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## ON A SMALL QUANTITY OF SIPHONARIA MATERIAL FROM QUEENSLAND

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PLATE 1, FIGS. 1-8

Since the publishing of my "Systematic Monograph of the Patelliformia" many malacologists have sent material of this group to me for identification. In addition, I have studied the rich material of Patelliformia in the museum of natural history in Brussels, most of which originating from the Dautzenberg collection. And always I have been met with the same impression, namely that there is a wide intra-specific variation and that, often, it is very difficult to delimit related species from one another. The main purpose of this paper and particularly its part dealing with *Siphonaria virgulata* is to stimulate the Australian malacologists to a close study of variation, possible geographical races, and species delimitation from a modern systematic point of view, of the Australian forms of *Siphonaria*.

SIPHONARIA (PACHYSIPHONARIA) VIRGULATA  
HEDLEY from Currumbin, Queensland (six specimens,  
National Museum of Victoria, F. 13952).

A description of *S. virgulata* is given by me (1946 p. 23). The specimens from Currumbin, however, differ in many details from that description. The number of radial ridges is still higher, and the ridges are still finer and situated still more densely together. The edge is hardly scalloped at all. The outline is somewhat darker than in all specimens from other localities I have seen. The inside is considerably darker, only a central spot being bluish or brownish white. In a narrow zone on the inside and along the edge there are short and slender white radii corresponding to the radial ridges on the outside. Inside this zone there are concentric dark-brown or black zones reaching the pale apical spot. Even the muscle impression is dark. The ventral side of the foot is uncoloured, its sides being pale-gray with white dots, the latter probably corresponding to glands. The pallial border has faint pale-gray spots.

The morphology of the distal genitalia (figs. 1-2) confirms that the population represents a form of *S. virgulata* or a very closely related species. In two dissected specimens there was a spermatophore in the accessory organ. The spermatophore has a rather clumpy form and consists of a comparatively thick, chitinous wall. One half of the structure is regularly cylindrical with a bluntly pointed end. The other end is somewhat irregularly shaped with at least one blunt process. One end of the spermatophore is in close contact with the wall of the

accessory organ. The epithelium of this very small portion of the wall consists of extremely long and slender cells with invisible nuclei. It seems possible that this epithelium contributes to the formation of the chitinous spermatophore.

The radula of the Currumbin form differs in some details from those of previously studied specimens. According to my experience of intra-specific variability of the radula in Basommatophora in general the present differences cannot be motive enough to separate the Currumbin population as a distinct species.

All previously known findings of *S. virgulata* are from New South Wales. In the natural history museum of Brussels there are also two lots from Tasmania. The population from Currumbin, Queensland, dealt with here, seems to represent an isolated occurrence to the north of the main distribution area of the species. If that is true the aberrant characteristics of the Currumbin specimens may be due to geographical isolation and the population may represent a geographical race of *S. virgulata*. I do not find it appropriate, however, to name this possible race until its relation to the main form of *S. virgulata* is known. It would be appreciated if an Australian malacologist tried to obtain a series of populations of *S. virgulata* from the Sydney area to Currumbin or even still further northward. A critical examination of the material obtained may show whether the various characteristics of the species have irregular or spotted distributions along the coast or they form gradually changing clines. The method of procedure to be used in working out the material is shown in a previous paper (Hubendick 1950).

SIPHONARIA (SIPHONARIA) SAVIGNYI PHILIPPI  
from Woody Point, Moreton Bay, Queensland (one  
specimen, National Museum of Victoria, F. 13951).

The specimen is comparatively big, 31 mm. in length. With the exception of the size and the inside coloration the shell fits well to the description in Hubendick 1946. Inside, along the margin, there are short brown radii corresponding to the interspaces between the ridges on the outside. Further inside, but peripheral to the muscle impression, many of the brown radii join each other, forming a brown zone. From the muscle impression and inwards the colour is bluish and centrally it is pale-brown. The dorsal side of the body of the animal is grayish, the rest of the animal is somewhat dirty-yellow.

In my monograph *S. savignyi* is given only from the Red Sea and the Gulf of Suez. In the Dautzenberg collection in Brussels, however, there is one specimen from New Caledonia. The last mentioned occurrence makes the finding from Queensland less astonishing.

SIPHONARIA (SIPHONARIA) ATRA PILSBRY from Woody Point, Queensland (three specimens from National Museum of Victoria, F. 13951; Cairns Reef, North Queensland, one specimen from same collection, F. 820).

This form, which agrees with Iredale's *cumelas*, is without doubt included in the range of variation of *S. atra*. The species is previously known from Queensland. It is common in the East Indies and known from Madagascar to Fiji.

The specimen from lot No. 820 which has to be classified as *S. atra* differs completely from the remaining specimens from the same lot. Previously they have all been classified as *S. bifurcata* Reeve by Sowerby (see below) but the lot is undoubtedly heterogenous.

#### FURTHER FORMS OF THE INDIAN-WESTPACIFIC FORM-GROUP.

In the "Monograph of the Patelliformia" (1946, § 72) I defined the Indian-Westpacific form-group. This comprises a number of forms, some of them may be species, which are highly variable and connected with one another through series of transitional forms. Since then I have examined several museum collections of *Siphonaria* and also living populations in the Philippines. It becomes more and more evident that the taxonomical conditions in the Indian-Westpacific form-group (as well as in some other form groups of *Siphonaria*) are extremely obscure. Studies of the background of variation and speciation within the group and examination of big numbers of population samples are necessary to unravel the tangle in a proper way.

Among the Queensland species involved in the Indian-Westpacific form-group are Iredale's species *marza*, *zanda*, and *oppositus*. The form from New Caledonia named *commixtus* by Iredale but never described belongs to the same form-group. Another member is *luzonica* Reeve. The distal genitalia of this species from Rottnest Island, West Australia (National Museum of Victoria F. 13940) are figured in fig. 3. Even *S. atra* Pilsbry (see above) and related forms may belong to the same group.

The following lots from National Museum of Victoria are Queensland representatives of some of the above-mentioned forms or close relatives to them: Yorkey's Knob, Cairns (F. 15030, 5 spms.); Heron Island (F. 15035, 3 spms.); Shoal Point, Mackay (F. 15036, 2 spms.); Airlie's Landing, Cannonvale (F. 15037, 3 spms.); Yorkey's Knob, Cairns (F. 15039, 2 spms.); Cape Edgecumbe, Bowen (F. 15042, 3 spms.). I find it most appropriate not to attach any names to these specimens at present.



SIPHONARIA (SIPHONARIA) BIFURCATA REEVE from Cairns Reef, North Queensland (three specimens from National Museum of Victoria, F. 820).

These specimens look like a transitional form between *S. zanda* and *S. savignyi*. The specimens have, however, been identified previously by Sowerby as *S. bifurcata* Reeve. As Sowerby with all probability compared the specimens with the type in the British Museum this identification has to be accepted, though it does not fit at all to the description of *S. bifurcata* by Reeve 1856. On my request Dr. Rees at British Museum kindly compared the specimens with the holotype. He confirmed Sowerby's determination as far as the two last mentioned specimens are concerned. This means that *S. bifurcata* in my previous papers on *Siphonaria* (1945, 1946) actually corresponds to another species. Further, the identity of *S. bifurcata* seems to have been misunderstood in many European collections.

*S. bifurcata* Reeve is identical with the species *S. kurracheensis* Reeve in my previous papers. This species belongs to *Siphonaria s. str.*

As "*S. bifurcata*" was selected as type species of *Ductosiphonaria* this group name becomes a synonym of *Siphonaria s. str.*

Basing on the anatomically verified belonging of my "*S. bifurcata*" to "*Ductosiphonaria*" and the close relationship between this species and *S. baconi* Reeve I concluded that also the latter species must belong to "*Ductosiphonaria*." An examination of the type of *S. baconi* in British Museum verifies the close relationship between this species and the form dealt with as *S. bifurcata* in my monograph (1946 p. 37). The two forms may possibly be even specifically identical.

SIPHONARIA (PLANESIPHON) ZEALANDICA QUOY AND GAIMARD from Caloundra, Queensland (two dry and three alcohol specimens from National Museum of Victoria, F. 13873).

Syn.: *S. zebra* Reeve 1856.

*Planesiphon elegans* Iredale 1940.

*S. (Ductosiphonaria) bifurcata* Reeve 1856 in Hubendick 1945 and 1946 p. 37.

After having seen the type of *S. zealandica* Q. and G. in Paris (the locality "New Zealand" of the type is probably erroneous), *S. zebra* Reeve in London and a borrowed paratype of *S. elegans* Iredale it appears obvious that these species are identical with the one dealt with under the name "*bifurcata* Reeve" in my

previous papers. As *bifurcata* Reeve has proved to be another species, belonging to *Siphonaria* s. str., Quoy and Gaimard's name has to become the valid name for "*bifurcata*" in my publications.

McAlpine (1952) pointed out that Iredale's *elegans* and the species in my papers identified as *elegans* could not be the same. They were even anatomically different. The latter belong to *Siphonaria* s. str. and is probably a new species. McAlpine found, however, that the real *elegans*, i.e. *zealandica* Q. and G. and "*bifurcata*" in my papers, does not even fit the anatomical characteristics of *Ductosiphonaria*. The species under consideration was designated as type species of that section by me. I have dissected specimens of *zealandica* from Caloundra and found that McAlpine is right. I have also dissected more specimens from Port Jackson, specimens of the same lot as I used for my previous studies. The genitalia of these agreed with McAlpine's description and with those of *zealandica* from Caloundra. The material from Port Jackson must have been heterogenous and a few animals, the shells of which were not included in the sample, belonged to *Ductosiphonaria diemenensis* Quoy and Gaimard. That is the only way of explaining the contradicting results.

The reproductive system of *S. zealandica* is figured and briefly described by McAlpine (1952) as belonging to *Ductosiphonaria bifurcata* (Reeve). His figure and description is schematic and some details of importance for the classification are not included. Some complimentary notes will be given here.

Only the distal genitalia of this species are of importance for comparative purposes. Parts of these distal genitalia differ, however, from all other anatomically known *Siphonariidae*. *S. zealandica* has something like a genital atrium (figs. 5-6) which is formed by the distal continuation of the epiphallus duct. The gonoduct and the spermathecal duct open out into a thin-walled chamber which, in its turn, is communicating with the junction between epiphallus duct and genital atrium through a fairly narrow opening. The cross-section through the epiphallus-duct (fig. 7) shows a structure similar to that, which is characteristic for all species belonging to the subgenus *Siphonaria*. It has a thin, peripheral muscle sheath, an incomplete layer of connective tissue and its lumen is covered with a partly ciliated epithelium. The central wall has one big and two smaller folds. The spermatophore, finally, consists of a simple, roughly cylindrical sac, which tapers fairly abruptly and continues with a slender, terminally pointed, appendix (fig. 8).

*Siphonaria zealandica* Q. and G., though being identical with "*bifurcata*" in my previous papers, i.e. the type species of *Ductosiphonaria*, does not belong to that group. Consequently

its systematical position and sectional name must be reconsidered. The name *Ductosiphonaria* is excluded by two reasons. As *S. bifurcata* Reeve has proved to belong to *Siphonaria* s. str. (see above) the name *Ductosiphonaria* remains only as a synonym of *Siphonaria* s. str. Further, *S. zealandica* must be separated from *S. diemenensis* Quoy and Gaimard, the second species originally included in the group *Ductosiphonaria*, and placed in a group of its own. *S. elegans*, the oldest synonyme of *S. zealandica* given a new group name, was originally described under the generic name *Planesiphon* Iredale (1940). That name, however, did not become valid as Iredale omitted to designate a genotype. But McAlpine (1952) designated *S. elegans* as the genotype of *Planesiphon* and considered the latter as a synonyme of *Ductosiphonaria*. The last name, having lost its validity, must be replaced by *Planesiphon*. It cannot, however, remain as a genus but as a section. Iredale gave a diagnosis of *Planesiphon* based on specific characteristics only.

The section *Planesiphon* is characterized by the presence of a genital atrium, a chamber in which the gonoduct and the epiphallus duct meet before entering the genital atrium, and an epiphallus duct with a histological structure of the same type as in the subgenus *Siphonaria* in general.

The genitalia of *S. zealandica* differ from those of the sections *Simplisiphonaria*, *Hubendicula* and *Heterosiphonaria* in the first place by having a well developed genital atrium. Similarly to the condition in the section *Sacculosiphonaria* the gonoduct and the spermathecal duct meet before entering the genital atrium. There is a slight possibility that the chamber in *S. zealandica*, which the gonoduct and spermathecal duct enter, is homologous with the muscular sheath in the sections *Sacculosiphonaria* and *Siphonaria* s. str. The spermatophore in *S. zealandica* differs from that in *S. japonica* of *Sacculosiphonaria* but that difference is merely of specific range as different types of spermatophore occurs for instance within the section *Siphonaria* s. str. The taxonomical position of *Planesiphon* will be in subgenus *Siphonaria* and not far from the section *Sacculosiphonaria*.

*Siphonaria* (*Hubendicula*) *diemenensis* Quoy and Gaimard. No new material.

McAlpine has found and I have confirmed that neither the nominal type species of *Ductosiphonaria*, "*S. bifurcata* Reeve", nor the species I identified as *bifurcata* Reeve, i.e. *S. zealandica* Q. and G., belong to the anatomically defined group *Ductosiphonaria*. This group name could not remain valid unless *S. diemenensis* Q. and G. was designated as type species. McAlpine prefers, however, to substitute the new name *Hubendicula* for *Ductosiphonaria* and designates *S. diemenensis* as the type species.



The taxonomic value of *Hubendicula* cannot be generic, as McAlpine has proposed. The genus *Siphonaria* is too uniform to be split up in different genera and *Hubendicula* has to be considered as a section within the subgenus *Siphonaria*. The second subgenus within the genus *Siphonaria* is *Liriola* Dall (cf. Hubendick 1946). Further, the characteristics McAlpine uses in his diagnoses of *Hubendicula* and *Ductosiphonaria* are in most items of merely specific value.

**SIPHONARIA (SIPHONARIA) LACINIOSA (LINNE)**  
from Yorkey's Knob, Cairns, Double Island near Cairns and from Cairns Reef, Northern Queensland (National Museum of Victoria, F. 15031, F. 13925, and F. 13923 respectively).

All specimens are typical but of different forms, those from Yorkey's Knob and Cairns Reef representing forma *exigua* and the one from Double Island forma *sipho*. Iredale's *Legosiphon optivus* from Magnetic Island, Queensland, is identical with *S. laciniosa*.

**SIPHONARIA (SIPHONARIA) RUCUANA PILSBRY (?)**  
from Etty Bay, Queensland and Cape Edgecumbe, Bowen, Queensland (National Museum of Victoria F. 15040 and F. 15041 respectively).

The determination is not completely certain. *S. rucuana* is originally described from Rinkin Island. In the collection of Institut Royal des Sciences Naturelles de Belgique in Brussels there are both dry and spiritus material of *S. rucuana* from the Seychelles. An examination of the genitalia shows that the species belongs to *Siphonaria* s. str.

**SIPHONARIA (SIPHONARIA) AUSTRALIS QUOY AND GAIMARD** from Masthead and Heron Islands, Capricorn Group, Queensland (National Museum of Victoria, F. 13924, F. 15032, F. 15034, and F. 15038).

*S. australis* is originally described from New Zealand but is known also from Australia and some smaller islands in the South-western Pacific. The specimens from Masthead Island are small and pale brown. The main radial ribs are well elevated. The underside is uncommonly pale, only the area just inside the muscle impression being brown. It is possible that the Queensland populations of *S. australis* are racially separated from those of other areas. If so its complete name should be *S. (S.) australis* Q. and G. *promptus* Iredale. A rich material from many localities, however, is necessary to allow a definite conclusion in this question. The Capricorn population does hardly represent a sort of micro-geographical race because similar forms are obtained from two different islands in the group.

**SIPHONARIA (SIPHONARIA) CURRUMBINENSIS** N. SP. from Currumbin (type locality), Queensland and from Noosa, Queensland (ten specimens in all, six in alcohol; National Museum of Victoria, F. 13953 and F. 13948 respectively). Type F. 15562 in National Museum of Victoria.

Shell medium large, medium high. Upper side with about 35 radial ribs, about fifteen of which are predominating. Between the ribs sometimes still finer radial riblets. The very slightly projecting siphon formed of two ribs, sometimes with a third, narrow rib between the two. A very minute concentric sculpture may be present. The small, pointed apex is turned backwards and slightly to the left. The embryonic shell, when present, continues to the right. The apex is dark, the interspaces are brownish and the ribs white or very pale-brown. Interior with white spots or short radii corresponding to the ribs. Inside and between these spots is a dark-brown or black zone. The muscle impression is sometimes purplish-grey, sometimes not distinguished from the surrounding by colour. The centre is brown. Yellow rays sometimes radiate from the centre, particularly through the siphonal groove and in a frontal direction.

The foot and the head of the animal is pale. The mantle border has dark spots and parts of the dorsal side of the animal is dark-gray.

Anatomically the species agrees with the structure in *Siphonaria* s. str. (fig. 4).

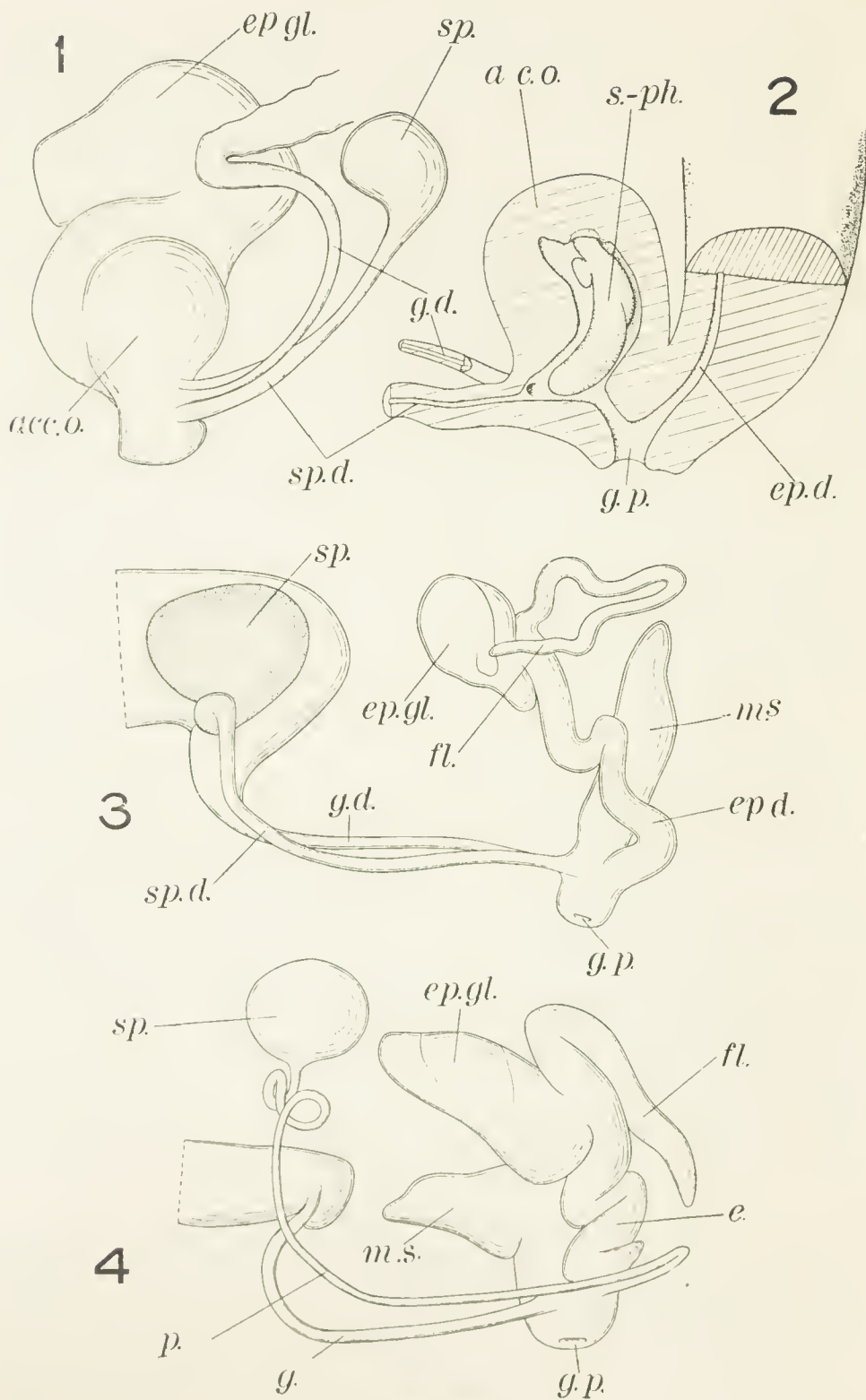
Conchologically *S. currumbinensis* resemblances *S. japonica* Donovan. But this resemblance is only superfiscial the species being anatomically distinct. The resemblance to *S. parvicostata* Deshayes may, however, correspond to a close relationship. *S. parvicostata* differs from *S. currumbinensis* by having relatively few, in the frontal portion generally none, low and broad, distinctly dominating ribs. Yellow rays on the under side are never observed in *S. parvicostata*. This type of colour pattern occurs in the somewhat resembling species *S. belcheri* Hanley, which, however, belongs to subgenus *Liriola* and is not closely related to *S. currumbinensis* belonging to subgenus *Siphonaria*.

#### ACKNOWLEDGMENTS

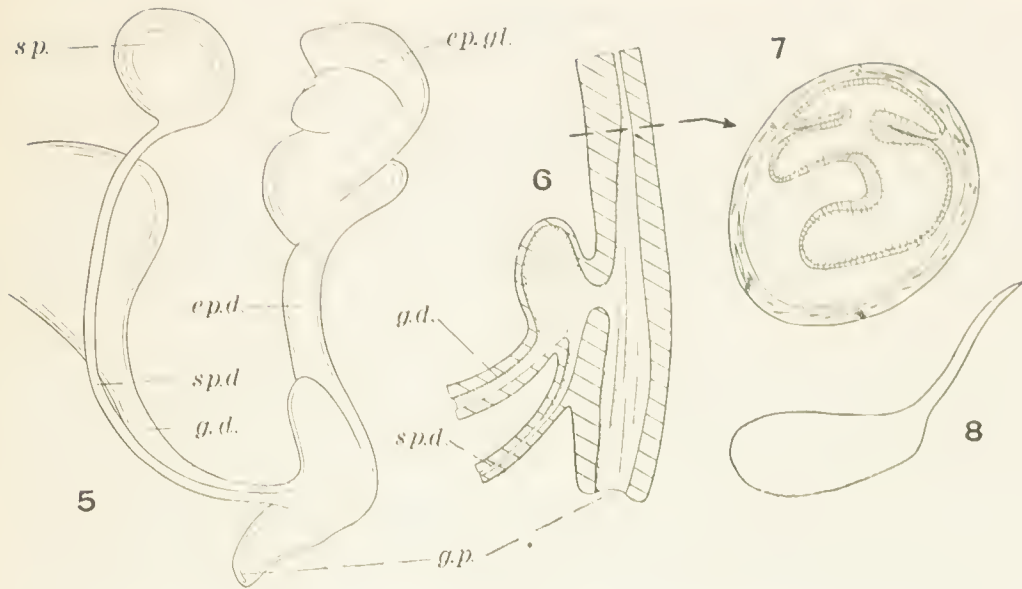
I wish to acknowledge my indebtedness to the National Museum of Victoria for the loan of the above material, and through them Mr. R. Kenny, Mr. R. Endean and Professor W. Stephenson of the Zoology Department, University of Queensland, who collected much of it.

I also wish to express my gratitude to Miss J. Hope Macpherson, National Museum of Victoria, who has kindly assisted in obtaining this complementary material particularly through sending me some of Iredale's paratypes on loan.





FIGS. 1-4.



Figs. 5-8.

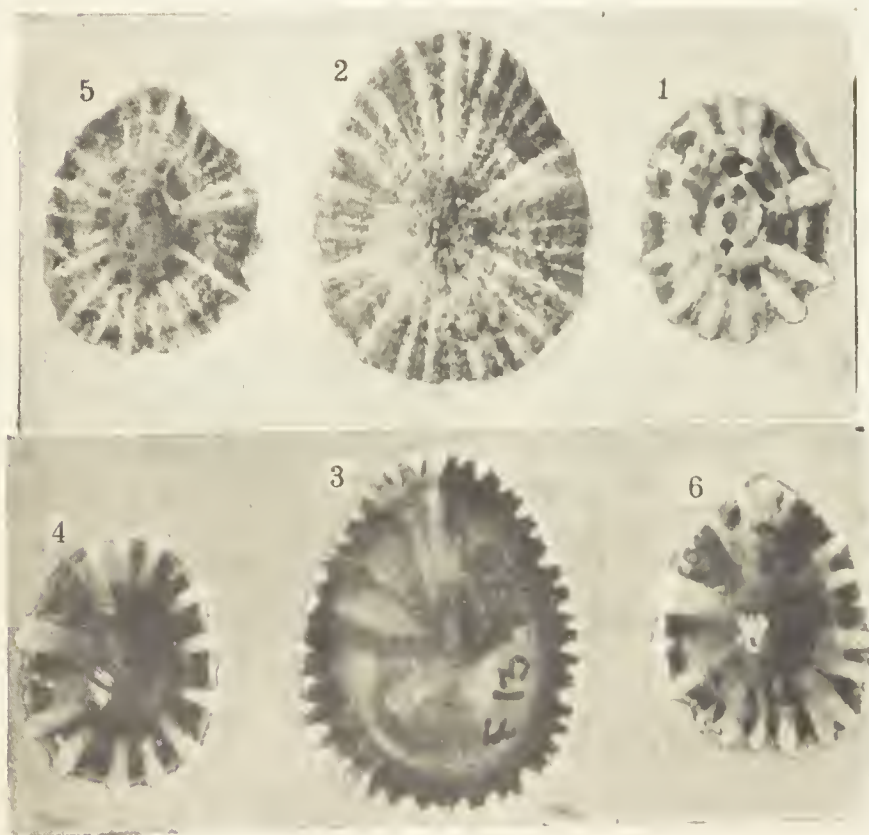


PLATE 1.

## Literature

- Hubendick, B., 1945. Phylogenie und Tiergeographie der Siphonariidae, etc. *Zool. Bidrag Uppsala*, 24: 1.
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- , 1950. Geographical Variation of *Siphonaria pectinata* (L.). *Atlantide Rep.*, 1: 151. Copenhagen.
- McAlpine, D., 1952. Notes on some Siphonariidae. *Proc. Roy. Zool. Soc. New South Wales*, 1951-52, p. 40. Sydney.

## Figs. 1-4.

- Fig. 1. *Siphonaria virgulata* from Currumbin. Distal genitalia, medial view. Ca. 20.
- Fig. 2. *Siphonaria virgulata* from Currumbin. Distal genitalia, lateral view. Parts of the walls removed. Ca. 30.
- Fig. 3. *Siphonaria luzonica* from Rottneest Island. Distal genitalia, lateral view. Ca. 14. Note the pigmentation of the spermatheca.
- Fig. 4. *Siphonaria currumbinensis* n. sp. from Currumbin. Distal genitalia, lateral view. Ca. 14.

acc.o. = accessory organ; ep.d. = epiphallus duct; ep.gl. = epiphallus gland; fl. = flagellum; g.d. = gonoduct; g.p. = genital pore; m.s. = muscular sheath; sp. = spermatheca; sp.d. = spermathecal duct; s.-ph = spermatophore.

Figs. 5-8. *Siphonaria zealandica* from Port Jackson.

- Fig. 5. Distal genitalia, lateral view. Schematic. Ca. 8.5.
- Fig. 6. Longitudinal section through most distal parts of genitalia. Schematic. Ca. 14.
- Fig. 7. Cross section through epiphallus duct. Schematic. Ca. 60.  
Peripheral area = muscles; dotted area = mainly connective tissue.
- Fig. 8. Outline of spermatophore. Ca. 33.  
Same abbreviations as in Figs. 1-4.

Plate 1 figs. 1-6. *Siphonaria* (*Siphonaria*) *currumbinensis* n. sp., 2.5 times natural size. Figs. 1-4, from Currumbin, Queensland (figs. 2-3, the holotype). Figs. 5-6, from Noosa, Queensland. In figs. 1, 2, and 5 dorsal view, in figs. 3, 4, and 6 ventral view. All shells with frontal end directed upwards.