

On *Sacculina gordonii*, a new species of the Genus, Parasitic on *Atergatis floridus*

By H. BOSCHMA,

Professor of Zoology at the University at Leiden

Some time ago Dr. Isabella Gordon of the British Museum (Natural History) sent me for identification a specimen of a Sacculinid on *Atergatis floridus*. The specimen belongs to the collection of the Raffles Museum, and, as it proved to be the type of a new species, the description is given here together with a few remarks on the specimen.

Sacculina gordonii nov. spec.

Locality: Sultan Shoal, Singapore, Adolf Monteiro coll., 27. 10. 1930; 1 specimen on *Atergatis floridus* (Rumph.).

Diagnosis of the species. Male genital organs in the posterior part of the body, outside the visceral mass. Testes completely separated, enormously enlarged, forming wide, thin-walled sacs, which suddenly pass into the vasa deferentia. One of the testes much larger than the other. Colleteric glands flattened, with a comparatively small number of tubes. External cuticle covered with hairs which have the same structure as the main layers of this cuticle. The hairs have a length of 10–20 μ and bear minute lateral hairs. Internal cuticle with narrow bands of retinacula, which are composed of one to six spindles; the latter have a length of 10–20 μ and are not barbed.

The specimen is more or less triangular with rounded angles, the anterior region forming the base of the triangle whilst the stalk is found at the apex. The surface of the mantle possesses a few folds and grooves (fig. 1), whilst at the surface which was turned against the abdomen of the host there is a short concavity caused by pressure of the surroundings of the gut of the crab against the parasite. The dimensions of the specimen are: breadth 18 mm., height (the distance between the anterior and posterior region), not including the stalk, 16 mm, and thickness 5 mm. The mantle opening, which is found in the anterior part of the surface which was turned towards the thorax of the crab, does not project noticeably above its surroundings; it forms a rather narrow slit with an irregular margin, probably owing to contraction of this part of the mantle during the preservation of the specimen.

The anatomy of the specimen could be studied by means of a series of longitudinal sections. The chief facts derived from the study of these sections are the following.

The male genital organs are found in the posterior part of the body, in the muscular region to which the stalk is attached. They lie therefore outside the visceral mass. Both testes have a greatly enlarged shape (figs. 2, 3), they form wide pouches which are provided with a thin wall. The testis of the left side is much larger than that of the right side, the greater part of the latter is more or less compressed as a consequence of the enormous development of the left testis. In fig. 2 the dorsal parts of the two testes are visible, here the left testis is seen as a wide sac, whilst of the right testis the dorsal extremity appears. In fig. 3 the widest portion of the right testis has been drawn, here the left testis has approximately the same size as in the section represented in fig 3 (the two sections are drawn on different scales!).

Towards the ventral region of the body the two testes pass into the vasa deferentia, which form short, nearly straight tubes, which are comparatively sharply limited from the testes. Originally undoubtedly the testes have been more or less globular, during the growth of the animal they have developed into the voluminous sacs with their irregular shape.

Near the central part of the lateral surfaces of the visceral mass the colleteric glands (figs. 2, 4) are found, slightly nearer to the anterior region than to the posterior part of the visceral mass. These glands are rather flat, they do not project strongly above the surfaces of the visceral mass. They contain a comparatively small number of branched tubes (a small number when compared with that in many other specimens of large size belonging to different species of the genus). In sections

through the central region of the colleteric glands (fig. 2) merely a few rather wide canals are visible in the interior of these organs. Sections through a more marginal part of the colleteric gland show a more numerous quantity of these tubes (fig. 4), as the more peripheral branches then become visible.

For the greater part the visceral mass consists of groups of eggs in the ovary. Between these groups there are visible a few muscles, chiefly running in transverse direction, whilst the whole organ is surrounded by a thin muscular layer. The mantle cavity contains a large quantity of eggs. The mantle itself possesses the usual muscle components, the sphincter of the mantle opening is well developed. As already mentioned above the posterior part of the body is highly muscular. Many of these muscles penetrate into the stalk and others surround the different parts of the male genital organs.

The thickness of the external cuticle of the mantle varies in different parts, in most regions it does not exceed 30μ . Its surface is covered with hairs which in different parts of the mantle vary slightly in shape and size (fig. 5). The length of these excrescences is $10-20\mu$ in some regions of the mantle they are rather short and possess distinct minute lateral hairs (fig. 5a), in other parts of the mantle the excrescences are slenderer and then usually they are covered with a few minute lateral hairs only (fig. 5b). These excrescences consist of the same kind of chitin as that of which the main layers of the cuticle are composed, consequently they appear as direct protuberances of this cuticle (fig. 5c).

The retinacula of this species are variable in size and shape (fig. 6). Generally each retinaculum bears one or two spindles, but in some of these excrescences the number of spindles may be much larger, so that six spindles may be found together. The basal part of the retinacula is not developed, it consists of a more or less circular area of the internal cuticle. The spindles vary strongly in size, the smallest have a length of 10μ the largest are 20μ long. They do not bear barbs.

The retinacula are not evenly distributed on the surface of the internal cuticle, but they are arranged into narrow bands which alternate with large patches which are completely devoid of retinacula.

As far as concerns the position and the shape of the male genital organs and the structure of the external cuticle of the mantle *Sacculina gordonii* corresponds with *S. eriphiae* (first mentioned by Smith, 1906), *S. hirta* (cf. Boschma, 1933), and *S. inflata* (the parasite of *Hyas* and *Cancer*, cf. Leuckart, 1859; Anderson, 1862; Boschma 1931a). In these four species the male genital organs are found outside the visceral mass, in the

muscular region of the body to which the stalk is attached. The testes are more or less globular, at least sharply limited from the vasa deferentia, in contradistinction to those species which have cylindrical testes which pass gradually into the vasa deferentia. Moreover in the four species at least one of the testes is enormously enlarged, forming a wide sac with a thin wall, and the two testes remain separated for the whole of their extent.

Concerning the structure of the external cuticle the four species correspond in possessing similar excrescences. The latter consist of fairly long hairs which are composed of the same kind of chitin as that of the main layers of the cuticle.

Sacculina gordonii differs from the three other species by the arrangement of its retinacula in distinct rows on the internal cuticle. In *S. eriphiae* and in *S. hirta* the retinacula are more or less regularly distributed on the surface of the internal cuticle, whilst in *S. inflata* retinacula probably do not occur, as they could not be found in any specimen examined in this respect. Moreover the colleteric glands of *S. gordonii* differ from those of the three other species. In *S. eriphiae*, *S. hirta*, and *S. inflata* the colleteric glands are comparatively thick, more or less hemispherical, whilst in *S. gordonii* these glands form flat patches at each side of the visceral mass.

Besides *Sacculina gordonii* three other species of Sacculinidae are known as parasites of the crab *Atergatis floridus*, viz., *Sacculina weberi*, *Loxothylacus corculum*, and *Loxothylacus aristatus*. The excrescences of the external cuticle of *Sacculina weberi* (cf. Van Kampen and Boschma, 1925; Boschma, 1931b) do not differ strongly from those of *S. gordonii*. In *S. weberi* they are more loosely distributed, they are more rigid, and, especially, the little lateral hairs consist of stiff little spines. Moreover the retinacula are different in the two species, those of *S. gordonii* do not possess a basal part and their spindles are not barbed, whilst those of *S. weberi* have distinct basal parts and possess barbed spines. Anatomically the difference between the two species is still more striking: in *S. gordonii* the testes are found outside the visceral mass, in *S. weberi* these organs are embedded in the visceral mass.

The two species of the genus *Loxothylacus* which are known as parasites of *Atergatis floridus* differ from *Sacculina gordonii* in important anatomical characteristics. Moreover the excrescences of the external cuticle have a different shape from that in *S. gordonii*. The excrescences of *L. corculum* (cf. Kossmann, 1872; Van Kampen and Boschma, 1925) consist of enormous conical spines, whilst those of *L. aristatus* (cf. Boschma, 1931b) are composed of groups of spines which are arranged on common basal parts.

It is far more difficult to identify a parasite belonging to the Sacculinidae from the Indo-malayan region than those from European waters. In the latter region from each species of crab no more than one Sacculinid parasite is known. In many cases a species of *Sacculina* or of *Drepanorchis* is known to infest two or more species of crabs, but these crabs never bear parasites belonging to another species of the family. In oriental waters this rule does not hold: when the host is known the parasite may belong to several species of Sacculinidae. So including the new species described in the present paper, *Atergatis floridus*, e.g., is known as a host of four different species of Sacculinidae. Many other instances of this phenomenon are known.

LITERATURE CITED

- ANDERSON, J., 1862. On the Anatomy of Sacculina, with Description of the Species. Ann. Mag. Nat. Hist. (3), vol. 9.
- BOSCHMA, H., 1931a. On the Identity of Sacculina inflata. Proc. Roy. Soc. Edinburgh. vol. 51.
- _____, 1931b. Die Rhizocephalen der Siboga Expedition. Supplement. Siboga-Expeditie, monogr. 31bis.
- _____, 1933. The Rhizocephala of the British Museum (Natural History) (to appear in the near future).
- KAMPEN, P. N. VAN, and H. BOSCHMA, 1925. Die Rhizocephalen der Siboga Expedition. Siboga-Expeditie, monogr. 31bis.
- KOSSMANN, R., 1872. Beitrage zur Anatomie der schmarotzenden Rankenfussler. Verh. med.-physiol. Ges. Würzburg, N. F., vol. 3.
- LEUCKART, R., 1859. Carcinologisches. Arch. f. Naturgesch., Jg. 25, vol. 1.
- SMITH, G., 1906. Rhizocephala. Fauna und Flora des Golfes von Neapel, 29. Monogr.

Fig. 1. *Sacculina gordonii*, the surface of the parasite which was turned against the thorax of its host. At the upper part of the figure the mantle opening, at the lower part the stalk. $\times 2$.

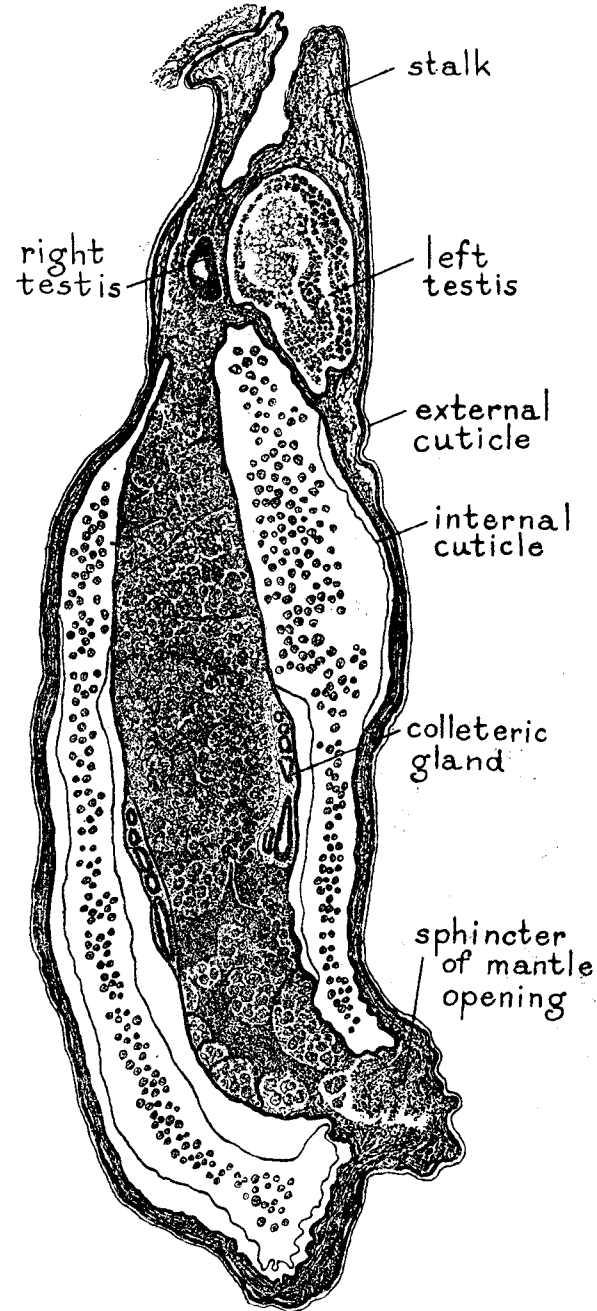
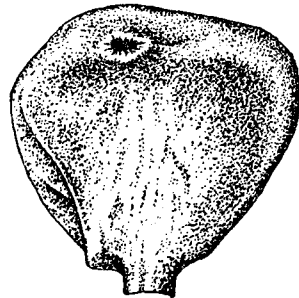


Fig. 2. *Sacculina gordonii*. Longitudinal section in the vicinity of the mantle opening. $\times 10$.

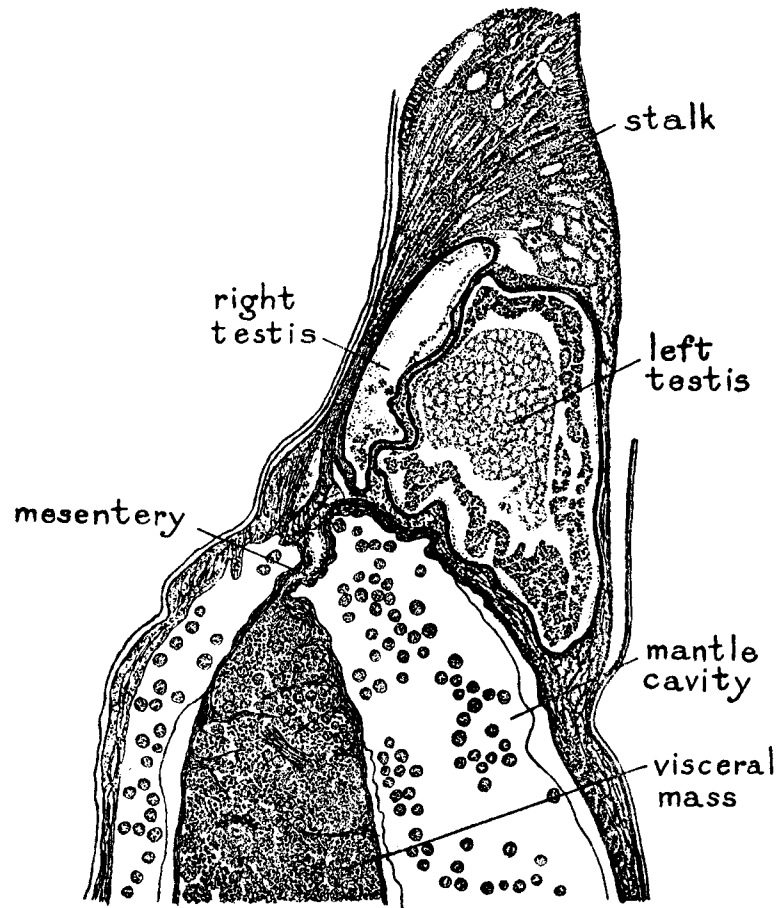


Fig. 3. *Sacculina gordoni*. Posterior part of a longitudinal section in a more ventral plane than that of fig. 2. $\times 18$.

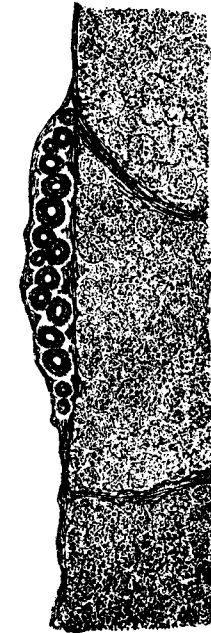


Fig. 4. *Sacculina gordoni*. Section through the colleteric gland and part of the adjoining visceral mass. $\times 36$.

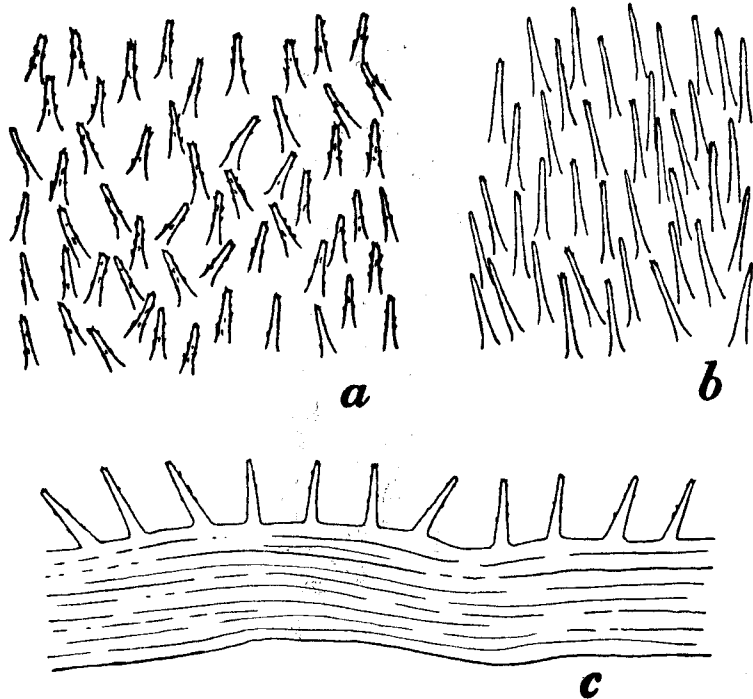


Fig. 5. *Sacculina gordonii*. *a*, excrescences as they are distributed on the external cuticle; *b*, the same on another part of this cuticle; *c*, section of the external cuticle. $\times 530$.

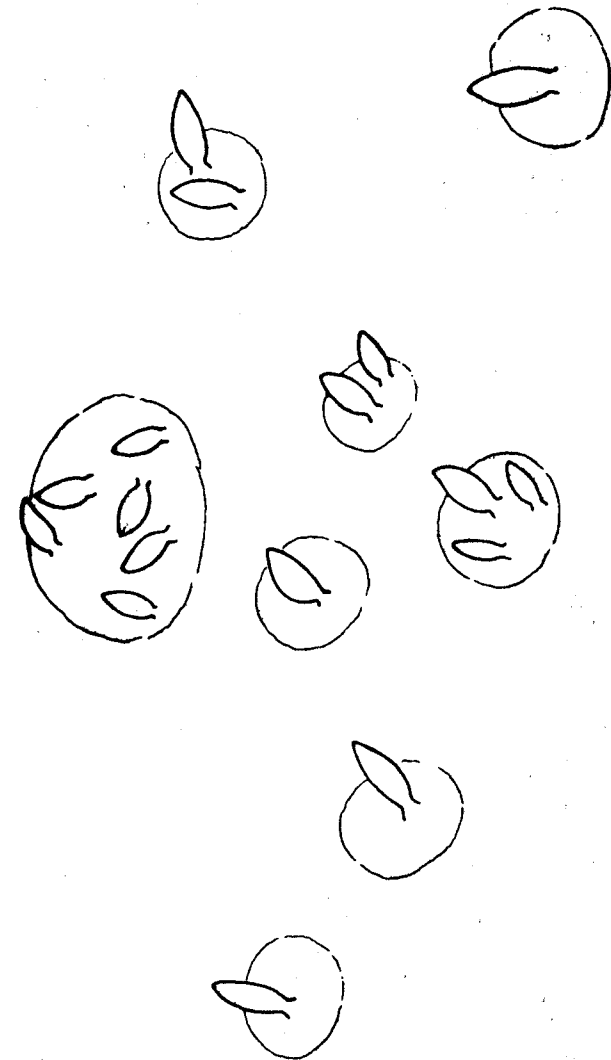


Fig. 6. *Sacculina gordonii*. Part of a band of retinacula. $\times 530$.