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Dedicated to Professor Dr. H. Engel

Loxothylacus engeli nov. spec., a rhizocephalan parasite of the crab *Anasimus latus* Rathbun

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ABSTRACT

Description of *Loxothylacus engeli* nov. spec., parasitic on the crab *Anasimus latus* Rathbun from the mouth of the Suriname River. The new species is compared with two others having a smooth or nearly smooth external cuticle, viz. *L. bicorniger* Boschma, 1950 and *L. scaber* (Boschma, 1931).

In the collections brought together by the "Coquette" in the region of the mouth of the Suriname River there is a specimen of the spider crab *Anasimus latus* Rathbun bearing the rhizocephalan parasite described in the present paper. As the parasite has a smooth external cuticle without excrescences, the description is nearly exclusively based on its internal structures. The new species is named in honour of Professor Dr. H. Engel, at the occasion of his seventieth birthday.

Loxothylacus engeli nov. spec.

"Coquette" Station 32, N. E. of the mouth of the Suriname River, 6°51′ N., 54°53.5′ W., depth 28 fms., bottom mud and shells, May 12, 1957, one specimen on *Anasimus latus* Rathbun.

In its external appearance (fig. 1) the parasite is roundish or slightly oval. The dorso-ventral diameter is 7 mm, the antero-posterior diameter 6 mm, and the thickness from left to right side 3½ mm. The mantle opening lies at the top of a roundish papilla containing the well-developed sphincter, the stalk is attached to a shallow concavity of the mantle in the middle of the posterior surface. With the exception of a broad furrow in the middle of the right side, caused by pressure of the median ridge of the abdomen of the host against the parasite, the mantle has a smooth surface, without grooves or conspicuous wrinkles.

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Longitudinal sections through the middle part of the body (fig. 2*a*) show that the stalk is attached to the mantle at some distance from the visceral mass, a character indicating that the species must be placed in the genus *Loxothylacus*. The complete mesentery, extending from the region of the stalk to the sphincter of the mantle opening, also points to this generic position.

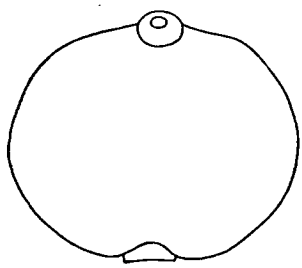

FIG. 1. *Loxothylacus engeli* nov. spec. Left side. × 5 1/3.

The third generic character of *Loxothylacus* (testes more or less crescentic, curved along the dorsal region of the visceral mass) is rather indistinct in the new species, far less pronounced than in most of the other species of the genus, as results from the following notes.

The vasa deferentia (fig. 2*a*) are straight, narrow canals running closely

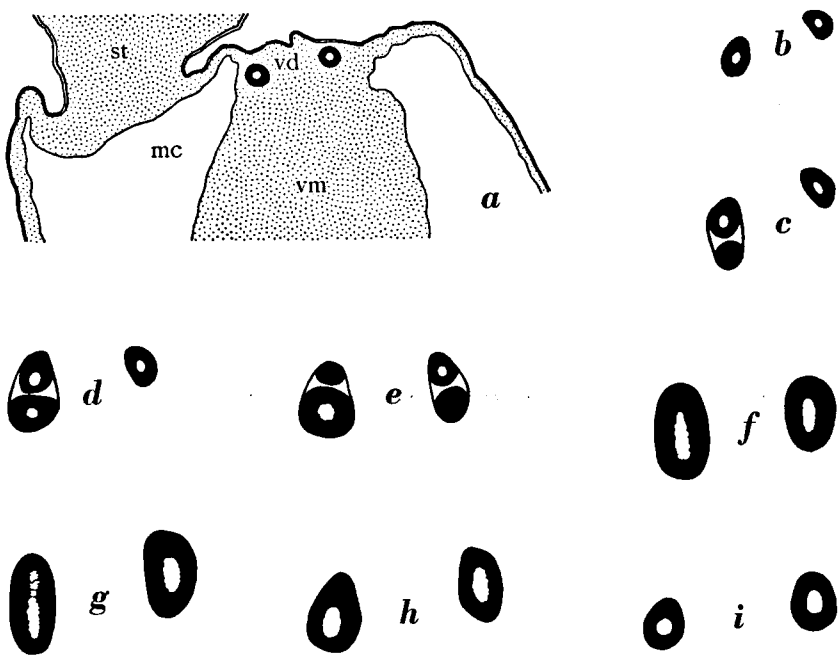

FIG. 2. *Loxothylacus engeli* nov. spec. *a*, posterior part of a longitudinal section of the region of the stalk. *b-i*, transverse sections of the male organs, from the middle part of the body to the dorsal region. *mc*, mantle cavity; *st*, stalk; *vd*, vas deferens; *vm*, visceral mass. × 30.

along the posterior border of the visceral mass. Gradually they pass into the testes, the region of transition apparently being indicated by a slight increase in size (fig. 2*b*). In their ventral half both of the testes show an inconspicuous twist, a little-pronounced curvature towards the anterior region (fig. 2*c-e*), in following sections the dorsal part of the curvature appears, here the testes have an elongated oval lumen extending in antero-posterior direction (fig. 2*f, g*). Farther dorsally the terminal parts of the testes do not proceed in the direction of the curvature but for a short distance continue their course in the dorsal direction (fig. 2*h, i*).

The colleteric glands (fig. 3) are contained in the anterior half of the visceral mass. They are filled with a cushion-shaped mass of tubes without any indication of an arrangement in rows. In the region of their greatest division the sections show 30 (fig. 3*a*) and 23 tubes (fig. 3*b*), each of which containing a well-developed layer of chitin.

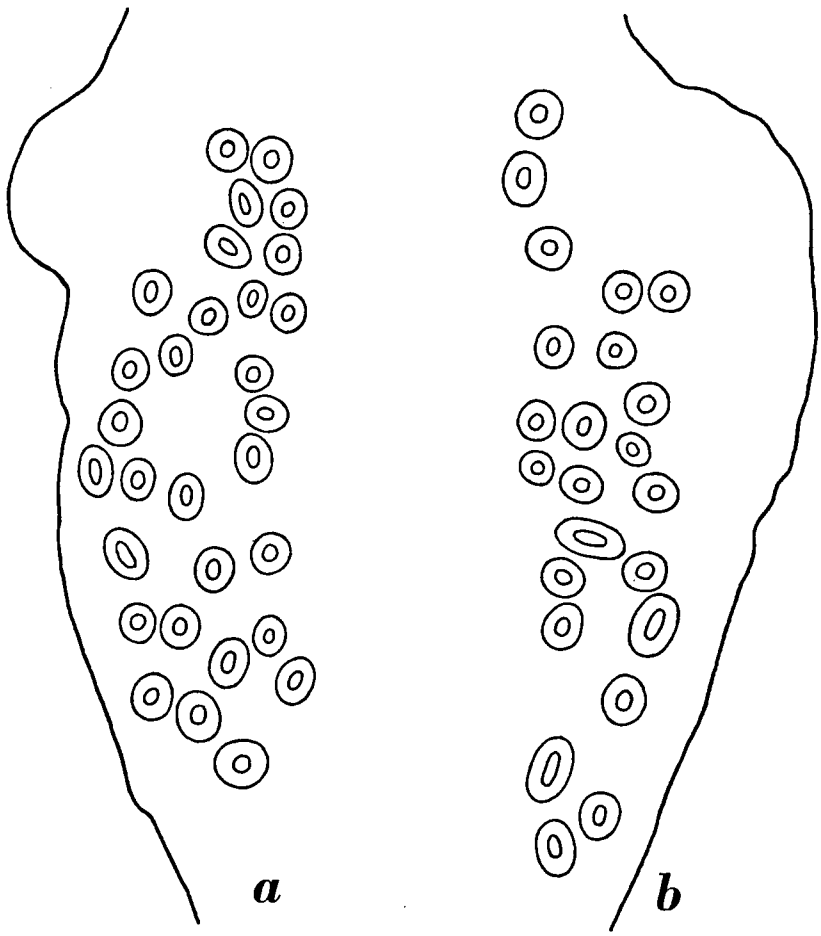

FIG. 3. *Loxothylacus engeli* nov. spec. Longitudinal sections of the two colleteric glands. × 180.

The external cuticle of the mantle has a smooth surface, without excrescences. In sections it appaers slightly wrinkled (fig. 4*a*). The thickness is from 3 to 5 μ, much thinner than in most species of Sacculinidae.

The internal cuticle of the mantle bears numerous retinacula (fig. 4*b*). Each of these has about eight barbed spindles, with a length of about 16 μ.

A key to the species of the genus *Loxothylacus* (cf. Boschma, 1955 : 11) contains only one with a smooth external cuticle, without excrescences, namely *Loxothylacus bicorniger* Boschma, a parasite of *Portunus (Portunus) ventralis* A. Milne Edwards from Hog Island, Nassau, Bahamas.

The different habitats of *Anasimus latus* and *Portunus (Portunus) ventralis* gives already an indication for a specific distinction of their parasites. Rathbun (1925) records as depths of occurrence of *Anasimus latus* 26 to 88 fathoms (47 to 160 m), whilst *Portunus (Portunus) ventralis* is only known from the shore or very shallow water, about 4 feet or 1.20 m (Rathbun, 1930).

The two parasites also differ in their specific characters. In *Loxothylacus bicorniger* the visceral mass is rather broadly united to the right half of the stalk (Boschma, 1950, fig. 35*a*), in *L. engeli* the two parts of the body are not joining (fig. 2*a* in the present paper). The well-developed left testis of *L. bicorniger* shows a distinct curvature, its terminal part is enlarged into a comparatively wide pouch (Boschma, 1950, fig. 35*b-e*), in *L.engeli* the curvature of the testes is indistinct, and their cavities remain narrow for the whole of their extent (fig. 2 in the present paper).

In the two species the colleteric glands have a similar appearance, with cushion-like arrangement of their tubes; the number of tubes in a longitudinal section of the region of their strongest division is 25 in *Loxothylacus bicorniger* (cf. Boschma, 1950, fig. 35*f-h*), 30 in *L. engeli* (present paper, fig. 3*a*). In the two species the colleteric glands are found in different positions, in *L. bicorniger* near the centre of the lateral surfaces of the visceral mass, in *L. engeli* at a comparatively short distance from the anterior end of the visceral mass.

The greater part of the external cuticle of the mantle of *Loxothylacus bicorniger* has a thickness of 6 to 8 μ (Boschma, 1933, fig. 22*a*), in *L. engeli* the thickness of the external cuticle generally is from 3 to 5 μ (present paper, fig. 4*a*). These differences are too slight to point to a specific distinction. The retinacula of the internal cuticle of the mantle in the two species have spindles entirely corresponding in shape, in size, and in structure.

In their external appearance the two species show rather striking differences. In *Loxothylacus bicorniger* the middle parts of the dorsal and ventral regions are elongated into pointed prominences, giving the animal a more or less lozenge-shaped form (Boschma, 1950, fig. 2*l*), in *L. engeli* the dorsal and ventral regions are evenly rounded, the specimen thereby obtaining a regularly circular or slightly oval shape (present paper, fig. 1).

The differences of the external appearance of the two parasites gives already an indication for specific distinctness. More important for specific identifi-

cation are the differences in the shape and structure of the male organs. The terminal wide pouch of the fully developed testis of *Loxothylacus bicorniger* and the narrow lumen of the testes of *L. engeli* form a decisive argument for their specific difference. The other structures (colleteric glands, external cuticle, and retinacula) are not strikingly different in the two species.

Since the appearance of the key to the species of the genus *Loxothylacus* referred to above, another species with a smooth or slightly rough external

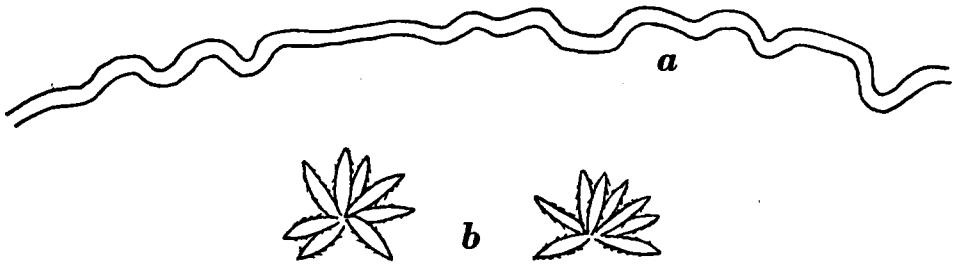

FIG. 4. *Loxothylacus engeli* nov. spec. *a*, section of the external cuticle; *b*, retinacula × 530.

cuticle has been placed in the genus, namely *L. scaber* (Boschma), originally described as *Sacculina scabra* Boschma, 1931, type specimen on *Thalamita investigatoris* Alcock from the Borneo Bank in the East Indies. Investigation of a specimen on *Thalamita admete* (Herbst) from New Guinea led to the conclusion that the species ought to be transferred to the genus *Loxothylacus*. In *L. scaber* the visceral mass is attached directly to the region of the stalk, and the curvature of the male organs is very little pronounced, accordingly the generic position of this species remains rather doubtful. However this may be, the species can be easily distinguished from *L. engeli* on account of the structure of the male organs as the vasa deferentia are partly united to form a single common cavity.

As remarked above, the curvature of the male organs of *Loxothylacus engeli* is very little pronounced, far more indistinct than in most species of the genus. An argument for placing the species in the genus *Loxothylacus* is, however, that one of the species, *L. variabilis* Boschma, 1940, shows all the transitions between completely straight male organs and those with a wide curvature. The peculiar excrescences of the external cuticle, forming a dense mass of small hairs interspersed with a few long slender spines, prove the specific identity of the eight specimens examined, though the curvature of the male organs could be expressed in the following manner: distinct, narrow; distinct, rather wide; practically absent; one slight bend in right testis but this testis running in dorsal direction; totally absent; distinct, rather wide; distinct, rather narrow; distinct, wide (Boschma, 1940 : 314). The peculiarities of the curvature of the male organs of *Loxothylacus engeli* as well as of *L. bicorniger* and *L. scaber*, all fall within the range of variation as observed in the species *L. variabilis*.

In the description of *Loxothylacus variabilis* some importance was attached

to the fact that in some of the specimens the two testes are fully developed with a distinct curvature, whilst in other specimens one of the male organs has remained rudimentary (Boschma, 1940). As far as the other species dealt with in the present paper are concerned, *L. bicorniger* has one fully developed male organ, the other rudimentary, whilst in *L. scaber* and in *L. engeli* the two male organs are of approximately equal size and structure. It is now known that the so-called testes of the Rhizocephala in reality must be regarded as spermathecae, which reach their complete development only after having taken up the reproductive glands of complementary males (Ichikawa & Yanagimachi, 1958, 1960). If both of the spermathecae are "fertilized" in this manner, the fully developed parasite has two spermathecae of about equal size; if the process takes place in one of the spermathecae, only this organ comes to complete development, the other remaining rudimentary; if none of the spermathecae is "fertilized", the external sac of the parasite detaches itself from the host at an immature stage. The rudimentary state of one of the male organs therefore does not form a character of specific value.

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