is different: The preceding variety had a pure light-brown colour, and the present variety is completely light grass-green, except for the 1st and 5th pyramidal triangular figures, reckoning from the posterior end, which are white. This rare *Chiton* is from Mogadori.

There is one specimen of this "variety" in the collection, 22 mm long, 12 mm wide, the girdle, deprived of most of its scales,

Variety c of Fig. 8, Table 6.

Although this beautiful *Chiton* at first glance seems to be very similar to the preceding variety, a closer investigation reveals many new features by which it is distinguished from that one and from all previously known *Chitons*. The valves are placed very close to each other and overlap, their anterior sharp edge is completely straight and consequently not roundly incised, nor is the centre of its back provided with an overhanging point. The strongly elevated pyramidal triangular figure is longitudinally downwards provided with deep undulating lines which on both sides are nicely encircled by alternately white and black tubercles. Below they are not rounded,



Fig. 8c. *Chiton olivaceus*, var. *c* Spengler, 1797; = *Chiton (Rhyssoplax) olivaceus* Spengler, 1797.

but this part is covered by the girdle which is set with fine small scales. Like in the two preceding Chitons the depressed portion is [76] incised by deep transverse lines even down to the girdle. The colour is green up to the sharp back which is reddish brown. It comes from the same locality as the preceding *Chiton*.

The only specimen of this "variety" present measures 27 × 16 mm and is well preserved and stretched, the girdle still in possession of its scales.

It is not clear in what respects the specimen should differ from the foregoing one, which came from the same locality: Mogador, on the Atlantic coast of Morocco, 31°30'N 9°50'W (which is a questionable locality for the species).

Variety d of fig. 8. Table 6.

This *Chiton* had deserved to be erected as a distinct species because of its unusual pyramidal triangular figure. However, since the ground pattern otherwise fully agrees with that of the three preceding varieties, I am reluctant to increase the number of species. The pyramidal triangular figure of the six intermediate valves consists of two elevated blunt ribs and between these a roundish hollowed longitudinal groove is running downwards. The posterior valve is furnished with ten round folds running longitudinally. The anterior valve, however, is very small. The triangular figures, as well as the whole covering of the posterior valve, is provided with undulating elevated lines, running transversely with a moiré appearance. The colour of this *Chiton* is dark brown in the triangular figures, but the remaining part is completely covered with sharp alternating transverse white and black bands. From Tranquebar.

There are four curled up specimens in the collection, the largest, when stretched, 2 cm long by estimate. As Mörch (1870: 111) already remarked: "Spengler rightly believes that this *Chiton* has deserved to be erected as a distinct species". This is quite true, for it differs widely from *C. olivaceus*. The head valve (not the tail valve as Spengler erroneously stated) is ornamented with ten low, rounded, radial ribs, corresponding with the eight slits of the insertion plate; the lateral areas show two low radial ribs, the foremost forming the diagonal ridge, the hinder one accompanying the posterior margin of the valve, the interstice wide, hollow. The central areas are smooth, with alternating light and dark longitudinal bands on the pleurae, which may have deceived Spengler to suppose that they constituted longitudinal ribs as in *C. olivaceus*.

As it appears, the specimens are conspecific with *Plaxiphora tricolor* Thiele, 1909, originating



Fig. 8d. *Chiton olivaceus*, var. *d* Spengler, 1797. One out of four specimens, disarticulated. Lectotype, designated herein; = *Plaxiphora tricolor* Thiele, 1909.

with fine stripes along their margins. All the six intermediate valves are circularly rounded at the lower margin, where they are attached to the girdle. The girdle is very broad, leathery and yellow, and full of deep holes in which the spines are situated. These holes may have induced Linné to give the species its name. All Chitons have at the lower margin of the eight valves a narrow edge without covering or enamel, over this the girdle is stretched, together with the animal, on whose back seven partitions, thin as paper, connect the eight valves of the shell, internally towards the outside, and unite them into one body. Table 6 fig. A. Regarding this edge it should further be noted that on both terminal valves they have a number of incisions, like combs or teeth, and their surface is provided with deep [78] grooves. The other six valves are rounded downwards at their side, bearing only a small tooth. This arrangement and division of the teeth are not the same in all Chitons, but different in almost every species. The colour of this *Chiton* is mainly black, if its back is undamaged, which is, however, seldom the case. The back is without covering (enamel) and lustre. Internally the valves are divided into two parts after the rounding of them, one part is white, the other blackish brown. The biggest specimens have a length of 76 mm and are 38 mm broad. The Arabian Expedition sent it from the Red Sea together with

from a Lobos Island, without further indication.

Leloup (1937:167) synonymized *Plaxiphora indica* Thiele, 1909, and *P. platei* von Knorre, 1925, with *P. tricolor*, and later (Leloup, 1942: 31) he even decided that the three names were synonymous with *P. parva* Nierstrasz, 1906, from Mozambique. Having seen a great many specimens of *P. indica* from Sri Lanka (Ceylon) in The Natural History Museum, London, from the collection of R. Winckworth, I can only conclude that this form is totally different from *P. tricolor*.

No. 9. *Chiton punctatus*

Linné, Syst. Nat. No. 6. testa octovalvi, valvulis [77] ad latera striis longitudinalibus semicircularibus, dorso striis laevibus transversis.

The circumference of this *Chiton* is a regular oval. Its eight valves are strong and thick-shelled, elevated, roundly vaulted, without a sharp back. The pyramidal triangular figures are imperceptibly separated from the remaining part by a rounded edge, and from below upwards towards the middle they are provided with circular stripes and folds, running longitudinally all over the shell.

The two terminal valves are densely set

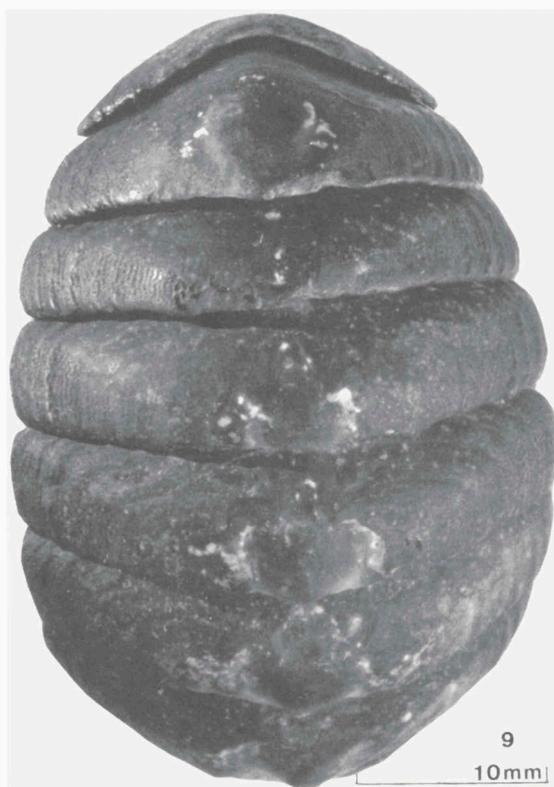


Fig. 9. *Chiton punctatus*; Spengler, 1797 (non Linnaeus, 1758), sive *C. testudo* Spengler, 1797. Lectotype, designated herein; = *Acanthopleura vaillantii* de Rochebrune, 1882.

other products of this sea. Due to the similarity of the valves it might be called *Chiton Testudo*.

Under the name *Chiton testudo* there are two samples present in the collection: one containing three very dark blackish brown, curled up specimens, partly disarticulated, soft parts and girdle covering missing, the tegmentum heavily varnished, though recognizable as the only *Acanthopleura* species occurring rather commonly in the NW Indian Ocean and in the Red Sea, *A. vaillantii* de Rochebrune, 1882 (syn.: *A. haddoni* Winckworth, 1927). The largest specimen, when stretched, ca. 5 cm long by estimate. The same sample also contains the skeleton of a girdle and the girdle bridges of some specimen of *Chiton* sensu stricto (the impressions of the lost girdle scales clearly visible). The oldest label reads: "*Chiton punctatus*. Der Schildkrote. No. 9", a more recent label reads: "Syntypes of *Chiton testudo* Spengler, 1797. Red Sea, 1761-1763. P. Forsskål/Arabian Expedition." The second sample only contains the skeletons of the girdle and girdle bridges of two specimens. The smaller one also contains the dried soft parts of the animal, the larger one may constitute the fig. A of Tab. 6 (the fleshy part of *C. punctatus*).

No. 10. *Chiton aculeatus*

Linné, Syst. Nat. No. 3. Testa octovalvi, valvulis ad latera striis granulosis undatis ad longitudinum testae; ultima valvula longiore.
Chemnitz, Tom. X. Fig. 1692.

The outer circumference of this very large *Chiton* is the usual oval, like in the preceding species. It is rather flattened round, vaulted without a sharp back. The pyramidal triangular figures are narrow, and only slightly elevated above the remaining broad parts, in addition, strongly rounded [79] below at the girdle and provided with elevated points united into different figures as in the terminal valves, of which the anterior one is very small. The remaining portion of the intermediate valves is covered with fine elevated undulating stripes, each of the valves has in the middle of the back a point which is provided with black spots. The very broad, fleshy girdle is densely set with spines, which, considering their nature, are rather long, pointed at both ends, and, in addition, somewhat curved. Of these spines some are dark red,

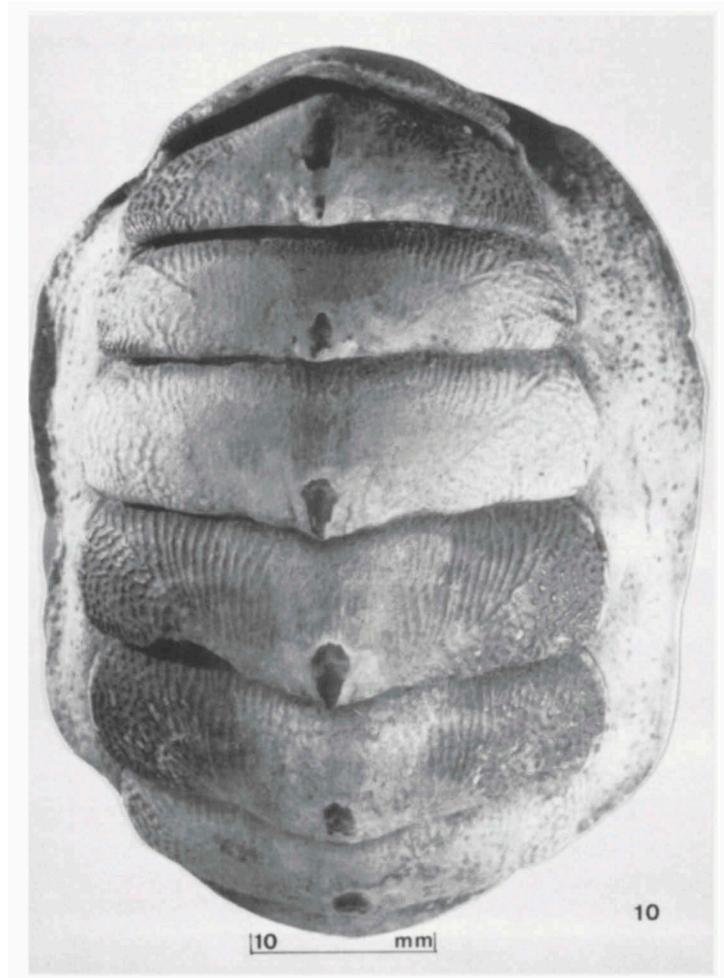


Fig. 10. *Chiton aculeatus*; Spengler, 1797 (non Linnaeus, 1758). Nicobar Is.;
= *Acanthopleura gemmata* (de Blainville, 1825).

others are quite white, and where they are missing, they have left deep holes. The colour of this *Chiton* is very variegated and irregular. Some of the valves are yellow with darker spots on the back, others are black mixed with some yellow. The specimen is 76 mm long and 38 mm broad, exclusive of the girdle. It is found around the Nicobar Islands.

There are two lots of this species present. The first contains three specimens. The largest is 52 mm long, rather strongly curled, the girdle naked. Another one is wholly curled up, the tegmentum thickly varnished; it has the girdle still covered with spines. The third one, the smallest, is curled up, 2 cm long, the girdle naked, valve VIII disarticulated. In all respects the specimens are conspecific with those hitherto called *Acanthopleura gemmata* (de Blainville, 1825).

The second sample contains one specimen, much eroded, curled up and varnished; estimated length 4-4.5 cm when stretched. A label added by R.C. Bullock reads "this is the specimen mentioned by Spengler", which cannot be true as Spengler gave a good description of



Fig. 11. *Chiton cimicinus* Spengler, 1797; (= *Chiton cimex* Chemnitz, 1785). Lectotype; = *Leptochiton asellus* (Gmelin, 1791).

and these as well as the terminal valves are cut through by circular lines at equal distance. The remaining small part of the valves is interwoven transversally and longitudinally with very fine wavy stripes, whereby the whole surface looks like the finely tuberculate skin of a fish. Its colour is olive green with black stripes across towards the pyramidal triangular figures. On the remaining part they are beautifully shaded longitudinally. Since the valves are thin and transparent, the above mentioned black figures are visible through them on the interior bluish-grey side. Its length is 9.6 mm, its breadth 6.4 mm. It occurs off Bergen in Norway. Tab. 6. fig. 11.

There is a sample in the collection, labelled "*Chiton cimex* Chemnitz, Bergen. Norge. Original Ch. VIII, f. 815. *C. cimicinus* Spengler. Original sp. N.S.S. p 79. t 6. Legit Spengler." It contains 3 blackish, flat specimens, 7.5, 9 and 10 mm long, all unmistakably the species now known as *Leptochiton asellus* (Gmelin, 1791). *C. cimex* Chemnitz was based upon specimens received from Spengler. The name was validated by Gmelin (1791: 3206, sp. 20).

Another sample in the Spengler collection, labelled "*Chiton cimicinus*. Loc. Norvagia, *C. cimex* Spgl Origin. Legit: Coll. O. Fbr." contains two specimens: the smaller one stretched, obviously a specimen of what now is known as *Lepidochitona cinerea* (Linnaeus, 1767), the larger one wholly curled up, a specimen of *Leptochiton asellus*.

The name *Chiton cimex* was printed a few lines higher than *Chiton asellus* (Gmelin, 1791: 3206, sp. 21), but as the name *C. cimex* never reappeared in the literature it seems best to disregard it.

the ornamentation of the valves (not discernible in this eroded shell). The author qualifies the shell as "very large", with black points on the apices, all features applicable to the largest specimen of the first mentioned sample.

Although Linnaeus (1758: 667) in his description of *C. aculeatus* refers a.o. to "*Limax marina*" of G.E. Rumphius, 1705: 10, f. 4, which is probably a worn specimen of *A. gemmata* (see frontispiece of Kaas & Van Belle, Monograph of living Chitons, vol 2, 1985), his other references are, according to Hanley (1855: 13-15) quite dubious; so we think it right to follow Hanley's recommendation and consider *Chiton aculeatus* a nomen dubium.

No. 11. *Chiton cimicinus*

Testa octovalvi carinata, valvulis rugoso striatus ad longitudinem corporis, ad latera triangulis radiatis, stris semicircularibus transverse notatis.

Chemnitz Tom. VIII. Fig. 815.

This small *Chiton* has an elongate round shape. It is only slightly vaulted, but has a very sharp back. The six intermediate valves have quite distinct [80] and sharply raised pyramidal triangular figures which are rounded below,

B. valvulis laevis.

Chitons with smooth valves.

No. 12. *Chiton salamander*

Testa octovalvi carinata, valvulis verrucosis, margine posteriori angulato, corpore aculeato.
Chemnitz, Tom. VIII. Fig. 806.

This *Chiton* is regularly oval, and although it is only slightly vaulted, it [81] has nevertheless a sharp back. The six intermediate valves are on both sides at the anterior, visible margin sculptured so that a raised point with black spots is formed in the middle of the back as in *Chiton aculeatus*. The pyramidal triangular figures are only elevated from the remaining part of the valves by a rounded and almost invisible edge. On the



surface all eight valves are covered with small tubercles which -like the elevated spots- are placed in straight rows resembling the chagreen skin of a shark. The girdle is densely covered with small, partly blunt spicules so that they look as if they constituted one body; they are alternately black and white without any order. This *Chiton* is black; there are, however - among the younger specimens which have their chagreen skin intact- some which longitudinally on the back have yellow bands on both sides of the yellow spots, whereby they are similar in colour to the *Salamander*. Large and fully grown specimens are generally covered by a calcareous crust, since they often attach themselves to the rocks above the water, and they therefore lose the fine chagreen skin. Their habitat is St. Thomas in the West Indies.

Fig. 11+. *Chiton cimicinus* Spengler, 1797. One of two specimens obtained from O. Fabricius, the other one being *Leptochiton asellus* (Gmelin).

The collection contains one sample, labelled "Chiton salamander Sp. St. Thomas, Original



Fig. 12. *Chiton salamander* Spengler, 1797. Paralectotype; = *Acanthopleura granulata* (Gmelin, 1791).



Fig. 13. *Chiton fascicularis* Linnaeus, 1767. The disarticulated specimen depicted by Spengler on pl. 6 fig. 15, valve VIII now missing; = *Acanthochitona fascicularis* (Linnaeus, 1767).

sp. N.S.S. IV, 1, p. 80 No. 12. Legit: Spengler." There are six more or less curled up specimens present, varying in length from 1.5 to 2.5 cm (but much longer when stretched in a living state). The largest one is here designated the lectotype. The species is the commonest in the Caribbean area, known as *Acanthopleura granulata* (Gmelin, 1791).

No. 13. *Chiton fascicularis*

Linné, Syst. Nat. No. 4. Testa octovalvi, corpore ad valvulas utrinque fasciculato.
Chemnitz, Tom. X. Fig. 1688.

[82] This *Chiton* described by Linné, until his time must have been very rare, since it is neither known nor described by other conchologists. It is distinguished by so many characteristics from the other species belonging to this genus that nobody who sees it could mistake its identity. The stellate bundles formed by transparent white rays -which are attached to the girdle below along the margin- make it a most admirable creature.

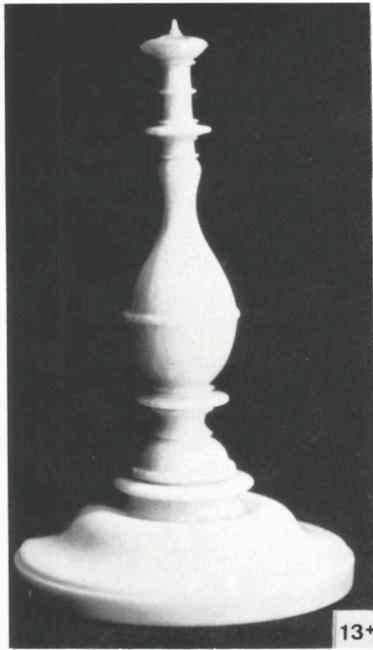


Fig. 13⁺. The box in which *C. fascicularis* is kept also contains a bipartite ivory chess-piece; on the bottom of the pedestral is written in pencil: "Spgl. Z.M.". A second label in the box reads (in Danish): "has been glued on the foot-piece of this. Presumably originating from art-director Spengler.

The external circumference of this *Chiton* is an elongate oval. It has no sharp back, is round, vaulted, and only slightly elevated. The six intermediate valves lack the pyramidal triangular figures which are found in all other *Chitons*. The anterior terminal valve is very small. All eight valves are covered with small tubercles like a fine chagreen skin. In proportion to the narrow shell the girdle is very broad, to give room for nineteen bundles of setae. In addition, it is densely set with alternately green and black spines. The fine white rays, which resemble a star, all issue from a centre of the size of a pinhead, composed of small spines and raised above the other rays in the star. The base of each star is attached to a deep funnel-shaped depression which is much widened above. This *Chiton* [83] is black. In the middle of the back of the six intermediate valves a whitish-grey band is running longitudinally in a straight line, in the middle of which each of the above mentioned valves has a black anteriorly pointed spot. This *Chiton*, which is 34 mm long and 13 mm broad, comes from Cap de bonne Espérance. I possess different specimens from the Barbary which are much smaller. Prof. Wahl found it in Norway, of the same size as those from the Mediterranean Sea.

Another feature should be mentioned, viz. the unusual formation of the eight valves when the animal and the girdle have been detached. The stonehard valves are three times as long as broad. The enamel coat of the valves is unusually narrow in proportion to the breadth. The six intermediate valves, on the anterior side or sharp edge, are incised and strongly rounded on both lower margins. Round all the valves that part which is surrounded by the girdle projects considerably outwards. On the posterior round valve there are five incisions which form six teeth. On the other six valves that part of the margin is strongly rounded and anteriorly provided with a small tooth. The anterior and smallest valve in the middle of its edge has an unusual round incision, and a small tooth on both sides. The colour of the said edge is beautifully Saxon green on both sides. [84] Internally in the middle that portion which is enamelled externally is shiny crimson. Tab. 6, fig. 13.

The only specimen in the collection is the disarticulated animal depicted on Spengler's pl. 6 fig. 13, of which valve VIII (erroneously called the anterior one by Spengler) is missing. The box also contains an ivory chess-piece. According to the label the specimen comes from "Cap Barbariet" (probably in Algeria, from where Linnaeus got his specimens).



Fig. 14. *Chiton marmoratus*; Spengler, 1797 (also Spengler, 1775, but unnamed, description and fig. only); = *Chiton marmoratus* Gmelin, 1791; lectotype, designated herein.

The elevated pyramidal triangular figures are smooth as a mirror as are also the other parts of all the eight valves. The girdle is not very broad, and the scales covering it are small, thin, flattened and elongate round. They are beautifully arranged with alternating white and black bands like the scales in fishes. The valves have very different colours; they are, however, generally darker or lighter olive, with many black and dark brown [85] spots, which are all arranged longitudinally at equal distance from each other. The centre of the six valves is remarkable by six converging coal black spots forming a band along the back. Both the round terminal valves are olive spotted with white. The margin to which the girdle is attached is very narrow. Both the round terminal valves have many small teeth which above have deep stripes. On the other six valves the margin is divided by a single incision only. On the surface they are -like the two others- hollowed to deep grooves. On the inside all the valves are light green. Of this medium-sized species the biggest specimens are generally 52 mm long and 26 mm broad exclusive of the girdle. They occur round St. Croix and St. Thomas.

There is a box in the collection containing 7 specimens from St Thomas (one partly disarticulated), which constitute Spengler's syntypes. We designate a curled-up specimen, measuring 3.8×2.5 cm as the lectotype. Furthermore there is one box with 4 complete specimens and a disarticulated one, the largest 5.5 cm long, the disarticulated specimen small and incomplete. According to the label they originate from the West Indies and were obtained

No. 14. *Chiton marmoratus*

Testa octovalvi laevissima fornicata, valvuli ad marginem posteriore vix angulatis, ad latera triangule elevato, corpore squamoso.

Beschäftigung der Berlinischen Gesellschaft. Tom. I, p. 325. Tab. 7, fig. N. Knorr, Tom. A, Tab. 17, Fig. 3, 4. Chemnitz Tom. 8, Fig. 803-805.

In the above mentioned "Berlinische Beschäftigungen" I described in detail this species of *Chiton*. Therefore I shall here state only the most essential characters which make this *Chiton* easily recognizable. It has an elongate oval shape. It is semi-circularly vaulted without a sharp back. The



Fig. 14⁺. *Chiton marmoratus* var. Spengler, 1797;
= *Chiton marmoratus* Gmelin, 1791.

some time before 1800; fide Chemnitz.

A Variety of *Chiton marmoratus*, Tab. 6,
Fig. 14.

As long as the differences in Chitons consist only in the colour, the spots and the bands, or even in a single colour, it is unnecessary to separate them as varieties; but when the shape of such a *Chiton* deviates too much from that of its congeners, the methodical investigators -in order to avoid confusion- will do well in erecting varieties. The present *Chiton* is just such a case. It is true that the surface of the eight smooth valves agree [86] in all parts with the preceding one, but the circumference of the shape is very different. It is narrow, but extremely long and deep. As it is equally broad throughout its length, it has the appearance of a cylinder. It is 78 mm long and 18 mm broad, and in the middle of its length it is 13 mm deep. Thus it more resembles a long, deep baker's trough than a boat turned upside down. It is found round St. Croix and St. Thomas.

There are four specimens of this variety present in the collection, the largest 55 mm long, the smallest partly disarticulated. Apart from being highly elevated and round-backed, they differ in no way from typical *C. marmoratus*.

No. 15. *Chiton papilio*

Testa octovalvi dorsata longissima antice attenuata, valvulis angulatis vix striatis, prima & ultima ad marginem interiorem decedentata.

The eight valves of this beautiful *Chiton* are unusually long and strong, and their mutual proportions are quite different from those of all other species of this genus hitherto known to me. The hindmost valve is extremely narrow. The following valves increase in breadth to the sixth, only the 7th and 8th valves again decrease in size. This *Chiton* thus has a long protracted pear-shaped form. The back is high and not vaulted, but rises on both sides rectilinearly, forming together with the ventral part, a triangular prism. The smallest or last valve is incised at the anterior margin in order to



Fig. 15. *Chiton papilio* Spengler, 1797. Holotype; = *Chaetopleura papilio* (Spengler, 1797).

Fig. 16. *Chiton dentatus* Spengler, 1797. Holotype; = *Callochiton dentatus* (Spengler, 1797).

give room for the sharp back of the preceding valve. The pyramidal triangular figures on the sides of the six intermediate [87] valves are very high and finely striped in round arches, like the remaining part behind these triangular figures, which, in addition, is very rounded at the lower margin above the girdle. Since this *Chiton* has no girdle, that part which should have been occupied by the girdle could be seen. On both terminal valves the said part is provided with 11 or 12 narrow or broad teeth. Each of the six intermediate valves has a broad, round shape, and towards the posterior end, due to an incision, a small tooth. Everything is snow white and shiny. The colour of this *Chiton* is beautiful brown-red, scattered with white feather-like spots. In addition, the six intermediate valves have triangular white spots longitudinally on the back, and in the middle these are interrupted by dark red spots. This pattern, together with the whole shell shape, gives it the appearance of a butterfly. In this respect it is used by the inhabitants of Cap de bonne Espérance when they arrange bouquets made of shells and wish to ornament them with insects of the same kind. On the inside this *Chiton* is dirty white on the sides, in the centre, however, it is light brown. It is 76 mm long and 38 mm at its broadest part. It is found off Cap de bonne Espérance. Tab. 6, fig. 15.

The collection only contains the specimen (=holotype) described above by Spengler. It is a slightly bent shell, without its soft parts and girdle.

The author described it at length and very well, although one should be prepared to read "anteriorly" for "posteriorly", "last valve" for "first valve", and the reverse, as is the case in all his descriptions. This is the more remarkable as on page 64, in describing the characteristics of the genus, Spengler explicitly declares that the arrangement of the valves is such "that the foremost valve is on top". Taking these facts into consideration it must be said that the species is easily recognizable. Nowadays it is known as *Chaetopleura papilio* (Spengler, 1797).

[88]

No. 16. *Chiton dentatus*

Testa octovalvi carinata, valvulis ad marginem lateralem sexdentatus, anteriore viginti octo, posteriore viginti quator dentatis.

This *Chiton* from the Cap is egg-shaped. The back is very high, almost in straight line with a sharp edge in the middle of the back. The posterior valve is the smallest, the six following valves increase in breadth, and the last one, which is again somewhat smaller with its curvature forms the ovoid shape. The pyramidal triangular figures, which are rounded below, are only slightly elevated, not quite smooth, but almost imperceptibly striped lengthwise and transversally. Otherwise the valves are quite smooth. A singular peculiarity appears in the *Chiton*, viz. that the adapted margin, to which the girdle is attached, is situated at only the thickness of paper deeper than the enamelled surface of all eight valves. This white margin is very narrow, particularly on both terminal valves, which in the most beautiful way is meticulously set with 52 deeply incised and separate teeth. Each of the six other valves has six teeth on either side, which are somewhat larger than those mentioned above. This *Chiton* thus has 124 teeth, all of which are rounded and polished on the sides and anteriorly, which is not the case in any other *Chiton*. The girdle is extremely narrow, thin, [89] transparent, and devoid of scales; but judging from the impressions it was presumably provided with small scales. This *Chiton* is brown-red, on both sides of the back ornamented with white zigzag stripes. Inside it has a beautiful crimson colour. It is 57 mm long and 38 mm broad, and it occurs off Cap de bonne Espérance. Tab. 6, fig. 16.

Spengler's holotype of *C. dentatus* is still present; it is a slightly curled shell without the soft parts, some rests of the girdle folded under at the sides, so that the insertion teeth of all the valves are clearly visible.



Fig. 17. *Chiton politus* Spengler, 1797. Lectotype, designated herein; = *Chiton (Rhyssoplax) politus* Spengler, 1797.

For a long time the species was known as *C. fulgetrum* Reeve, 1847, and later as *C. castaneus* Wood, 1815, although Mörch (1870: 112) had established the conspecificity of *C. dentatus* and *C. fulgetrum*. Kaas & Van Belle (1985: 15) restored Spengler's older name. Hence, referring it to *Callochiton* Gray, 1847, the species should be called *C. dentatus* (Spengler, 1797).

No. 17. *Chiton politus*

Testa octovalvi carinata, laevis oblonga, valvulis ad latera triangulis elevatis, valvula posteriore pyramidata.

Its shape is a long oval, tapering at both ends. The back, which rises in a sharp ridge, together with the lateral walls and the breadth of its base, almost forms an equilateral triangle. All valves are so close to each other as if they constituted a single shell. They are all shining and smooth without points or stripes. The pyramidal triangular ornamentations are much elevated. The broad girdle is covered with small scales. The margin or the projecting edge over which it stretches is very narrow. The basic colour of the shell is a pale flesh colour with brown-red spots and curved lines of the same colour. There are darker spots on the sharp dorsal ridge. It is [90] 32 mm long and 19 mm broad. It occurs at Cap de bonne Espérance.

This species had been recognized by Mörch (1870: 112) as identical to *C. cymbiola* Sowerby II, 1840, a name which at a later date was replaced by the older *C. tulipa* Quoy & Gaimard, 1835, by which name it is still known.

C. politus is represented in the collection by two specimens, the smaller one somewhat curled-up, complete, the soft parts and the girdle with its scales still present, measuring 22 × 13 mm, here designated as the lectotype. The paralectotype is considerably larger, partly disarticulated, only the valves I-V still kept together by the naked girdle, VI-VIII loose. There are two valves VIII, but one of them does not belong to the present specimen as it is differently coloured. As Mörch (l.c.) observed, "Die erste Schale bei dem einen Explr. hat dieselben triangulösen Erhöhungen wie die Mittelschilder. Vielleicht Monstrosität." As the valve was still attached to the girdle we soaked and loosened it, just to find out that the anterior margin, though neatly rounded, had no insertion plate at all (fig. 17⁺). This is a remarkable

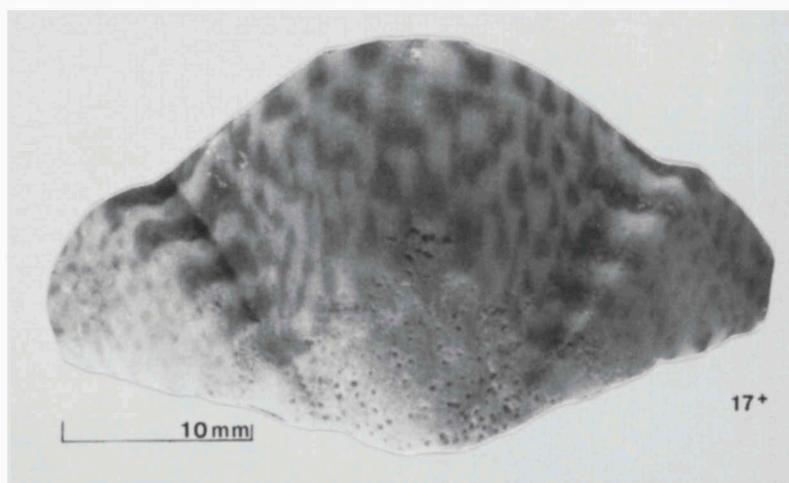


Fig. 17⁺. *Chiton politus* Spengler, 1797. Isolated abnormal valve I of paralectotype.

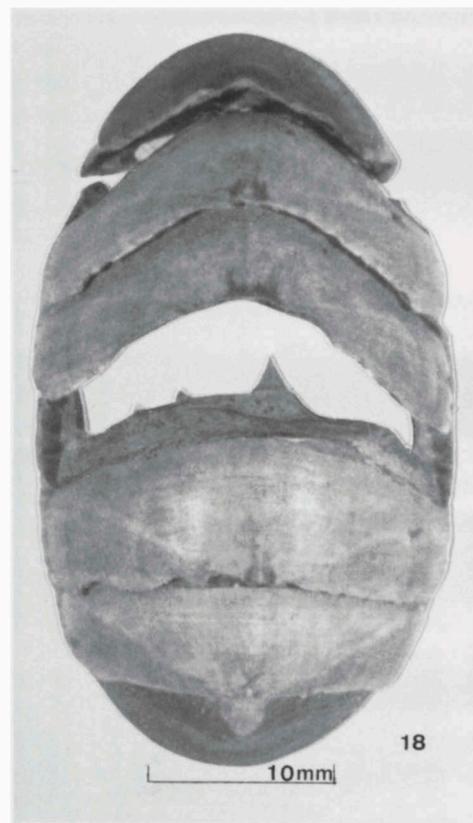


Fig. 18. *Chiton bicolor* Spengler, 1797. Holotype; = *Callochiton dentatus* (Spengler, 1797).

the six intermediate valves is light scarlet, intermingled with white spots. Each of these valves has a small red transparent point in the middle of the back at the sharp edge. Both terminal valves are black-brownish, thus forming a remarkable contrast to the other valves. The inside colour is a beautiful crimson. It is 33 mm [91] long and 20 mm broad. It occurs off Cap de bonne Espérance. Tab. 6, fig. 18.

The holotype is still present; it is a partly disarticulated specimen, ca. 26 mm long, 14 mm broad, the valves I, II and V loose. Although somewhat smaller it differs in no way from No. 16, *C. dentatus*, nor from the next species, No. 19, *C. planatus* Spengler. The name *Chiton bicolor* is preoccupied by *C. bicolor* Gmelin, 1791, a nomen dubium, based on Chemnitz, 1885: pl. 94, fig. 794 (*Chiton extus viridis, intus candidus*), which from the description as well as from the poor figure, is irrecoznizable. Kaas & Van Belle (1985: 17) restored the name *Callochiton dentatus* (Spengler, 1797) as the valid one. Hence, *C. bicolor* Spengler, non Gmelin, and *C. planatus* Spengler have become synonyms.

No. 19. *Chiton planatus*

Testa octovalvi complanata, laeviter carinata, valvulis ad marginem lateralem quinquedentatus.

monstrosity indeed, unequalled in chitons.

In accordance with article 23 of the International Code of Zoological Nomenclature *Chiton (Rhysoplax) politus* Spengler, 1797, has priority over the younger name *Chiton (Rhysoplax) tulipa* Quoy & Gaimard, 1835.

No. 18. *Chiton bicolor*

Testa octovalvi oblonga convexa extus griseo-purpurascens, valvulis laevibus: vermalibus, corpore laevi.

The circumference of this *Chiton* is an elongate oval. It is only slightly vaulted and without a sharp back, and it is so thin-shelled as a playing-card, which is unusual. The pyramidal triangular figures on the six intermediate valves are only slightly elevated. Below they are rounded, and each of them has fine, deeply incised, short teeth which serve to fasten the girdle. Otherwise they are, like the remaining parts of all eight valves, quite smooth. Both the round terminal valves bear below the girdle numerous small teeth, hardly one half line long, a feature found in most Capean Chitons. The girdle is narrow and without scales, but was previously covered with such. The colour of



Fig. 19. *Chiton planatus* Spengler, 1797. Holotype; = *Callochiton dentatus* (Spengler, 1797).



Fig. 20. *Chiton ruber*; Spengler, 1797 (non Linnaeus, 1767). One out of three specimens from Greenland and/or Iceland; = *Tonicella marmorea* (Fabricius, 1780).

This *Chiton* has a long, straight, oval shape. Its eight valves are very flattened, i.e. not very vaulted; it has, however, a sharp back. The pyramidal triangular figures are only recognizable by a flat edge, which separates them from the remaining part of the valve. Below they are rounded as usual, and like both the round terminal valves they have as many flattened folds as they have teeth to which the girdle is usually attached. This can be explained in the following way. Since the coat of enamel of this *Chiton* is very thin, and the incisions of the teeth reach so far up on the exterior side, the coat of enamel covers the incisions formed by the teeth. In this way the above mentioned folds appear. The same holds good for *Chiton dentatus*, no. 16, and of the preceding one which both have similar folds, however, less distinct. Since this *Chiton* has lost its girdle, it is possible to see the number as well as the formation of the teeth, and the narrow margin, which is otherwise concealed by the girdle. The foremost [92] valve has 24 teeth, the opposite one 20. The six intermediate valves have one very broad tooth and four small teeth. This *Chiton* is crimson with scattered, irregularly shaped, dark-brown spots. On the inside the valves are crimson in

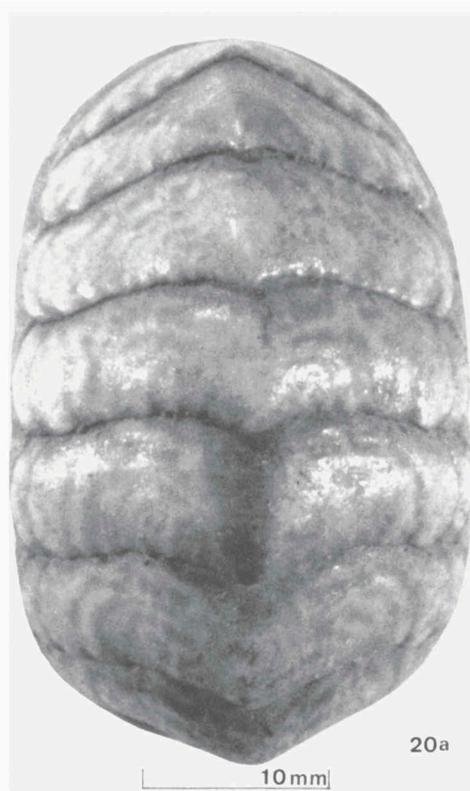


Fig. 20a. *Chiton ruber* Linnaeus, 1767, var. *a* Spengler, 1797. One out of five specimens from Iceland; = *Tonicella rubra* (Linnaeus, 1767).

the pyramidal triangular figures are only slightly elevated, and, like the remaining part of the shell, with curved stripes across. Anteriorly, on both sides of the sharp edge, they are hollowed so that a [93] point is formed in the middle of the back. By means of a good magnifying glass it is clearly seen that the whole *Chiton* is covered with fine grains; likewise, the chagreened girdle is provided with very small, flat and shining scales. The prevailing colour is red with yellow transparent irregular spots mixed with red stripes and dots. It differs considerably in size. Previously only small specimens were known, now they arrive from Greenland, as large as a grain of barley, up to a length of 51 mm and a breadth of 26 mm.

There are two rather large, curled specimens, which may have attained a length of more than 3 cm when alive; a third specimen is stretched but much smaller, measuring 16 mm in length. All three are *Tonicella marmorea* (Fabricius, 1780). The locality is uncertain. The oldest label, written by Spengler himself, reads: "*Chiton ruber*, No. 20. Aus der Nordsee." A more recent, calligraphical label says: "Orig. Sp. N.S.S. 4, 1. p.92 no 20. *Chiton ruber* L. Sp. Grönland. Island." The same data are found on the museum label.

the middle, and white on the sides. It is 38 mm long and 26 mm broad. It is found off Cap de bonne Espérance.

The holotype is a specimen deprived of its soft parts and girdle, rather flat, but in no other way differing from no. 16, *C. dentatus*, or from no. 18, *C. bicolor*. As *C. dentatus* has been elected as the valid name for the species (Kaas & Van Belle, 1985: 17) *C. planatus* becomes another synonym of the latter.

No. 20. *Chiton ruber*

Linné, Syst. Nat. No. 7. Testa octovalvi arcuata substriata, corpore rubro.
Chemnitz, Tom. 8. Fig. 813.

The differences within this species are so great that not all specimens can be identified by the characteristics of the species, since distinct varieties occur among them, which, however, cannot be considered separate species. I shall try and take a middle course and list some varieties.

Linné *Chiton ruber* which occurs off Iceland and Greenland has an elongate oval circumference and a highly vaulted back. On the six intermediate valves the

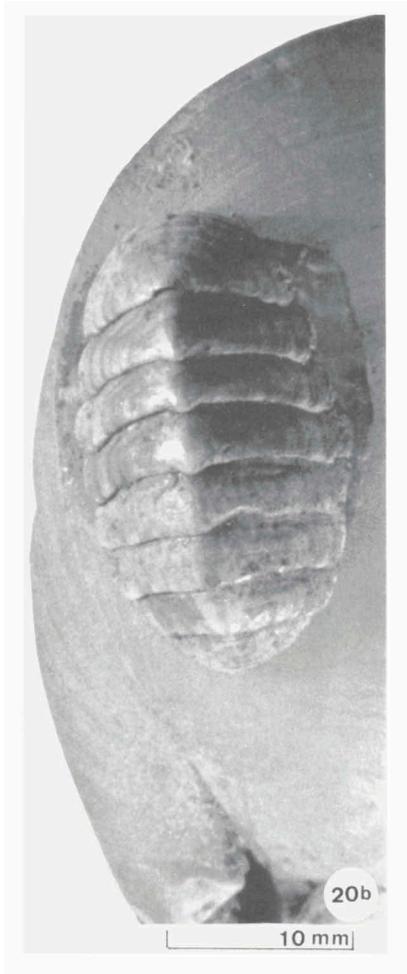


Fig. 20b. *Chiton ruber* (non Linnaeus, 1767), var. *b* Spengler, 1797. One out of two specimens from unknown habitat; = *Tonicella marmorea* (Fabricius, 1780).

Fig. 20c. *Chiton ruber* (non Linnaeus, 1767), var. *c* Spengler, 1797. One out of two specimens from the "Norwegian Sea."; = *Ischnochiton (Stenosemus) albus* (Linnaeus, 1767).

Chiton ruber, Varietas a

This little *Chiton* is completely egg-shaped, otherwise it is identical with the preceding one. It is found off Iceland.

There are five complete, slightly rolled-up specimens and a partly disarticulated one, all of them correctly identified as *C. ruber*, now *Tonicella rubra* (Linnaeus, 1767).

Varietas b

The difference of this *Chiton* mainly consists in the very flat back, on which both sides meet in a sharp edge in a straight line. The girdle is broad, brown and transparent. Furthermore it is remarkable by the beautiful alternation of the red and yellow

colours. It is 19 mm long and 13 mm broad.

The locality of the two specimens present is not stated. The larger one is stretched, 17 mm long; the second one is only 9 mm long and attached to the dorsal valve of a brachiopod shell. Both are *Tonicella marmorea* (Fabricius, 1780).

[94]

Varietas c

Still another variety of this little *Chiton* from the Norwegian Sea should be noted, which Linné called *ruber*. It is long and narrow, highly vaulted with a sharp back. This small *Chiton* looks like a cylinder cut through and rounded on both sides. The girdle is broad and nicely set with very small white transparent scales. The colour is uniform, pink on all eight valves. It is 13 mm long and 4 mm broad.

The difference in colour and shape of this species of *Chiton* is so great that it would take too long to describe all the varieties.

The two specimens in the collection are stuck to small pieces of cardboard. Both are *Ischnochiton (Stenosemus) albus* (Linnaeus, 1767), coloured like the inconsiderable var. *infus-catus* Sparre Schneider, 1881, described from Troms in Norway.

No. 21. *Chiton oryza*

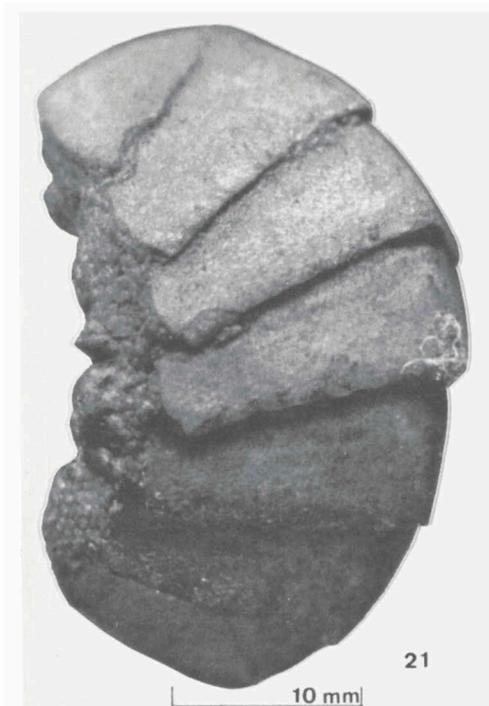


Fig. 21. *Chiton oryza* Spengler, 1797. Holotype; = *Ischnochiton (Stenosemus) albus* (Linnaeus, 1767).

Testa octovalvi oblonga carinata, valvulis granulatis.

This small *Chiton* is oval with a very elevated, sharp back. The pyramidal triangular figures are only slightly elevated and rounded below. All the valves are covered with tubercles. The girdle is moderately broad and densely set with scales. The colour is milky white. It is 4.8 mm long and 3.2 mm broad. It is found off Norway.

The holotype of this species is a very small, completely rolled-up specimen, stuck to a small piece of cardboard. Obviously it is a young *Ischnochiton (Stenosemus) albus* (Linnaeus, 1767).

[95]

No. 22. *Chiton minimus*

Testa octovalvi ovata, dorsata, glabra, valvuli dorso elevato rotundato.



Fig. 22. *Chiton minimus* Spengler, 1797. Holotype; = *Tonicella rubra* (Linnaeus, 1767).

This *Chiton*, which is the smallest of them all, is egg-shaped and very elevated, but with a rounded back. The six intermediate valves have the pyramidal triangular figures distinctly separated. They are slightly rounded at the lower margin. All eight valves are smooth and have a uniform beautiful rosy colour. It is 2.4 mm long and 1.6 mm broad. It occurs off Norway.

The single specimen (holotype) is very small indeed. Nevertheless it could be identified as a very young *Tonicella rubra* (Linnaeus, 1767). It is not identical with *Chiton minimus* Gmelin, 1791, based on Chemnitz (VIII: 298, pl 96 fig. 814), a nomen dubium, which might be *Chiton albus* Linnaeus.

No. 23. *Chiton onyx*

Testa octovalvi oblonga complanata, carinata, valvulis granularis pellucidis postice emarginatis, apice in medio producto.

This very rare little *Chiton* is elongate oval. It is not very elevated, but has a sharp back. In contrast to the other *Chitons*, which are vaulted or have a straight-lined back, the back of this *Chiton* is hollowed above from the middle on both sides. The valves are not placed close to each other, but are separated on the anterior side, where the sharp edge is roundly incised with a projecting point in the middle. Regarding the pyramidal triangular figures, there are no special comments. The lower margin of the [96] whole shell is provided with a broad girdle with scales. The whole *Chiton* is set with elevated tubercles. It is white and transparent. Its length is 4.8 mm, its breadth 3.2 mm. It is found off Norway.

There is only one specimen, the holotype, in the collection, which is in a rather bad shape; valves I and II are missing and the girdle is deprived of its armature. Nevertheless, from the shape of the valves, the pustulose tegmentum, which is still to be recognized in places, and especially from the deep pores in the girdle, at the sutures of the valves, it is quite clear that it is a young *Acanthochitona crinita* (Pennant, 1777). This species is not rare on the Norwegian coast as far north as the Lofoten Islands.

No. 24. *Chiton albus*

Linné, Syst. Nat. No. 8. Testa octovalvi laevis alba, vix dorsata, minus carinata, valvula prima postice emarginata.

Chemnitz, Tom. 8 fig. 817.

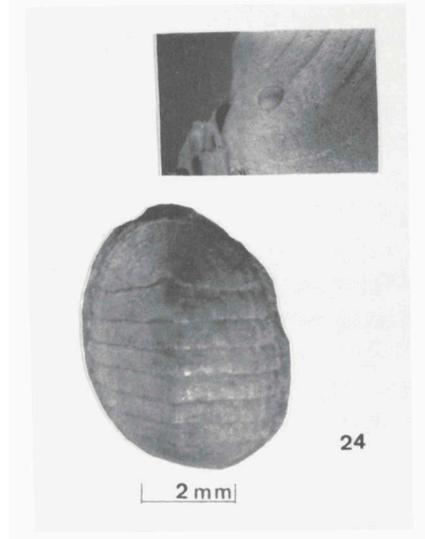
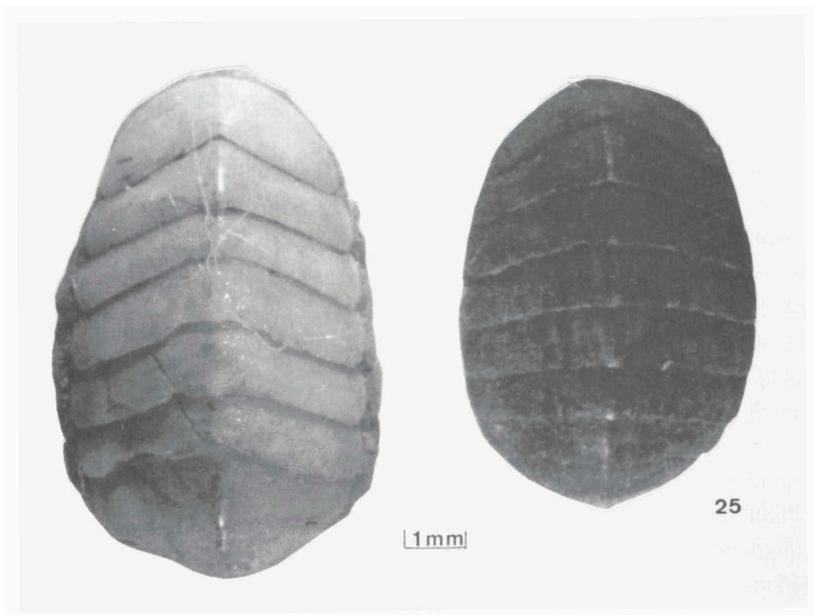


Fig. 23. *Chiton onyx* Spengler, 1797. Holotype; = *Acanthochitona crinita* (Pennant, 1777), juv.

Fig. 24. *Chiton albus*; Spengler, 1797 (non Linnaeus, 1767); = *Leptochiton asellus* (Gmelin, 1791).

Fig. 25. *Chiton cinereus*; Spengler, 1797 (non Linnaeus, 1767). Two out of three specimens. On right = *Leptochiton asellus* (Gmelin, 1791), on left = *Ischnochiton* (*Stenosemus*) *albus* (Linnaeus, 1767).



This *Chiton* is a regular oval. Its back is roundly vaulted with a rather sharp edge. Since the eight valves are placed very close to each other, one of the terminal valves had to be incised at the sharp edge when it should be placed close to the following valve. The pyramidal triangular figures on the six intermediate valves are almost imperceptibly elevated. Transversely, towards the girdle, they have many circular incised stripes, and, like the whole *Chiton*, they are completely covered with fine granular lines running downwards following the breadth, but they are so delicate that they cannot be seen with the naked eye.

The same holds good of the girdle, which is set with scales. This *Chiton* is white and has attached itself to a big shell of *Venus islandica*, which, moreover, is provided, interiorly and exteriorly, with a great number of [97] *Serpula triquetra*. Its length is 4.0 mm, its breadth 3.2 mm. It is found near Trondheim in Norway.

From the Barbary I have received numerous specimens of this *Chiton* which otherwise is found only in the Northern Sea. These are much bigger, and consequently the fine markings which ornament the covering are much better recognizable. Here the pyramidal triangular figures are distinct, although they are only slightly elevated. Like the northern specimens they have circular incisions transversally, which at the lower margin above the girdle are very deeply incised. The same is the case at both the round terminal valves. Besides these circles, which on the pyramidal triangular figures are placed at a great distance from each other, are delicate lines intersected by points running downwards throughout the length of the specimen. The remaining part of the six intermediate valves is provided, in the most beautiful way, with regular fine granular lines longitudinally on the whole shell. In the same way, the two rounded terminal valves are furnished with these lines longitudinally, so that the whole covering of this *Chiton* looks like woven cloth. The girdle is covered with shining, almost invisible, scales. The colour is dirty white. The biggest specimen is 13 mm long and 8 mm broad. Table 6, fig. 24.

There is a very small specimen, attached to the dorsal side of an old valve of *Arctica islandica* (L.), which, however, is not *Ischnochiton (Stenosemus) albus* (L.), but a young *Leptochiton asellus* (Gmelin, 1791). As to the specimens from the Barbary (=Algeria) to which Spengler refers, they are in all probability the later described *Leptochiton algesirensis* (Capellini, 1859) of which one (undescribed) specimen from unknown habitat [98] has been added to the collection before 1807.

No. 25. *Chiton cinereus*

Linné, Syst. Nat. No. 9, testa octovalvi ovata.

Born, Mus. Caes. Tab. I, fig. 3.

Chemnitz, Tom. 8, fig. 818.

The egg-shape and the more or less dark-grey colour are sufficient characteristics to separate this *Chiton* from the preceding species. It is rather strongly vaulted, with a sharp back in the middle. The six intermediate valves have elevated pyramidal triangular figures, which are rounded below as in most Chitons. The covering is all over provided with fine grains as if it was strewn with fine sand, but this cannot be seen without a good magnifying glass. This explains why most authors have regar-

ded this *Chiton* as quite smooth and devoid of pyramidal triangular figures, or, their specimens may not have been intact, since the coverings of most Chitons are, as a rule, damaged. The specimens may also have been varieties. Thus I possess a quite white specimen like *Chiton albus*, which -unless it has faded- is most probably a variety. Could not one ask whether Adanson's Kalison in his *Histoire naturelle du Sénégal* should be *Chiton cinereus*? One need only read Adanson's description of it, in which he describes in detail Linné *Chiton fasciculatus* (sic!) with its 18 stellate [99] bundles. The ground colour of this *Chiton* is ash-grey, but in fresh specimens all eight valves are ornamented with beautiful yellow and dark-brown spots and bands. It is seldom more than 6.4 mm long and 4.8 mm broad. It is found off Norway.

Neither of the three specimens of "*Chiton cinereus*" present in the collection has been correctly identified. The largest as well as the smallest are *Ischnochiton* (*Stenosemus*) *albus* (Linnaeus, 1767), the third is a specimen of *Leptochiton asellus* (Gmelin, 1791).

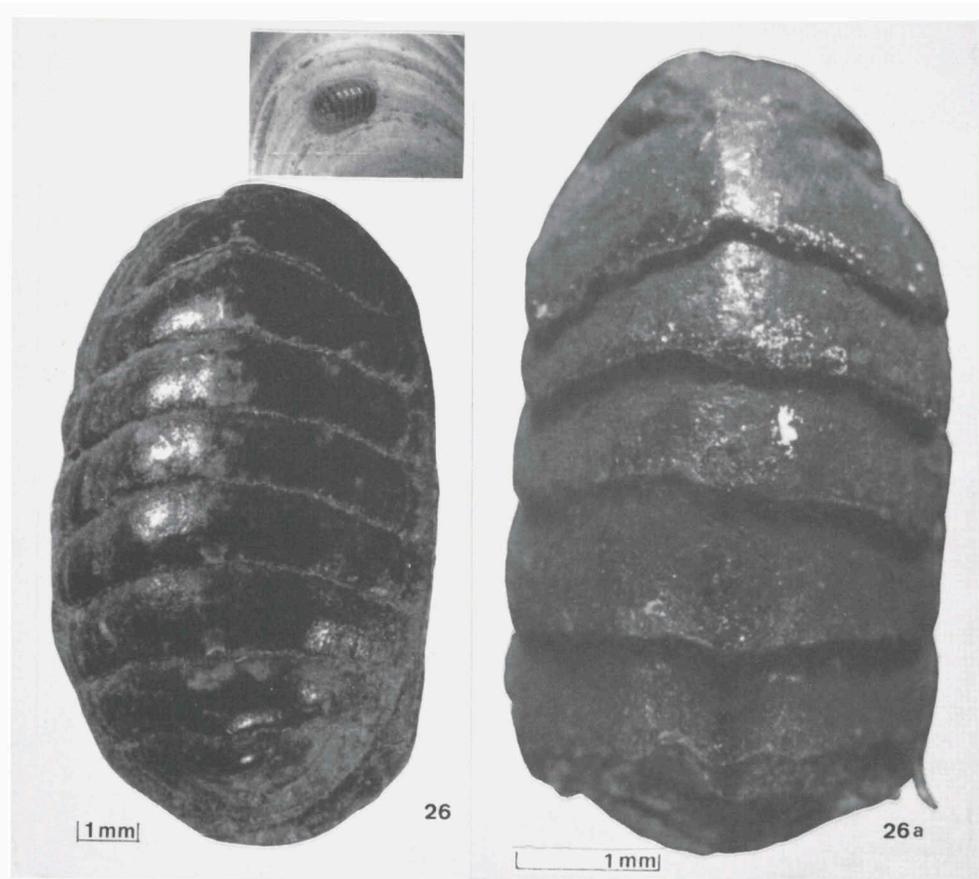


Fig. 26-26a. Fig. 26. *Chiton asellus* Gmelin, 1791, holotype; = *Leptochiton asellus* (Gmelin, 1791). Fig. 26a. *Chiton asellus* (non Gmelin, 1791) var. *a* Spengler, 1797; = *Leptochiton sarsi* Kaas, 1981.



Fig. 26b. *Chiton asellus* (non Gmelin, 1791) var. *b* Spengler, 1797. One out of five specimens; = *Ischnochiton (Stenosemus) albus* (Linnaeus, 1767).

attached to a shell of *Modiolus*, "ex Museo Spengleriano". Gmelin, who validated the name (1791: 3206, no. 21), added nothing new to the description. At the time Kaas studied the Spengler material of *C. asellus*, working on his paper on Scandinavian species of *Leptochiton* Gray, 1847 (Kaas 1981: 217-229) he only saw the two specimens collected by O. Fabricius at "M. og Kragerö", which he erroneously took for syntypes. So he selected the larger one as the lectotype. Some time after his paper had been printed he received from Dr J. Knudsen a box containing the *C. asellus* specimen on a large *Modiolus*, constituting Chemnitz's and consequently also Gmelin's holotype. As neither Chemnitz, nor Gmelin, mentioned other specimens, the two specimens from "M. og Kragerö", Spengler received from O. Fabricius, cannot have type status. Consequently the designation of a lectotype (Kaas, 1981: 219) is to be rejected.

Chiton Asellus Varietas a

There are several varieties of this small northern *Chiton*. One of these is long and

No. 26. *Chiton Asellus*

Testa octovalvi oblonga, laevissima, dorso rotundato, valvulis ad marginem interioriem striis transverse rotundatis.

Chemnitz, Tom. 8, fig. 816.

This *Chiton* has an elongate oval shape. The valves are almost vaulted in a semi-circle. Although no sharp edges are noticeable, by which the pyramidal triangular figures are generally separated from the remaining part of the valves, dark traces of their usual attachment are, however, seen. Below, towards the girdle, all eight valves are transversally striped with circular lines. To the naked eye they appear quite smooth, but by means of a magnifying glass it is discovered that they are set with small grains like shagreen skin. The colour of this *Chiton* is black, and its girdle, which is set with scales, has the same colour. As a rule it attaches itself [100] to other shells. It is 9.6 mm long, and 4.8 mm broad. It is found off Norway.

The species was inadequately described and irretrievably illustrated by Chemnitz from a specimen



Fig. 26c. *Chiton asellus* Gmelin, 1791, var. *c* Spengler, 1797. One out of five specimens from Kullen (Sweden); = *Leptochiton asellus* (Gmelin, 1791).

the valves which had not been coated black by foreign deposits. All specimens were identified as *Ischnochiton (Stenosemus) albus* (Linnaeus, 1767) (Kaas, 1981: 219, fig. 5).

Varietas c

A third remarkable variety has a short, oval circumference. It is very slightly vaulted, but has a sharp back. It is densely set with tubercles, and it is coal-black. The girdle is narrow and covered with small black [101] scales. This *Chiton* is distributed from the North Sea to Kullen, whence the fishermen bring them to the market together with other products of the sea.

narrow with a high and sharp back; it resembles a cylinder cut longitudinally. The pyramidal triangular figures are here distinctly separated, below very rounded, and in their total length provided with circular lines, transversally incised.

This small specimen from Norway is totally covered with a thick black crust of foreign deposit, which almost completely hides the pustulose sculpture of the tegmentum. Nevertheless it could be identified as a specimen of *Leptochiton sarsi* Kaas (Kaas, 1981: 219, fig. 4).

Varietas b

This variety is remarkable by the fact that on the black coat, which covers the six intermediate valves, six white, straight bands run across the back down to the girdle. Close above the girdle a similar white band runs round all eight valves.

There are five specimens of this "variety" present. The 6 white bands running across the back of the intermediate valves are only the anterior margins of

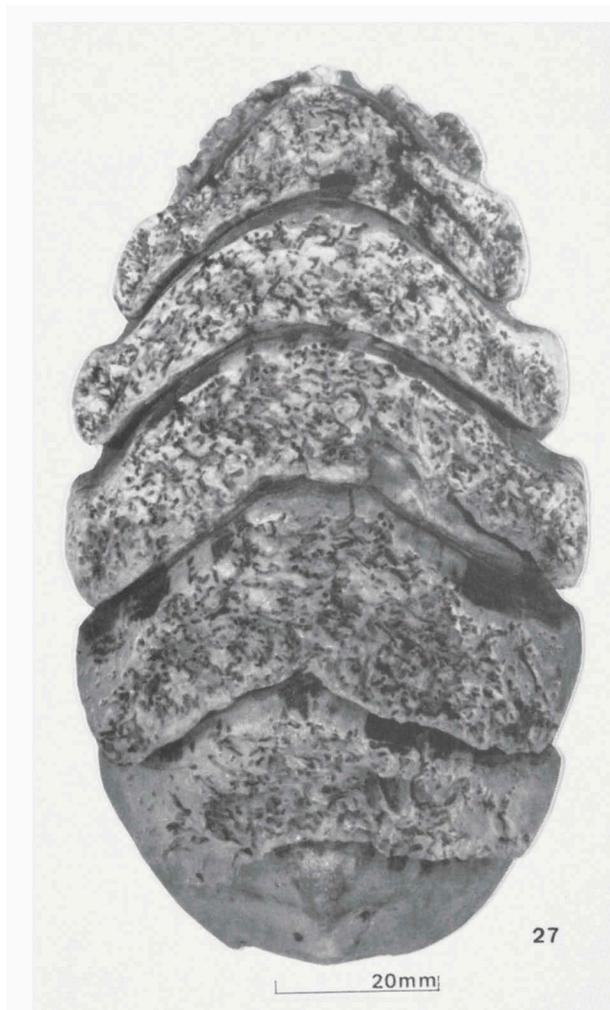


Fig. 27. *Chiton gigas* (Spengler, 1775, description of an unnamed specimen) Gmelin, 1791. Specimen from "Cap de bonne Espérance"; = *Dinoplax gigas* (Gmelin, 1791).

Chiton are extremely thick. At the place where the seven anterior valves overlap, they are roundly hollowed in the middle and have a projecting edge, which is as broad as the valve is thick. Below, just above the girdle, the six intermediate valves are very rounded anteriorly and here form the pyramidal triangular figures, which in this *Chiton* are short and narrow and curved backward in a circle posteriorly. [102] The thick, fleshy girdle is smooth, transparent and yellow. There is no indication that it was set with scales or spicules. The projecting edge, over which the girdle is stretched, is broad and deep in order to connect the valves. At the broad terminal valve 12 strongly incised teeth can be counted due to the transparency of the girdle. On the inside all the valves are shiny white. Nothing can be said about the exterior colour, as the surface, with age, becomes damaged by worms. Its length is 114 mm, its breadth 63 mm. Judging from the size and thickness of the shell it weighs 6 1/2 lod [old Danish

Four out of the five specimens of this "variety" present in the Spengler collection, are glued to a piece of cardboard; a fifth one is attached to the inside of a specimen of *Gari depressa* (Pennant, 1777). All of them are *Leptochiton asellus* (Kaas, 1981: 219, Fig. 3). Kullen is a rocky headland sticking out from the Swedish coast at the entrance to the Sound (Öresund).

No. 27. *Chiton gigas*

Testa octovalvi antice attenuata, dorsate, valvulis crassis emarginatis, ad marginem inferiorem rotundatis, triangulo notatis, valvula anterior minima, quinta maxima.

This *Chiton* rightly deserves to be called giant, since in size it greatly exceeds all other known Chitons. It is pear-shaped rather than egg-shaped, since it is so narrow at the anterior end that the comparison to an egg does not apply. The posterior valve is very narrow and small. The following four valves increase in breadth, and the three last ones at the opposite end decrease in breadth. The back is only slightly vaulted, and does not rise steeply. The valves of this *Chi-*

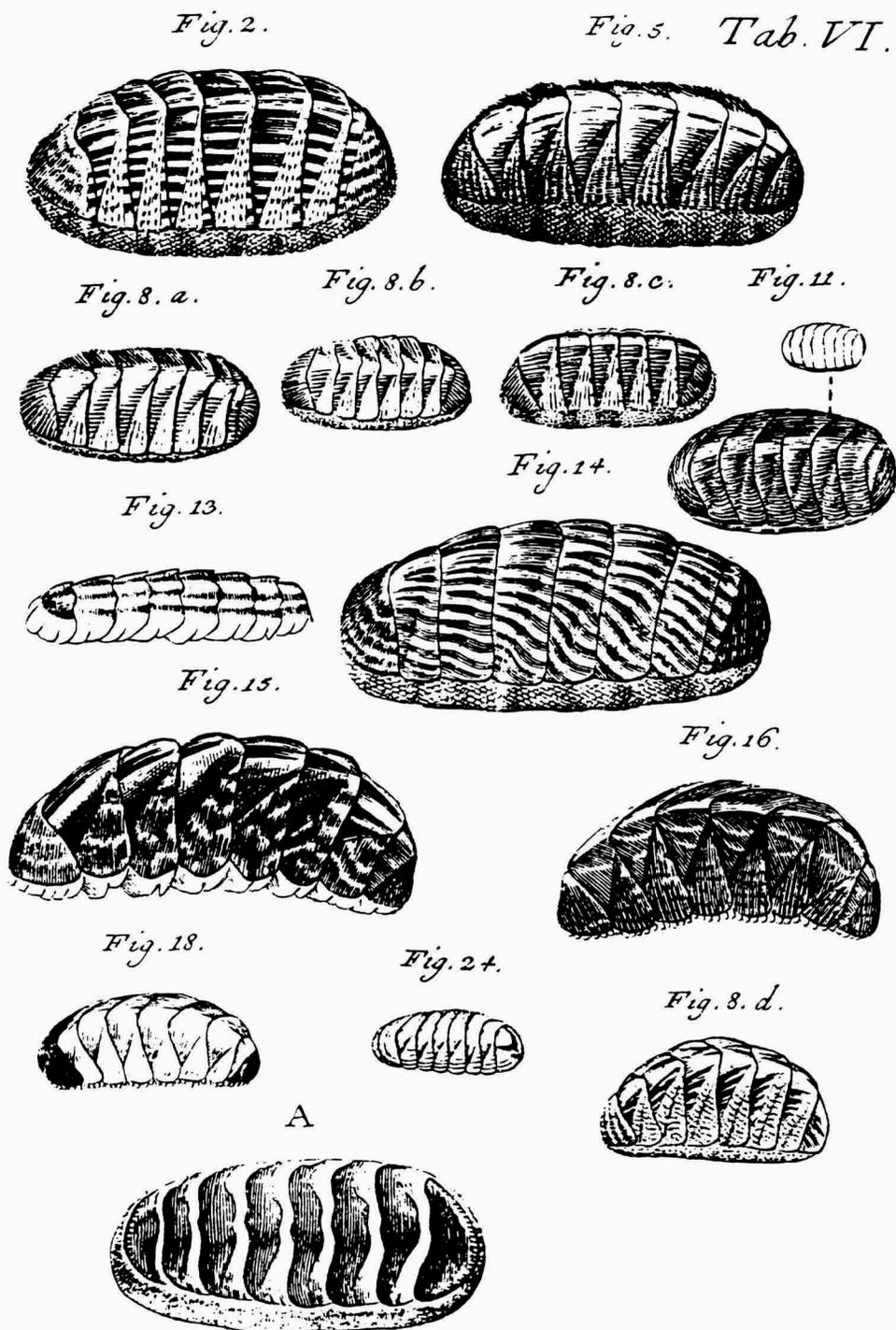
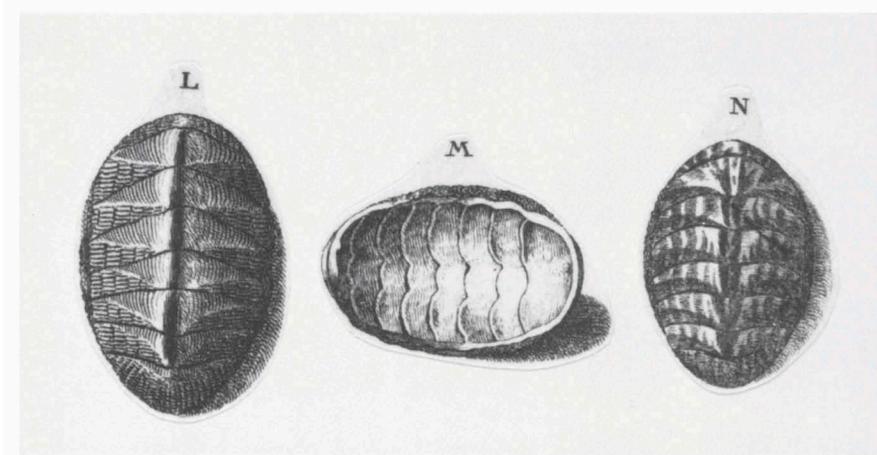


Plate 6 of Spengler: Fig. 2. *Chiton squamosus*. Fig. 5. *Chiton viridis*. Fig. 8a. *Chiton olivaceus*, b.c.d. Fig. 8. Fig. 11. *Chiton cimicianus* (sic!), enlarged. Fig. 13. *Chiton fascicularis*. Shows the unusual formation of the eight valves, when the animal with the girdle is removed. [103] Fig. 14. Variety of *Chiton marmoreatus* (sic!). Fig. 15. *Chiton papilio*. Fig. 16. *Chiton dentatus*. Fig. 18. *Chiton bicolor*. Fig. 24. *Chiton albus*. Fig. A. The fleshy part of *punctatus* (cf. p. 63, fig. 9). Its girdle and seven partitions which are connected with the animal and which surround the calcified valves.



Figs. L, M, N of Spengler's Tab. VII in "Beschäftigungen der Berlinischen Gesellschaft Naturforschender Freunde" (vol. 1, 1775). L, M = *Chiton tuberculatus* Linnaeus, 1758, dorsal and ventral view, N = *Chiton marmoratus* Gmelin, 1791, dorsal view.

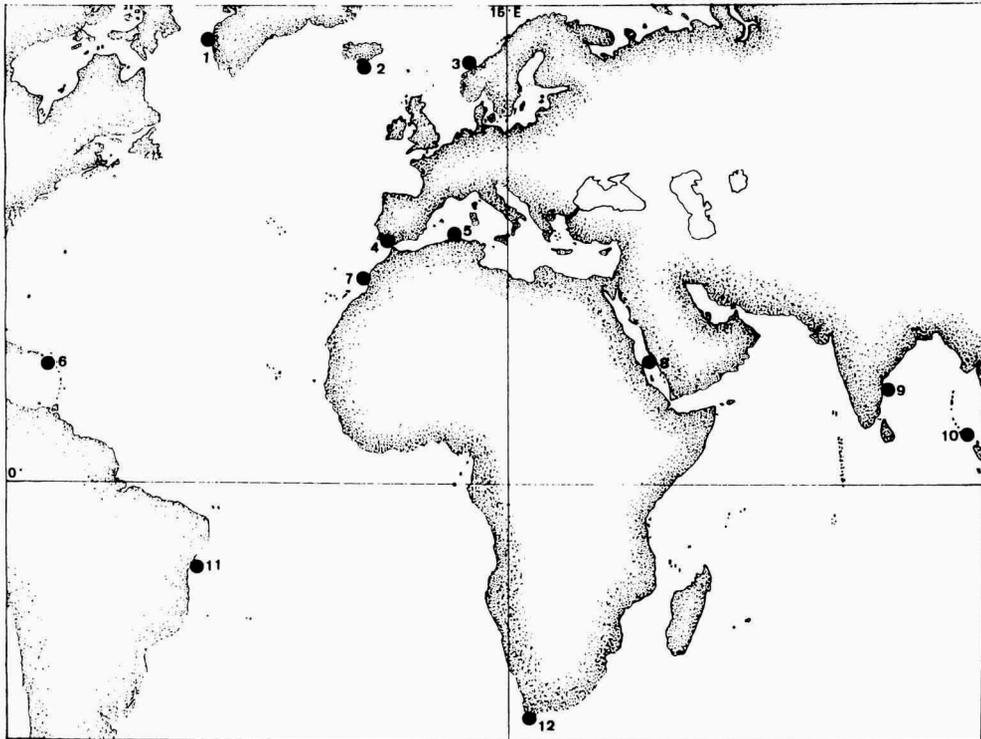
weight unit, 1 lod = approximately 15.5 gram] after removal of the animal. It occurs off Cap de bonne Espérance.

The only specimen in the collection is 11 cm long, its valves I-VI seriously eroded and infested by boring animals. The species is now known as *Dinoplax gigas* (Gmelin, 1791).

Evaluation

Honour is due to Lorenz Spengler for having been the first to describe the *Chiton* shells in detail (1775: 315-331) and to have given excellent copper plates of two species, now recognized as *Chiton tuberculatus* Linnaeus, 1758 (pl. 7 figs. L, M, dorsal and ventral view) the type of the genus, and as *Chiton marmoratus* Gmelin, 1791 (fig. N, dorsal view). A third species, *Dinoplax gigas* (Gmelin, 1791) was described, but not depicted. It is a pity that Spengler attached no names to the species. He did so only in his 1797 monograph of the chitons, of which a translation is herewith presented. By then, however, several of his new species had been published by his friend Johann Hieronymus Chemnitz in Martini's "Neues systematisches Conchylien-cabinet", vols VIII (1784) and X (1788). This work has been placed on the list of rejected works by the International Commission on Zoological Nomenclature, as not being strictly binominal. Some of these names, however, were validated by Gmelin in the 13th edition of Linnaeus' "Systema Naturae" (1791), resulting in three names now credited to Gmelin, but originally created by Spengler. The types of these species are still present in the Spengler collection, viz. *Chiton marmoratus* Gmelin, 1791, *Chiton asellus*, now *Leptochiton asellus* (Gmelin, 1791) and *Chiton gigas*, now *Dinoplax gigas* (Gmelin, 1791), all based on the same specimens as described in Spengler's 1775 paper.

That after the publication of Pilsbry's Monograph of the Polyplacophora in Tryon's "Manual of Conchology", vols 14 and 15 (1892-1894) only three Spenglerian



The small world of eighteenth century naturalists. (Animals from the Indo-Pacific and Pacific coasts had not yet been collected and sent to European investigators). Black dots on the map indicate the locations from which Spengler obtained his chiton specimens.

1 Grönland, 2 Iceland, 3 Off Norway (mostly Bergen, but also Trondheim and Kragerö in the Oslo Fiord), 4 Mediterranean (probably near Gibraltar), 5 "Barbariet" (Barbaria is the old name of the North African coast, mostly Algeria), 6 West Indies (principally the Danish Virgin Islands of St. Croix and St. Thomas), 7 Mogador (now Essaouira, on the W coast of Morocco), 8 Red Sea (ex Forsskål Arabian Expedition, 1761-63), 9 Tranquebar (on the Coromandel coast of India), 10 Nicobar Islands, 11 "America" (here restricted to the coast of Brazil), 12 Cape of Good Hope (Cap de bonne Espérance).

names were recognized as valid, viz. *C. viridis*, *C. olivaceus* and *C. papilio* (now *Chaetopleura papilio*) is probably due to the inaccessibility of Spengler's paper on account of language difficulties. In this connection a phrase of Hanley's "Ipsa Linnaei Conchyliæ" (1855: 15, under *Chiton squamosus*) is worth quoting: "Spengler (whose opinion is adopted by Schumacher), in his valuable yet neglected Monograph of the genus *Chiton*), remarks on the incorrectness of the ordinary appropriation of this name and proposes *undatus* for the Bornian *squamosus*".

In the meantime two other Spenglerian names, viz. *Chiton angulatus*, now *Chaetopleura angulata* (Spengler, 1797) (syn.: *C. ferrugineus* Spengler, 1797) and *Chiton dentatus*, now *Callochiton dentatus* (Spengler, 1797) (syn.: *Chiton bicolor* Spengler, 1797 and *Chiton planatus* Spengler, 1797), have been recognized as valid names for respectively *Chaetopleura fulva* (Wood, 1815) and *Callochiton castaneus* (Wood, 1815) by Kaas & Van Belle (in Catalogue of living Chitons, 1980:8, *C. angulata* and in Monograph of living Chitons, vol. 2: 15, 1985, *C. dentatus*). In the present paper we recognize *Chiton poli-*

tus Spengler, 1797, as the valid name for the species up till now called *Chiton* (*Rhyssoplax*) *tulipa* Quoy & Gaimard, 1845. This brings the number of valid Spenglerian species names up to 6 out of 27.

Acknowledgements

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