

MINISTERIE VAN ONDERWIJS, KUNSTEN EN WETENSCHAPPEN

# ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN

DEEL XXXV, No. 12

28 juni 1957

## NOTES ON RHIZOCEPHALA OF THE GENUS LOXOTHYLACUS

by

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In the collections brought together by Dr. L. B. Holthuis during a visit to Australia there is a specimen of the crab *Pilumnopus serratifrons* (Kinahan) bearing the Rhizocephalan parasite *Loxothylacus spinulosus* Boschma. The locality of the type specimen of this parasite was mentioned as "Pacific Ocean" (Boschma, 1928, p. 172); in all probability it was collected in the region of the East coast of Australia, because the crab *Pilumnopus serratifrons* is known from this region only. The new record gives occasion to restrict the type locality of *Loxothylacus spinulosus* to Mosman, Sydney, New South Wales. Examination of the specimen showed that it corresponds in all essential characters with the type specimen, while a parasite of the crab *Glabropilumnus seminudus* (Miers) from Hongkong, previously identified with *L. spinulosus* (Boschma, 1933), proved to belong to a distinct species, which is described in the present paper.

*Loxothylacus spinulosus* is the second species of the family Sacculinidae to become known from Australian waters; the first was *Sacculina duracina* Boschma, a parasite of *Parthenope* (*Parthenope*) *longimanus* (Leach) from Port Molle, Queensland (cf. Boschma, 1933, p. 483). In all probability at least two other species of Sacculinidae will become known from the Australian East coast, for Haswell (1888) noted the occurrence in Port Jackson of parasites of the group on the crabs *Thalamita sima* H. Milne Edwards and *Nectocarcinus integrifrons* (Latreille); actual specimens from this region are needed to determine the specific status of these parasites.

### ***Loxothylacus spinulosus* Boschma**

*Loxothylacus spinulosus* Boschma, 1928, p. 172; 1955, p. 45 (p.p.).

#### **Material examined:**

"Pacific Ocean", 1 specimen on *Pilumnopus serratifrons* (Kinahan), in collection Leiden Museum, received from Museum Godeffroy.

No. 1340. Balmoral Beach, Mosman, Sydney, New South Wales, under stone in tidal zone, 1 specimen on *Pilumnopus serratifrons* (Kinahan), Dr. L. B. Holthuis leg., April 23, 1955 (type locality restricted to Mosman, Sydney, by present designation).

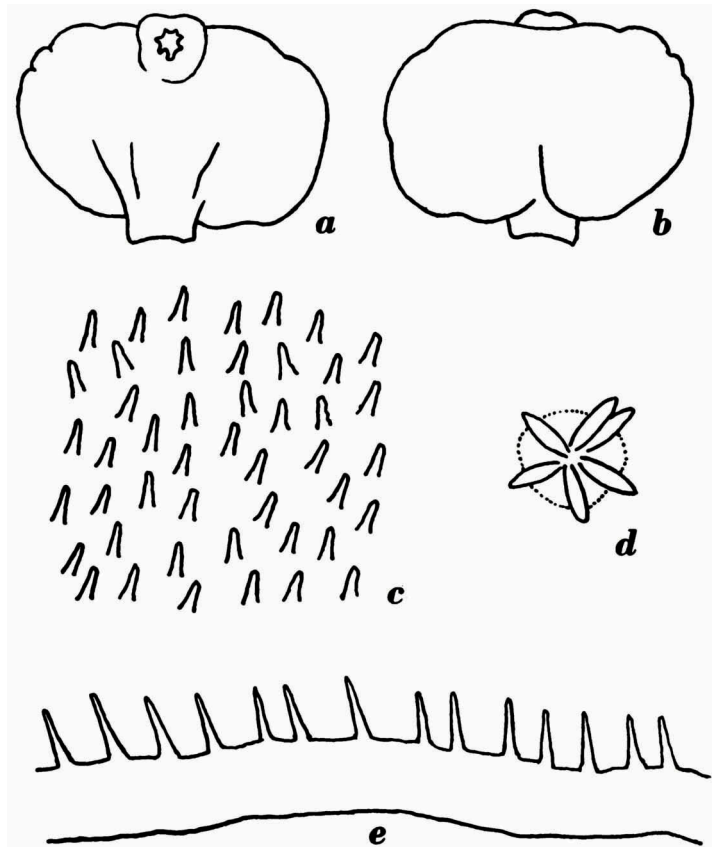


Fig. 1. *Loxothylacus spinulosus* Boschma, specimen no. 1340. *a*, left side; *b*, right side; *c*, excrescences of the external cuticle in surface view; *d*, retinaculum; *e*, section of the external cuticle. *a*, *b*,  $\times 6$ ; *c*-*c*,  $\times 530$ .

The specimen collected by Dr. Holthuis (fig. 1*a*, *b*) has a dorso-ventral diameter of  $6\frac{1}{2}$  mm, an antero-posterior diameter of  $4\frac{1}{2}$  mm, and a thickness of 3 mm. In its external appearance the specimen bears a strong resemblance to the type specimen (Boschma, 1928, fig. 11), the shape being slightly more oval. As in the type specimen the mantle opening lies in the centre of a somewhat protruding muscular wall, which is turned to the left side of the centre of the anterior region. At the left side there are a few grooves in the vicinity of the stalk, at the right side there is a rather pronounced median groove; a few smaller grooves occur in the dorsal and ventral borders of the mantle.

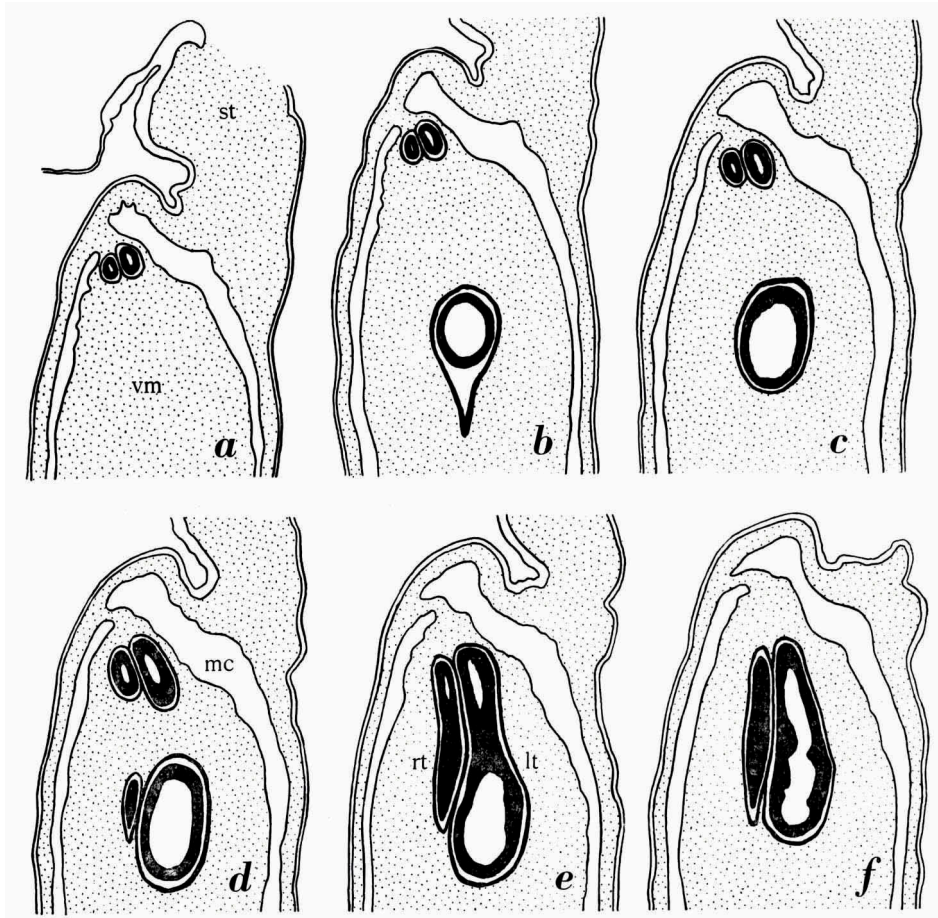


Fig. 2. *Loxothylacus spinulosus* Boschma, specimen no. 1340, posterior parts of longitudinal sections running from the ventral to the dorsal region of the male genital organs. lt, left testis; mc, mantle cavity; rt, right testis; st, stalk; vm, visceral mass.  $\times 30$ .

A longitudinal section through the stalk shows that the visceral mass is attached to the mantle distinctly to the right of the stalk (fig. 2a); this section contains the rather narrow vasa deferentia, which are surrounded by a muscular sheath. Farther towards the dorsal region the terminal part of the right testis appears in the sections, at some distance anteriorly of the vasa deferentia (fig. 2b); still farther dorsally the terminal part of the left testis appears next to the right (fig. 2d). Examination of the following part of the series leads to the curvature of the two testes (fig. 2d, e, f). In this specimen the right testis is considerably larger than the left, the cavity of the former being much wider than that of the latter.

For comparison with the male organs of specimen no. 1340 some sections of the type specimen (cf. Boschma, 1928, fig. 9) are represented in fig. 4. Here the attachment of the visceral mass to the mantle occurs in a manner altogether similar to that in the type specimen, and the two male genital organs are of an entirely corresponding shape. The strange fact presents itself that

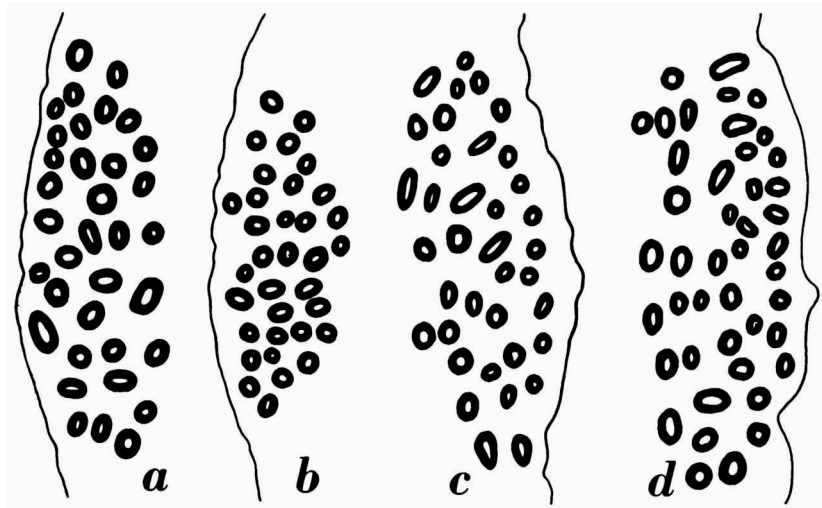


Fig. 3. *Loxothylacus spinulosus* Boschma, longitudinal sections of colleteric glands. a, b, type specimen; c, d, specimen no. 1340. a, b,  $\times 127$ ; c, d,  $\times 80$ .

here the left testis is the larger of the two, just the opposite of the conditions in specimen no. 1340. Another difference is that in the type specimen the curvature of the testes occurs distinctly dorsal to the stalk (fig. 4), while in specimen no. 1340 the testes lie in a more median position, just behind the region of the stalk (fig. 2). The narrow mantle cavity in the one specimen (fig. 4) and the comparatively wide mantle cavity in the other (fig. 2) are differences connected with the depositing of the eggs in the mantle cavity.

In the two specimens the colleteric glands are of an altogether similar shape and structure (fig. 3). The tubes are arranged in a cushion-like manner, about four to five irregular rows in a transverse direction. In the figured sections of the type specimen there are 35 and 34 tubes respectively (fig. 3a, b); in those of specimen no. 1340 there are 37 and 43 tubes respectively (fig. 3c, d).

The thickness of the external cuticle of the mantle in specimen no. 1340 varies from 15 to 20  $\mu$  (fig. 1e); it is, therefore, considerably thicker than in the type specimen, in which it is about 5  $\mu$  thick. The upper surface of

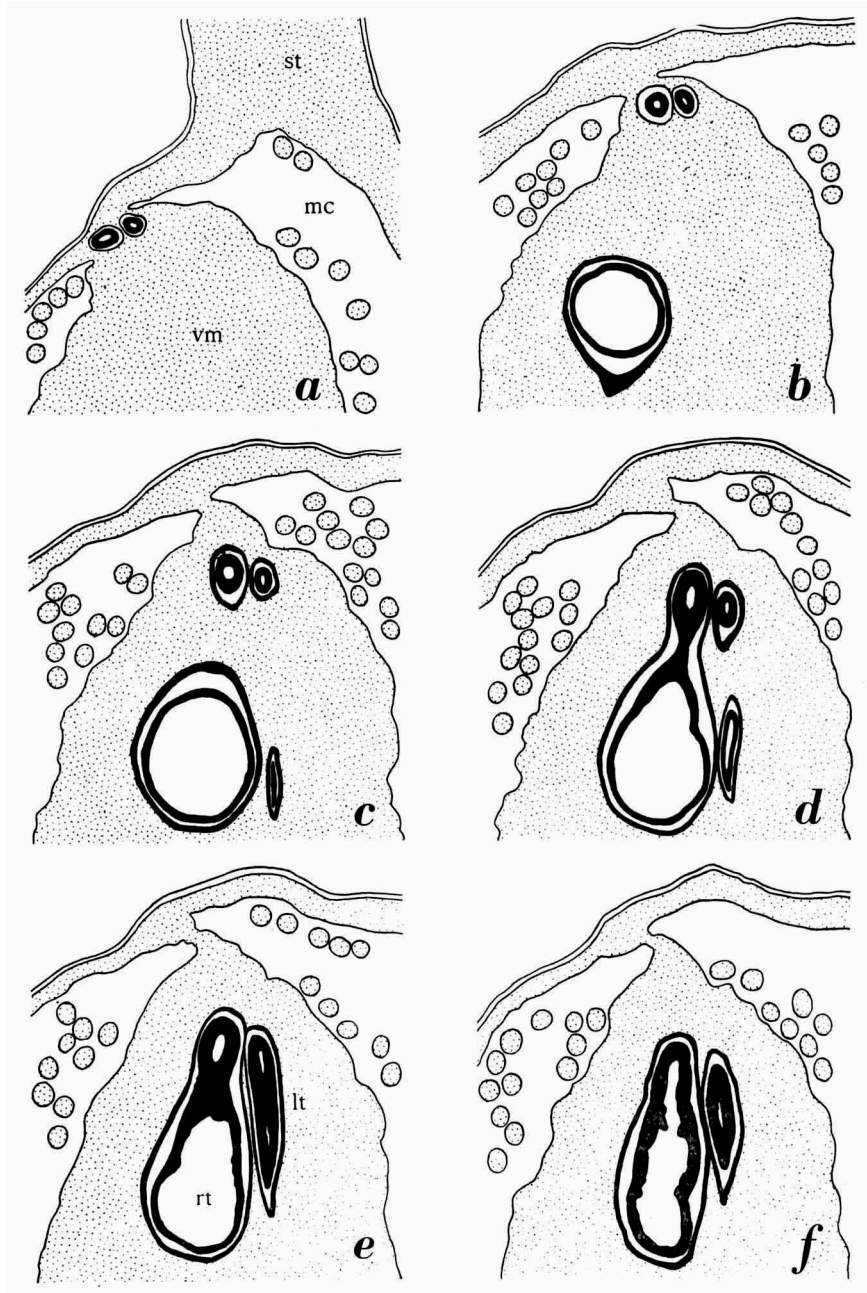


Fig. 4. *Loxothylacus spinulosus* Boschma, type specimen, posterior parts of longitudinal sections running from the ventral to the dorsal region of the male genital organs. lt, left testis; mc, mantle cavity; rt, right testis; st, stalk; vm, visceral mass.  $\times 36$ .

the external cuticle is covered with rather short or somewhat longer papillae (fig. 1c, e), their length varying from 7 to 15  $\mu$ . The shape and the distribution of these papillae is not strikingly different from those of the type specimen (Boschma, 1928, fig. 10), though here they are much smaller, their size generally not exceeding 4.5  $\mu$ . These differences are of the same order as those occurring in excrescences of other species of Sacculinidae.

The internal cuticle of the mantle of specimen no. 1340 bears retinacula consisting of a basal part and about 6 spindles, which have a length of 15 to 18  $\mu$ , and in the present specimen do not show distinct barbs (fig. 1a). The presence of retinacula of this shape indicates that the parasite of *Glabropilumnus seminudus* (Miers) from Hongkong, which has retinacula with one or two spindles only (Boschma, 1933, fig. 53b), and which previously was united with *Loxothylacus spinulosus*, is a distinct species.

The two parasites of *Pilumnopus serratifrons* closely correspond in their external appearance, in the structure of the male genital organs and of the colleteric glands, and in the excrescences of the external cuticle (retinacula were not found in the type specimen). On the other hand the specimen on *Glabropilumnus seminudus* differs from these two specimens in some details of sufficient importance for a specific distinction, these differences in the first place being those of the retinacula and of the colleteric glands. Accordingly the specimen is described below as the type of a new species.

***Loxothylacus omissus* nov. spec.**

*Loxothylacus spinulosus* Boschma, 1933, p. 541.

**Material examined:**

Hongkong, 2 specimens on *Glabropilumnus seminudus* (Miers), Barney leg., in collection of British Museum (Natural History).

The sectioned specimen (one section figured, Boschma, 1933, fig. 52) is here indicated as the type of the new species.

In its external appearance (l.c., fig. 49b) the new species shows rather pronounced differences from *L. spinulosus*, the dorso-ventral diameter being nearly twice the antero-posterior diameter. The figure moreover shows that the musculature of the mantle opening is much less pronounced than in the two specimens of *L. spinulosus*.

Sections through the stalk show that the visceral mass is attached to the right side of the mantle at some distance of the stalk (fig. 5a). The figured sections further show that the male organs of *L. omissus* (fig. 5a-f) are not fundamentally different from those of *L. spinulosus* (figs. 2 and 4). In the type specimen of *L. omissus* the two testes are well developed, though the left is much larger than the right. The terminal extremity of the left testis appears in sections at some distance dorsally of the stalk (fig. 5b); farther



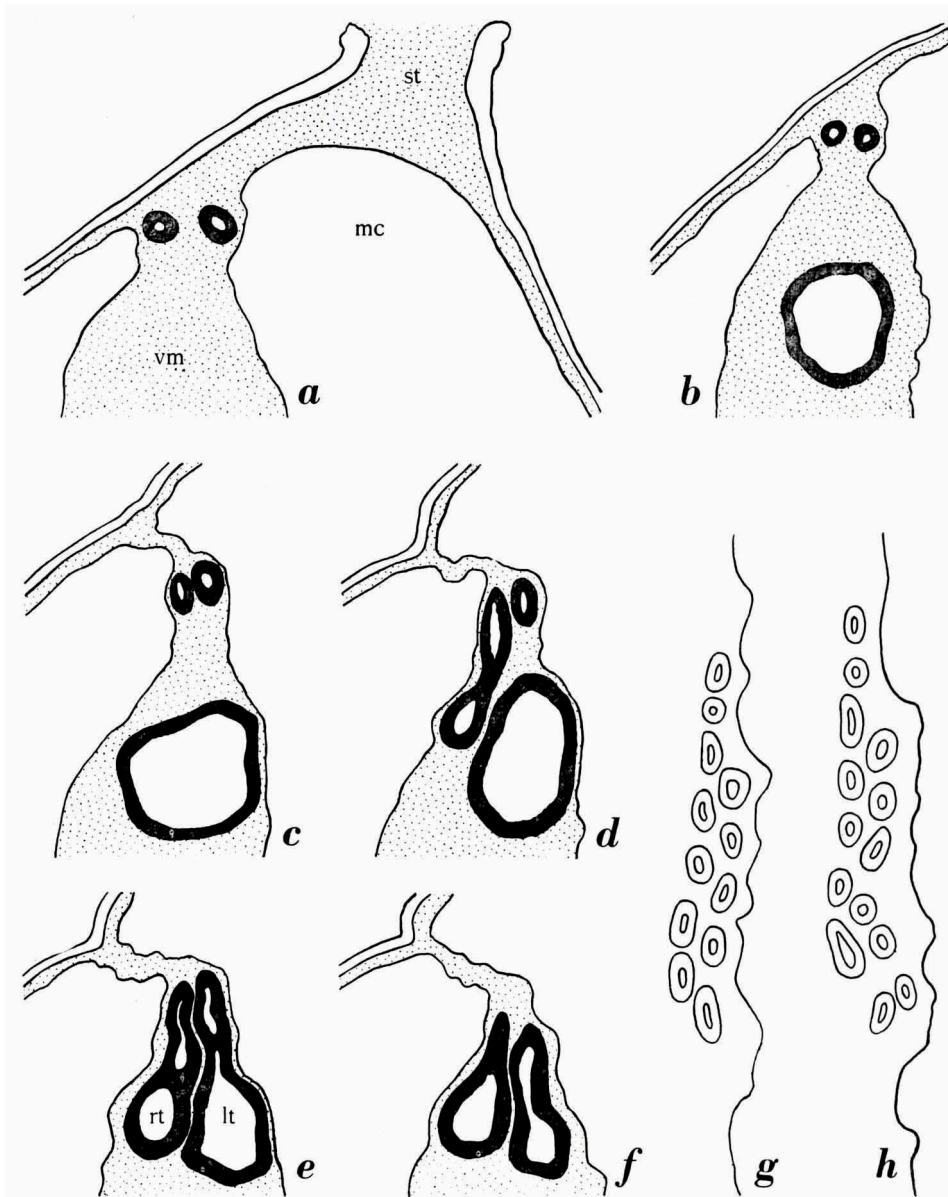


Fig. 5. *Loxothylacus omissus* nov. spec. *a-f*, posterior parts of longitudinal sections, running from the ventral to the dorsal region of the male genital organs; *g, h*, longitudinal sections of one of the colleteric glands. lt, left testis; mc, mantle cavity; rt, right testis; st, stalk; vm, visceral mass. *a-f*,  $\times 64$ ; *g, h*,  $\times 152$ .

dorsally the left testis gradually widens (fig. 5c); still farther dorsally the curvature of the right testis appears next to the left (fig. 5d). In their extreme dorsal parts the sections of the two testes are of approximately equal size (fig. 5e, f). Here the two testes are closely joining, but their cavities remain completely separated.

The colleteric glands lie in the central part of the lateral surfaces of the visceral mass, somewhat nearer to the anterior region (Boschma, 1933, fig. 52). Longitudinal sections show that they contain a comparatively small number of tubes (12 and 14 in the figured sections, fig. 5g, h), the tubes having a pronounced tendency for an arrangement in two rows parallel to the surface of the visceral mass. The structure of the colleteric glands of *L. omissus* is essentially different from that in *L. spinulosus*, not only on account of the smaller number of tubes but especially because of the different arrangement of the tubes.

The peculiarities of the external cuticle were described in a previous paper (Boschma, 1933, fig. 53a, c), the excrescences being not essentially different from those of *L. spinulosus*. On the other hand the retinacula present distinct specific characters, those of *L. omissus* having one or two spindles only (l.c., fig. 53b), those of *L. spinulosus* having about six spindles (fig. 1d).

In the cited paper (p. 544) I wrote: "It is not altogether certain that the specimens from Hongkong belong to the same species as the specimen from the Pacific Ocean", the differences at that time not appearing striking enough to justify specific separation. It is especially the retinacula that now lead to a separation of the two forms, a further argument being found in the different structure of the colleteric glands.

In the (artificial) key to the species of the genus *Loxothylacus* (Boschma, 1955, p. 11) the new species *L. omissus* must occupy the place of *L. spinulosus*, the last named species then being included in the group represented in the Pacific region by *L. brachythrix* and *L. amoenus*, both of which have testes with much wider cavities, and colleteric glands with a much larger number of tubes.

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