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THE RHIZOCEPHALAN PARASITE OF THE CRAB *XANTHO INCISUS* (LEACH)

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As shown by Holthuis (1954), the correct name for the European crab commonly referred to as *Xantho floridus* (Montagu) is *Xantho incisus* (Leach). A Rhizocephalan parasite of this crab was first mentioned (without an indication of specific characters) by Gerbe (1862); afterwards specimens were recorded by Kossmann (1873), who suggested that they might be identical with his *Sacculina benedeni*, the parasite of the crab *Pachygrapsus marmoratus* (Fabricius), at present considered identical with *Sacculina carcini* Thompson.

Bonnier (1887) used the name *Sacculina gerbei* Giard for the parasite of *Xantho incisus*; this name was, however, not mentioned in any of the several papers by Giard dealing with Rhizocephala. In the present paper the parasite is referred to with the name *Sacculina gerbei* Bonnier, though perhaps the correct indication would be "*Sacculina gerbei* Giard in Bonnier".

Guérin-Ganivet (1911) used the name *Sacculina gerbei* Giard for the parasite of *Xantho incisus*; he examined a specimen from the collection of the Marine Laboratory at Wimereux without exact data of a locality and remarks (l.c., pp. 51-52):

Cette Sacculine rentre à la rigueur dans la catégorie de celles qu'on pourrait sans doute assimiler à *Sacculina carcini*. La forme du seul exemplaire que j'ai examiné n'est cependant pas absolument identique à cette dernière; les deux diverticules latéraux font défaut et l'orifice cloacal est au sommet d'une proéminence du manteau. La cavité incubatrice était vide et la masse viscérale lisse; la glande collétérique est située à la limite de séparation du tiers moyen et du tiers inférieur de la masse viscérale; je n'ai pu observer le testicule, ne voulant pas détériorer par trop cet échantillon unique. Je ne me décide d'ailleurs à lui conserver provisoirement le nom spécifique que lui avait attribué Giard qu'en raison de la situation de la glande collétérique qui me paraît quelque peu différente.

The differences from *Sacculina carcini* as noted by Guérin-Ganivet in the passage quoted above do not result in constant specific characters. Many specimens of *Sacculina carcini* have pointed dorsal and ventral protuberances of the mantle, but these are lacking in other specimens; in many specimens the mantle opening occurs at the top of a small papilla, but in other specimens this opening does not rise noticeably above the surface of the mantle (cf. Boschma, 1927, fig. 1). The colleteric glands of *Sacculina carcini* may

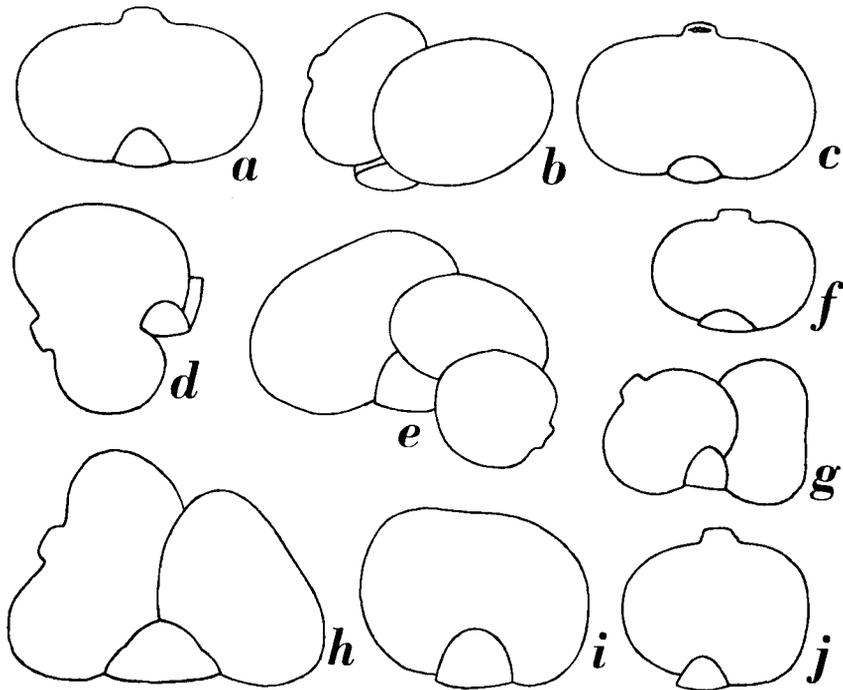


Fig. 1. *Sacculina gerbei* Bonnier, right side, each figure showing the tip of the abdomen of the host. $\times 3$.

occur in the centre of each of the lateral surfaces of the visceral mass, but often lie in the anterior half, not unfrequently at one third of the length.

The available data warranted the preliminary conclusion that in all probability the name *Sacculina gerbei* was to be regarded as a synonym of *Sacculina carcini*; consequently in a recent paper (Boschma, 1955) I placed *S. gerbei* with a question mark under *S. carcini*. The data in the present paper, based on an examination of several specimens, show that this opinion was incorrect because the characters of *S. gerbei* are distinctly different from those of *S. carcini*. I am greatly obliged to Professor H. Nouvel,

Zoological Institute of the University of Toulouse, for placing at my disposal ten specimens of *Xantho incisus* (Leach), each bearing one or more parasites, collected by him on July 27, 1949, at Saint-Jean-de-Luz (Bay of Biscay). This material proved altogether satisfactory to determine the specific status of *Sacculina gerbei*.

Generally the parasites have an elliptical shape (fig. 1); in most specimens the region of the mantle opening protrudes as a short tube over the surface of the mantle. As a rule the parasites are attached to the topmost half of the abdomen of the host. In the following list the hosts are arranged according to size, as measurements of the parasites are noted dorso-ventral diameter, antero-posterior diameter, and thickness respectively.

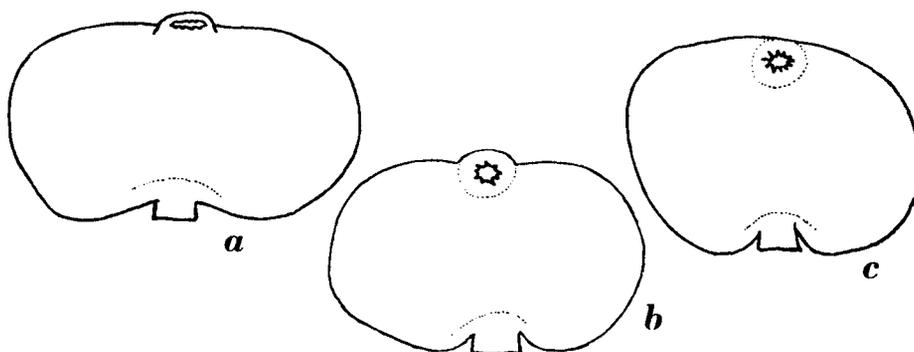


Fig. 2. *Sacculina gerbei* Bonnier, left side of three specimens. $\times 4$.

Carapace breadth crab 24 mm; parasites $10 \times 8 \times 3\frac{1}{2}$, $8 \times 5 \times 3$, and $5\frac{1}{2} \times 5 \times 2\frac{1}{2}$ mm (fig. 1e);

carapace breadth crab 20 mm; parasites $11 \times 7 \times 4$ and $9 \times 7 \times 4$ mm (fig. 1h);

carapace breadth crab $19\frac{1}{2}$ mm; parasite $10 \times 7 \times 5$ mm (figs. 1i, 2c);

carapace breadth crab 18 mm; parasite $10\frac{1}{2} \times 6 \times 5$ mm (figs. 1c, 2b);

carapace breadth crab 18 mm; parasite $9 \times 7\frac{1}{2} \times 4\frac{1}{2}$ mm (fig. 1d);

carapace breadth crab 18 mm; parasite $7 \times 4\frac{1}{2} \times 3$ mm (fig. 1f);

carapace breadth crab 17 mm; parasite $11 \times 6 \times 4$ mm (figs. 1a, 2a);

carapace breadth crab 16 mm; parasites $8 \times 6\frac{1}{2} \times 2\frac{1}{2}$ and $7 \times 4 \times 2\frac{1}{2}$ mm (fig. 1b);

carapace breadth crab 14 mm; parasites $6\frac{1}{2} \times 4\frac{1}{2} \times 2\frac{1}{2}$ and $6 \times 5 \times 2$ mm (fig. 1g);

carapace breadth crab 13 mm; parasite $8 \times 6 \times 4$ mm (fig. 1j).

The numbers indicate that in comparison with the dimensions of the

hosts the parasites are of a fairly large size, their greater diameter being about half that of the hosts. The drawings in fig. 1 show that the shape of the abdomen of one or two of the hosts approaches that of a normal female (fig. 1*f, h*), in the other crabs the abdomen is shaped as that of a normal male or shows characters intermediate between those of normal males and females.

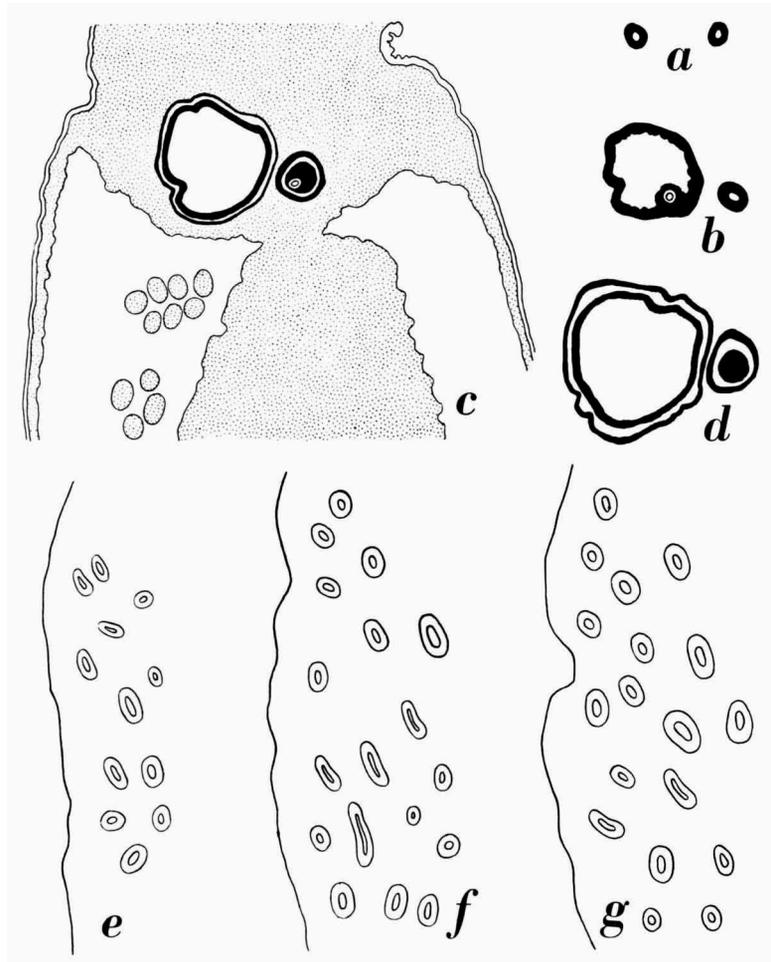


Fig. 3. *Sacculina gerbei* Bonnier. *a*, transverse section of the two vasa deferentia; *b*, transverse section of the male organs, dorsally from *a*; *c*, posterior part of a longitudinal section of the body in the region of the stalk; *d*, transverse section of the male organs, dorsally from *c*; *e-g*, longitudinal sections of one of the colleteric glands, each following section farther towards the centre. *a-d*, $\times 30$; *e-g*, $\times 127$.

Three specimens were longitudinally sectioned, the left side of these is drawn in fig. 2 to show the position of the mantle opening in the anterior part of the body and the situation of the stalk in a slightly depressed area in the posterior part.

Transverse sections of the male genital organs of one of the specimens are represented in fig. 3*a-d*. The vasa deferentia are narrow tubes

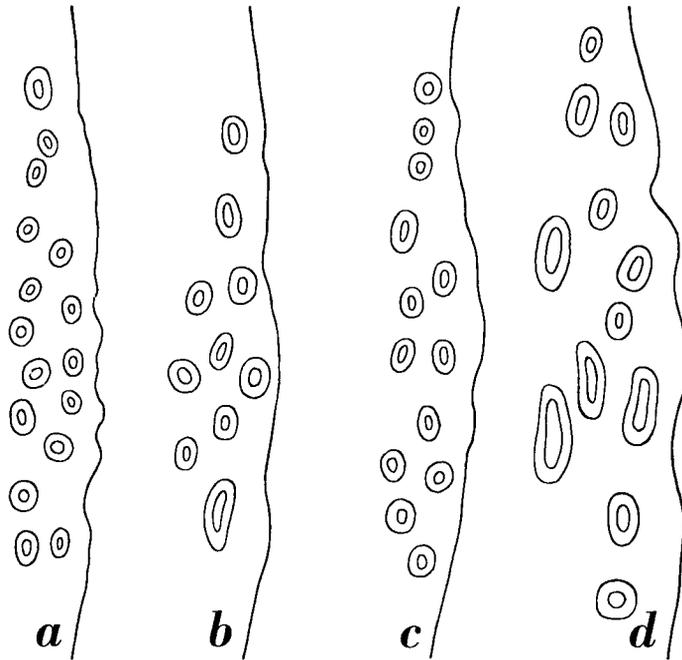


Fig. 4. *Sacculina gerbei* Bonnier, longitudinal sections of colleteric glands of two specimens; *a* and *c* from the peripheral region, *b* and *d* farther towards the centre. $\times 127$.

(fig. 3*a*), showing a distinct chitinous wall in the region of their transition into the testes. In this region one of the testes has a fairly large size (fig. 3*b*), in the corresponding part of the other male organ the testis is comparatively narrow (fig. 3*c*). This testis remains small also farther towards the dorsal region, while the other testis becomes much wider (fig. 3*d*). The cavity of the larger testis is wide, that of the smaller testis is very narrow.

The male organs of the two other specimens show corresponding peculiarities, here again there is a conspicuous difference in size between the

two testes, the one being only slightly wider than the vas deferens, the other having developed into a rather voluminous organ with a wide cavity.

In the three sectioned specimens the colleteric glands lie at some distance from the central part of each of the lateral surfaces of the visceral mass, their centre at about one third of the length of the visceral mass, so that they have distinctly shifted in an anterior direction. Guérin-Ganivet (1911) noted this peculiarity also in his specimen, regarding it as a specific character; this does not hold, for a similar situation is of common occurrence in *Sacculina carcini*.

In one of the three sectioned specimens of *Sacculina gerbei* the colleteric glands form rather thick masses in which the canals are arranged in three or four rows (fig. 3e-g), here the maximal number of canals counted in a longitudinal section amounts to 18. In the two other specimens the colleteric glands are much flatter, as a rule showing two rows of canals arranged more or less parallel to the surface of the visceral mass (one specimen, fig. 4a, b; the other specimen, fig. 4c, d); in these glands the maximal number of canals in one section is 16 (fig. 4a) and 13 (fig. 4c).

In the three sectioned specimens the thickness of the external cuticle of the mantle varies from 12 to 20 μ . On its upper surface this cuticle bears short hairs or elongate papillae varying in length from 10 to 25 μ , these may occur rather crowdedly (fig. 5a) or are rather sparsely distributed (fig. 5b). Especially in their topmost parts these excrescences show a number of minute lateral hairs.

A search for retinacula was made on various parts of the internal cuticle of the three sectioned specimens, in only one fragment these were found to occur in two separated spots (fig. 5c). Where they occur the retinacula consist of numerous single spindles arranged in more or less irregular rows or patches. The spindles have a length of 12 to 16 μ , and seem to be devoid of barbs.

The structure of the male organs proves that *Sacculina gerbei* is specifically different from *S. carcini*; moreover, the two species have entirely different retinacula. On the other hand, the internal anatomy of *S. gerbei* is very similar to that of three other species occurring in European waters, viz., *Sacculina gonoplaxae* Guérin-Ganivet, *Sacculina atlantica* Boschma, and *Sacculina zariquieyi* Boschma. In a previous paper (Boschma, 1947) I commented upon the difficulties for defining the specific characters of *S. gonoplaxae*, *S. atlantica*, and *S. zariquieyi*, three species with inconspicuous differences in their internal structure, with similar excrescences, and apparently characterized by not having retinacula. *Sacculina gerbei* now proves to be a fourth species with a corresponding combination of characters. The

occurrence of retinacula in the last named species cannot serve as a character to distinguish it from the other three parasites, for retinacula were not to be found in all the fragments of the internal cuticle of *S. gerbei* examined for this purpose, so that they easily can have been overlooked in the other species.

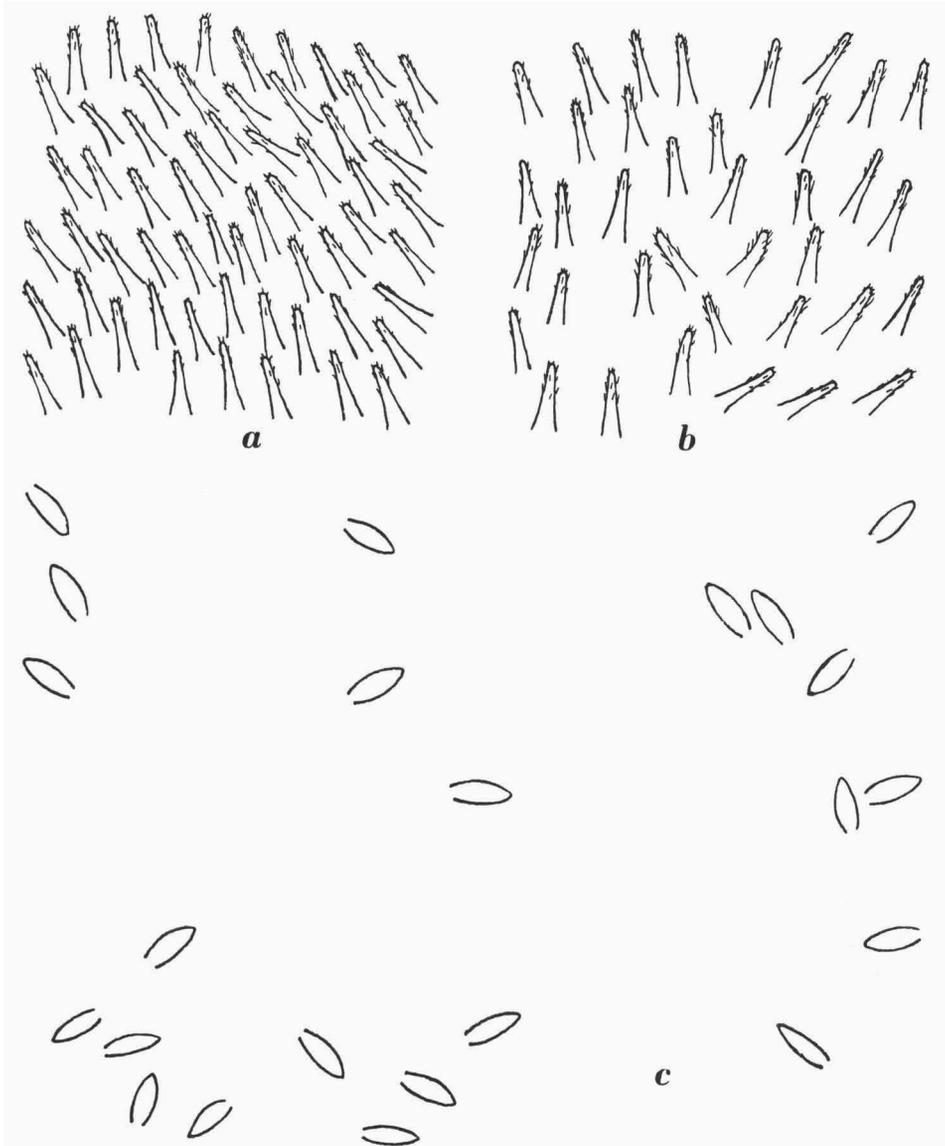


Fig. 5. *Sacculina gerbei* Bonnier. *a* and *b*, surface view of the external cuticle of two specimens, showing the excrescences; *c*, retinacula. $\times 530$.

The characters of the male organs and of the colleteric glands of the four species here dealt with are the following.

Sacculina gerbei (cf. figs. 3 and 4 in the present paper): vasa deferentia narrow, connected with the testes by a chitinous tube, one testis small with narrow cavity, the other large with wide cavity; colleteric glands flattened or rather thick, with up to 18 canals (in 2 to 4 rows) in a longitudinal section.

Sacculina gonoplaxae (cf. Boschma, 1937, fig. 39): vasa deferentia narrow, connected with the testes by a chitinous tube, testes of about equal size, both large with wide cavity; colleteric glands flattened, with up to 19 canals (in 2 rows) in a longitudinal section.

Sacculina atlantica (cf. Boschma, 1937, fig. 7): vasa deferentia narrow, connected with the testes by a chitinous tube, testes of about equal size, both rather narrow; colleteric glands flattened, with up to 9 canals (in one row) in a longitudinal section.

Sacculina zariquieyi (cf. Boschma, 1947, fig. 3): vasa deferentia narrow, region of transition into the testes without a distinct layer of chitin, testes of about equal size, both comparatively wide; colleteric glands rather thick, with up to 18 canals (in 2 or 3 rows) in a longitudinal section.

This survey indicates that the four species have much in common, but that each of the four has some characters different from those of the other species. As far as *Sacculina gerbei* is concerned its status as a distinct species now is beyond doubt, while it proved to be definitely different from *Sacculina carcini*.

In a list of parasites arranged under hosts (Boschma, 1955, p. 65) I noted "*Xantho poressa* (Olivi) [*X. hydrophilus* (Herbst)]: Sacculinid mentioned by Richiardi (1875)", while on p. 18 of the cited paper the same specimen inadvertently was referred to as a parasite of *Xantho incisus*; together with *Sacculina gerbei* it was tentatively placed in the synonymy of *Sacculina carcini*. The host of the parasite mentioned by Richiardi (1875) was originally recorded as *Xantho hydrophilus*, it was obtained in the Mediterranean, so that the correct name of the host is *Xantho poressa* (cf. Holthuis, 1954). The parasite of this crab has never been examined, therefore up to now its specific status remains unknown.

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