KONINKLIJKE NEDERLANDSCHE AKADEMIE VAN WETENSCHAPPEN

The Rhizocephalan parasites of the crab Actaea hirsutissima (Rüpp.)

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Reprinted from Proceedings Vol. L, Nº. 3, 1947

1947
NORTH-HOLLAND PUBLISHING COMPANY
(N.V. Noord-Hollandsche Uitgevers Mij.)
AMSTERDAM

Zoology. — *The Rhizocephalan parasites of the crab Actaea hirsutissima (Rüpp.).* By H. BOSCHMA.

(Communicated at the meeting of January 25, 1947.)

The present paper contains notes on four different species of Rhizocephala which may occur as parasites of the crab *Actaea hirsutissima* Rüpp. One of these is described here as a new species, *Sacculina ignorata;* previously specimens of this parasite had been wrongly identified. It proved to be distinct as it shows retinacula of a kind not yet known in parasites with more or less corresponding characters as far as concerns other parts of the body. Another species, *Loxothylacus variabilis,* until now was not recorded as a parasite of *Actaea hirsutissima.*

The four parasites dealt with here may be characterized in the following manner:

Sacculina brevispina V. K. and B., 1925 (diagnosis copied from BOSCHMA, 1937): Male genital organs in the posterior part of the body, outside the visceral mass, in their dorsal part largely united, forming a common wide sac. Testes abruptly passing into the vasa deferentia, which, especially in their ventral part, are rather narrow. Colleteric glands with comparatively few canals, arranged in a single row parallel to the surface of the visceral mass. External cuticle of the mantle rather sparsely covered with small blunt spines of approximately 15 μ length, which may possess a few minute hairs. Internal cuticle of the mantle with rows of retinacula, each consisting of a basal part and a variable number (1 to 4) of spindles. The latter are of variable size; they may reach a length of 20 μ.

Type on *Actaea hirsutissima* (Rüpp.); type-locality Sanguisiapo, Sulu Archipelago. The species is not known to occur on other hosts.

Sacculina microthrix Boschma, 1931c (diagnosis copied from BOSCHMA, 1937): Male genital organs in the visceral mass, completely separated. Testes more or less globular, rather abruptly passing into the comparatively wide vasa deferentia. Colleteric glands with a moderate number of canals. External cuticle of the mantle densely covered with small thin hairs which have a length of 3 to 8 μ. The structure of the chitin of these hairs is not different from that of the main layers. Retinacula unknown.

Type on *Actaea hirsutissima* (Rüpp.); type-locality Banda Neira. The species is not known to occur on other hosts.

Loxothylacus variabilis Boschma, 1940: Male genital organs of equal size or left small and right large. Curvature of male organs distinct, narrow or wide, or male organs slightly bent, or male organs practically straight. Colleteric glands with a moderate to fairly large number of branched canals. External cuticle densely covered with comparatively small hairs (minimum and maximum measurements 6 and 52 μ). Between these hairs there are larger spines in far smaller numbers (minimum and maximum measurements 30 and 186 μ). The excrescences have undivided tips or are irregularly divided into smaller branches. Retinacula with 1 to 5 spindles which may show barbs and vary in length from 9 to 13 μ.

Type on *Chlorodiella nigra* (Forsk.); type-locality near Koepang, Timor. The species moreover is known as a parasite of *Actaea rüppellii* (Krauss) and of another, unidentified Xanthid crab. To these hosts now *Actaea hirsutissima* (Rüpp.) must be added.

Sacculina ignorata nov. spec.: Male genital organs in the posterior part of the body, outside the visceral mass, completely separated. Testes more or less globular, abruptly passing into the wide vasa deferentia. Colleteric glands with a small number of canals (less than 10 canals in the most strongly branched region of these glands). 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 the cuticle. As a rule the spines of each group remain isolated, though they may be united on a common basal part. The length of the spines is 30 to 80 μ. Retinacula with single spines of a length of 10 to 15 μ, occurring in groups or rows on the surface of the internal cuticle.

Type on *Actaea hirsutissima* (Rüpp.); type-locality Ghardaqa, Red Sea (from edge of shore reef by the Laboratory, collected by Mahmûd Eff. Ramadan). The species is not known to occur on other hosts.

Some more details of the specimens examined follow here.

A well preserved specimen, from which a series of longitudinal sections has been made (no. 943 A), is selected as the type of the species. Its measurements are: greater diameter 9 mm, antero-posterior diameter 6½ mm, thickness 4 mm.

The male genital organs have the same shape and structure as those of numerous other parasites which possess excrescences of the external cuticle consisting of groups of hyaline spines. The male organs are found in the posterior part of the body, outside the visceral mass (fig. 1a). The vasa deferentia are rather wide, their lumen is divided into a number of cavities on account of a great number of ridges on the inner wall (fig. 1*b*). The testes are united to the vasa deferentia by a narrow canal with a chitinous wall. In fig. 1*c* this narrow canal is seen in the anterior wall of the right testis, the testis itself is surrounded by a thin muscular layer. The connection of the left vas deferens with its testis is represented in fig. 1*d*, here the narrow canal is found between the lumina of the vas deferens and of the testis. In the latter section a more dorsal part of the right testis is shown. As usual in the parasites of this group one of the testes is found at a slight distance behind the other.

The colleteric glands (fig. 2) are comparatively small. They contain few canals only (less than 10 in the most strongly branched region of the glands). The canals are neatly arranged in a single row along the surface of the visceral mass.

The external cuticle of the mantle is covered with excrescences in the shape of spines which consist of a hyaline, hard kind of chitin, distinctly

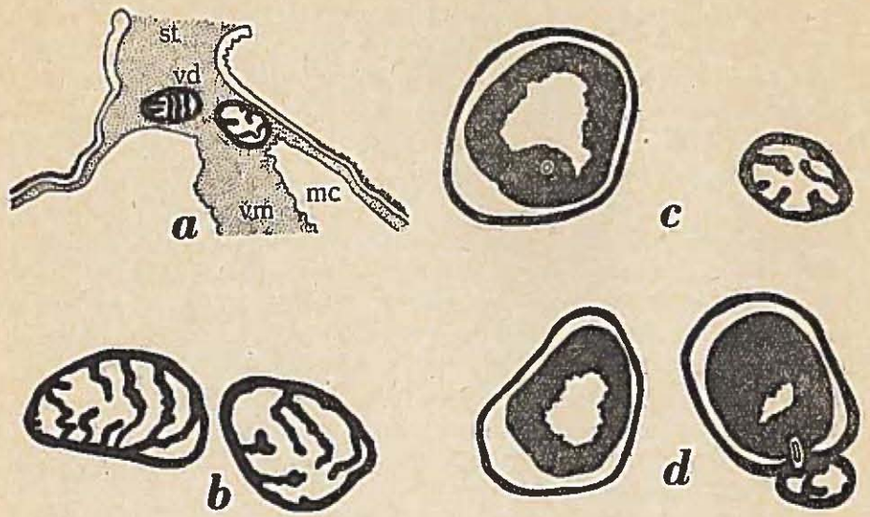

Fig. 1. *Sacculina ignorata*. *a*, longitudinal section through the stalk; *b—d*, parts of longitudinal sections showing the transverse section of the male genital organs in different planes; *b*, through the vasa deferentia, each following section from a more dorsal region. *a*, × 18, *b—d*, × 45.

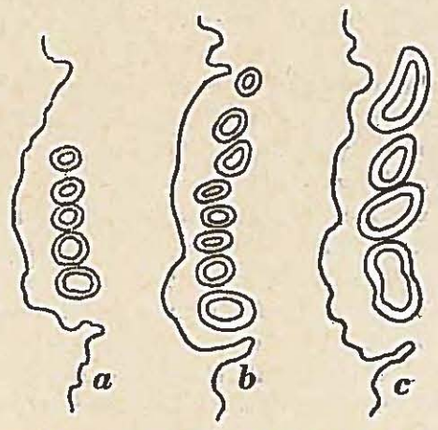

Fig. 2. *Sacculina ignorata*, longitudinal sections of one of the colleteric glands; *a*, of the peripheral region, each following section from a more central part. × 72.

different from that of the main layers of the cuticle. The spines are more or less arranged in groups of a few spines each (fig. 3). Generally the individual spines remain completely isolated, rather exceptionally two or three spines may be united in their basal part. In some regions of the

cuticle all the spines remain isolated, in other parts compounds of two or three spines are rather common. The length of the excrescences varies, in

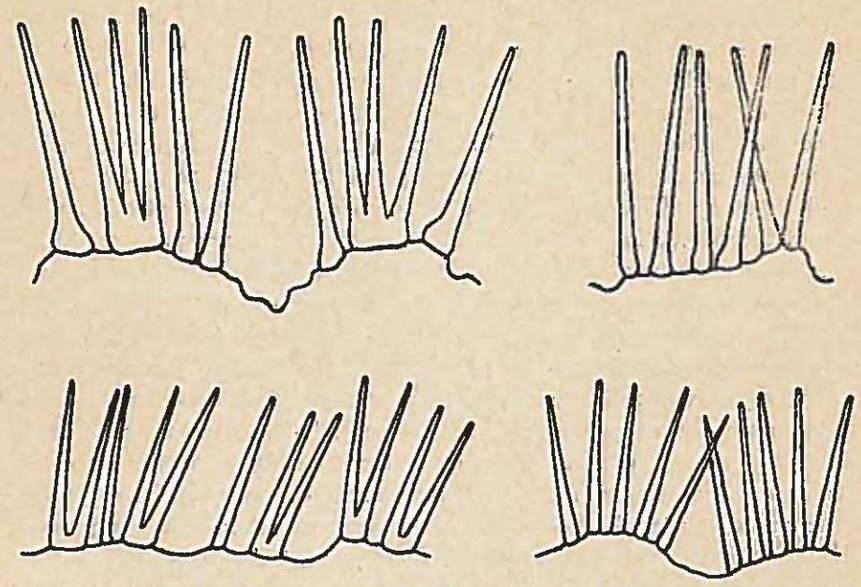

Fig. 3. *Sacculina ignorata*, excrescences on the surface of various parts of the external cuticle. × 530.

some regions of the mantle the spines are 30 to 50 μ, in other regions 55 to 65 μ.

On the internal cuticle of the mantle there occur retinacula which are arranged in groups or rows on the surface. (fig. 4). Each retinaculum

Fig. 4. *Sacculina ignorata*, retinacula as they are arranged on the internal cuticle. × 530.

consists of a single spindle which has a length of 10 to 15 μ. The spindles are not barbed.

In previous papers remarks have been made on specimens of parasites of *Actaea hirsutissima* which undoubtedly belong to *Sacculina ignorata*. These specimens were collected in the Red Sea at Jiddah in 1881, their state of preservation was not sufficient for a distinct study of the internal organs. The excrescences of these specimens were described by VAN KAMPEN and BOSCHMA (1925), here already attention was drawn to the fact that the spines for the greater part are not united into compounds with a common basal part. In another paper (BOSCHMA, 1928, fig. 2*d*) an excrescence is represented consisting of three united spines. Later (BOSCHMA, 1931b, fig. 11*d*) a section of the posterior part of the body was represented, showing one of the testes. In the same paper (l.c., fig. 13) drawings of groups of excrescences as they occur on the external cuticle of the mantle are figured. The spines of these two specimens may attain a length of 80 μ, so that they may become slightly larger than those of the type specimen.

Various species of crabs may be found to be infested by parasites which completely correspond with *Sacculina ignorata* as far as concerns the shape of the male genital organs and that of the colleteric glands whilst moreover they show excrescences of the external cuticle of similar structure. Now in *S. ignorata* as a rule the excrescences consist of isolated or very little united spines whilst as a rule in the other forms the spines are united into compounds. But in this respect *S. ignorata* is but gradually distinct from the other forms. The retinacula of *S. ignorata*, however, form a character of a high order and on account of these excrescences the species is easily to be distinguished from the other forms with similar male and female organs. In these latter forms a thorough search has been made for retinacula on the surface of the internal cuticle; as they never were found it seems a safe conclusion to state that these forms are devoid of retinacula.

Sacculina phacelothrix Boschma, 1931a, closely corresponds with *S. ignorata* in the shape of the male genital organs, of the colleteric glands, and of the excrescences of the external cuticle, which consist of isolated hyaline spines arranged in small groups. The two species show, however, striking differences in the shape of their retinacula, which in *S. ignorata* have a single spindle each, whilst in *S. phacelothrix* each retinaculum has 3 to 5 spindles. These differences are so pronounced that they give proof of the specific distinction of the two forms.

The characters of *Sacculina microthrix* (cf. BOSCHMA, 1931c) seem to be of distinct specific value. As, however, the specimens on which the description is based still are immature it is not quite certain that the definite specific characters, especially those of the excrescences of the cuticle, as yet are known. The male organs of *S. microthrix* closely correspond with those of *S. ignorata*, the colleteric glands have a far larger number of canals (cf. BOSCHMA, 1937).

The other two parasites of *Actaea hirsutissima* are strongly different from *S. ignorata*. In *S. brevispina* the male genital organs are largely united and the excrescences of the cuticle are different, this holds for the spines

as well as for the retinacula. In *S. brevispina* the spines of the external cuticle are far more sparsely distributed than those of *S. ignorata*. In both species the retinacula are arranged in rows, but whilst in *S. ignorata* all retinacula consist of a single spindle, in *S. brevispina* two to four spindles may be united on a common basal part. *Loxothylacus variabilis* differs from *Sacculina ignorata* besides by its generic characters by the peculiar shape of its excrescences.

It is interesting that in the specimen of *L. variabilis* on *Actaea hirsutissima* two layers of external cuticle are present (fig. 5). Both layers have a quite similar structure, the outer layer is thinner than the inner, and the smaller excrescences are more densely arranged on the inner layer than on

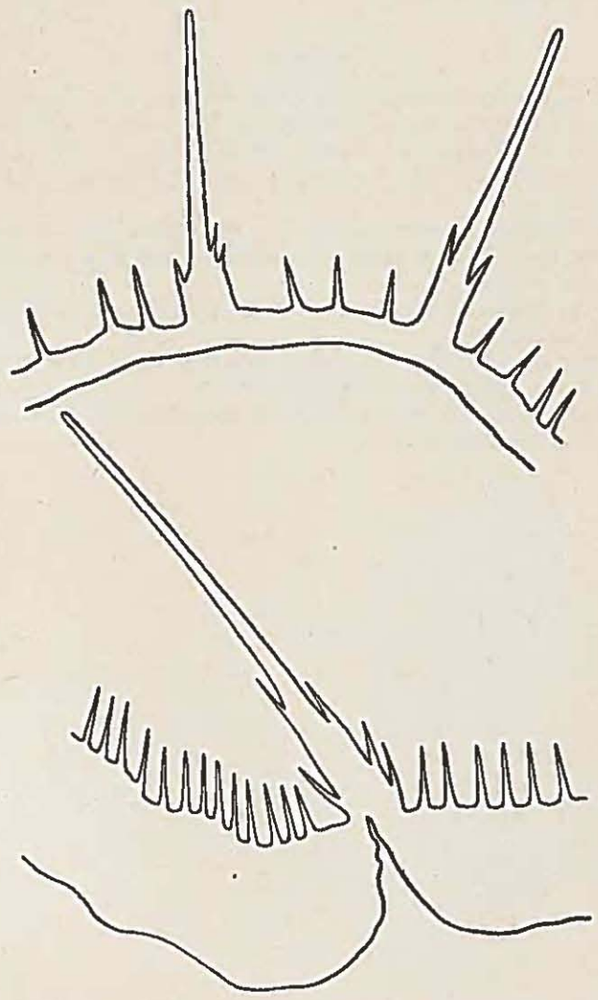

Fig. 5. *Loxothylacus variabilis*, specimen on *Actaea hirsutissima*, section of the two layers of external cuticle. × 530.

the outer. As far as concerns the male genital organs this specimen shows a strong resemblance to the type (BOSCHMA, 1940), as these organs are not strongly unequal in size and possess a distinct curvature.

The pronounced differences in the characters of the four species of Sacculinidae known to occur as parasites of *Actaea hirsutissima* show that these differences really are due to specific qualities of the parasites themselves. The influence of the host is not evident in these characters.

In contradistinction to the three other species which till now are known as parasites of *Actaea hirsutissima* (Rüpp.) only, *Loxothylacus variabilis* is known to infest four different species of crabs. As, however, all these crabs belong to the family Xanthidae it is not astonishing that they may have the same species of parasite.

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