

BRIAROSACCUS CALLOSUS, A NEW GENUS AND NEW SPECIES OF A RHIZOCEPHALAN PARASITE OF LITHODES AGASSIZII SMITH

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By H. BOSCHMA

*Of the University in Leiden, Holland*

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The collection of the United States National Museum contains among a large number of other specimens, which for the greater part are representatives of previously described genera, one that is remarkable for its enormous size. It is a parasite of *Lithodes agassizii* Smith, which has been taken from its host. Consequently its position on the host is unknown, but probably the long axis of the parasite was lying in the transverse plane of the host, as in this manner more space is available between the thorax and the abdomen of *Lithodes*.

The internal anatomy of the parasite is very similar to that of *Peltogaster*, and the parasite certainly is a representative of the Peltogastridae. In some respects, however, the specimen differs from *Peltogaster* and the other known genera of the family, and these differences are striking enough to establish for this specimen a new genus, which I propose to call *Briarosaccus* on account of the gigantic size of the type specimen. This genus may be defined as follows:

**BRIAROSACCUS, new genus**

Body slightly elongate, curved. Stalk about in the central part of the dorsal surface. Mantle opening at one extremity. Mesentery from the mantle opening to the posterior part of the dorsal surface, thin, except in the region of the stalk. Colleteric glands at the left and right side of the mesentery, highly lobular. Testes paired, situated in the dorsal part of the visceral mass, parallel to long axis.

In general structure *Briarosaccus* reminds one strongly of that of *Peltogaster*, from which it differs chiefly in the relative narrowness of the mesentery, the more complicated structure of the colleteric glands, and in its peculiar retinacula. The mesentery which joins the mantle to the visceral mass in *Peltogaster* is very broad (Boschma, 1928, fig. 4), having the breadth of one-fourth or more of the surface of the latter. Consequently it can not be compared directly with that in the Sacculinidae, in which there is a narrow ligament connect-

ing the visceral mass with the mantle. In *Briarosaccus* the mesentery is comparatively narrow as in the Sacculinidae (fig. 3).

The type specimen of the genus, described below, may be characterized as a distinct species especially by the structure of the chitinous covering of the mantle.

**BRIAROSACCUS CALLOSUS, new species**

*Type*.—Cat. No. 62304, U.S.N.M., on *Lithodes agassizii* Smith, "Albatross" Sta. 2666 (off Fernandina, Fla., 270 fathoms) or Sta. 2677 (off Cape Fear, N. C., 478 fathoms), 1886.

External cuticle thick and callous, with grooves and shallow pits. The surface is covered with small excrescences, which have a length of approximately  $9\mu$  and form a dense covering of the outer layer.

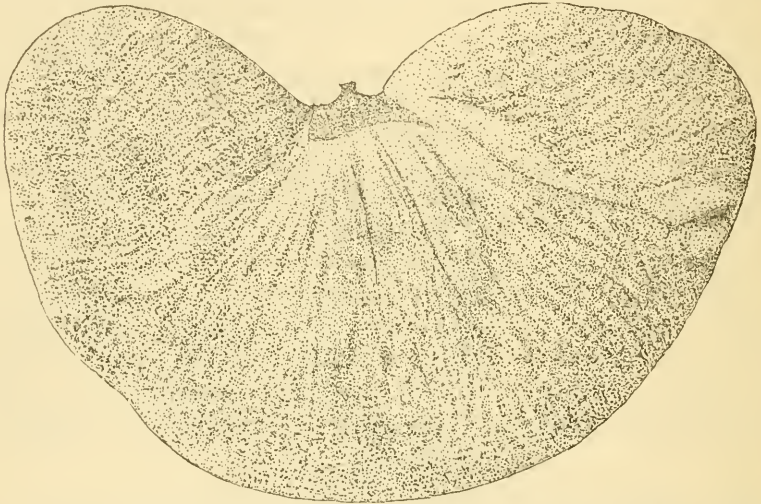


FIGURE 1.—*BRIAROSACCUS CALLOSUS*, RIGHT SURFACE. NATURAL SIZE

Internal cuticle with retinacula of large size, containing numerous spindles, which vary in length from  $15\mu$  to  $55\mu$ .

The specimen has a length of 98 mm, its height attains 53 mm, and the thickness amounts to 31 mm. As compared with all other Rhizocephala hitherto known it really is a gigantic animal (fig. 1). The thick external cuticle possesses a number of grooves which spread from the stalk toward the ventral region of the parasite. Between these grooves and especially at the ventral region the surface of the mantle shows numerous small depressions, giving the surface a dotted appearance. The stalk is surrounded by a strong shield, consisting of chitin of a harder kind and of a darker color than the remainder of the external cuticle. The mantle opening is found at one side of the animal, which consequently has to be regarded as the anterior pole. In Figure 1 it is visible, though rather indistinctly,

at the extreme right of the figure. It is surrounded by a thick sphincter, as a result of which the parts around the mantle opening slightly protrude, forming thereby a kind of wall. The shape of the mantle opening is more distinctly visible in Figure 2, which represents a part of the anterior region of the animal.

For the study of the internal structure the mantle has been removed from the visceral mass. Figure 3 shows the greater part of the internal surface of the mantle. At the left side of the figure the mantle opening, surrounded by its strongly developed sphincter, may be seen. Slightly above the center of the figure the region of the stalk is to be seen as a concavity in a part of the mesentery. The latter, which has been detached from the visceral mass, extends from the sphincter of the mantle opening to the posterior part of the dorsal surface (behind the stalk). Only a part of the mesentery, the posterior part, is found exactly at the dorsal surface; the anterior



FIGURE 2.—BRIAROSACCUS CALLOSUS, PART OF THE MANTLE, WITH THE MANTLE OPENING. APPROXIMATELY NATURAL SIZE

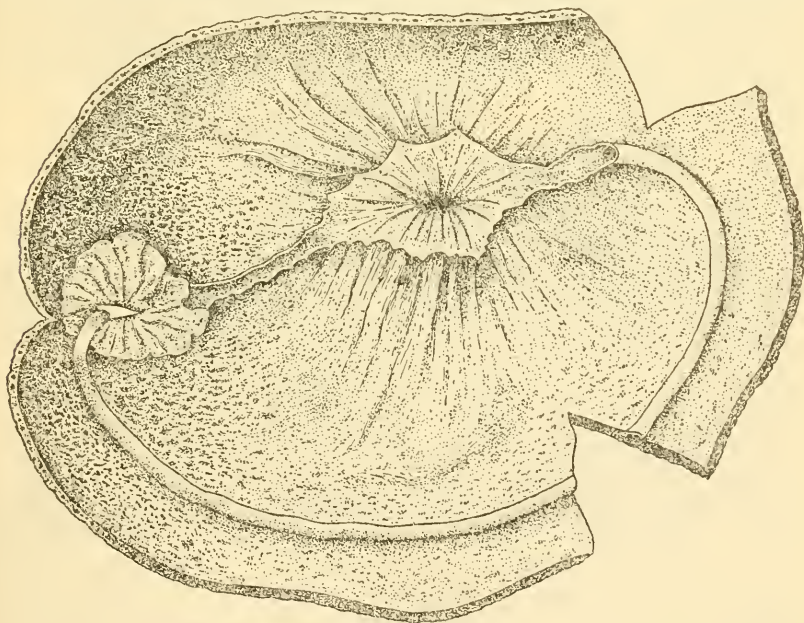


FIGURE 3.—BRIAROSACCUS CALLOSUS, THE GREATER PART OF THE MANTLE, INTERNAL SURFACE

part of the mesentery stretches from the mantle opening along the right surface of the mantle toward the stalk. The mantle opening



also does not occupy exactly the anterior pole, but lies slightly on the right side of the median plane. Consequently the parasite is not completely bilaterally symmetrical. Except the central part of the mesentery, which surrounds the stalk, the whole of this organ

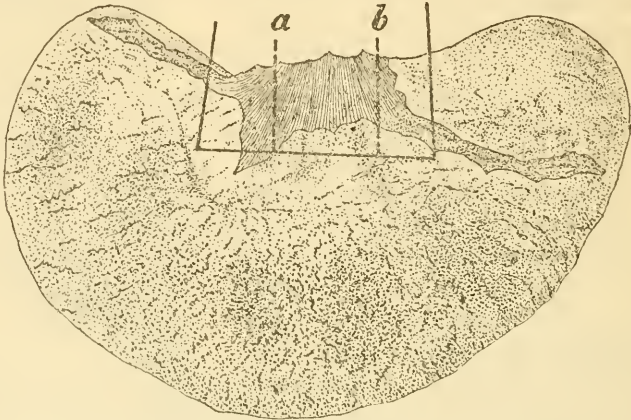


FIGURE 4.—BRIAROSACCUS CALLOSUS, VISCERAL MASS, RIGHT SURFACE. THE SOLID LINE DELIMITS THE PART FROM WHICH SECTIONS HAVE BEEN MADE, THE LINE *a* LOCATES FIGURE 6, AND *b*, FIGURE 5

constitutes a narrow strip of tissue connecting the visceral mass with the mantle. The central part is much broader; here a quantity of strong muscles are present which fasten the visceral mass to the shieldlike portion of the cuticle round the stalk. As in other Rhizo-



FIGURE 5.—BRIAROSACCUS CALLOSUS, PART OF A TRANSVERSE SECTION *b* IN FIGURE 4, SHOWING THE TESTES.  $\times 7$

cephala, the mesentery contains large lacunae, one of which is in connection with a spacious lacuna found in the posterior region and in the median plane of the ventral surface of the mantle. In the anterior region this lacuna terminates in the sphincter of the mantle

opening. This lacuna is distinctly visible in Figure 3; it denotes approximately the ventral and posterior border of the mantle when not spread out as in the figure.

Nearly the whole space of the mantle cavity was occupied by the well-developed visceral mass, no eggs or developing larvae being present in the mantle cavity. The visceral mass (fig. 4) possesses a somewhat wrinkled surface, doubtless on account of the pressure of the irregular internal surface of the mantle. The scar of the removed mesentery is visible in the figure, at the left side the posterior part, which lies approximately in the median plane; at the right side of the figure the anterior part of the mesentery, which deviates from the median plane and runs along the right side of the visceral mass toward the mantle opening, is to be seen.

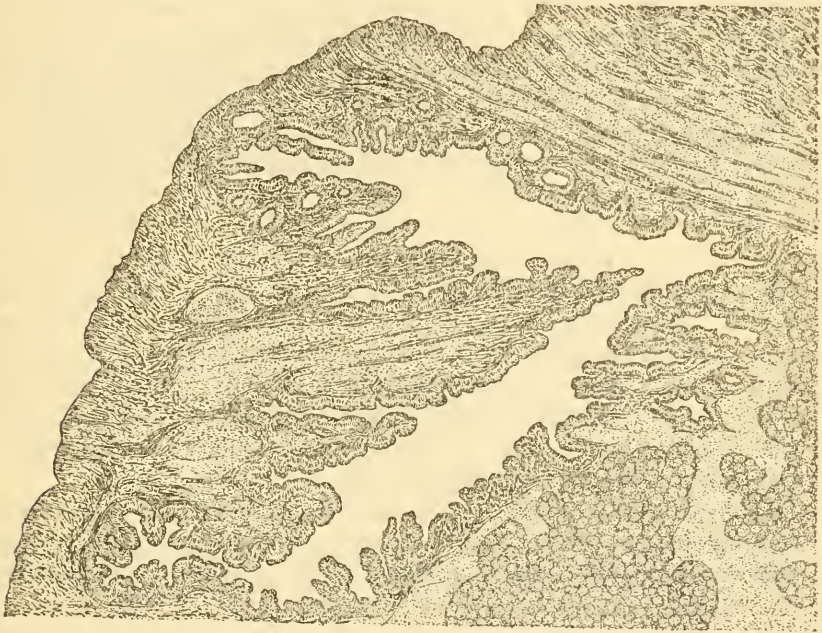


FIGURE 6.—*BRIAROSACCUS CALLOSUS*, PART OF A TRANSVERSE SECTION *a* IN FIGURE 4, SHOWING ONE OF THE COLLETERIC GLANDS. THE CONTENTS OF THIS GLAND HAVE BEEN OMITTED IN THE FIGURE.  $\times 14$

For the study of the internal organs a part of the visceral mass has been cut off. This part, from which a series of sections has been made, is indicated in Figure 4 by the full line. Parts of two sections are represented in the present paper; Figure 6 is a drawing of a part of a section corresponding with the line *a* in Figure 4, whilst Figure 5 is drawn after a section from the region indicated with *b* in Figure 4.

With the exception of the part surrounded by the line in Figure 4, the visceral mass consists nearly completely of groups of eggs in the ovary; between these groups of eggs numerous smaller and larger muscles are present. As already remarked, the central part of the

dorsal region is highly muscular (fig. 5); moreover, in this part large lacunae are found which are connected with the one which runs along the ventral surface of the mantle.

The testes (fig. 5) are found in the dorsal part of the visceral mass, in the region below the stalk. They consist of more or less straight tubes which are directed parallel to the median plane. Surrounding the testes there are lacunae of rather large size. The male genital openings could not be found in the sections, as the posterior part of the testes is rather indistinctly visible. In common with all other organs, the testes have a comparatively large size; their diameter amounts to 1 mm approximately in some parts.

The colleteric glands have a much more complicated structure than those of the other Peltogastridae. They are at each side of the median plane, not far from the stalk; their larger diameter amounts to 10 mm approximately. The lumen of the glands is rather wide, projecting from the center outward as a number of diverticules which in turn give rise to smaller divisions toward the periphery of the gland (fig. 6). The epithelium of these glands consists of a double layer of rather high cells, which are surrounded externally by a thin muscular layer. At various points the latter is connected with the muscles which traverse the visceral mass. The colleteric glands contain a rather irregular mass of secretion (for the sake of clearness omitted in the figure) in which no distinct structure can be found. An opening of the glands on the periphery of the visceral mass could not be detected, but at the proximal side of the glands there is a large opening, constituting the passage for the ripe eggs into the glands. By their highly complicated structure the colleteric glands of *Briarosaccus* form one of the generic peculiarities separating the genus from the other Peltogastridae.

The specific characters of *Briarosaccus callosus* may be derived with sufficient accuracy from the details of the chitinous coverings of the external and internal surface of the mantle. As might be expected, these parts also are characterized by their thickness and solidity.

The external cuticle of the mantle (fig. 7a) consists of two layers, owing to the fact that the cuticle is in the process of ecdysis. One might think that the two layers had developed by fission of the originally simple external cuticle, but as both of the two layers at their upper surface possess the characteristic small excrescences described below, we have here a formation of a new layer under the old external cuticle. These two layers of the cuticle, both with their characteristic excrescences, have been found in different Sacculinidae (Boschma, 1927); and the phenomenon, therefore, is not at all uncommon among Rhizocephala. Both of the layers of the external cuticle possess at their upper surface numerous small slender papillae (fig. 7b), which have a length of about  $9\mu$ . Those of the outer layer are



somewhat less regular by being partially worn off, but on the whole they have the same form and size.

The two layers of the external cuticle have approximately the same thickness, which in the lateral parts of the mantle is about  $275\mu$ . With a number of folds and irregular excrescences the two cuticular layers project into the mantle, causing thereby the wrinkled appearance of the whole animal.

The mantle is highly muscular; in transverse sections a number of muscular elements are visible, which constitute the transverse musculature of the mantle. Moreover, many of the epithelial muscular cells connect the external and the internal cuticle. Besides the

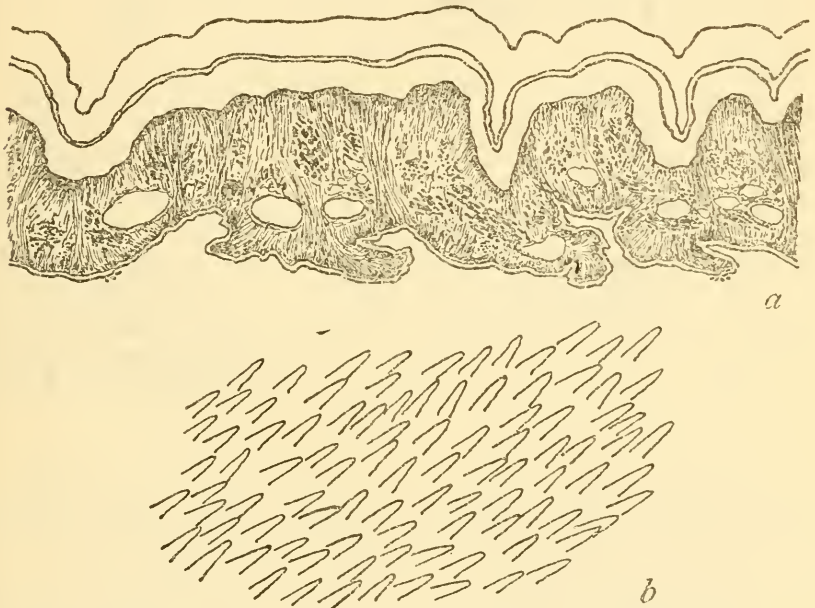


FIGURE 7.—*BRIAROSACCUS CALLOSUS*. *a*, SECTION THROUGH THE MANTLE, SHOWING THE TWO LAYERS OF THE EXTERNAL CUTICLE, THE INTERNAL CUTICLE, AND THE EPITHELIUM, MUSCLES, AND LACUNAE OF THE MANTLE.  $\times 18$ . *b*, EXCRESCENCES OF THE EXTERNAL CUTICLE, SEEN FROM ABOVE.  $\times 660$

muscles and the epithelium the mantle contains several lacunae of different sizes.

As the external cuticle the internal chitinous sheath of the mantle is strongly developed; it may even attain a thickness of  $50\mu$ . Its surface is rather irregular and wrinkled, and bears a large quantity of well-developed retinacula, two of which may be seen in the section represented in Figure 7*a*. The retinacula of *Briarosaccus* (fig. 8) differ from those of *Peltogaster* by their great number of spindles. They occur in abundance on the lower surface of the internal cuticle (fig. 8*a*) and vary in size from  $75\mu$  to over  $200\mu$ . A few more strongly enlarged retinacula are represented in Figures 8*b-d*, from which may be seen the strong variability in the shape of these organs and of their spindles. Not only the number of spindles in each retinaculum is different (this

number varies from 10 to 40 approximately) but also the size and shape of the spindles are subject to strong variation. The shape of the spindles strongly suggests those in *Peltogaster*, which have been described by Delage (1886) and figured by the present author (Boschma, 1928, fig. 3). The spindles have a more or less pointed extremity; some are comparatively slender, others are thicker. The length of the spindles, even of those of one retinaculum, varies from  $15\mu$  to  $55\mu$ . Barbs could not be found at the surface of the spindles, but when studied with a high power their surface appears somewhat

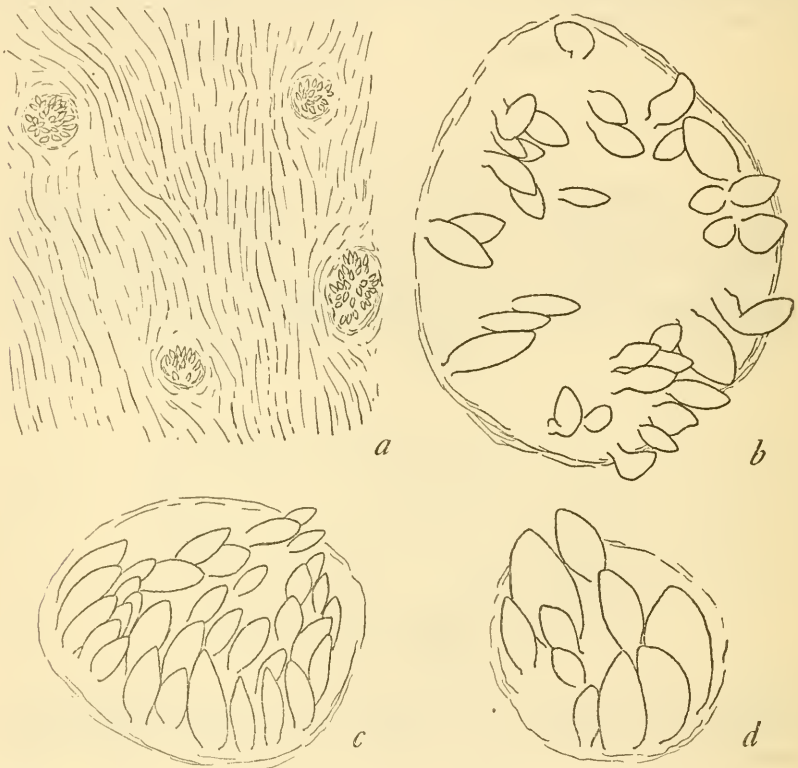


FIGURE 8.—*Briarosaccus callosus*, RETINACULA. *a*, PART OF THE INTERNAL CUTICLE WITH RETINACULA.  $\times 45$ . *b*, *c*, AND *d*, THREE DIFFERENT RETINACULA.  $\times 330$

granulated, but without definite excrescences such as occur on the spindles of many *Sacculinidae*. The basal part of the spindles is more or less narrowed, forming a kind of short stalk.

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