THE SPECIFIC CHARACTERS OF SACCULINA ROTUNDATA MIERS AND SACCULINA YATSUI NOV. SPEC.

by

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In a previous paper (Boschma, 1935) I made some remarks concerning the parasites of *Pachygrapsus crassipes* Randall from Japan, viz., *Sacculina confragosa* and the specimens mentioned then under the name *Sacculina rotundata.* The latter parasite, indeed, shows some resemblance to *S. rotundata,* but a closer examination of its characters shows that it is specifically distinct from this species. It appears to be a new species which is described in the present paper as *Sacculina yatsui.* Moreover the results of a more or less detailed investigation on *Sacculina rotundata* are given here to show the differences between the two species.

Sacculina yatsui nov. spec.

Sacculina rotundata: Boschma 1935.

Material examined:

Sagami Bay, 1901, Dr. Haberer. Zool. Museum Munich. 2 specimens.

Sagami Bay, March 1903, Dr. Haberer. Zool. Museum Munich. 2 specimens.

Aburatsuko, Misaki, litoral, August 1929, Prof. A. S. Pearse. Museum Leiden. 1 specimen [1]).

Misaki, Marine Biol. Sta., 1930, Prof. Naohide Yatsu. Museum Leiden. 5 specimens (holotype and paratypes).

Shimoda, Shizuo-ken, sea shore near Marine Biological Laboratory, May 3, 1934, Prof. Yaichiro Okada. Museum Leiden. 3 specimens.

All the specimens mentioned above are parasites of *Pachygrapsus crassipes* Randall.

Diagnosis. Male genital organs in the posterior part of the body, outside the visceral mass. Testes more or less globular. Colleteric

1) The statement in my previous paper (Boschma, 1935, p. 152) is erroneous; this should have read: "Aburatsuko, Misaki, litoral, August 1929, A. S. Pearse. Museum Leiden. 2 *Sacculina confragosa,* 1 *Sacculina rotundata.*"

glands with a moderate number of tubes. External cuticle of the mantle with hyaline spines, consisting of a kind of chitin which is different from that of the main layers of this cuticle. The spines occur in groups, usually they are united into compounds of two or a few more, sometimes they remain isolated. These excrescences vary in length between 30 and 65 μ. Retinacula unknown, probably not occurring.

The animals occur in two forms (fig. 1), which at least partially may be due to the mantle cavity being filled with eggs or not. When the mantle cavity contains eggs the specimens appear like the left specimen of fig. 1; these are rather thick (5—7.5 mm). Specimens which do not contain eggs in the mantle cavity are much thinner (e.g., 2—3 mm), the dorsal and ventral side of the mantle then shows a quantity of grooves (right specimen of fig. 1). In these thinner specimens the dorsal and ventral parts of the posterior region often project consider-

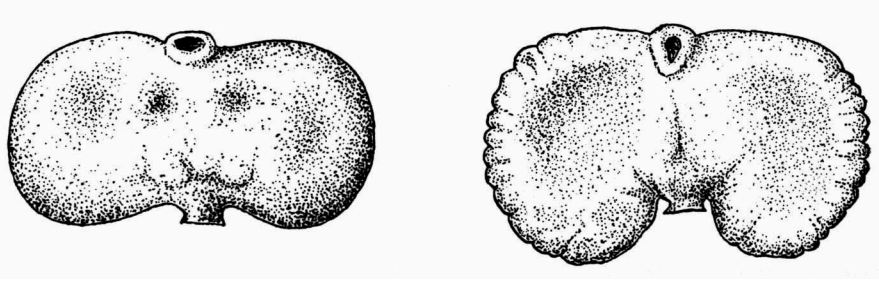

Fig. 1. *Sacculina yatsui.* Two specimens (paratypes) from Misaki. The surface which was turned towards the thorax of the hosts is shown. × 3.

ably beyond the stalk. Generally the surface of the mantle shows a number of grooves or shallow pits, especially at the side which lies against the abdomen of the host; these are impressions of parts of the thorax, of the abdomen, and the pleopods of the hosts. The mantle opening lies in the middle of the anterior region, often it is turned towards the thorax of the host. It is surrounded by an inconspicuous wall, which projects slightly above the surface of the mantle.

The measurements of the specimens are given in the following table, which also contains the dimensions of the breadth of the carapax of the hosts and data on the shape of the abdomen of the hosts. Six of the hosts have a broad abdomen, being crabs of female appearance, six other specimens have the narrow abdomen which occurs in the male specimens, one has a more or less intermediate form of abdomen.

Locality	Greater diameter	Lesser diameter	Thickness	Greater diameter of carapax of host	Abdomen of host	Remarks
Misaki.	15	9	5	30	narrow	holotype
Misaki.	16	8	5	28.5	narrow	paratype, fig. 1
Misaki.	17	10	4	27	broad	paratype, fig. 1
Misaki.	12	8	4.5	23.5	narrow	paratype
Misaki.	16	9	3	27	broad	paratype
Sagami Bay. .	17	10.5	2.5	30	broad	—
Sagami Bay. .	16	9	2	29	intermediate	—
Sagami Bay. .	13.5	8	3	23	broad	—
Sagami Bay. .	12	7	3	29	narrow	—
Aburatsuko . .	17	11	7	—	narrow	on detached abdomen
Shimoda. . . .	19	10.5	7.5	23	narrow	—
Shimoda. . . .	20	12	7	26	broad	—
Shimoda. . . .	19	11.5	6.5	32	broad	—

For the study of the internal organs longitudinal sections have been made from the holotype and from the specimen from Aburatsuko.

The male genital organs of the holotype (fig. 2) lie completely in the posterior part of the body, outside the visceral mass. Fig. 2a represents a part of a section through the extreme ventral region of the male genital organs, it shows the right male genital opening and the left vas deferens in transverse section. The lumen of the vasa deferentia here is rather wide, its wall shows numerous ridges perpendicular to its surface. In fig. 2b transverse sections of a more dorsal part of the vasa deferentia are visible; the ridges on the walls of these canals are so strongly developed that in this section the lumen of each vas deferens is divided into several parts. In fig. 2c the ventral part of the left testis is shown. Here this organ does not yet possess a cavity. It is surrounded by a muscular wall, between this wall and the testis the dorsal part of the right vas deferens is visible. This part possesses a very narrow lumen which is surrounded by a thick chitinous wall. Fig. 2d shows next to a section of the right vas deferens the median region of the left testis, which has a comparatively

wide lumen. In fig. 2e the extreme dorsal part of the right vas deferens is drawn at the right of the figure. In the middle of the figure the narrow canal with its thick layer of chitin, which connects the left vas deferens with its testis, is seen in the neighbourhood of this testis (from the latter only the most ventral part of its wall is visible,

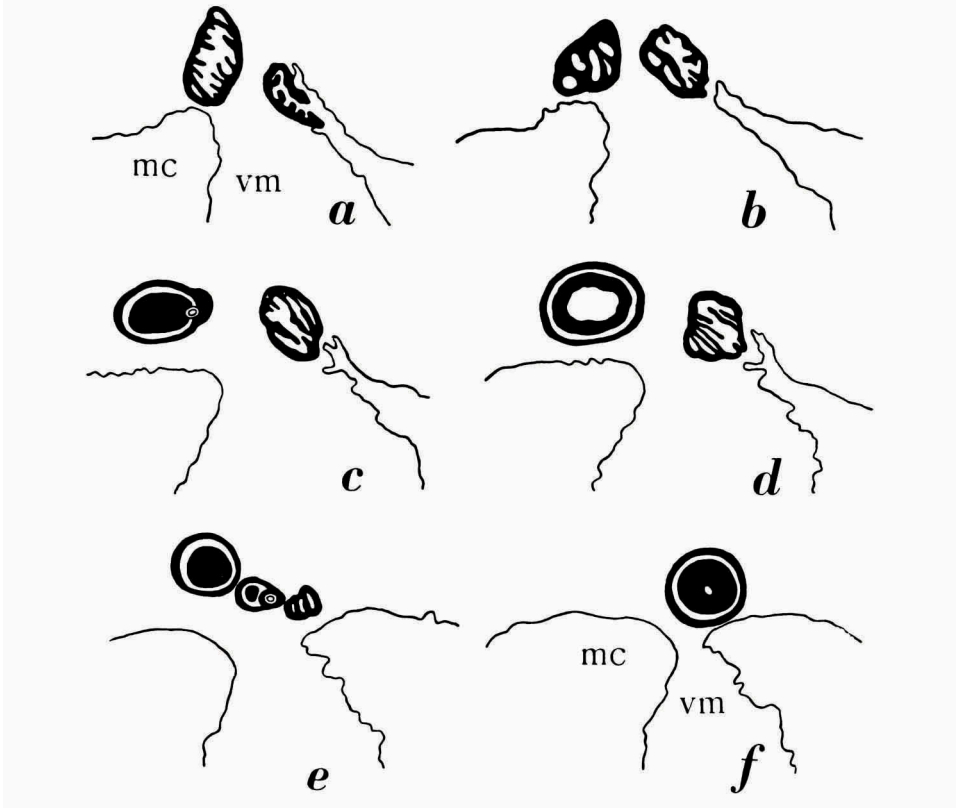

Fig. 2. *Sacculina yatsui*. Misaki. Parts of longitudinal sections, containing transverse sections of the male genital organs; posterior end of the body at the upper side of the figures. mc, mantle cavity; vm, visceral mass. × 18.

surrounded by the muscular layer). At the left side of this figure the extreme dorsal part of the left testis (the lumen has already vanished) is to be seen, with its surrounding muscular layer. In fig. 2f the median part of the right testis is shown with its muscular layer. The wall of this testis is very thick, the lumen is narrow.

The male genital organs of the specimen from Aburatsuko do not differ in any important detail from those of the holotype. The most

striking particulars may be briefly mentioned here. In this specimen the vasa deferentia extend somewhat farther ventrally than those

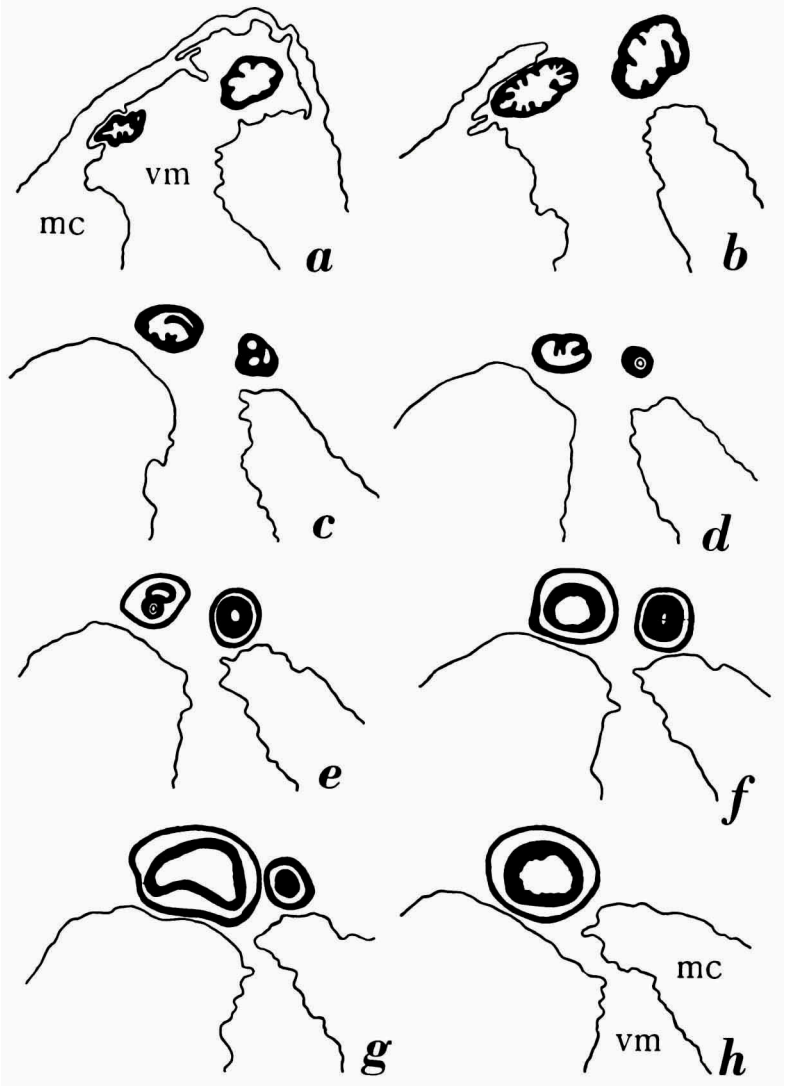

Fig. 3. *Sacculina yatsui*, Aburatsuko. Parts of longitudinal sections, containing transverse sections of the male genital organs; posterior end of the body at the upper side of the figures. mc, mantle cavity; vm, visceral mass. × 18.

of the type specimen, they protrude beyond the part where the visceral mass is attached to the posterior region of the body, so that the extreme

ventral portion of the vasa deferentia is contained in the visceral mass (fig. 3a). Soon, however, the vasa deferentia pass into the posterior part of the body (fig. 3b,c). These canals, which in their ventral part have a wide lumen, at their dorsal extremity become very narrow (fig. 3d, in the right vas deferens the narrow opening is surrounded by a thick layer of chitin). Fig. 3e shows sections of the right testis and of the extreme dorsal part of the left vas deferens with the thick layer of chitin, at both sides the male organs are surrounded by a muscular layer. In fig. 4f the right testis has reached its largest size, its opening is narrow; the left testis has a much wider lumen. Towards the dorsal region the right testis soon becomes smaller, the left testis larger (fig. 3g). The left testis extends somewhat farther towards the dorsal region of the body than the right (fig. 3h, which is from a more dorsal region than that of the extreme dorsal part of the right testis).

In both specimens from which sections have been made, therefore, the right testis has a much thicker wall and a much narrower lumen than the left.

Parts from longitudinal sections of the holotype, as far as they contain portions of one of the colleteric glands, are represented in fig. 4. In fig. 4a—c the chitinous tubes, which occur in the canals of the gland, are drawn only, in fig. 4d around some of the larger canals the epithelium of the canals is indicated. Fig. 4d represents part of a section in the vicinity of the median region of the colleteric gland. The greater part of the canals is very wide, they are few in number. At the right side of the figure the atrium is visible. A section through the marginal part of the same colleteric gland is shown in fig. 4a; fig. 4b and c are drawn from sections intermediate between the others. Towards the periphery of the gland the canals gradually become narrower. The canals occur in moderate numbers, the largest number in one of the figured sections (fig. 4b) is 26. In each of the figures the double line at the left side represents the chitinous covering of the visceral mass.

Sections of one of the colleteric glands from the specimen from Aburatsuko are shown in fig. 5. The chitinous layer of the visceral mass in drawn here as a double line at the right side of the figures. The thick black parts represent the epithelium of the gland together with its internal chitinous layer. Fig. 5a shows the colleteric gland in approximately median section, at the left side the atrium is visible, which widely opens into the visceral mass. In the lower part of the

figure the opening of the gland (the female genital opening) is shown; to the right of this opening the chitin of the visceral mass is considerably thickened: this chitinous plug obliterates the genital opening till the eggs are extruded into the mantle cavity (in this specimen the chitinous covering of the visceral mass in some spots has detached itself from the epithelium). Moreover this section contains a few of the glandular canals, the greater part of which are

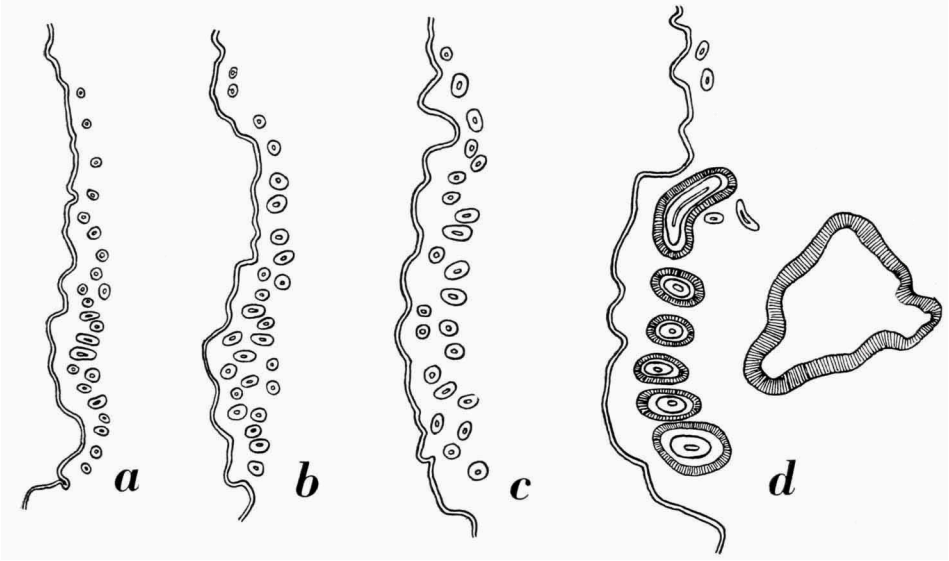

Fig. 4. *Sacculina yatsui,* Misaki. Longitudinal sections of one of the colleteric glands; posterior end at the upper side of the figures. × 60.

of large size. Towards the periphery of the gland the canals gradually divide into canals of smaller size (fig. 5b—e). The largest number of canals in one of the figured sections (fig. 5c) is 28.

When comparing the colleteric glands of the specimens from which sections have been made we see that the canals in these glands occur in moderate numbers, and, moreover, that the canals remain more or less at the surface of the glands, so that they are arranged in one or two rows parallel to the surface of the visceral mass.

The external cuticle of the mantle of the holotype has a thickness of 35—60 μ, in the sectioned specimen from Aburatsuko this layer has a thickness of 75—115 μ. The upper surface of the external cuticle bears excrescences of a hyaline structure which in contradistinction to the main layers of the cuticle remain uncoloured in borax carmine. The excrescences consist of pointed spines which are arranged in groups

on the surface of the cuticle. In many parts these groups are surrounded by small grooves so that they are more or less isolated (fig. 6a). The spines of each group may remain completely separated from each other; generally, however, they are united by fusion of their basal parts into groups of two to four spines. The individual spines vary in length and in thickness, in the various individuals as well as in different parts of the cuticle of each individual.

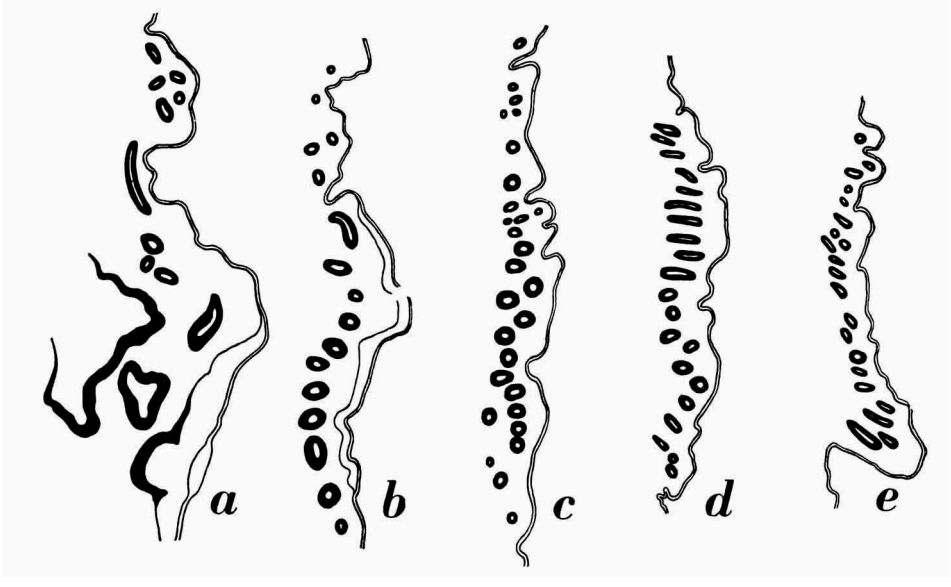

Fig. 5. *Sacculina yatsui,* Aburatsuko. Longitudinal sections of one of the colleteric glands; posterior end at the upper side of the figures. × 45.

Some of the excrescences of different specimens of *Sacculina yatsui* are represented in fig. 6 and 7. Fig. 6a shows a section of the external cuticle of the holotype, the upper region of the cuticle is divided here by conspicuous furrows into minute mounds, each of which bears a number of spines which for the greater part are fused into groups of two or three each. In fig. 6b the excrescences of two other parts of the external cuticle of the same specimen are drawn: at the left side of the figure the spines, which are arranged into groups, remain completely separated from each other (this occurs rarely in the species), at the right side of the figure some excrescences of slightly larger size, each consisting of two to four spines, are represented. Fig. 6c and d show isolated excrescences from the external cuticle of the paratypes. The excrescences at the left side of fig. 6c consist of exception-

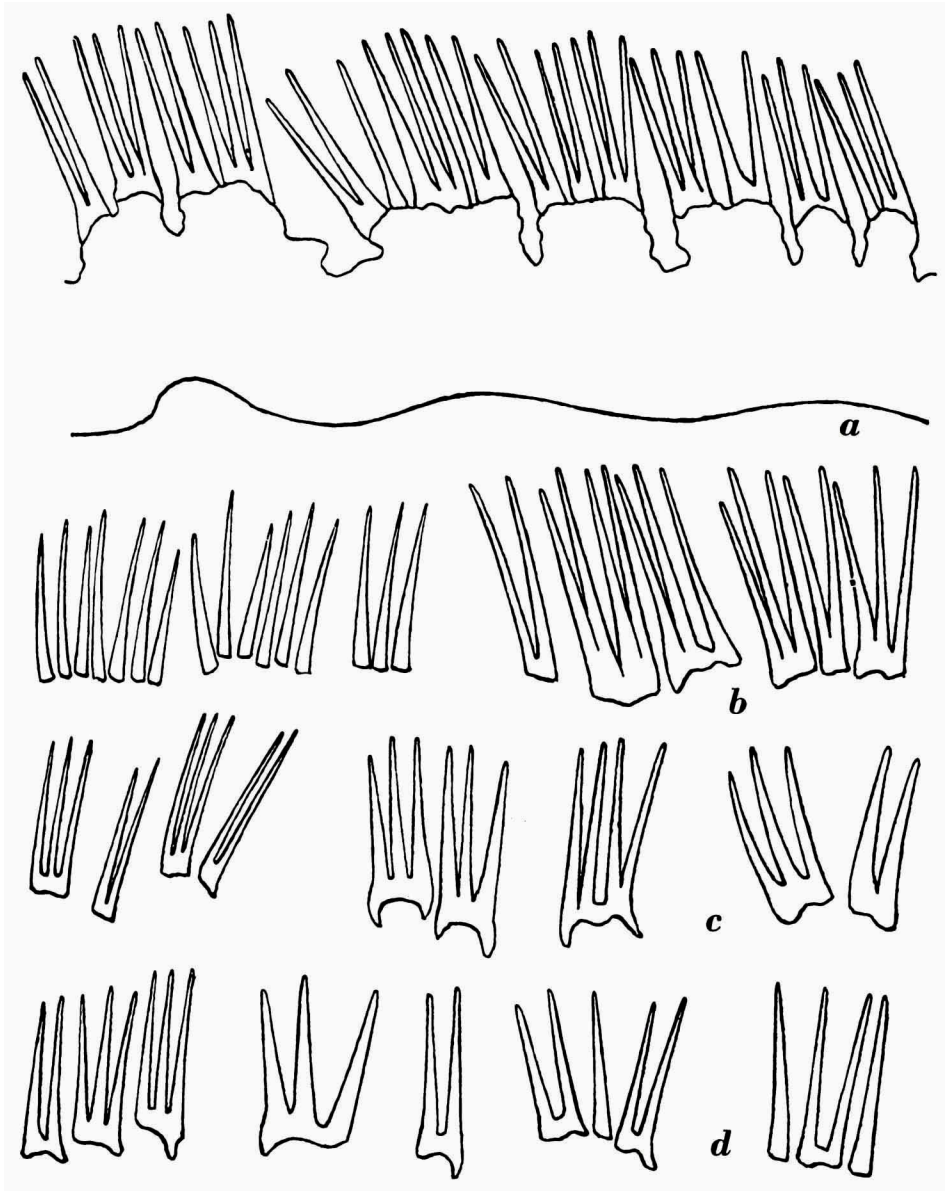

Fig. 6. *Sacculina yatsui,* Misaki. a, section of the external cuticle of the type specimen; b. excrescences of the external cuticle of the type specimen; c, and d, excrescences of the external cuticle of other specimens from the same locality. × 530

ally slender spines, those in the middle of the same row have a concave basal part which surrounds the extremity of a small mound of the cuticle. Among those represented in fig. 6d there is one with rather thick spines which diverge more strongly.

To show that in general the excrescences of the external cuticle of

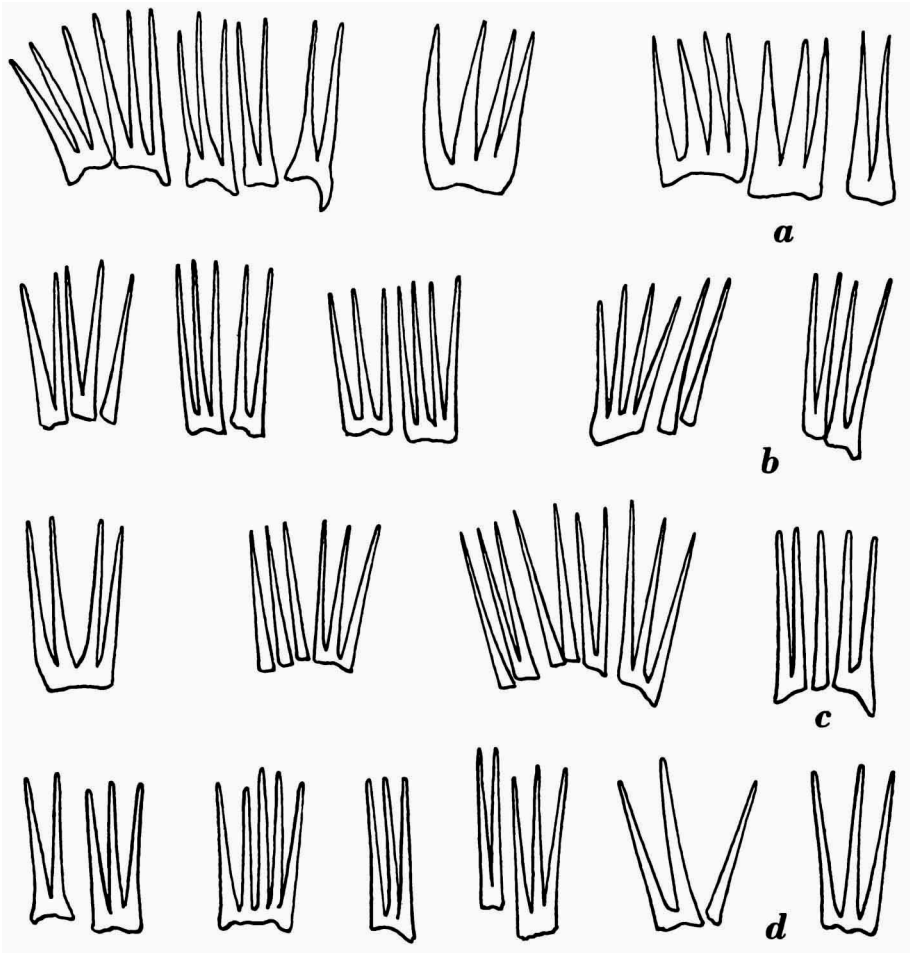

Fig. 7. *Sacculina yatsui*. Excrescences of the external cuticle of different specimens. a, from Aburatsuko; b, and c, from Sagami Bay; d, from Shimoda. × 530.

Sacculina yatsui in different specimens exhibit a great similarity a few of these from specimens from other localities than the types are drawn in fig. 7. Here also some of the excrescences consist of much thicker spines than the others, some remain separate, others are

combined into groups of two or three, or, exceptionally, into groups of four or five spines.

The size of the excrescences, from the basal part to the extremities of the spines, usually varies between 30 and 50 μ, rarely they may attain a length of 65 μ.

No retinacula could be found on the parts of the internal cuticle of the mantle examined for this purpose.

In its specific characters *Sacculina yatsui* presents a strong resemblance to *Sacculina rotundata*. The particulars of a few specimens of the latter species are given below so that afterwards the specific characters of the two species can be compared.

Sacculina rotundata Miers

Sacculina rotundata: Miers (1880), Boschma (1933).
p. p. *Sacculina pilosa:* Van Kampen and Boschma (1925), Boschma (1928).
p. p. *Sacculina rotundata:* Boschma (1931).

Material examined:

Malaysia, Bleeker collection. British Museum. 1 specimen (holotype of the species).
Beo, Talaud Islands (Siboga Expedition, Sta. 131). Zool. Mus. Amsterdam. 1 specimen.
Sula Sanana. Museum Leiden no. 496. 1 specimen.
Moluccas, Forsten. Museum Leiden no. 495. 1 specimen.
All the specimens mentioned above are parasites of *Eriphia laevimana* Latr.

The specimen on *Eriphia laevimana* from Banda (Siboga Expedition, Sta. 240) which is in immature condition, was not studied again. Moreover the specimens on *Eriphia* (?) *scabricula* Dana and on other species of hosts, mentioned in the literature cited above, were not taken into account. In the present paper the study of the specific characters of *Sacculina rotundata* is restricted to specimens living on *Eriphia laevimana*, which may be regarded as typical specimens of the species.

In comparison to that of *Sacculina yatsui* the diagnosis of *S. rotundata* may be given as follows: Male genital organs in the posterior part of the body, outside the visceral mass. Testes more or less globular. Colleteric glands with a large number of tubes. External cuticle of the mantle with hyaline spines, consisting of a kind of chitin which is different from that of the main layers of this cuticle. The spines are united into compounds of usually more than 10 spines each, exceptionally into compounds of 3 or 4. These excrescences vary in length between 80 and 150 μ. Retinacula unknown, probably not occurring.

Some data concerning the shape and size of the specimens, as these are given in previous papers, may be mentioned here.

The type specimen (Miers, 1880, p. 470, pl. 15, fig. 18) had an oval shape, the mantle opening was very narrow and inconspicuous. According to Miers the length is 5 lines, the breadth 7 lines, which gives for the greater diameter 14.8 mm, for the lesser diameter 10.6 mm. The figure shows that the surface of the mantle was not wrinkled.

The specimen from the Siboga Expedition (Van Kampen and Boschma, 1925, pl. 1, fig. 3) also is of an oval shape; its dimensions are: greater diameter 19 mm, lesser diameter 12 mm, thickness 9 mm. Here the mantle opening again is small, not prominent. The surface of the mantle on the whole is comparatively smooth.

The specimen from the Moluccas (Boschma, 1928, p. 153) again has an oval shape, its greater diameter is 12.5 mm, its lesser diameter 9 mm, and its thickness 6.5 mm. The mantle opening is small and surrounded by a slight thickening of the mantle; the mantle itself is very little wrinkled.

The specimen from Sula Sanana (Boschma, 1928, p. 153) has a similar shape, it is oval. The dimensions are: greater diameter 16 mm, lesser diameter 11 mm, thickness 6 mm. The mantle opening is small, the surface of the mantle shows a great number of wrinkles and more or less deep grooves.

Longitudinal sections have been made from the specimen from the Siboga Expedition and from that from Sulu Sanana (the mantle completely or nearly completely detached before sectioning); the specimen from the Moluccas has been prepared into a series of transverse sections.

Fig. 8 represents parts of the sections of the specimen from Sula Sanana, containing transverse sections of the male genital organs. These organs are situated nearly completely outside the visceral mass, they lie in the posterior part of the body from which the stalk takes its origin. Only the extreme ventral parts of the vasa deferentia are found in the lateral region of the posterior part of the visceral mass (fig. 8a, at the right side the part of the vas deferens in the immediate neighbourhood of the male genital opening). The lumen of the vasa deferentia is comparatively wide, its wall shows some ridges more or less perpendicular to its surface (fig. 8a,b). In the section of fig. 8c the left vas deferens passes into the region with narrow lumen which connects this canal with the testis, in fig. 8d this part with the narrow

lumen possesses its thick chitinous wall, it is seen here penetrating the muscular sheath of the left testis of which the extreme ventral wall

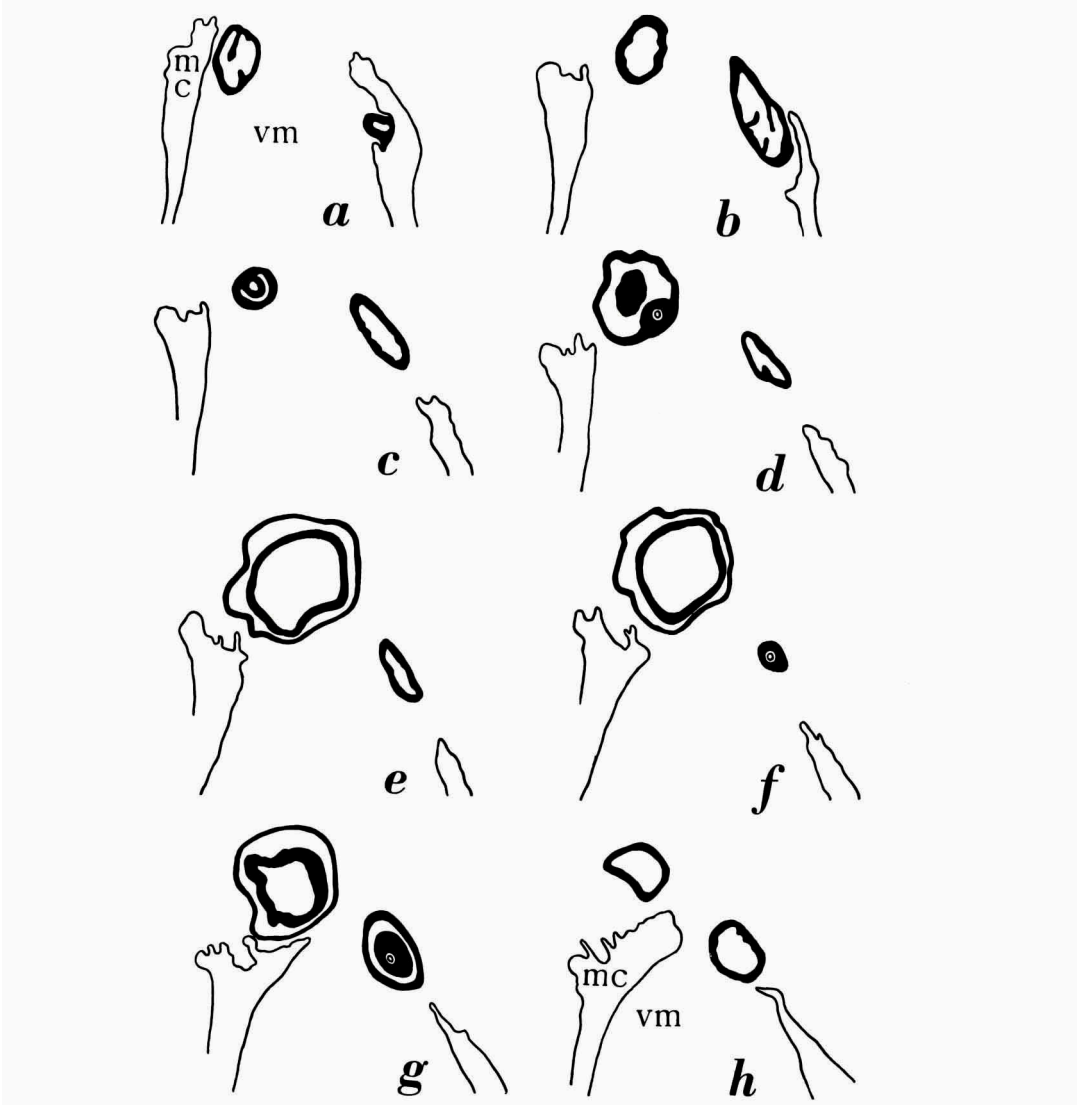

Fig. 8. *Sacculina rotundata,* Sula Sanana. Parts of longitudinal sections containing transverse sections of the male genital organs; posterior end of the body at the upper side of the figures. mc, mantle cavity; vm, visceral mass. × 18.

is just visible. At the right side of the same figure the right vas deferens is visible. Fig. 8e shows the left testis in the region of

its largest size; it has a comparatively thin wall. In the section represented in fig. 8f the left testis has approximately the same size, the right vas deferens has become the narrow canal with its thick internal covering of chitin. Fig. 8g represents a section in which the narrow canal with its thick chitinous wall passes into the right testis;

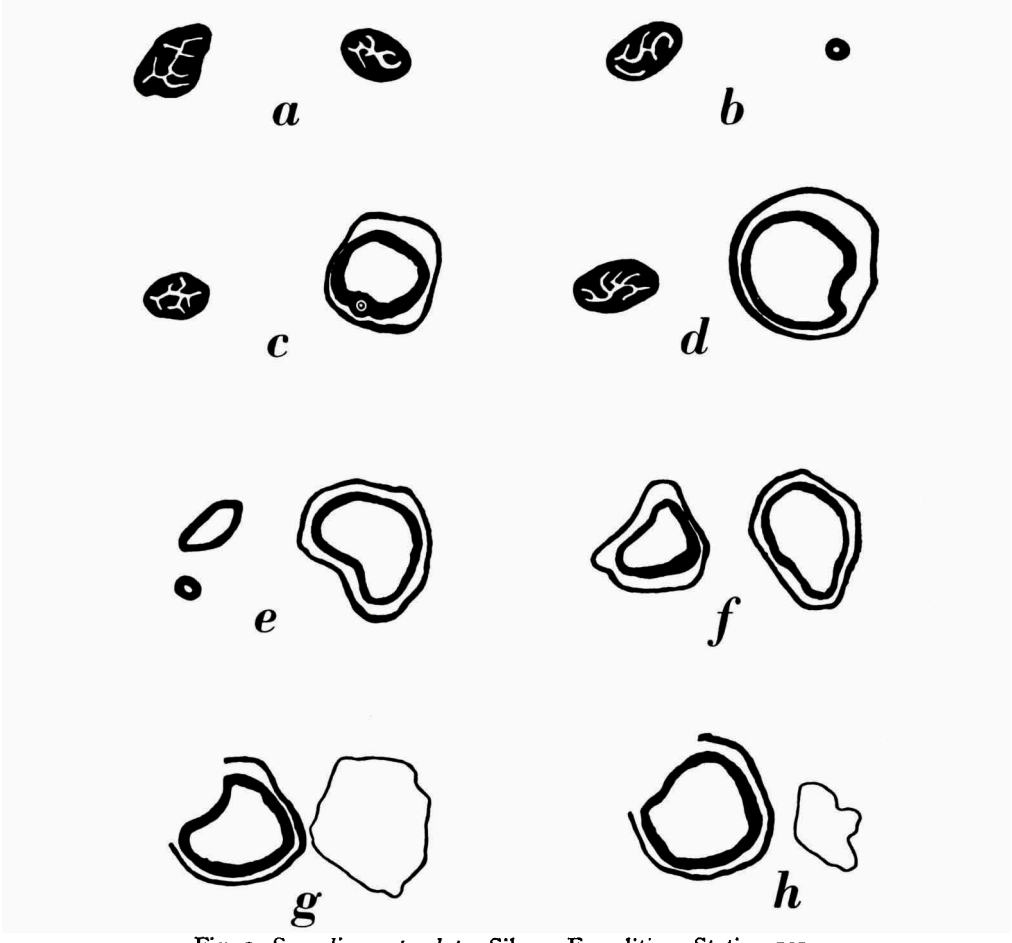

Fig. 9. *Sacculina rotundata,* Siboga Expedition, Station 131.
Transverse sections through the male genital organs; posterior end of the body at the upper side of the figures. × 18.

the dorsal part of the left testis is drawn at the left side of the figure. In fig. 8h, still nearer to the dorsal part of the animal, the dorsal parts of the muscular sheaths of the two testes are represented.

The male genital organs of the specimen from Station 131 of the Siboga Expedition differ in some respects from those of the specimen

from Sula Sanana. As in the latter these organs are found in the posterior part of the body, outside the visceral mass. Fig. 9a represents transverse sections of the ventral part of the two vasa deferentia, which have a very narrow lumen, owing to the fact that the ridges on the wall of these canals have become rather voluminous. In fig. 9b the right vas deferens has passed into the narrow tube which at its dorsal end will terminate into the testis. Here this tube does not yet possess its internal covering of thick chitin. The latter is present in the section of fig. 9c, the chitinous tube is penetrating here the wall of the testis, which is surrounded by its muscular sheath. In fig 9d the right testis has reached its largest size, the left vas deferens still shows a similar

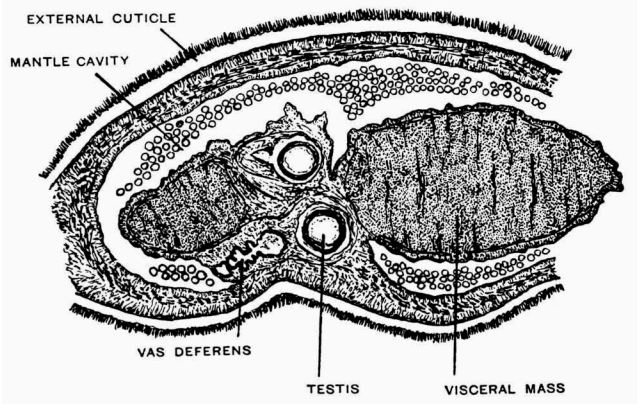

Fig. 10. *Sacculina rotundata,* Moluccas. Transverse section of the posterior part of the body. × 10.

structure as in the sections from the more ventral region. Fig. 9e shows the left vas deferens, and, in the lower part of the figure, the narrow canal which forms the dorsal end of this vas deferens, it does not yet contain its internal chitinous covering. In the section of fig. 9f both testes have approximately the same size, the right testis is shown here in its extreme dorsal part. Towards the dorsal region the left testis gradually becomes somewhat larger (fig. 9g,h), in these parts only the muscular sheath of the right testis remains.

Some of the transverse sections of the specimen from the Moluccas are very instructive, as they show a nearly complete longitudinal section of the testes (fig 10). In this figure the right testis is seen in the upper part, the left testis with its vas deferens in the lower part. The vas deferens has a comparatively wide lumen into which a great number of ridges are penetrating. The whole of the male genital

organs is embedded in the muscular mass of the posterior part of the body to which the stalk is attached.

In the specimens from the Siboga Expedition and from the Moluccas the testes of each side of the body are of approximately equal sizes, in the specimen from Sula Sanana the right testis is much smaller than the left and has a much narrower lumen than the latter.

The colleteric glands of the specimen from the Siboga Expedition

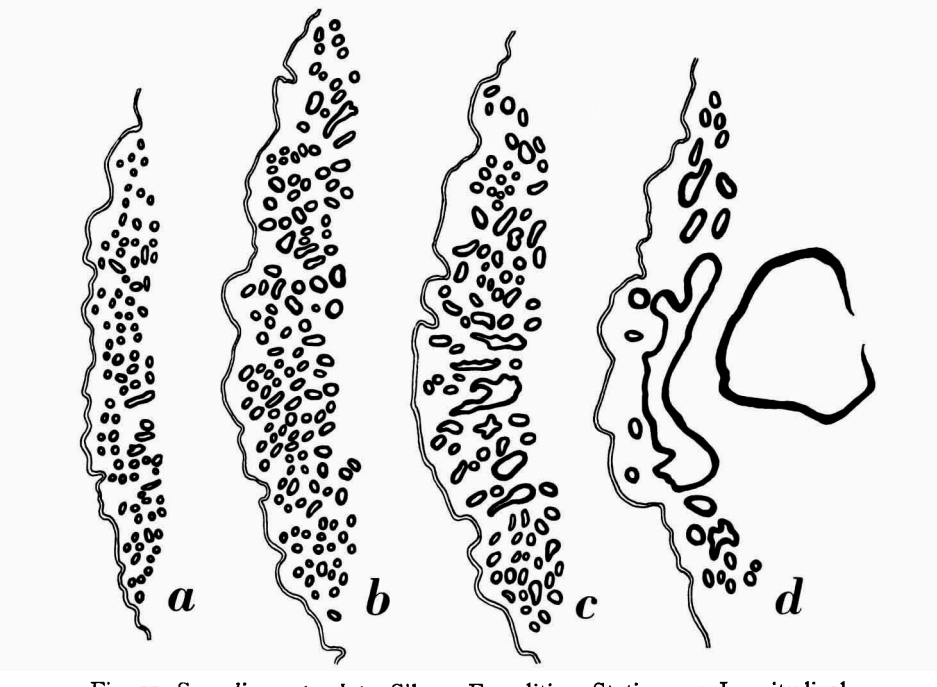

Fig. 11. *Sacculina rotundata*, Siboga Expedition, Station 131. Longitudinal sections of one of the collecteric glands; posterior end at the upper side of the figures. × 45.

(fig. 11) contain tubes which do not possess a chitinous layer, in the figure, therefore, the epithelium of the canals of this gland is drawn. The double line at the left side of each figure represents the chitinous covering of the visceral mass. Fig. 11a shows sections of the canals of the colleteric gland in its peripheral part, each following figure represents a section somewhat nearer to the median region of the gland, fig. 11d is from the vicinity of the median region. This figure shows the atrium which opens into the visceral mass. One of the larger canals is present here in more or less longitudinal section. In fig. 11c some canals of comparatively large size are to be seen, the greater

part has divided already into numerous smaller branches. This is still more evident in fig. 11b, the number of canals in this part of the colleteric gland amounts to 135. In fig. 11a the number of canals is smaller, they are also somewhat smaller in diameter.

In fig. 12 parts of longitudinal sections of the specimen from Sula Sanana are drawn, representing parts of one of the colleteric glands. Here the epithelium of the canals of the gland is drawn in black,

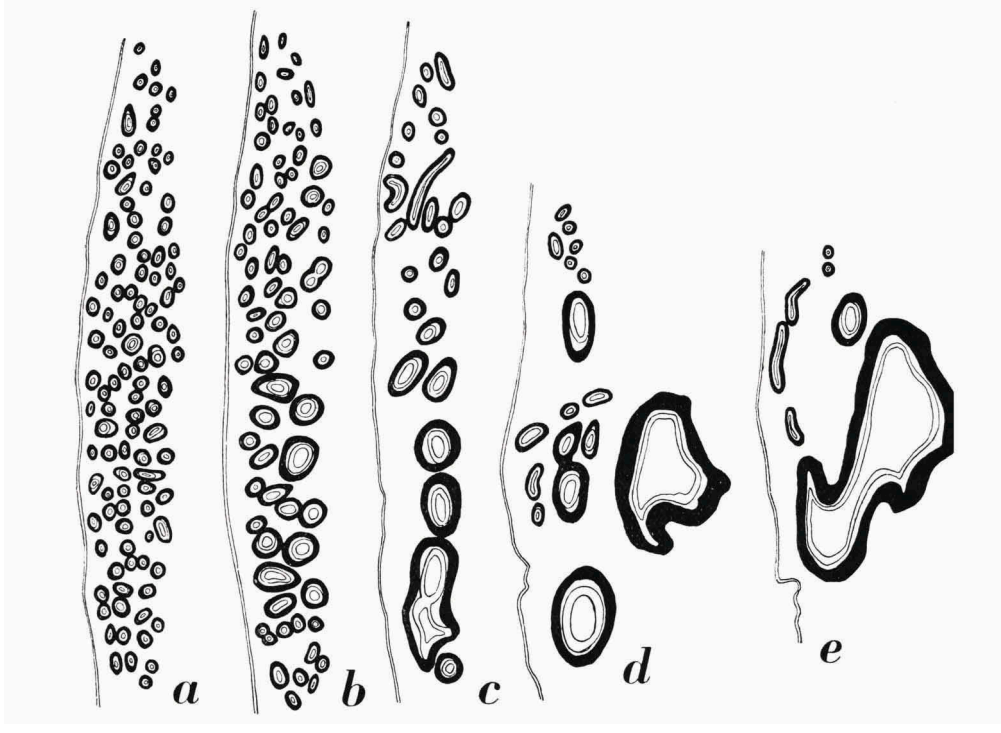

Fig. 12. *Sacculina rotundata*, Sula Sanana. Longitudinal sections of one of the colleteric glands, posterior end at the upper side of the figures. × 45.

in each of the tubes the layer of chitin is shown, which in many of the canals is not or incompletely in contact with the epithelium. The double line at the left side of each figure represents the chitinous layer of the visceral mass. Fig. 12e shows the canal system of the gland in the vicinity of the median region, there is one wide canal and a few smaller ones. In fig. 12d, somewhat farther from the median region, there is a slight increase in the number of canals, many of which are of large size. The canals are still more divided into smaller ones in the section of fig. 12c, but the largest number of branches

is found in sections of the gland which are farther to its peripheral part (fig. 12b and a). In the sections of the gland represented here the largest amount of canals (102) is found in that of fig. 12a.

In the colleteric glands of *Sacculina rotundata* the canals do not show an arrangement in rows parallel to the surface of the visceral mass.

The thickness of the external cuticle of the mantle in the specimen from the Siboga Expedition on an average is about 160 μ, the thinner parts measure about 110 μ, the thicker parts may attain a thickness of 190 μ. In the specimen from Sula Sanana the thickness of the external cuticle is 110—190 μ (previously stated as 130—150 μ, cf. Boschma, 1928); in that from the Moluccas this cuticle varies in size from 55 to 115 μ (the lower values only are given in a previous paper, viz., about 60 μ, cf. Boschma, 1928).

From the type specimen of *Sacculina rotundata* about half of the mantle is present in the collection of the British Museum, so that the excrescences of the external cuticle could be examined (cf. Boschma, 1933, p. 505, fig. 24). These excrescences consist of a variable number of spines, united in their basal part. They vary in size between 80 and 130 μ approximately.

The excrescences of the external cuticle of the specimen from Station 131 of the Siboga Expedition correspond in every detail with those of the type specimen. They have been described in previous papers (Van Kampen and Boschma, 1925, p. 13, fig. 3; Boschma, 1931, fig. 3c). Fig. 13 in the present paper shows two groups of excrescences, each group from a different part of the mantle. Those of fig. 13a are composed of a comparatively large number of stout spines, those of fig. 13b consist of a smaller number of spines of a somewhat slenderer type. The excrescences of this specimen, measured from the base to the extremities of the spines, have a total length of 90 to 120 μ.

A figure of one of the excrescences of the specimen from Sula Sanana is given in a previous paper (Boschma, 1928, fig. 2b). The excrescences of this specimen do not differ in any respect from those of the specimen from the Siboga Expedition. They vary in length from 90 to 130 μ.

In the same paper a figure of an excrescence of the specimen from the Moluccas is found (Boschma, 1928, fig. 2a). Here again the size and shape of the excrescences is similar to those of the type specimen. Two groups of excrescences, each from a different part of the cuticle of the specimen from the Moluccas, are represented in fig. 14. Fig. 14b shows the excrescences as they occur on the greater part of the

external cuticle: large groups of spines united on a common basal part. Exceptionally the compounds of spines consist of small numbers only, as those represented in fig. 14a. Here also the surface of the main part

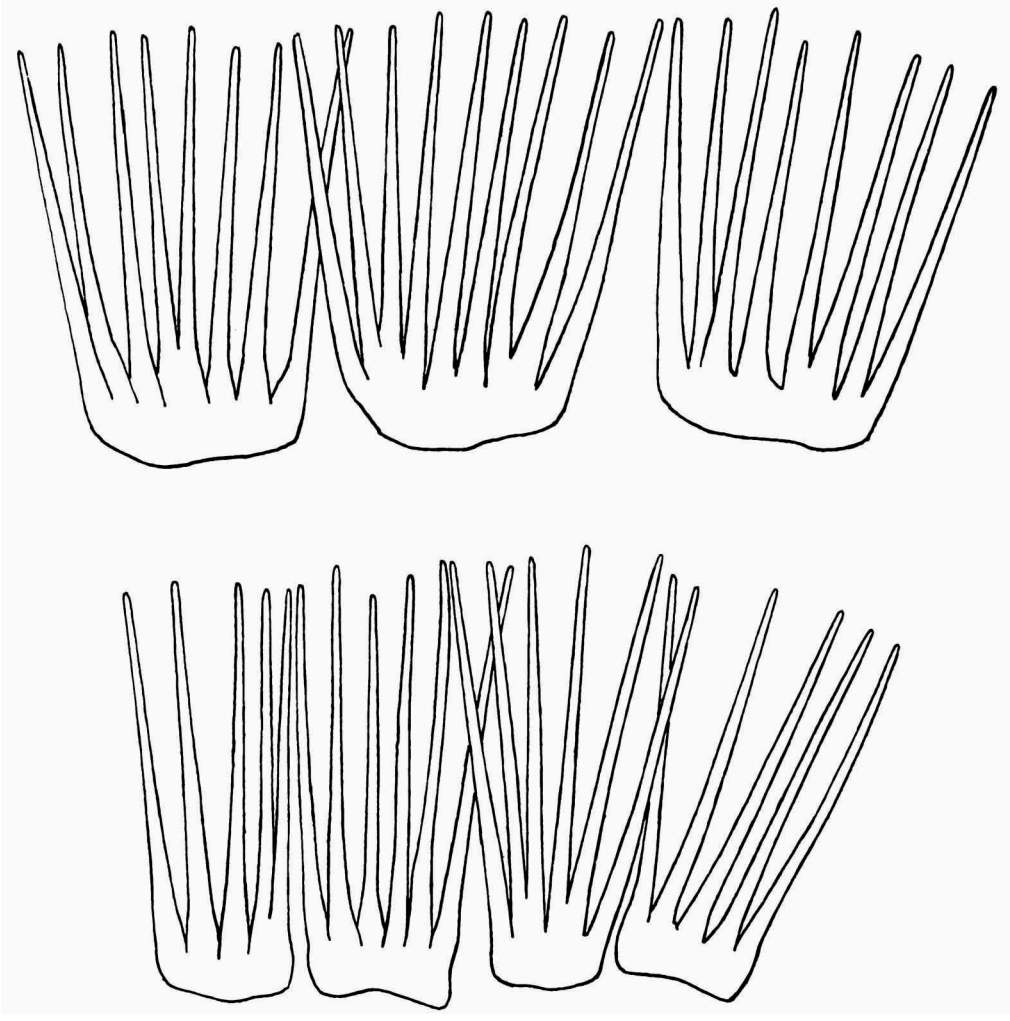

Fig. 13. *Sacculina rotundata,* Siboga Expedition, Station 131. Excrescences from two different parts of the external cuticle. × 530.

of the external cuticle is drawn, the figure shows the grooves which surround the excrescences, so that each of these rests on the top of a small mound. In this specimen the size of the excrescences, measured from the base to the extremities of the spines, generally varies between

90 and 135 μ, in some parts of the mantle there occur excrescences with a length of about 150 μ.

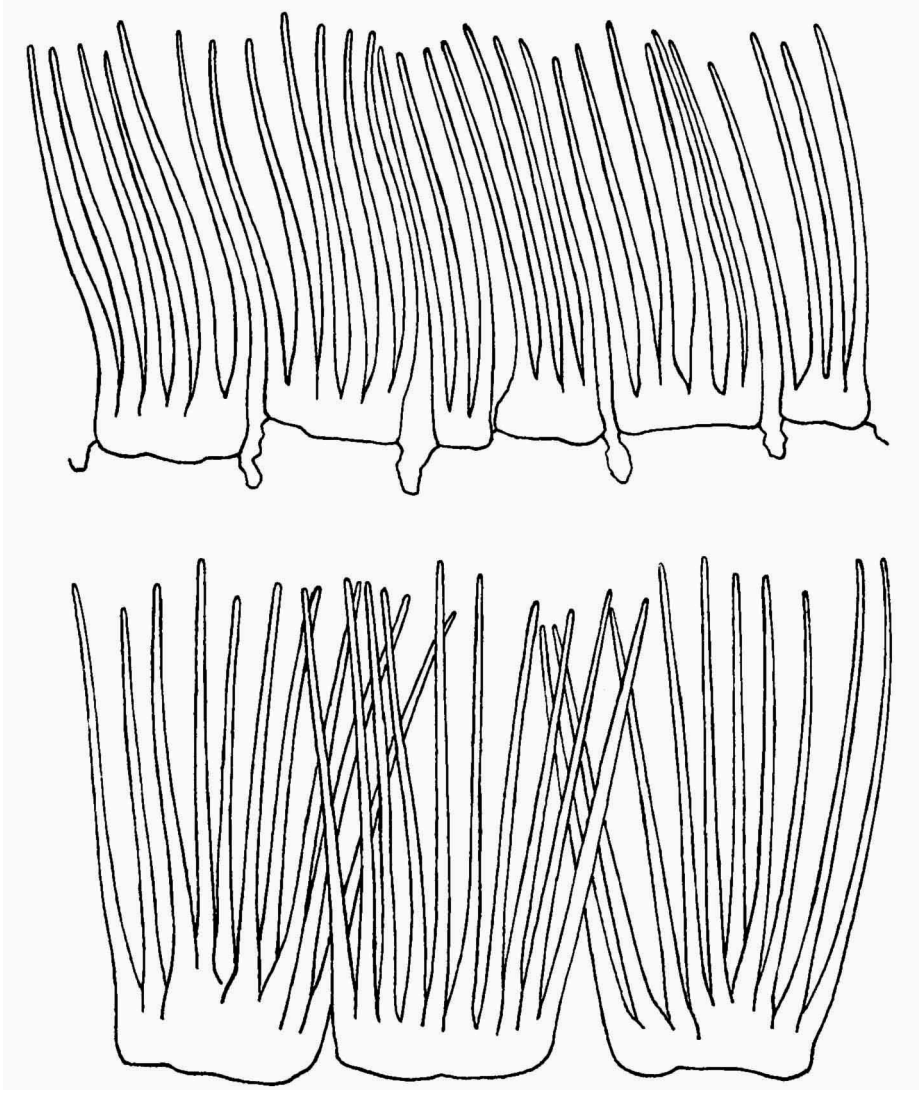

Fig. 14. *Sacculina rotundata*, Moluccas. Excrescences from two different parts of the external cuticle. × 530.

In the values for the minimum size of the excrescences are not included those of the excrescences of the parts of the mantle in the neighbourhood of the stalk and of the mantle opening. Here the

excrescences generally become smaller than on the other parts of the mantle and they have a tendency to become irregular in shape.

Retinacula could not be found on the internal cuticle of any of the three specimens dealt with above. There may occur on the internal cuticle minute pits as they have been described in a previous paper (Van Kampen and Boschma, 1925, p. 14, fig. 3 D). These small grooves are present on the internal cuticle of the specimen from the Siboga Expedition as well as on that of the specimen from the Moluccas (cf. Boschma, 1928, p. 153).

The specimens of parasites on *Eriphia laevimana* described above at some length may be regarded as typical representatives of the species *Sacculina rotundata*. The parasite of *Eriphia* (?) *scabricula* Dana from the Goram Islands described in a previous paper (Boschma, 1933) shows characters which are slightly different from those of the typical specimens. It is, therefore, not absolutely certain that the parasite on *Eriphia* (?) *scabricula* belongs to *S. rotundata*. Still more uncertainty remains in regard to the specimens from other hosts referred to *S. rotundata* in previous papers (Boschma, 1928, 1931). These parasites have to be studied in more detail before a decision can be made concerning their correct identification.

For the present we may leave this question unsettled and compare the typical specimens of *Sacculina rotundata* to typical specimens of *S. yatsui*, viz., the specimens of this species which are parasites of *Pachygrapsus crassipes* Randall.

The two species do not differ notably in size. As far as concerns the specimens dealt with in the present paper the values for the greater diameter of *Sacculina yatsui* are from 12 to 20 mm; those for *S. rotundata* are from 12.5 to 19 mm.

The shape of *Sacculina rotundata* is oval. Among the material of *S. yatsui* there are more or less oval specimens like the left one of fig. 1, although in all specimens the values for the lesser diameter in the region of the main axis are smaller than those in the dorsal and ventral half of the body. In many specimens the difference is much greater; then the dorsal and ventral parts of the posterior region project considerably beyond the stalk, as in the right specimen of fig. 1.

In *Sacculina yatsui* the mantle opening is surrounded by a distinct wall which projects above the surface of the mantle: in *S. rotundata* the mantle opening and its surrounding parts do not extend above the surface of the mantle. In *S. rotundata* the mantle opening is narrow, in *S. yatsui* it is comparatively wide.

The male genital organs of the two species are strikingly similar, the differences between the species in this respect are not greater than those which exist between different individuals of each species.

The colleteric glands of the two species are different as far as concerns the number of tubes and their arrangement. In the colleteric glands of *Sacculina yatsui* there is a moderate quantity of canals; in general the canals are arranged into one or two rows parallel to the surface of the visceral mass, so that the glands remain comparatively flat. In the colleteric glands of *Sacculina rotundata* the number of canals is extremely large and there is no tendency of an arrangement in rows.

The most striking differences between the two species are those of the excrescences of the external cuticle. Those of *Sacculina yatsui* are comparatively small (30—65 μ) and consist of small compounds of two or a few more, or, more rarely, single. The excrescences of *Sacculina rotundata* are much longer (80—150 μ) and form groups consisting of 10 or more spines (rarely smaller groups of 3 or 4).

Judging by the material from which sections are available the external cuticle of *Sacculina yatsui* on the whole is somewhat thinner than that of *S. rotundata*. The differences, however, are not striking enough to serve as a specific character.

The differences in shape of the two species are not sufficiently distinct to use these as specific characters. As such, however, may be regarded the differences in the colleteric glands, and, especially, those of the excrescences of the external cuticle of the mantle.

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