SOME RHIZOCEPHALAN PARASITES OF XANTHID CRABS

BY

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The present paper deals with variation in two species of the genus *Loxothylacus*, each occurring as a parasite on two different crabs of the family Xanthidae. As in other species of the genus the variation manifests itself chiefly in the male organs; in the two species the distinctive characters in the first place are those of the excrescences of the external cuticle of the mantle.

Loxothylacus murex nov. spec.

Benkulen, Sumatra, 1 specimen on *Xanthias lamarcki* (H. M. E.), VON MARTENS leg. (collection Zoological Museum Berlin, no. 2788); holotype, 6 × 5 × 3 mm.

Kupang, Timor, 1 specimen on *Cymo melanodactylus* de Haan, Snellius Expedition; paratype, $7\frac{1}{2} \times 5\frac{1}{2} \times 3\frac{1}{2}$ mm.

The two specimens (fig. 1) are of a similar shape; both are roundish to slightly oval. In the two specimens the mantle opening is found in a

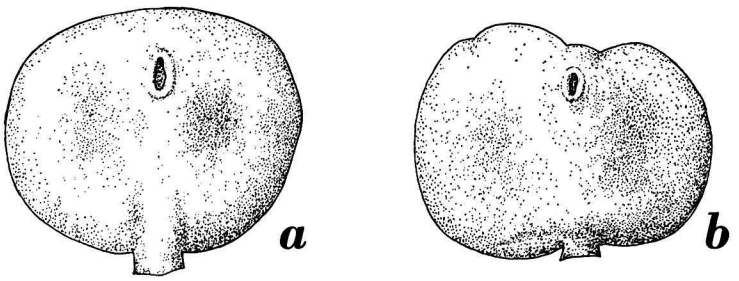

Fig. 1. *Loxothylacus murex* nov. spec., left side. *a*, specimen on *Xanthias lamarcki*; *b*, specimen on *Cymo melanodactylus*.

corresponding part of the mantle, on the left side, at some distance from the posterior margin. In the specimen on *Cymo* the posterior margin of the mantle has a few shallow grooves, the rest of the mantle to the naked eye has a smooth surface. In the two specimens there is a broad groove in the posterior part of the right surface, where the median ridge of the abdomen of the host pressed against the parasite.

From each of the two specimens a series of longitudinal sections was made.

A section through the stalk of the specimen on *Xanthias lamarcki*

(fig. 2 *a*) distinctly shows the most striking generic character of *Loxothylacus*, as the visceral mass posteriorly is attached to the mantle at a considerable distance from the stalk. Towards a more dorsal region soon the vasa deferentia appear in the sections; at first both of these are rather narrow canals (fig. 2 *b*), but gradually the right vas deferens distinctly

Fig. 2. *Loxothylacus murex* nov. spec., specimen on *Xanthias lamarcki*. *a*—*g*, longitudinal sections of the posterior part of the visceral mass; *a*, through the stalk, each following section from a more dorsal region. *h*, *i*, longitudinal sections of one of the colleteric glands. *lt*, left testis; *mc*, mantle cavity; *rt*, right testis; *st*, stalk; *vm*, visceral mass. *a*—*g*, × 11; *h*, *i*, × 53.

increases in size, whilst the left remains narrow (fig. 2 *c* — *e*). The cavity of the larger vas deferens is rather irregular as a result of the development of a system of ridges on its inner wall. In its dorsal part the right vas deferens passes into its testis (fig. 2 *f*), which is distinctly curved (the dorsal part of the curvature is shown in fig. 2 *g*); its extremity consequently is pointing in a ventral direction (lower part of fig. 2 *e*). The left testis is much smaller than the right, it does not become appreciably wider than its vas deferens, whilst here the curvature is less pronounced than that of the right, as the extremity of the left testis is extending more or less in an anterior direction (fig. 2 *f*).

The colleteric glands contain a rather compact mass of branched canals, in the longitudinal sections of one of these glands represented here the one (fig. 2 *h*) contains 46 canals, the other (fig. 2 *i*) 42. In this specimen the canals contain a well developed layer of chitin.

The distinct specific characters are those of the external cuticle of the mantle. This cuticle bears excrescences consisting of a hyaline kind of

chitin, differing from that of the main layers of the cuticle. The excrescences are composed of groups of spines pointing in various directions. In the specimen on *Xanthias lamarcki* the total length of the spines in the greater part of the mantle is from 30 to 60 μ (fig. 3 *a* — *c*). The variation in shape and in size is shown in the figure.

The internal cuticle of the mantle bears numerous retinacula which

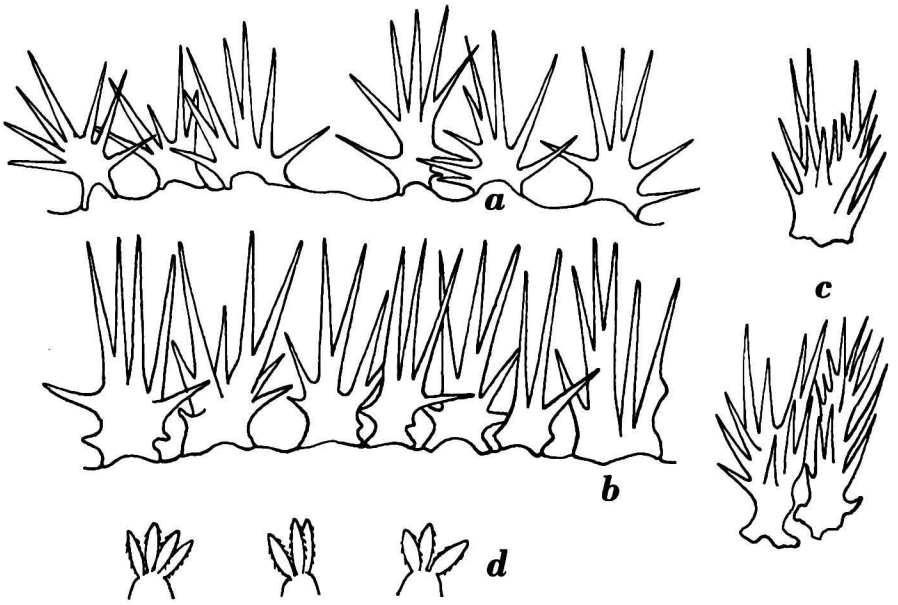

Fig. 3. *Loxothylacus murex* nov. spec., specimen on *Xanthias lamarcki*. *a*, *b*, excrescences on two different parts of the external cuticle; *c*, isolated excrescences of the external cuticle; *d*, retinacula. × 530.

are more or less regularly distributed on its surface. Each retinaculum consists of a basal part and three or four spindles (fig. 3 *d*), the latter have a length of about 12 μ, they possess numerous small barbs.

The specimen on *Cymo melanodactylus* also distinctly shows the generic characters of *Loxothylacus*, as here again the visceral mass is attached to the mantle at a large distance from the stalk (fig. 4 *a*). This section shows the ventral parts of the vasa deferentia, which here appear as narrow canals. Towards the dorsal part of the visceral mass the two vasa deferentia become distinctly larger (fig. 4 *b*), and gradually they pass into the testes (fig. 4 *c*), which possess a distinct curvature towards the anterior region and finally towards the ventral half of the visceral mass (the extremity of the right testis is shown in the lower half of fig. 4 *b*). The inner wall of the vasa deferentia shows some ridges, especially in the region in which these organs pass into the testes, but these ridges are less pronounced than those of the other specimen. Here the two male organs are of about equal size and are of an approximately similar shape.

The structure of the colleteric glands of the specimen on *Cymo melano-*

dactylus is similar to that of these organs in the specimen on *Xanthias lamarcki*. In the specimen on *Cymo* the canal system is slightly more strongly divided, as in a longitudinal section 66 of these canals may be

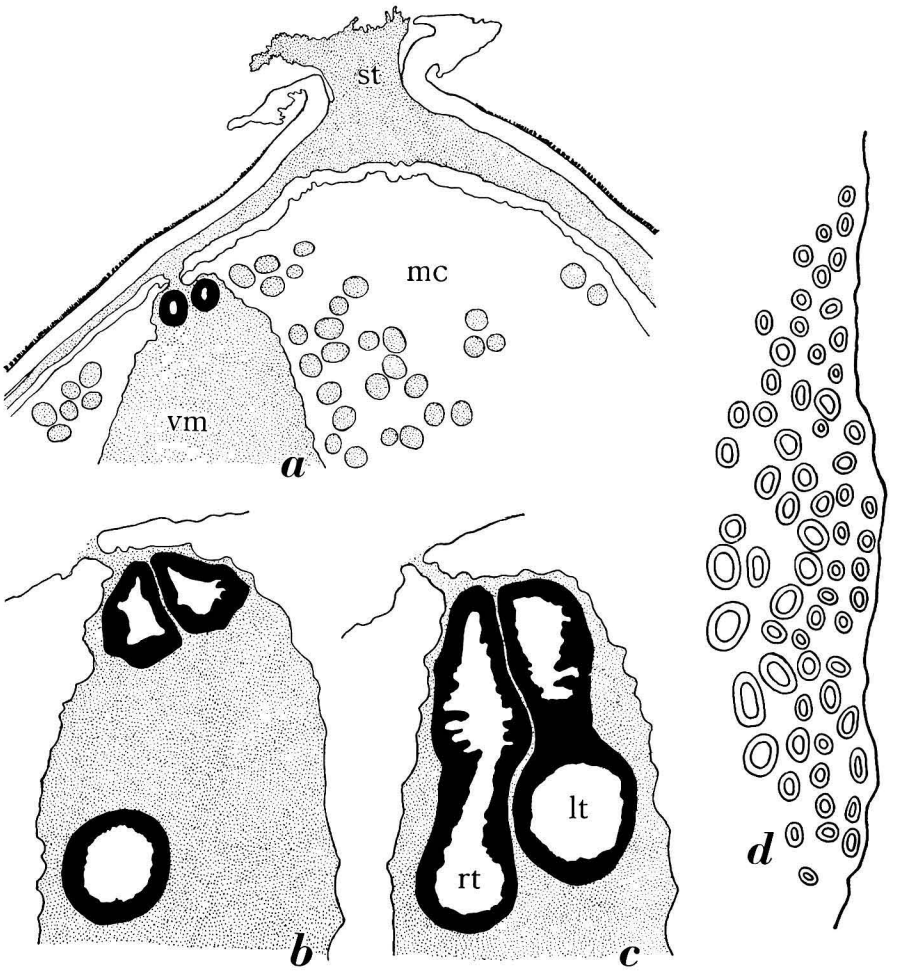

Fig. 4. *Loxothylacus murex* nov. spec., specimen on *Cymo melanodactylus*. *a*—*c*, longitudinal sections of the posterior part of the visceral mass; *a*, through the stalk, each following section from a more dorsal region. *d*, longitudinal section of one of the colleteric glands. *lt*, left testis; *mc*, mantle cavity; *rt*, right testis; *st*, stalk; *vm*, visceral mass. *a*—*c*, × 40; *d*, × 142.

counted (fig. 4 *d*). As in the other specimen the canals have a distinct layer of chitin.

The excrescences of the external cuticle of the mantle in the specimen on *Cymo melanodactylus* in every respect are similar to those of the other specimen. In the larger part of the mantle their size varies from 22 to 60 μ, they consist of groups of spines united on common basal parts, the whole consisting of a kind of chitin differing from the main layers of the cuticle by its more hyaline structure (fig. 5 *a* — *e*). In each excrescence the

spines are pointing in various directions. In some parts of the mantle the basal parts of the excrescences consist of a thin layer of chitin only (fig. 5 *a*), in other parts of the mantle these basal parts are of a more solid structure (fig. 5 *d*).

On the internal cuticle of the mantle there are numerous retinacula, consisting of a basal part and four or five spindles, the latter have a length

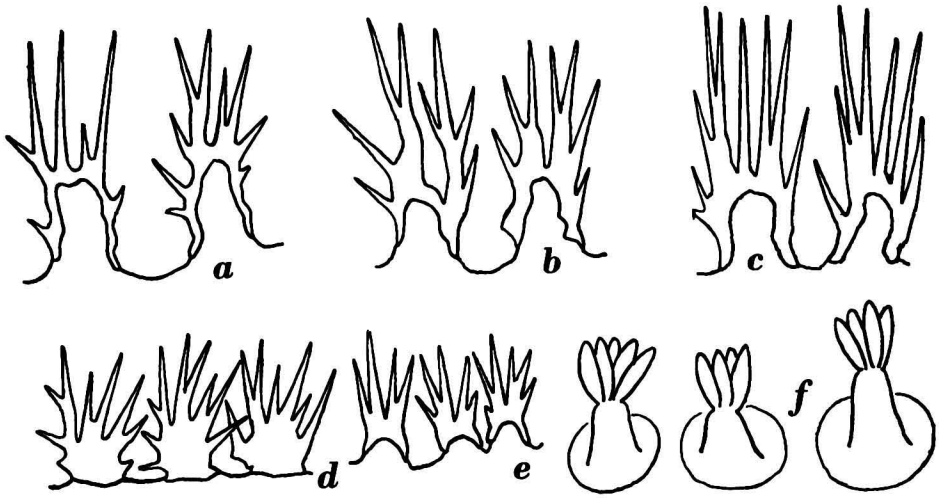

Fig. 5. *Loxothylacus murex* nov. spec., specimen on *Cymo malanodactylus*. *a*—*e*, excrescences from various parts of the external cuticle; *f*, retinacula. × 530.

of 15 μ approximately (fig. 5 *f*). As the spindles are covered by fragments of the thin chitinous matter enveloping the egg-masses in the mantle cavity it was not possible to ascertain whether the spindles are barbed or not.

The two specimens of *Loxothylacus murex* closely correspond as far as concerns the structure of the excrescences of the external cuticle. The retinacula are of a similar structure, the differences found in the two specimens may be the result of individual variation. In the two specimens the colleteric glands have a similar structure. The male organs, however, are rather different. In the specimen on *Xanthias lamarcki* one of the male organs (the right) is fully developed, the other remains more or less rudimentary. On the other hand in the specimen on *Cymo melanodactylus* the two male organs have a corresponding shape and a similar size. As, however, variation of this kind is of common occurrence in many species of *Loxothylacus*, the two specimens may be safely regarded as conspecific. The peculiar excrescences separate the new species at once from other representatives of the genus.

Loxothylacus corculum (Kossm.)

Beo, Karakelong, Talaud Islands (Siboga Expedition, Sta. 131), 1 specimen on *Atergatis floridus* (L.), 12 × 10 × 5 mm.

Mozambique, 1 specimen on *Xantho sanguineus* (H. M. E.), C. Cooke leg., May

1863 (collection Museum of Comparative Zoölogy, Cambridge, Mass., no. 1265), $9\frac{1}{2} \times 6 \times 3\frac{1}{2}$ mm.

Zanzibar, 2 specimens on *Xantho sanguineus* (H. M. E.), C. COOKE leg. (collection Museum of Comparative Zoölogy, Cambridge, Mass., no. 1269), one specimen $10 \times 7 \times 4$ mm, the other slightly smaller.

The specimen from the Siboga Expedition is one of the two that were attached to the abdomen of one specimen of *Atergatis floridus*, which explains their irregular asymmetrical shape (VAN KAMPEN and BOSCHMA, 1925). The type specimen of *Loxothylacus corculum*, a parasite of *Atergatis floridus*, was more or less heart-shaped (KOSSMANN, 1872). This shape is also that of the specimens on *Xantho sanguineus*. In the three specimens from this crab the mantle opening is surrounded by a comparatively thick wall; this opening is found on the left side, near the posterior margin of the mantle.

Longitudinal sections have been made of the specimen on *Atergatis floridus*, of the specimen on *Xantho sanguineus* from Mozambique, and of one of the specimens on the same crab from Zanzibar. The sections show that in the three specimens especially the male genital organs present rather striking differences.

In a previous paper (VAN KAMPEN and BOSCHMA, 1925, pl. II fig. 3) there is a figure of a longitudinal section of the visceral mass of the Siboga specimen of *Loxothylacus corculum*, showing that the visceral mass is attached to the mantle at a considerable distance from the stalk. A figure of a section from the same region is fig. 6 *a* in the present paper. It shows that the male organs have a wide curvature, so that the testes are far distant from the vasa deferentia. A section from a more dorsal region is represented in fig. 6 *b*. It shows the dorsal curved part of the male organs, the region in which the vasa deferentia are passing into the testes. Here the inner walls over the whole of their surface are beset with rather thick papillae or ridges, so that the cavities of the male organs here are comparatively narrow.

The colleteric glands of the specimen on *Atergatis floridus* have a rather large number of branched canals; in a longitudinal section of the most strongly branched region there are 80 of these canals (fig. 6 *c*). In this specimen the inner walls of the canals have a distinct layer of chitin.

The large conical excrescences of the external cuticle have been described in a previous paper (l.c., p. 35); they have a length of 115 to 520 μ, and in their basal parts a thickness of 78 to 173 μ. The retinacula have 8 to 12 barbed spindles, the latter have a length of 18 μ.

In the specimen on *Xantho sanguineus* from Zanzibar the two male genital organs are of a rather different size, the right being much larger than the left and being much more strongly curved (fig. 7 *a*—*c*). The left vas deferens too is much smaller than the right (fig. 7 *a*). The left testis is rather narrow, it runs chiefly in an anterior direction, whilst its cavity is narrow on account of numerous papillae and ridges on its inner

wall (fig. 7 *b*, *c*). The right testis has the shape of an enlarged pouch chiefly extending in an anterior direction (fig. 7 *b*, *c*) but the closed end is

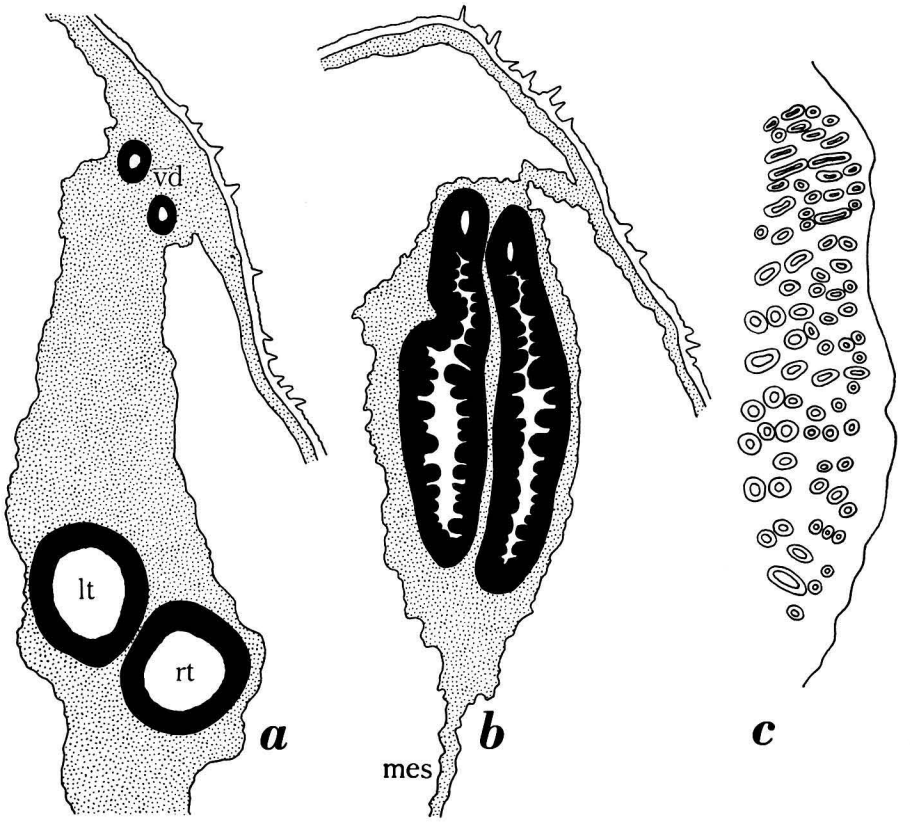

Fig. 6. *Loxothylacus corculum* (Kossm.), specimen on *Atergatis floridus*. *a*, longitudinal section from the neighbourhood of the stalk; *b*, longitudinal section from the dorsal region; *c*, longitudinal section of the right colleteric gland in its most strongly branched part. *lt*, left testis; *mes*, mesentery; *rt*, right testis; *vd*, vasa deferentia. *a*, *b*, × 23; *c*, × 80.

pointing towards the ventral half of the visceral mass (fig. 7 *a*). In the right male organ there are some ridges on the inner wall of the vas deferens, the inner wall of the testis is smooth.

The colleteric glands of the specimen on *Xantho sanguineus* from Zanzibar are very similar to those of the specimen on *Atergatis floridus*. The number of canals is slightly smaller, as in a longitudinal section of the most strongly branched region there are 65 of these canals (fig. 7 *d*). The canals possess a well developed layer of chitin.

The excrescences of the external cuticle of the specimens on *Xantho sanguineus* from Zanzibar are considerably smaller than those of the specimen on *Atergatis floridus*, though being of the same general appearance. They are comparatively slender (fig. 8 *b*, *c*), straight or slightly

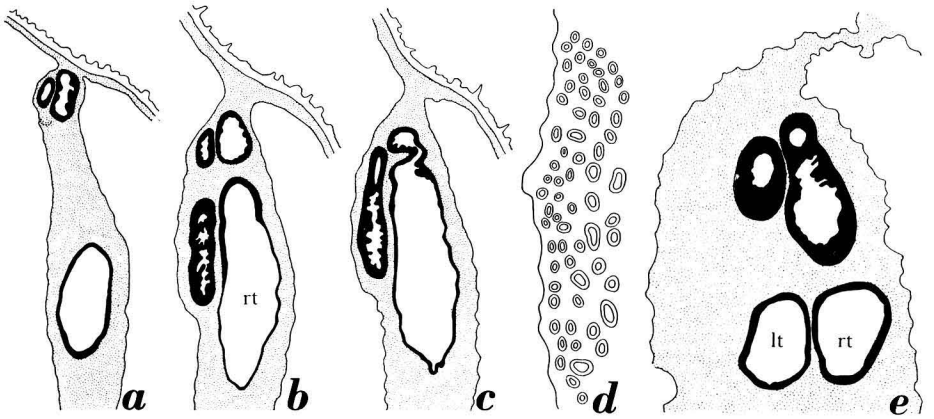

Fig. 7. *Loxothylacus corculum* (Kossm.). *a*—*d*, larger specimen on *Xantho sanguineus* from Zanzibar; *e*, specimen on *Xantho sanguineus* from Mozambique. *a*—*c*, longitudinal sections of the greater part of the visceral mass; *a*, from a more ventral region than *b*; *c*, from a more dorsal region than *b*. *d*, longitudinal section of the left colleteric gland in its most strongly branched part. *e*, posterior part of a longitudinal section of the visceral mass, showing the dorsal parts of the testes. *lt*, left testis; *rt*, right testis. *a*—*c*, × 27; *d*, × 86; *e*, × 27.

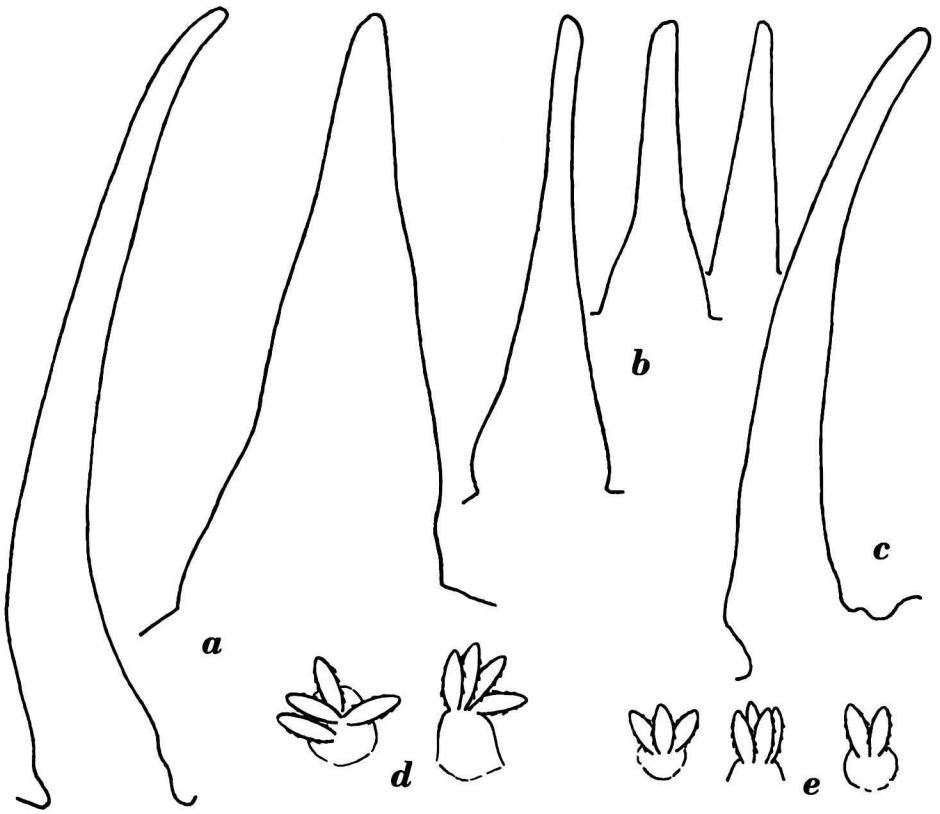

Fig. 8. *Loxothylacus corculum* (Kossm.), specimens on *Xantho sanguincus*. *a*—*c*, excrescences of the external cuticle; *a*, from the specimen from Mozambique, *b*, from the smaller specimen from Zanzibar, *c*, from the larger specimen from Zanzibar. *d*, retinacula from the specimen from Mozambique; *e*, retinacula from the smaller specimen from Zanzibar. × 530.

curved; their length varies from 64 to 160 μ, their basal thickness from 18 to 35 μ.

The retinacula of these specimens again are slightly smaller than those of the specimen on *Atergatis floridus*; moreover, they have a smaller number of spindles (up to four). The distinctly barbed spindles here may reach a length of 14 μ (fig. 8 *e*).

Of the specimen on *Xantho sanguineus* from Mozambique one section is shown here (fig. 7 *e*). In this specimen the male genital organs are of approximately equal size; their curvature, however, is much narrower than that in the specimens dealt with above. The vasa deferentia of this specimen have a number of ridges on their inner walls, especially in the region where they are passing into the testes.

The colleteric glands of this specimen do not differ in any important detail from those of the former specimen.

The excrescences of the external cuticle of the specimen on *Xantho sanguineus* from Mozambique may be broadly conical or of a more slender shape, straight or slightly curved (fig. 8 *a*). They vary in length from 150 to 200 μ; their basal thickness is from 32 to 68 μ.

The retinacula of this specimen as a rule bear four spindles, the latter have a length of up to 16 μ (fig. 8 *d*).

In all their salient characters the specimens on *Xantho sanguineus* closely correspond with the specimen on *Atergatis floridus*, though the measurements of the various organs are somewhat smaller. Undoubtedly all the specimens dealt with here belong to the species *Loxothylacus corculum*. It is interesting that in every specimen examined the shape of the male organs is slightly different from that of the others.

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