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## RHIZOCEPHALA FROM NEW GUINEA

### IV. NOTES ON PARASITES OF VARIOUS CRABS

by

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The parasites dealt with in the present paper were brought together by Dr. L. D. Brongersma, Dr. L. B. Holthuis, and Dr. M. Boeseman during their recent voyage to New Guinea <sup>1)</sup>. One of the specimens had to remain unidentified on account of lack of distinct characters; the other parasites proved to belong to previously described species, often presenting peculiarities leading to additional data of specific variation.

#### ***Sacculina brevispina*** Van Kampen & Boschma

No. 1323B. Biak Island, reef West of Sorido, 1 specimen on *Phymodius ungulatus* (H. Milne Edwards), February, 1955.

The type specimen of *Sacculina brevispina* is a parasite of the crab *Actaea hirsutissima* (Rüppell) from Sanguisiapu in the Sulu Islands (Van Kampen & Boschma, 1925, p. 27). The specimen from Biak Island was infesting another species of host, though both belong to the family Xanthidae. In some respects the specimen from Biak Island differs from the type of *Sacculina brevispina*, these differences are recorded below; they are, however, not of the kind to regard the two as specifically distinct.

The specimen from Biak Island has an irregularly oval shape (fig. 1a, b), at the posterior end a part of the body slightly protrudes next to the stalk. The mantle opening lies in the centre of the anterior region, somewhat turned towards the left side; its surroundings do not protrude over

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1) The voyage was made possible by a grant of the Netherlands Organization for Pure Research (Z. W. O.) and support from the Government of Netherlands New Guinea and the Royal Netherlands Navy.

the surface of the body. At the right side there is a distinct median groove in the posterior part, where the parasite was lying against the abdomen of the host (fig. 1*b*). The dorso-ventral diameter is  $7\frac{1}{2}$  mm, the antero-posterior diameter  $4\frac{1}{2}$  mm, and the thickness 2 mm.

The type specimen of *Sacculina brevispina* is slightly larger (dimensions 8 by  $6\frac{1}{2}$  by 3 mm), its mantle opening is wider, the surrounding parts somewhat extending over the surface, while at each side of the stalk the body has a distinctly protruding part (Van Kampen & Boschma, 1925, Pl. I

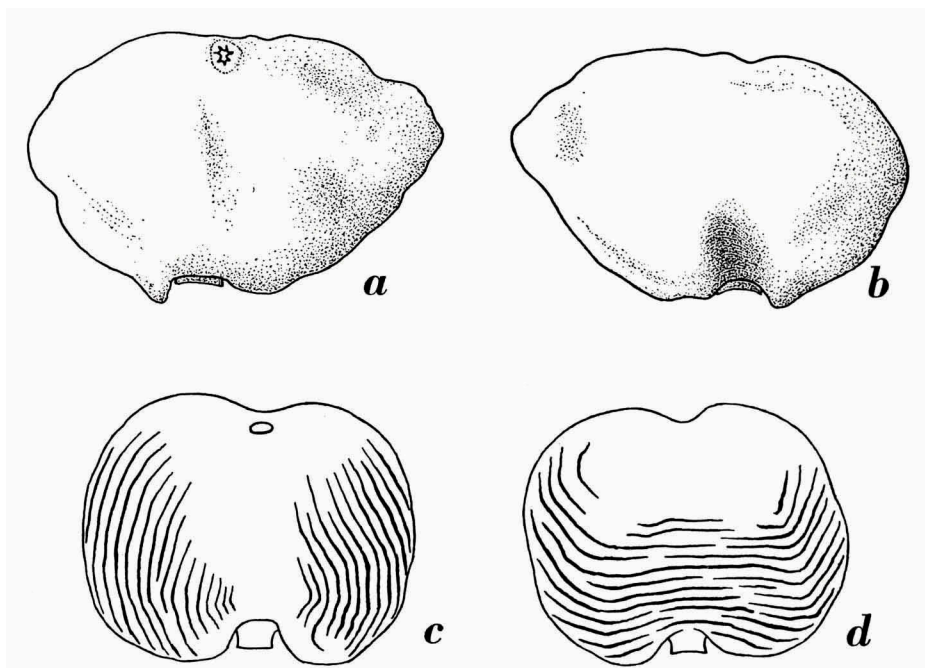


Fig. 1. *a, b*, *Sacculina brevispina* Van Kampen & Boschma, specimen no. 1323B; *a*, left side; *b*, right side. *c, d*, *Loxothylacus sclerothrix* Boschma, specimen no. 1325; *c*, left side; *d*, right side. *a, b*,  $\times 7\frac{1}{2}$ ; *c, d*,  $\times 5$ .

fig. 6). Its external appearance, therefore, is not strikingly different from that of the specimen from Biak Island.

In longitudinal sections it becomes apparent that the male genital organs of the specimen from Biak Island are contained in the posterior part of the body, outside the visceral mass (fig. 2*k, l*). The vasa deferentia are narrow canals (fig. 2*a, k*), in their dorsal parts at least one of the two has a well developed layer of chitin on its inner wall (fig. 2*b*). The testes are surrounded by a layer of muscles, at first they remain separated, but gradually, in their course towards the dorsal region of the body, they come

close together, being enveloped by a common muscular sheath (fig. 2*d, e*). Farther dorsally the two testes are still more closely joining (fig. 2*f, g*), gradually the cavities of the two unite (fig. 2*h*), till at last the common cavities

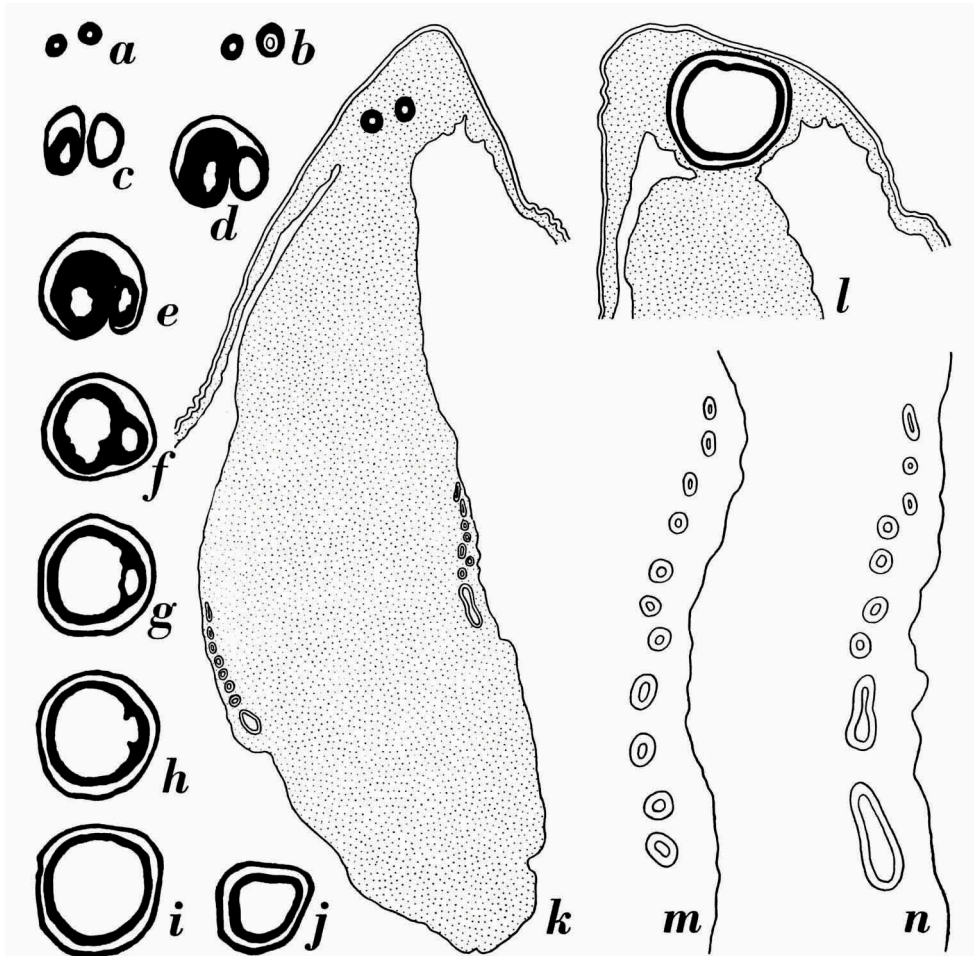


Fig. 2. *Sacculina brevispina* Van Kampen & Boschma, specimen no. 1323B. *a-j*, transverse sections of the male genital organs, from ventral to dorsal region; *k*, longitudinal section containing the vasa deferentia and the colleteric glands, the greater part of the mantle omitted; *l*, posterior part of a longitudinal section from the dorsal region of the male organs; *m, n*, longitudinal sections of one of the colleteric glands. Excrescences of external cuticle omitted. *a-l*,  $\times 30$ ; *m, n*,  $\times 127$ .

of the two have a circular shape in transverse section (fig. 2*i, l*). Still farther dorsally the combined testes become narrower (fig. 2*j*), soon terminating.

The structure of the male organs in the type of *Sacculina brevispina* (cf. Boschma, 1937, fig. 9a-h) in its chief peculiarities closely corresponds with that of the specimen from Biak Island. There are minor differences, in the type specimen no chitin was to be observed in the dorsal parts of the vasa deferentia, while the common part of the two male organs is flattened antero-posteriorly. The general structure, however, is not fundamentally different.

The colleteric glands of the specimen from Biak Island are found in the centre of each of the lateral surfaces of the visceral mass (fig. 2k).

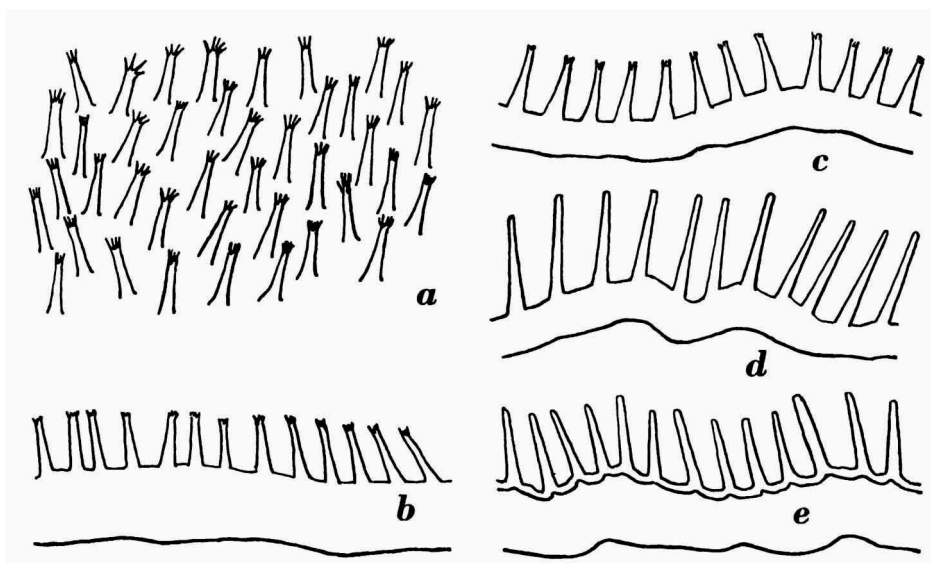


Fig. 3. *Sacculina brevispina* Van Kampen & Boschma, specimen no. 1323B. a, excrescences of the external cuticle in surface view; b-e, sections of the external cuticle.  $\times 530$ .

In these glands the tubes are arranged chiefly in one row along the surface (fig. 2m, n), the number of tubes being 11 in a longitudinal section in the region of strongest division. The type specimen of *Sacculina brevispina* has colleteric glands of an altogether similar structure, here the number of tubes is up to 14 in a longitudinal section (Boschma, 1937, fig. 9i-k).

In the specimen from Biak Island the external cuticle of the mantle generally has a thickness of 9 to 18  $\mu$ . Its surface is densely covered with rather stiff hairs of a length of 13 to 25  $\mu$  (fig. 3). Especially at their tops these hairs often bear a varying number of smaller hairs. Generally the excrescences consist of the same kind of chitin as that of the main layers

of the cuticle, exceptionally the hairs together with a thin upper layer of the cuticle are composed of chitin of a hyaline character, harder than that of the main layers (fig. 3e). In the type specimen (Van Kampen & Boschma, 1925) the external cuticle is thicker ( $30\ \mu$ ), while the excrescences are about  $15\ \mu$  long. The thickness of the external cuticle as a rule is subject to strong individual variation so that differences as here noted are not important.

In the type specimen retinacula were found, consisting of single spindles or of small groups of spindles, arranged in rows on the internal cuticle (Van Kampen & Boschma, 1925, fig. 16C). These structures were not found on the parts of the internal cuticle of the specimen from Biak Island which were examined for this purpose.

Two specimens of *Phymodius unguatus* bearing Rhizocephalan parasites were collected on the reef of Biak Island, the one of these is the specimen of *Sacculina brevispina* described above, while the other proved to belong to an altogether different species, *Loxothylacus sclerothrix*, as shown in a following part of the present paper.

#### ***Sacculina phacelothrix* Boschma**

No. 1329. Biak Island, reef West of Sorido, 1 specimen on *Chlorodiella nigra* (Forskål), January, 1955.

A parasite of *Chlorodiella nigra* from Trincomalee, Ceylon, in the collection of the Copenhagen Zoological Museum, was mentioned by Smith (1906) under the name *Sacculina carcini*. Later (Boschma, 1931) the specimen proved to represent a distinct species, *Sacculina phacelothrix*, with the following characters (Boschma, 1937, p. 290):

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 vasa deferentia; the latter are comparatively wide. Colleteric glands with few canals (less than 10 in longitudinal sections of the most strongly divided part), the canals neatly arranged in a single row parallel to the surface of the visceral mass. External cuticle of the mantle with excrescences of a hyaline kind of chitin, differing from that of the main layers of the cuticle. These excrescences are composed of groups of spines which in their basal part usually are not united, but they may be combined on a very little developed basal part. The spines have a length of 15 to  $30\ \mu$ , they may possess numerous minute lateral hairs. Internal cuticle of the mantle with retinacula which are more or less regularly distributed on its surface. Each retinaculum consists of a basal part and 3 to 5 spindles; the latter have a length of  $9\ \mu$  approximately.

In the cited paper another specimen on *Chlorodiella nigra* was mentioned in which the colleteric glands have a strongly branched system of tubes (up to more than 50 in a longitudinal section); this parasite afterwards was described as a separate species, *Loxothylacus vepretus*, the number of the colleteric glands in three specimens proving to be 40, 25, and 50, respectively (Boschma, 1947, fig. 5).

Up to now the type specimen of *Sacculina phacelothrix* is the only known representative of the species. The specimen from Biak Island is tentatively identified with this species, because it is a parasite of *Chlorodiella nigra* having male organs and colleteric glands of a structure altogether corresponding with those of the type specimen. Unfortunately the excrescences of the external cuticle in the specimen from Biak Island are not yet fully developed, while retinacula were not found on the internal cuticle.

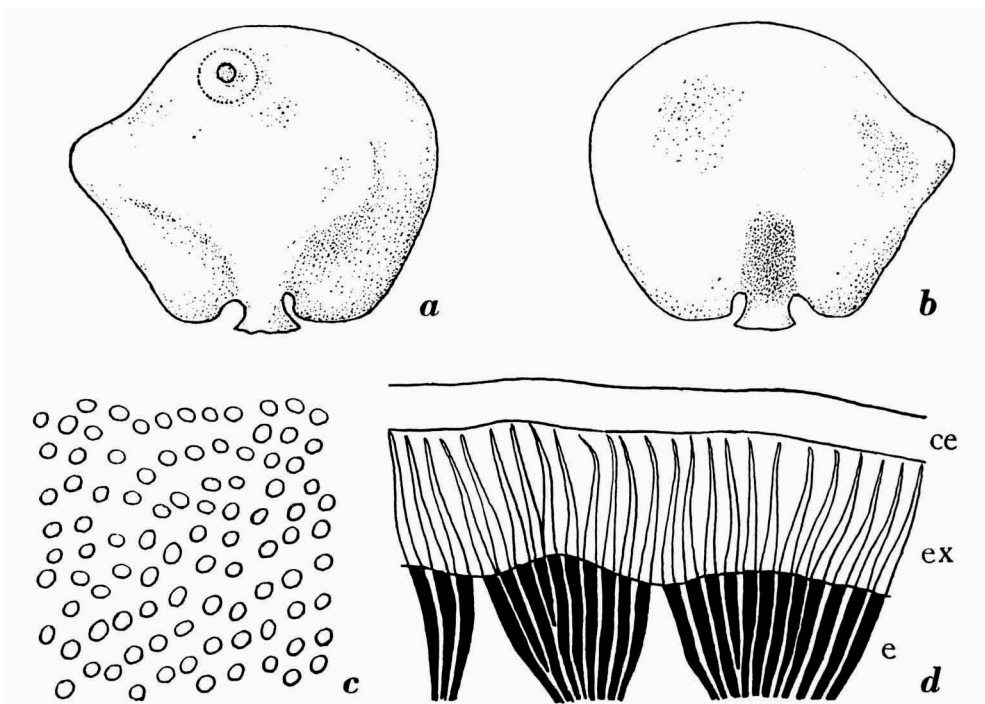


Fig. 4. *Sacculina phacelothrix* Boschma, specimen no. 1329. *a*, left side; *b*, right side; *c*, basal ends of the excrescences as appearing by transparency in surface view; *d*, upper part of a section of the mantle. *ce*, outer external cuticle; *e*, epithelial cells; *ex*, excrescences of the inner external cuticle. *a*, *b*,  $\times 10$ ; *c*, *d*,  $\times 530$ .

Lack of sufficient characters causes that the present identification is not absolutely certain, though probably correct, as shown below.

The type specimen of *Sacculina phacelothrix* measures 3 by  $2\frac{1}{2}$  by  $1\frac{1}{2}$  mm, it has an approximately circular shape (Boschma, 1931a, fig. 7g). The specimen from Biak Island is slightly larger, having a dorso-ventral diameter of 5 mm, an antero-posterior diameter of 4 mm, and a thickness of about 2 mm; it is of a rather asymmetrical shape, the dorsal half having an evenly convex contour, the ventral being bluntly pointed (fig. 4a, b).



The mantle opening is surrounded by a comparatively thick wall not rising over the surface of the mantle (fig. 4a), its shape and position entirely similar to the corresponding parts of the type specimen.

Longitudinal sections show that the male organs are like those of the type specimen (cf. Boschma, 1947b, fig. 8); parts of two sections are here shown, the one (fig. 5a) through the rather wide vasa deferentia, the other (fig. 5b) from the region of transition of the vasa deferentia into the testes, the figure shows the chitinous tube passing through the wall of one of the testes.

As in the type specimen the colleteric glands have very few tubes, up

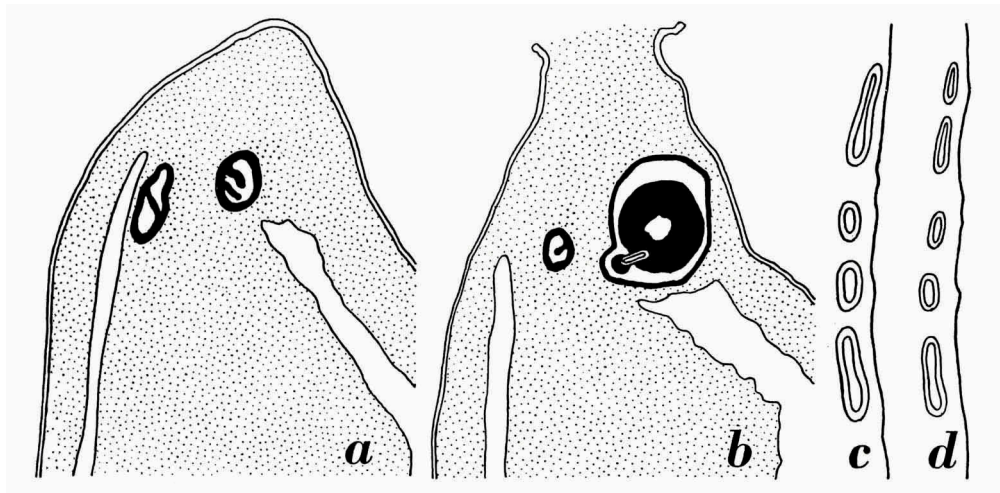


Fig. 5. *Sacculina phacelothrix* Boschma, specimen no. 1329. *a, b*, posterior parts of longitudinal sections, *b* through the stalk, *a* slightly farther towards the ventral region. *c, d*, longitudinal sections of one of the colleteric glands, *d* farther towards the periphery than *c*. *a, b*,  $\times 45$ ; *c, d*,  $\times 126$ .

to 5 in a longitudinal section of the region of strongest division, the tubes being arranged parallel to the surface (fig. 5c, d).

When examined in surface view the upper layer of the external cuticle of the mantle appears to be smooth or slightly rough without distinct excrescences; deeper focussing shows that under this layer there are a great number of papillae of regular distribution which have a diameter of 3 to 6  $\mu$  (fig. 4c). Sections of the mantle show that the external cuticle consists of two layers, an outer layer without any excrescences of a thickness of approximately 12  $\mu$  (ce in fig. 4d), and an inner layer consisting of an extremely thin membrane to which rather long pointed hairs are attached (ex in fig. 4d). These hairs consist of a rather weak kind of chitin, each

of the hairs is the direct continuation of a cell of the epithelium of the mantle (e in fig. 4d). When examined in surface view the basal parts of the hairs by transparency of the outer cuticle appear as the papillae of fig. 4c. Obviously the outer cuticle was intended to remain as long as the layer with the hairs had to undergo a further development leading to hyaline spines as they occur in the type specimen of *Sacculina phacelothrix* (cf. Boschma, 1931, fig. 22a, b).

Fig. 4d represents a part of the cuticle in which the hairs are fairly long (about 35  $\mu$ ), in other parts of the cuticle the hairs have half this length, while in still other parts the outer layer of the cuticle adheres to the epithelial cells, showing that the development of the hairs has not yet started.

Retinacula were not found on the parts of the internal cuticle examined. The presence of retinacula in the type specimen of *Sacculina phacelothrix* is an important character distinguishing the species from *Sacculina leptodidae* Guérin-Ganivet, in which to all appearances these structures are missing. In all other respects the two species are strongly similar. The colleteric glands of *S. leptodidae* as a rule have a larger number of tubes, but in some specimens the number of tubes is 5 in a longitudinal section (Boschma, 1948, fig. 20d).

Moreover, in the specimen here described the excrescences in course of development (ex in fig. 4d) are entirely similar to the corresponding structures of a specimen of *Sacculina leptodidae* on *Thalamita stimpsoni* A. Milne Edwards (Boschma, 1947a, fig. 3c). The outer cuticle preceding the definite cuticle is, however, distinct in the two species, without excrescences in the specimen on *Chlorodiella nigra*, with distinct excrescences in *Sacculina leptodidae*, which proved to be of constant shape in two specimens (i.e., figs. 3 and 4). This shows that the parasite of *Chlorodiella nigra* is specifically distinct from *S. leptodidae*, leading to a comparatively safe identification of the here described specimen with *Sacculina phacelothrix*.

#### **Sacculina spec.**

No. 1328B. Biak Island, reef West of Sorido, 1 specimen on *Tetralia glaberrima* (Herbst), February, 1955.

The parasite has an irregularly oval shape, the rather wide mantle opening, surrounded by a well developed sphincter, lies in the middle of the anterior region; the region of the mantle opening does not protrude over the surface of the mantle. The dorso-ventral diameter is 4 mm, the antero-posterior diameter 2½ mm, and the thickness 1½ mm.



The specimen was longitudinally sectioned, the state of preservation is, however, not perfect, while the visceral mass is rather damaged in the region where it is attached to the mantle. Moreover the specimen does not show characters which might lead to a definite specific identification. The male genital organs are found in the posterior part of the visceral mass, having a straight course in a ventro-dorsal direction. The two male organs are completely separated. The vasa deferentia are narrow canals which in their dorsal region form a narrow tube with chitinous inner wall; on each side this tube enters the testis of a more or less globular shape. The colleteric glands lie in the anterior half of the visceral mass, in a longitudinal section of the most strongly divided part they have about 16 tubes, arranged in two rows along the surface of the visceral mass. The external cuticle of the mantle has an entirely smooth surface, without any excrescences. The cuticle is extremely thin (thickness about  $3\ \mu$ ), in certain parts it is slightly wrinkled. Retinacula were not found.

The scanty data presented above indicate that the specimen does not show distinct characters leading to a reliable specific identification. This is to be regretted because the parasite dealt with here is the first to become known as infesting the crab *Tetralia glaberrima* (Herbst).

#### ***Heterosaccus ruginosus* Boschma**

No. 1318. Reef near Hollandia, New Guinea, 1 specimen on *Thalamita prymna* (Herbst), G. van Hout and G. T. Haneveld leg., April, 1955.

The description of *Heterosaccus ruginosus* was based on two specimens, the one a parasite of *Thalamita prymna* (Herbst) from Singapore, the other a parasite of *Lissocarcinus orbicularis* Dana from Amboina (Boschma, 1931), by subsequent designation the last named became the type specimen (Boschma, 1955a, p. 42). The measurements of the type specimen are  $6 \times 4\frac{1}{2} \times 3$  mm, those of the specimen on *Thalamita prymna*  $9 \times 5 \times 2$  mm. Shiino (1943) identified specimens on *Thalamita prymna* from Tanabe Bay, Japan, with *Heterosaccus ruginosus*; these were of considerably larger size, the measurements being  $18 \times 12.3 \times 7$  mm (apparently of the specimen with the larger dimensions); Shiino describes and figures an abnormality in the structure of the testes, which appear as if ruptured within their muscular sheaths in two spots. Nine specimens from the Nhatrang region, Indo-China, parasites of *Thalamita crenata* H. Milne Edwards, varying in size from  $24 \times 16 \times 5$  mm to  $16 \times 11 \times 4$  mm, were identified with *Heterosaccus ruginosus* (Boschma, 1955b). The same name is here given to a specimen on *Thalamita prymna* from Hollandia, New Guinea, not because this identification is undoubtedly right, but owing to lack of distinct specific characters, a common drawback in specimens of *Heterosaccus* with an ex-

ternal cuticle not bearing excrescences. The specimen is here described in some detail while comparing its peculiarities with those of previously described parasites to which the same name was given.

The parasite of *Thalamita prymna* is oval to kidney-shaped with a very wide mantle opening with a crenulated margin (fig. 6a), the left side is comparatively flat, the right side has a dorsal and a ventral convexity separated by a median longitudinal groove. The dorso-ventral diameter is 26 mm, the antero-posterior diameter 16 mm, and the thickness 8 mm, measurements of the same order as in the larger specimen on *Thalamita crenata* from Indo-China.

There is not a mesentery in the true sense. The vasa deferentia run along the part of the visceral mass that is broadly attached to the mantle, gradually passing into the testes which for some distance are continuing this course until in their dorsal parts they show a distinct curvature. In their extreme dorsal region the testes have a slightly sinuous course (fig. 6c, d), their terminal parts are distinctly pointing in a ventral direction (fig. 6b, lower part). The shape of the male organs largely corresponds with that in the parasites of *Thalamita crenata* from Indo-China (Boschma, 1955b, figs. 2, 3), though in the last named the curvature of the testes is more evenly convex.

The colleteric glands lie approximately in the central parts of the lateral surfaces of the visceral mass, containing a rather thick mass of tubes (fig. 6e, f). In the region of maximal division of the tubes a longitudinal section of a colleteric gland shows 48 tubes. The arrangement and the number of tubes closely correspond with the figured section of a colleteric gland of the specimen on *Thalamita prymna* from Singapore (cf. Boschma, 1955b, fig. 4d), though this specimen is less than half as large as the parasite from New Guinea. On the other hand the colleteric glands of a specimen on *Thalamita crenata* of about the same dimensions as the here described specimen show 86 tubes in a longitudinal section from the region of maximal division (i.e., fig. 4a). Apparently the number of tubes is subject to a great deal of variation, not directly correlated with the size of the parasites.

The external cuticle of the mantle is of varying thickness, in some parts of the mantle it is comparatively thin (about 12  $\mu$ ), in other parts it is much thicker (about 36  $\mu$ ). Its surface is smooth or covered with irregular small rugosities, never developing into excrescences of a definite shape. In some spots of the cuticle the surface is divided into small areas with sinuous contours (diameter 6 to 15  $\mu$ ).

Numerous retacula occur on the surface of the internal cuticle, consisting of a basal part and 4 to 6 spindles which do not show distinct barbs.

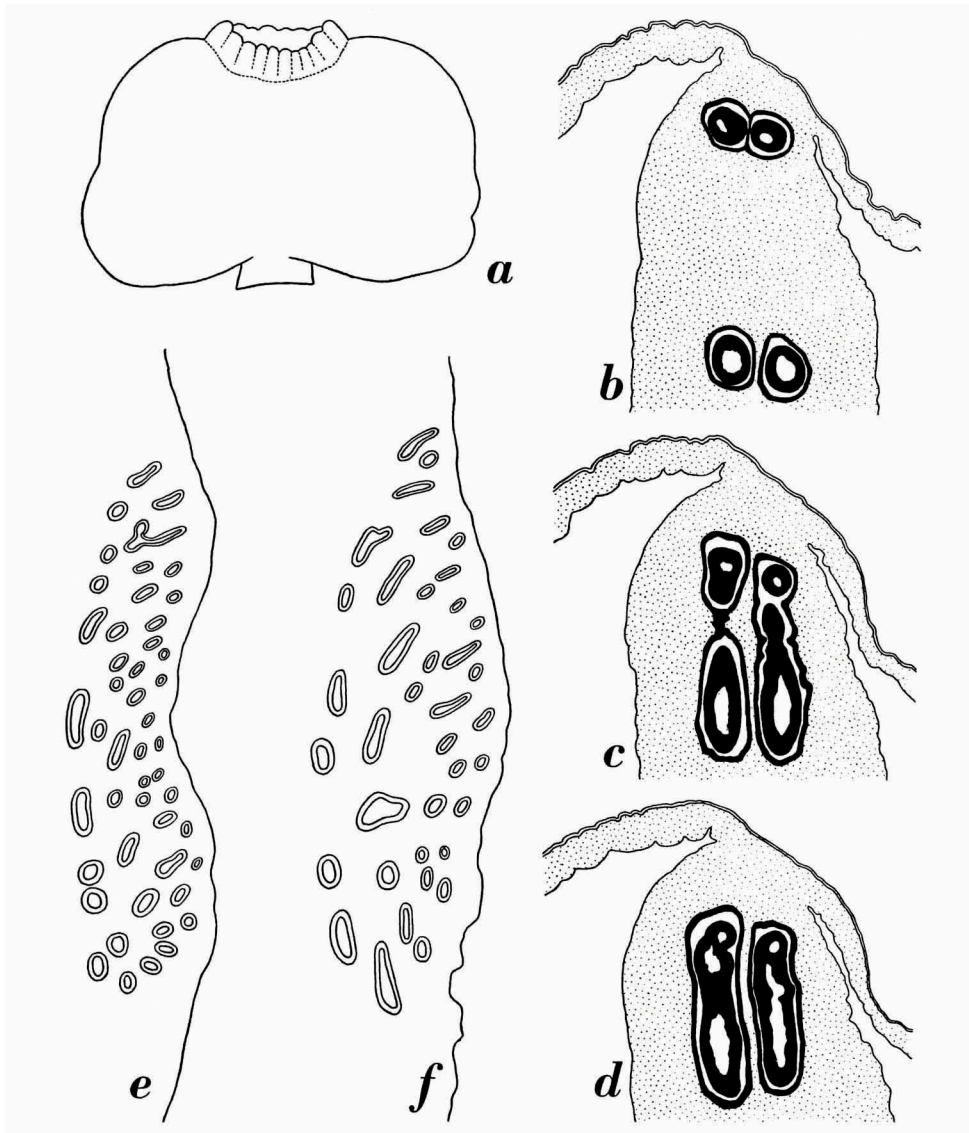


Fig. 6. *Heterosaccus ruginosus* Boschma, specimen no. 1318. *a*, left side; *b-d*, posterior parts of longitudinal section through the dorsal curvature of the testes; *e, f*, longitudinal sections of one of the colleteric glands. *a*,  $\times 2$ ; *b-d*,  $\times 12$ ; *e, f*,  $\times 53$ .

The minute structure of the external and of the internal cuticle consequently is not markedly different from the corresponding peculiarities of previously described specimens of *Heterosaccus ruginosus*. Perhaps one

restriction should be made, namely that in the specimens on *Thalamita prymna* from Japan the retinacula have 8 to 15 spindles, a much larger number than observed in other specimens (cf. Shiino, 1943, p. 31, fig. 21F).

### ***Loxothylacus sclerothrix* Boschma**

No. 1325. Biak Island, reef West of Sorido, 1 specimen on *Phymodius unguatus* (H. Milne Edwards), February, 1955.

The specimen is slightly panduriform, showing a distinct concavity in the centre of the anterior as well as of the posterior region (fig. 1c, d). The mantle opening is a narrow oval slit in the anterior region of the left side. The surface of the mantle shows a number of grooves parallel to each other, which on the left side chiefly run in an antero-posterior direction, on the right side chiefly transversely. The dimensions of the specimen are: dorso-ventral diameter 9 mm, antero-posterior diameter 7 mm, and thickness 4 mm.

The anatomical peculiarities were studied in a series of longitudinal sections.

The visceral mass is attached to the extreme right of the muscular region from which the stalk takes its origin (fig. 7a), in a sufficiently asymmetrical manner to show that in this respect the specimen is a typical *Loxothylacus*. The vasa deferentia begin their course as narrow canals (fig. 7a), towards the dorsal region they become wider, gradually passing into a part of the male organs in which the inner wall shows a system of ridges often reducing the cavities to narrow slits (fig. 7b-d). Farther dorsally these irregular parts pass into wider portions of the male organs (left side, fig. 7e; right side, fig. 7h). These wider parts of the male organs are in open communication in the median region of the body (fig. 7f), together forming a wide sac, generally showing traces of its being composed of two portions. The terminal part of the right half of the common sac (fig. 7d) extends somewhat farther ventrally than that of the left half.

In previously described specimens of *Loxothylacus sclerothrix*, viz., a specimen on *Actaea boletaria* Rathbun (Boschma, 1950, fig. 32), a specimen on *Carpilodes pediger* Alcock (Boschma, 1950, fig. 33), and a specimen on *Xantho sanguineus* (H. Milne Edwards) (Boschma, 1940, fig. 62), the combined terminal parts of the two male organs extend ventrally with a regular circular contour, while in the specimen on *Phymodius unguatus* from Biak Island the terminal parts of the common sac remain more or less separate. This difference, however, is not more striking than the differences shown by the three previously described specimens in other parts of the male organs, e.g., in the structure of the parts with irregular cavities. The four specimens of *L. sclerothrix* consequently present some

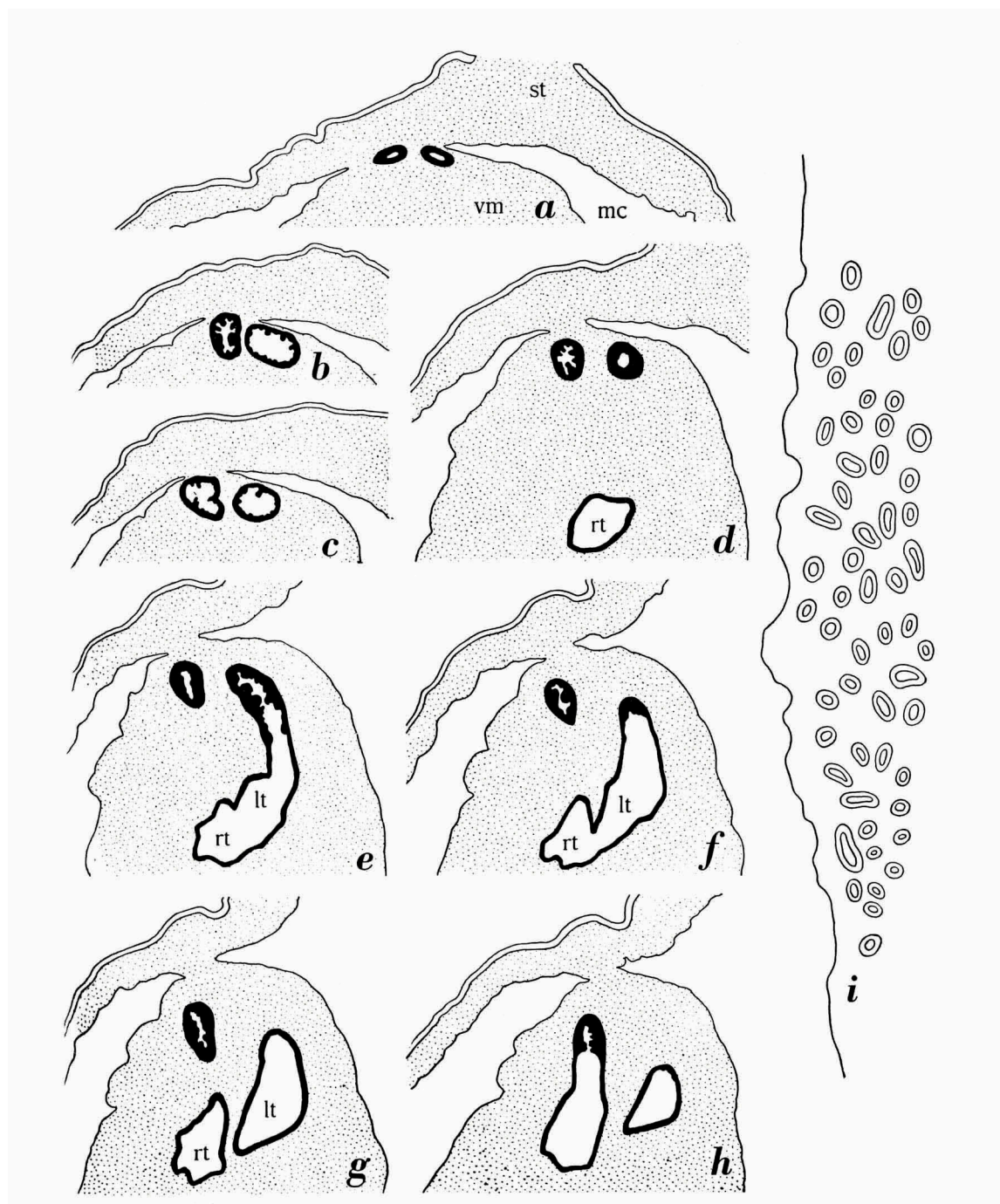


Fig. 7. *Loxothylacus sclerothrix* Boschma, specimen no. 1325. *a-h*, posterior parts of longitudinal sections, *a* through the stalk, each following section successively farther towards the dorsal region; *i*, longitudinal section of the right colleteric gland. lt, left testis; mc, mantle cavity; rt, right testis; st, stalk; vm, visceral mass. *a-h*,  $\times 27$ ; *i*,  $\times 114$ .

individual variation though the general shape of the male organs is of a common pattern.

In the specimen from Biak Island the colleteric glands form more or less flattened masses with regularly distributed tubes. The number of tubes counted in a longitudinal section of the most strongly divided region is 56 (fig. 7i). Apparently in *Loxothylacus sclerothrix* the number of tubes of the colleteric glands is more or less correlated with the size of the specimens. The parasite of *Actaea boletaria*, with a greater diameter of 4 mm, has 26 tubes (Boschma, 1950, fig. 32f); the parasite of *Carpilodes pediger*, with a greater diameter of 4 mm, has 31 tubes (Boschma, 1950, fig. 33a); the parasite of *Xantho sanguineus*, with a greater diameter of 7 mm, has 48 tubes (Boschma, 1940, fig. 63), and the parasite of *Phymodius unguulatus*, with a greater diameter of 9 mm, has 56 tubes (present paper, fig. 7i).

In the specimen from Biak Island the external cuticle of the mantle has a thickness varying between 18 and 30  $\mu$  (fig. 8c-e). Its surface is densely beset with small papillae with a diameter of 6 to 12  $\mu$ , the tops of which have a large number of minute spines. These excrescences often are crowdedly arranged (fig. 8a), in other parts of the mantle somewhat more sparsely (fig. 8b), but never widely separated. Sections show that the papillae are of a cylindrical shape, varying in height from 10 to 18  $\mu$ . Curiously enough in the specimen dealt with here the excrescences consist of a hyaline kind of chitin, differing from that of the main layers of the cuticle by being not stainable. Generally the excrescences are adhering to the upper layers of the cuticle, not penetrating downward (fig. 8c, d), exceptionally they show a number of small roots extending through the upper layers of the cuticle (fig. 8e). The shape and the size of the excrescences of the specimen on *Phymodius unguulatus* is not fundamentally different from what was found in previously described specimens (on *Actaea boletaria*, Boschma, 1933, fig. 21; on *Carpilodes pediger*, Boschma, 1950, fig. 34; on *Xantho sanguineus*, Boschma, 1940, fig. 64), but all the specimens that up to now became known have excrescences consisting of chitin not differing from that of the main layers of the cuticle. In one minor aspect the excrescences of the specimen from Biak Island differ from those of the specimens from other localities, viz., by the lack of small spines on their lateral surfaces; this may be correlated with the differences in the material structure of the excrescences.

The internal cuticle of the specimen from Biak Island bears numerous retinacula which consist of a comparatively large basal area on which 20 to 25 spindles occur with a length of 4 to 6  $\mu$ , apparently without barbs, closely corresponding with those found in other specimens of *Loxothylacus*



*sclerothrix* (Boschma, 1933, fig. 21d, e; 1940, fig. 65). These retinacula having an altogether peculiar structure, unlike those of all the other species of Sacculinidae, they furnish a strong argument for the identification of the specimen with *Loxothylacus sclerothrix*.

In their external appearance the various specimens which up to now have

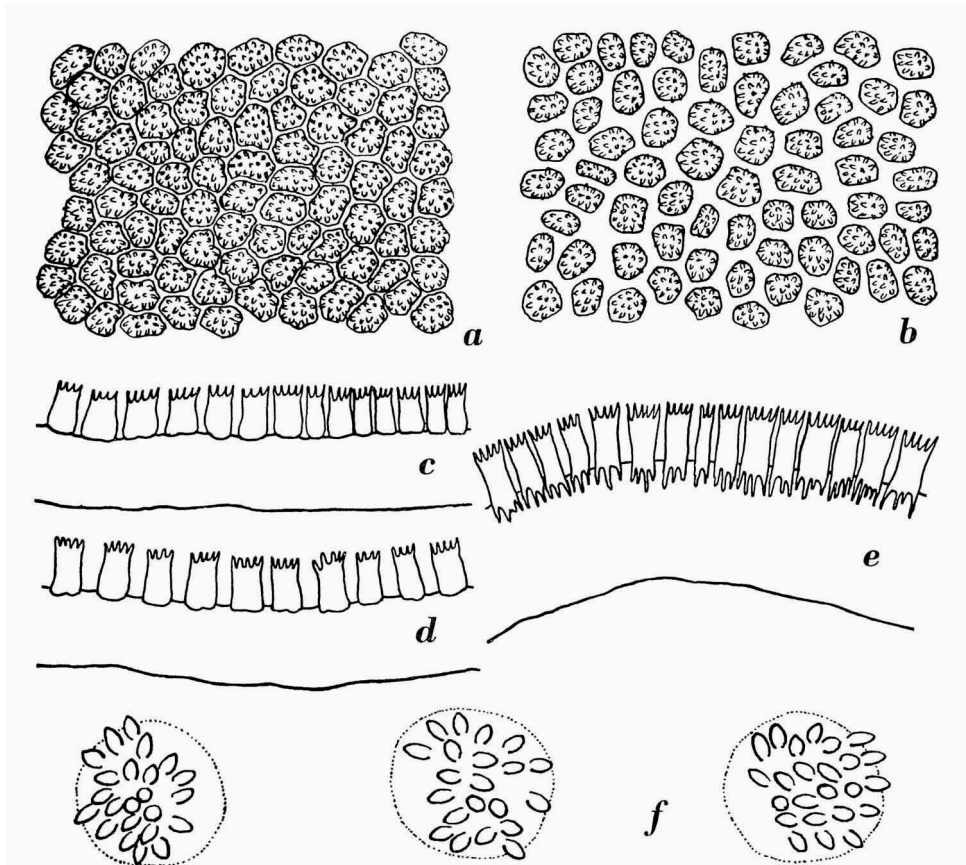


Fig. 8. *Loxothylacus sclerothrix* Boschma, specimen no. 1325. a, b, excrescences of the external cuticle in surface view; c-e, sections of the external cuticle; f, retinacula.  $\times 530$ .

become known as *Loxothylacus sclerothrix* are rather widely different. The specimen on *Actaea boletaria* is of a more or less circular shape with a comparatively smooth surface (Boschma, 1947c, fig. 5b, 1950, fig. 2k), the specimen on *Xantho sanguineus* is broadly oval with a comparatively smooth surface (Boschma, 1940, p. 367; not figured). On the other hand the specimen on *Phymodius unguulatus*, which has an oval shape, has a great



number of grooves (fig. 1c, d in the present paper), while in the more or less broadly oval specimen on *Carpilodes pediger* the mantle has numerous strongly developed grooves, giving the specimen a pronouncedly wrinkled appearance (Boschma, 1950, fig. 3f).

In the specimen of *Loxothylacus sclerothrix* from Biak Island the excrescences of the external cuticle differ from those of the previously described parasites of this species by their altogether different type of chitin. A similar, though less striking, difference is shown in certain parts of the cuticle of the specimen of *Sacculina brevispina* from Biak Island, as described on a previous page. Moreover, a corresponding peculiarity was observed in the specimens of *Loxothylacus variabilis* from Biak Island (cf. Boschma, 1955c), these having excrescences consisting chiefly of hyaline chitin, in contradistinction to the specimens which were examined during the original description of the species (Boschma, 1940). This leads to the conclusion that, as far as the material of the present collection is concerned, the Sacculinidae from Biak Island generally have a stronger development of the excrescences than specimens from several other localities.

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