

**Zoology. — Some Rhizocephalan Parasites of Maiid Crabs. By H. BOSCHMA.**

(Communicated at the meeting of September 25, 1948.)

***Sacculina spectabilis* nov. spec.**

p. p. *Sacculina pilosa* Van Kampen & Boschma, 1925.

p. p. *Sacculina rotundata* Boschma, 1931.

South of Salawati (1°42'.5 S, 130°47'.5 E), 32 m, Siboga Expedition Sta. 164, 1 specimen on *Paramithrax* (*Chlorinoides*) *longispinosus* (De Haan) (holotype).

**Diagnosis.** Male genital organs in the posterior part of the body, outside the visceral mass, completely separated. Testes more or less globular, rather abruptly passing into the comparatively wide vasa deferentia. Colleteric glands with a small number of canals. External cuticle of the mantle with groups of hyaline spines consisting of a kind of chitin which is different from that of the main layers of this cuticle. The spines take their origin from the inner surface of distinctly cup-shaped excrescences which are implanted on or in the main layers of the external cuticle. The height of the excrescences as a whole from the base of the common part to the tips of the spines may amount to 175  $\mu$ . The individual spines have a length of up to about 90  $\mu$ . Retinacula unknown, probably not occurring.

There is not a figure of the external shape of the specimen, as previously it was regarded as forming a part of the species at that time identified as *Sacculina pilosa* Kossmann (VAN KAMPEN & BOSCHMA, 1925). In the cited paper we remarked that the parasite had a more or less unsymmetrical shape, its dimensions were  $10.5 \times 7.5 \times 5$  mm. The mantle opening, on the anterior margin, was slightly protruding above its surroundings. The mantle showed a slight wrinkling.

The data given below are taken from the series of longitudinal sections. These distinctly show the configuration of the male organs; the colleteric glands, however, seem to be underdeveloped, as also the whole visceral mass, on account of the presence of a large Bopyrid parasite occupying the greater part of the mantle cavity.

The chief particulars of the male organs are shown in fig. 1. The vasa deferentia (fig. 1a) are rather wide, they possess a well developed system of ridges penetrating into the lumen. In a section from a more dorsal region the narrow canals with their chitinous walls which connect the vasa deferentia with the testes are represented, penetrating the thick walls of the testes (fig. 1b). In a section from a still more dorsal region the testes are shown in their largest size (fig. 1c), here the left is still devoid of a

cavity, whilst the right has a fairly large lumen. In a previous paper (BOSCHMA, 1931, fig. 11c) a section is represented which corresponds with that of fig. 1b in the present paper.

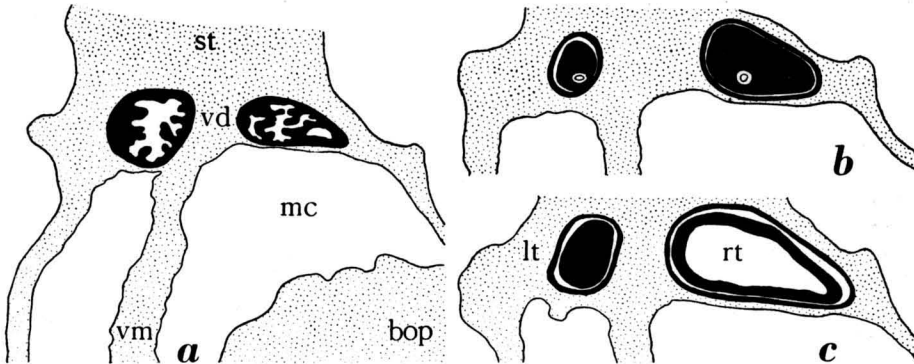


Fig. 1. *Sacculina spectabilis* nov. spec. Longitudinal sections of the posterior part of the body; a through the vasa deferentia, each following section from a more dorsal region. bop, Bopyrid parasite in mantle cavity; lt, left testis; mc, mantle cavity; rt, right testis; st, stalk; vd, vasa deferentia; vm, visceral mass.  $\times 36$ .

The colleteric glands are very indistinct, they seem to possess a small number of canals only. But whether this is a specific character or brought about on account of the presence of the Bopyrid parasite must remain undecided.

The excrescences of the external cuticle of the mantle are of a peculiar shape, different from those of other species with excrescences consisting of compounds of spines. They were figured in two previous papers (VAN KAMPEN & BOSCHMA, 1925, fig. 7, and BOSCHMA, 1931, fig. 3a, b), whilst two of these excrescences (or, more precisely, sections of them) are represented in fig. 2 of the present paper. The figure distinctly shows how the numerous spines are implanted on the inner surface of cup-shaped large excrescences. As a rule the spines are longest in the central parts of the cups (here they may reach a length of about  $90\ \mu$ ), whilst towards the margins they gradually become shorter. The height of the whole excrescences may amount to  $175\ \mu$ . The largest excrescences have a diameter of about  $140\ \mu$ .

Retinacula have not been found on the internal cuticle of the mantle, in all probability they do not occur in the species.

There are a number of species of the genus in which the excrescences of the external cuticle are composed of groups of spines which are united on a common basal part. Of these species *Sacculina rotundata* Miers and *Sacculina carpiliae* Guérin-Ganivet have excrescences of a similar size as those of *Sacculina spectabilis*. The latter species, however, is at once to be distinguished from the other two by the peculiar shape of the basal parts. In the two other species all the spines of one excrescence as a rule are of approximately the same length, whilst in *Sacculina spectabilis* the central

spines are decidedly longer than those on the margin of the cup-shaped basal part. These differences are striking enough to regard *Sacculina spectabilis* as a well defined distinct species.

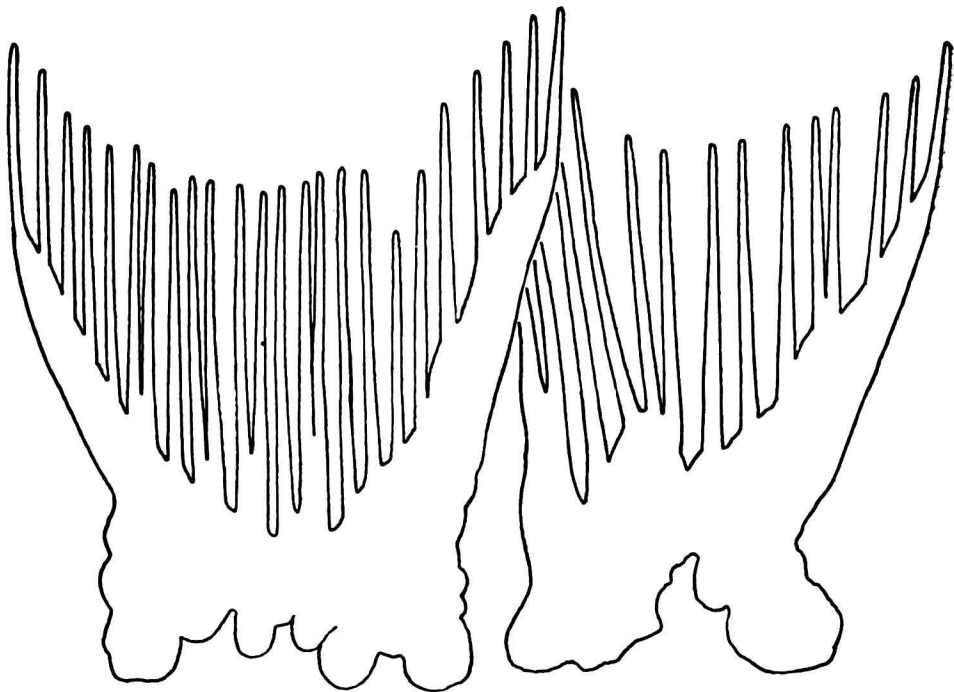


Fig. 2. *Sacculina spectabilis* nov. spec. Sections of excrescences of the external cuticle of the mantle.  $\times 530$ .

***Sacculina synaptothrix* nov. spec.**

p. p. *Sacculina pilosa* Boschma, 1928.

p. p. *Sacculina rotundata* Boschma, 1931.

Halmaheira, BERNSTEIN leg. (collection Leiden Museum), 1 specimen on *Tiarinia gracilis* Dana (holotype).

Obi latoe, shore or reef, April 23—27, 1930, Snellius Expedition, 2 specimens on *Tylocarcinus styx* (Herbst) (paratypes).

**Diagnosis.** Male genital organs in the posterior part of the body, outside the visceral mass, completely separated. Testes more or less globular, rather abruptly passing into the comparatively wide vasa deferentia. Colleteric glands with a comparatively small number of canals (14—22 in a longitudinal section). External cuticle of the mantle with groups of hyaline spines consisting of a kind of chitin which is different from that of the main layers of this cuticle. In groups of 2 to 6 the spines are united on comparatively thick branches, which in their turn are united on a common basal part. The length of the individual spines may amount to 60  $\mu$ , that of the branches including the spines to 70  $\mu$ , the whole

excrescences, including the basal part, may reach a height of 120  $\mu$ . Retinacula unknown, probably not occurring.

The three specimens, one a parasite of *Tiarinia gracilis*, the two others of *Tylocarcinus styx*, in all their characters sufficiently agree to be regarded as belonging to the same species.

The external shape of the specimen on *Tiarinia* is strikingly similar to that of one of the specimens on *Tylocarcinus*, both have the same nearly

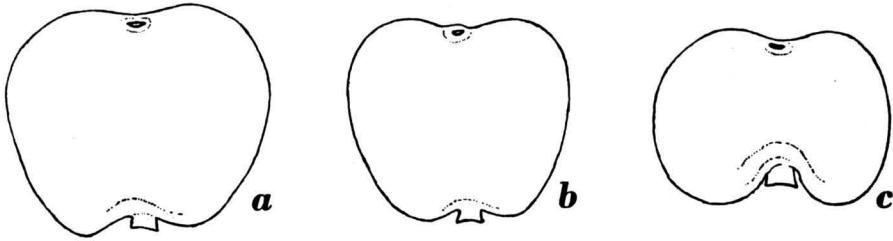


Fig. 3. *Sacculina synaptothrix* nov. spec. a, specimen on *Tiarinia gracilis* Dana; b and c, specimens on *Tylocarcinus styx* (Herbst). Left side. The larger diameter in mm is: a, 6; b, 6; c,  $5\frac{1}{2}$ .

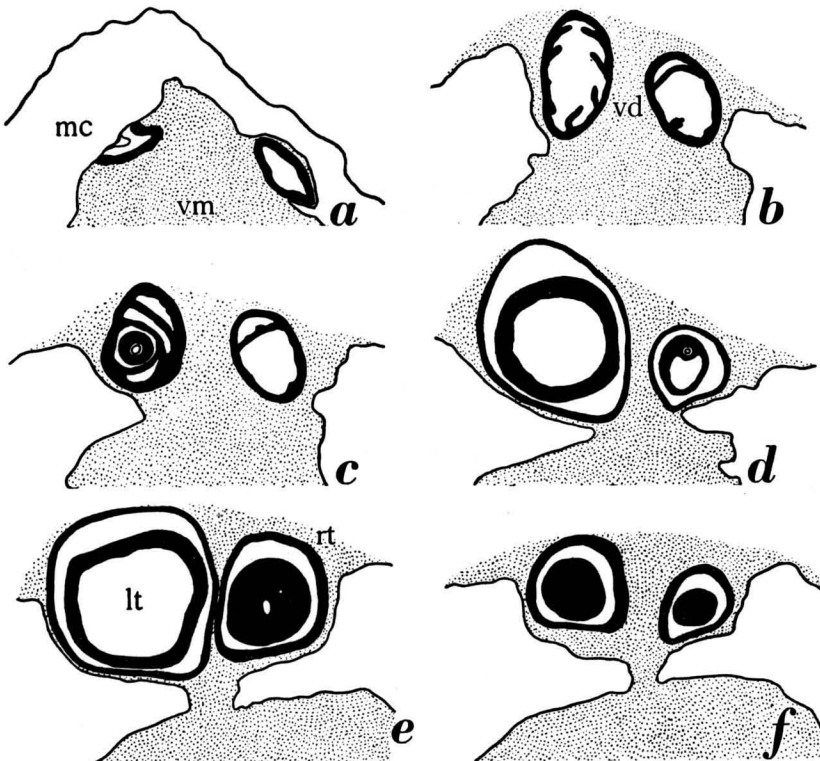


Fig. 4. *Sacculina synaptothrix* nov. spec., specimen on *Tiarinia gracilis* Dana. Longitudinal sections of the posterior part of the body; a through the region of the male genital openings, each following section from a more dorsal region. lt, left testis; mc, mantle cavity; rt, right testis; vd, vasa deferentia; vm, visceral mass.  $\times 45$ .

circular shape with slight concavities at the anterior and the posterior margins (fig. 3a, b). The external shape of the second specimen on *Tylocarcinus* is slightly different from that of the other two as it is more or less panduriform (fig. 3c). In all the specimens the mantle opening lies at the anterior margin of the left side (the surface regarding the thorax of the host, cf. BOSCHMA, 1948). Its surroundings do not noticeably protrude above the surface of the mantle. With the exception of a few little pronounced grooves in the posterior region the mantle to the naked eye presents a smooth surface.

Longitudinal sections have been made of all the three specimens, these show that they agree in all the salient points of their internal anatomy.

In the specimen on *Tiarinia* the male genital openings are found on the posterior extremity of the visceral mass ventrally from the region of attachment of the stalk (fig. 4a). Towards the dorsal region the vasa deferentia grow out into rather voluminous sacs which possess a few ridges on their internal surface (fig. 4b, c). Farther dorsally a narrow tube with a well developed chitinous wall forms the connection between the vas deferens and the testis (left in fig. 4c, right in fig. 4d). In a more dorsal region the testis of each side gradually obtains its greatest dimension. In this specimen the left testis grows to a somewhat larger size than the right

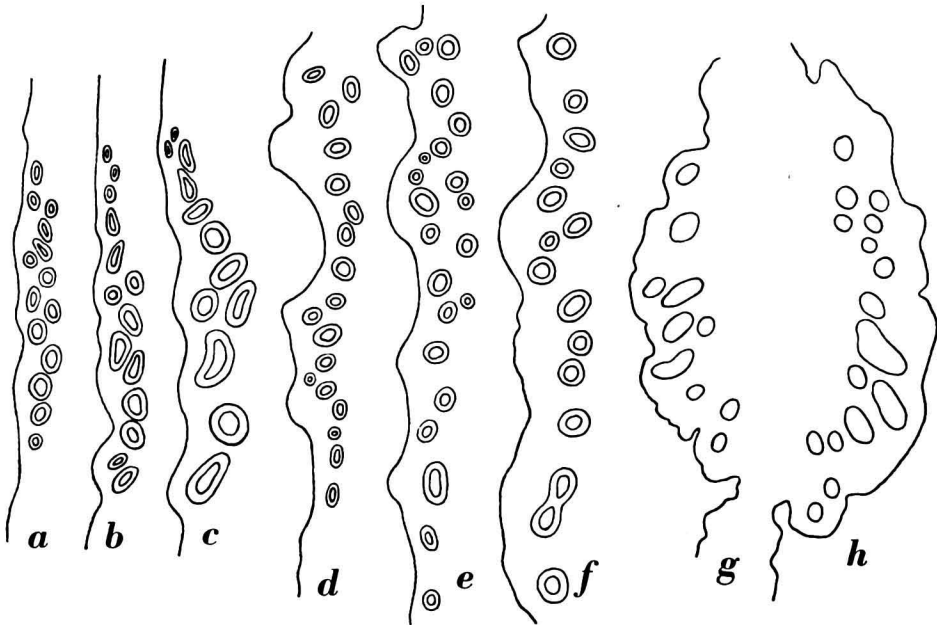


Fig. 5. *Sacculina synaptothrix* nov. spec. a—c, specimen on *Tiarinia gracilis* Dana, longitudinal sections of one of the colleteric glands; a from a rather peripheral region, each following section from a more central part. d—f, corresponding sections of one of the colleteric glands of one of the specimens on *Tylocarcinus styx* (Herbst). g, longitudinal section of the left colleteric gland of the other specimen on *Tylocarcinus styx* (Herbst).

h, longitudinal section of the right colleteric gland of the same specimen.

a—f,  $\times 80$ ; g, h,  $\times 135$ .

(fig. 4d, e), the cavity of the latter remains much smaller than that of the former. The extreme dorsal part of the two testes is represented in the section of fig. 4f.

The male organs of the two specimens on *Tylocarcinus* mutually are of an entirely similar structure, moreover they so completely correspond with those of the specimen on *Tiarinia* that only the chief individual peculiarities may be mentioned here.

In one of the specimens on *Tylocarcinus* the vasa deferentia show a greater amount of ridges than in the specimen on *Tiarinia*. In this specimen the two testes are well developed and have approximately the same size (fig. 7).

In the other specimen on *Tylocarcinus* the ridges of the vasa deferentia are inconspicuous. Here the two testes are of decidedly different size, the right being much larger and more fully developed, presenting a much wider cavity than the left (fig. 8).

The colleteric glands of the three specimens are strongly alike in shape and in the number and distribution of canals. The colleteric glands of the specimen on *Tiarinia* (fig. 5a—c) are rather flat organs, which show maximally 14 canals in a longitudinal section of the region of their most

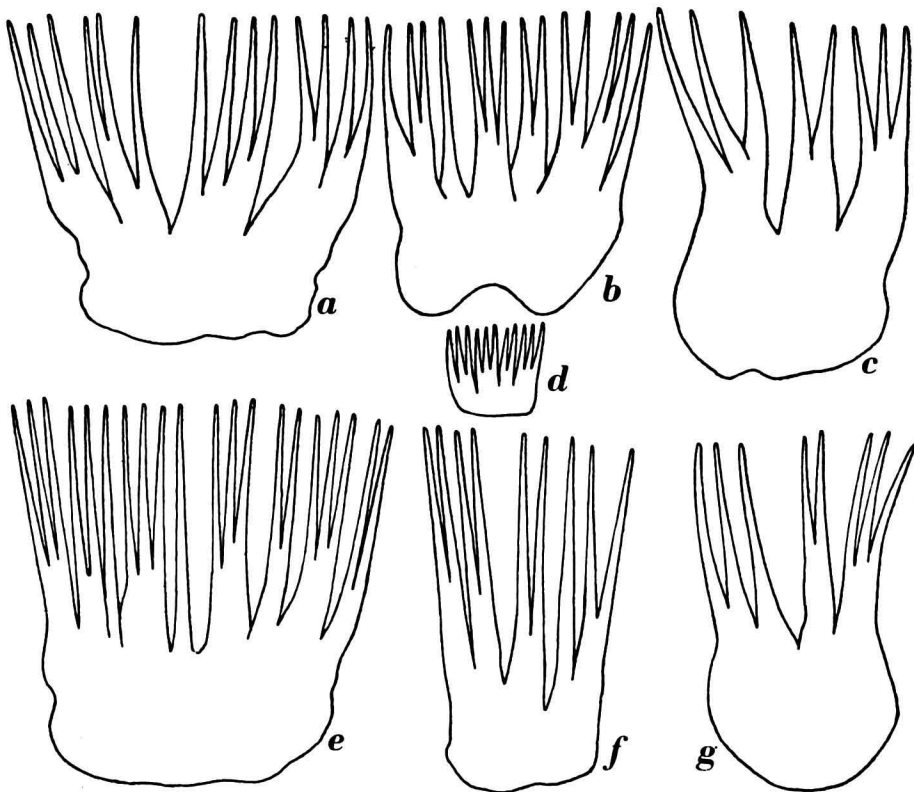


Fig. 6. *Sacculina synaptothrix* nov. spec., specimen on *Tiarinia gracilis* Dana, excrescences from various parts of the external cuticle.  $\times 530$ .

strongly branched part. These canals are arranged in one or two rows more or less parallel to the surface of the visceral mass.

In the first specimen on *Tylocarcinus* (fig. 5d—f) the colleteric glands are strikingly similar to those of the specimen on *Tiarinia*, they have approximately the same shape and show a system of canals of about the same arrangement. The maximum number of canals found in a longitudinal section in this specimen is 22.

In the second specimen on *Tylocarcinus* (fig. 5g, h) the colleteric glands are slightly more protruding over the surface of the visceral mass than those of the other specimens; their system of canals is not as distinct as in the former specimens, as the canals are not noticeably lined with chitin. The arrangement of the canals, however, is quite similar to that found in the other specimens. The largest number of canals counted in one longitudinal section of this specimen is 16.

In the specimen on *Tiarinia* the shape and size of the excrescences of the external cuticle of the mantle varies to some degree in different parts of the mantle. They invariably consist of groups of spines which are united

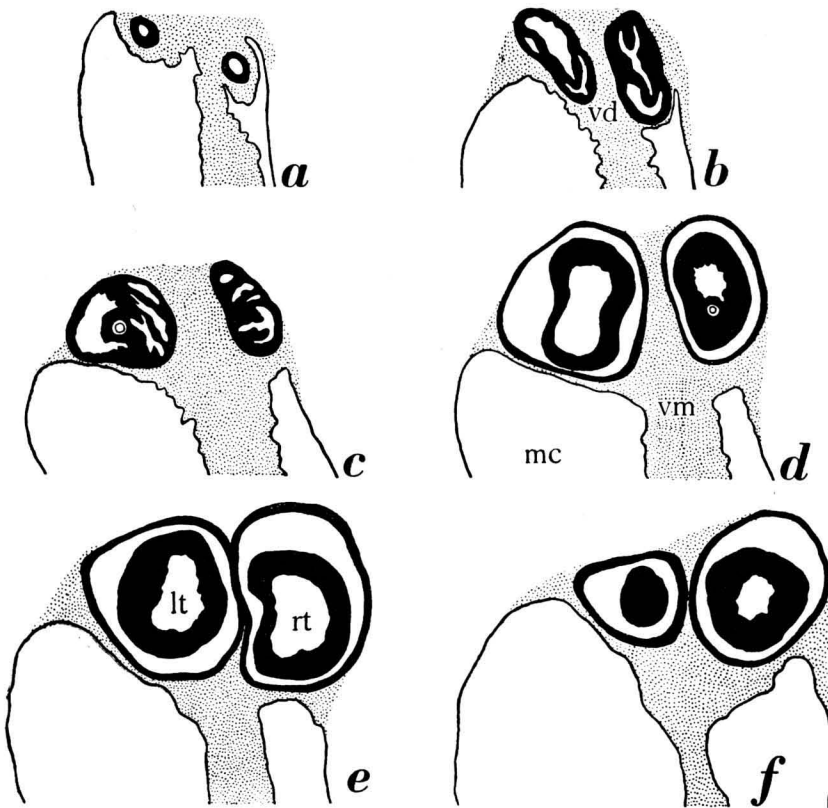


Fig. 7. *Sacculina synaptothrix* nov. spec., one of the specimens on *Tylocarcinus styx* (Herbst), longitudinal sections of the posterior part of the body; a from the ventral region of the male organs, each following section from a more dorsal part. lt, left testis; mc, mantle cavity; rt, right testis; vd, vasa deferentia; vm, visceral mass.  $\times 45$ .

on thicker branches, the latter again being united on a common basal part. The free spines as a rule are not longer than  $45\ \mu$  (exceptionally to  $65\ \mu$ ), the branches including the spines generally have a length of about  $60\ \mu$ , whilst the complete excrescences when well developed have a length of

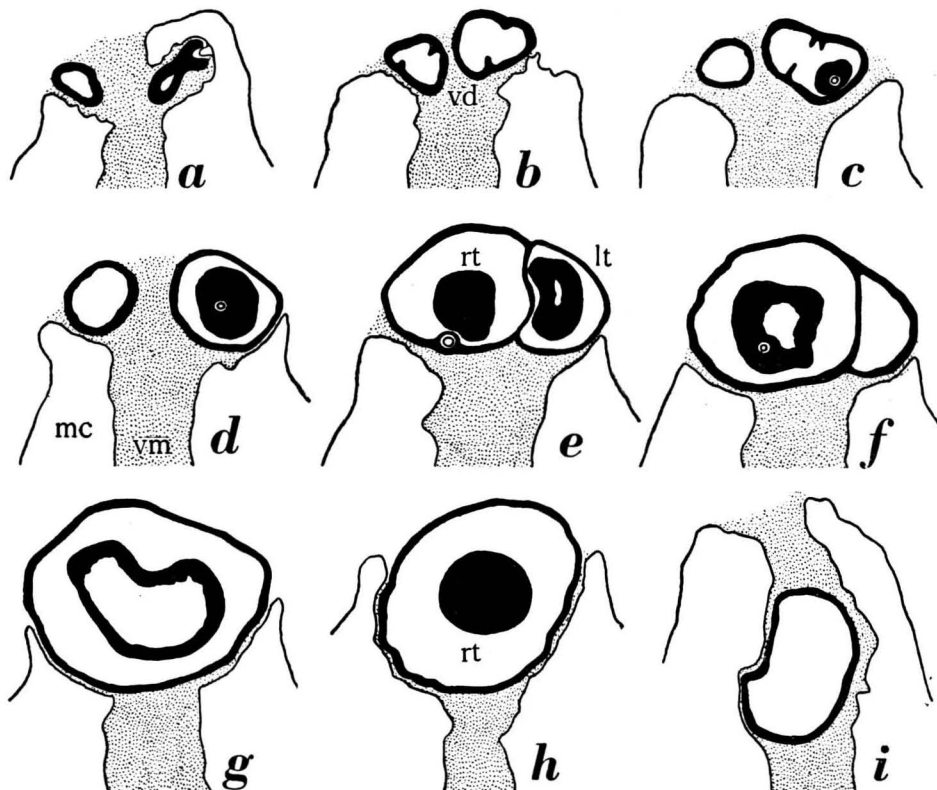


Fig. 8. *Sacculina synaptothrix* nov. spec., the other specimen on *Tylocarcinus styx* (Herbst), longitudinal sections of the posterior part of the body; a from the region of the male genital openings, each following section from a more dorsal part. lt, left testis; mc, mantle cavity; rt, right testis; vd, vasa deferentia; vm, visceral mass.  $\times 45$ .

$75$  to  $90\ \mu$ . In different parts of the mantle the excrescences show considerable variation in shape and size. Often the spines are rather short and strong, then as a rule the branches are rather distinct (fig. 6a—c, g). In other excrescences the spines are more slender and the branches are more crowded (fig. 6e, f). In the vicinity of the stalk the excrescences are much smaller, though of the same general character as elsewhere (fig. 6d).

The excrescences of the specimens on *Tylocarcinus* are of a somewhat different type from those of the former specimen, though in general they correspond in all important details. Here again small groups of spines are united on rather pronounced branches which in their turn are united on a well developed common basal part. The spines as a rule have a length of  $20$  to  $30\ \mu$ , exceptionally to  $40\ \mu$ , the branches (including the spines) have



a length of 45 to 60  $\mu$ , and in both specimens the maximal length of the excrescences is about 120  $\mu$ , though as a rule they remain shorter. Excrescences of various size and shape of one of specimens on *Tylocarcinus* are shown in fig. 9a, b, of the other specimen from the same crab in fig. 9c—e.

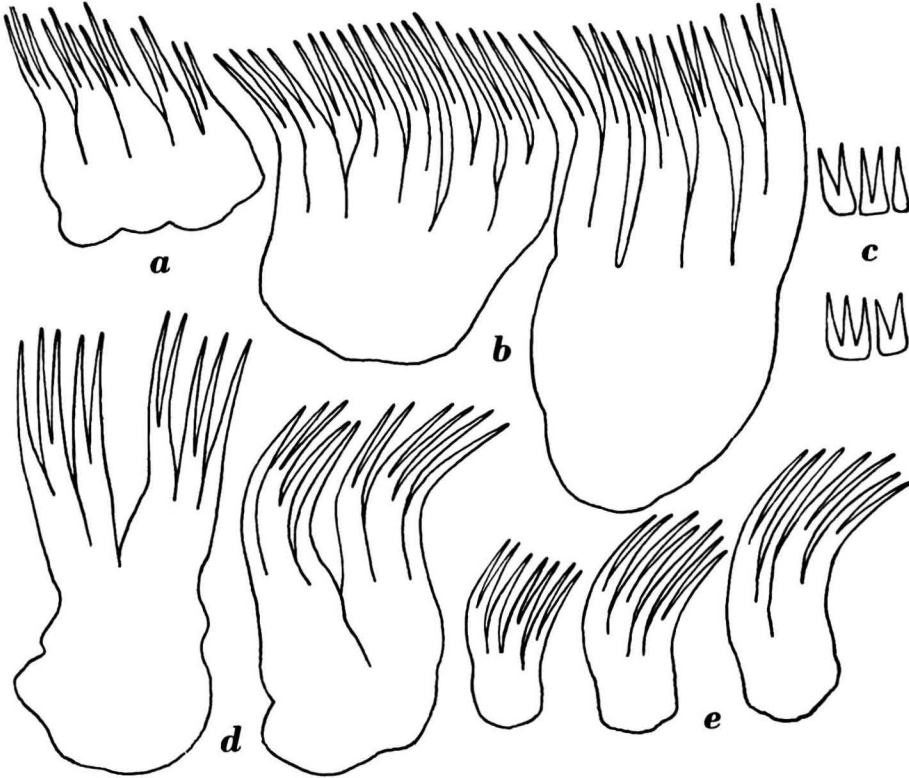


Fig. 9. *Sacculina synaptothrix* nov. spec., specimens on *Tylocarcinus styx* (Herbst), excrescences of the external cuticle. a, b, from one of the specimens; c—e, from the other specimen.  $\times 530$ .

The very small excrescences (fig. 9c) are from the vicinity of the stalk, where they do not grow out to the full size.

Retinacula were not found on the parts of the internal cuticle examined for this purpose, so that in all probability these organs do not occur in the species.

The most striking specific character of *Sacculina synaptothrix* is the peculiar structure of the excrescences of the external cuticle, different from those in other species especially on account of the presence of distinct branches.

#### *Sacculina glabra* V. K. & B.

*Sacculina glabra* Van Kampen & Boschma, 1925; Boschma, 1931; Boschma, 1937.

Beo, Talaud Islands, shore or reef, June 14—21, 1930, Snellius Expedition, 1 specimen on *Tiarinia gracilis* Dana.

The type specimen of *Sacculina glabra* was a parasite of the Maiid crab *Hyastenus subinermis* Zehntner; the present specimen, a parasite of the Maiid crab *Tiarinia gracilis* Dana, completely corresponds with the former in all important details. The external shape of the two specimens only is somewhat different. In the type specimen the mantle opening is found at the extremity of a rather narrow tube, in the present specimen the mantle opening and its surrounding tube are rather wide (fig. 10a). Moreover, in the type specimen the mantle shows a system of well marked grooves, whilst in the present specimen the surface of the mantle is smooth. The dimensions of the specimen on *Tiarinia* are  $5 \times 4 \times 2\frac{1}{2}$  mm.

From the type specimen a series of transverse sections was made (cf. BOSCHMA, 1937, fig. 38), from the specimen on *Tiarinia* a series of longitudinal sections. Therefore in the present specimen the male organs could be examined in transverse sections. A comparison with the longitudinal sections of the male organs in the type specimen shows that these organs in both specimens exactly agree in every detail. Fig. 11a shows

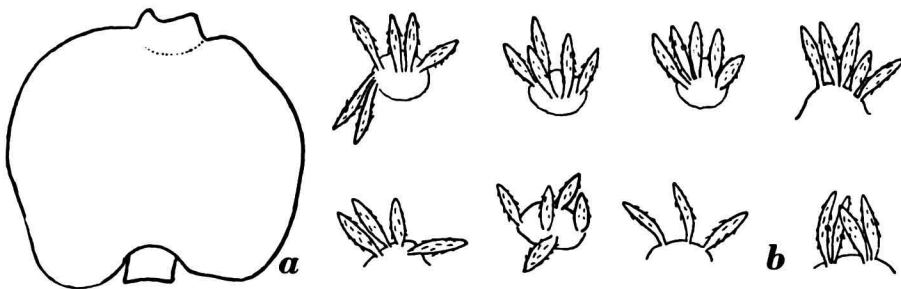


Fig. 10. *Sacculina glabra* V. K. & B., specimen on *Tiarinia gracilis* Dana. a, left side of the specimen (greater diameter 5 mm). b, retinacula. b,  $\times 530$ .

the ventral part of the two vasa deferentia, which here form comparatively narrow canals. Towards a more dorsal region the male organs considerably increase in size (fig. 11b) and still more dorsally their cavities become much narrower on account of irregular rather thick ridges developing on their inner walls (fig. 11c). In a still more dorsal region the two male organs again become canals with more or less circular contours and more or less circular cavities (fig. 11d).

The colleteric glands of the two specimens also have the same structure and a corresponding number of canals. A direct comparison is not possible as the one specimen was sectioned transversely and the other longitudinally. In the transverse sections of the colleteric glands of the type specimen the maximum number of canals is 23, in the longitudinal sections of the colleteric glands of the specimen dealt with here the maximum number of canals is 32 (fig. 11e, f). These numbers are of the same order. In the specimen dealt with here the canals of the colleteric glands have well developed chitinous walls, whilst in the type specimen hardly any chitin was present in these glands. These differences, however, depend upon different stages in the life history of the animals.

The external cuticle of the mantle is very thin, in the specimen dealt with here its thickness in various parts of the mantle varies from 3 to 12  $\mu$ . This is in accordance with that in the type specimen (about 7—8  $\mu$ ).

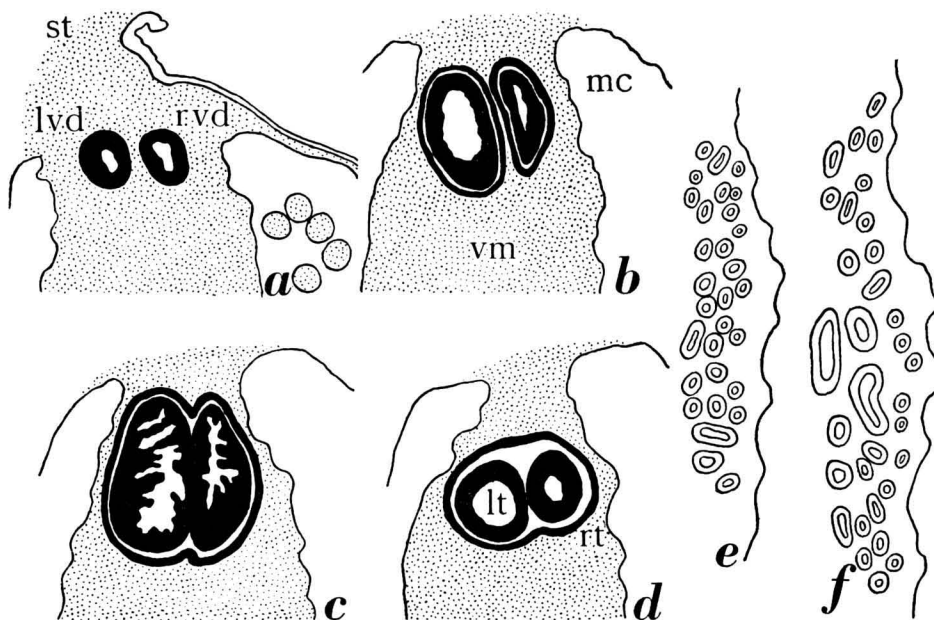


Fig. 11. *Sacculina glabra* V. K. & B., specimen on *Tiarinia gracilis* Dana. a—d, longitudinal sections of the posterior part of the body; a from the ventral region of the vasa deferentia, each following section from a more dorsal part. e, f, longitudinal sections of one of the colleteric glands, e from a more peripheral region than f.

a—d,  $\times 45$ ; e, f,  $\times 80$ .

In the type specimen no retinacula were found. They occur, however, on the internal cuticle of the mantle of the specimen on *Tiarinia*. The retinacula are more or less evenly distributed over the surface of the internal cuticle, they consist of a basal part and 3 to 6 spindles of rather slender shape (fig. 10b). The length of these spindles is about 15  $\mu$ , they possess distinct barbs.

*Sacculina glabra* on account of the peculiar structure of the male organs is a well characterized species, different from all others which have an external cuticle devoid of excrescences.

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