

Studies on *Ophryotrocha geryoncola* (Polychaeta: Dorvilleidae)

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ABSTRACT: *Ophryotrocha geryoncola* was first described by Esmark (1874) as *Eteonopsis geryoncola*. Bidenkap (1895) gave another short description. The species was redescribed by Wesenberg-Lund (1938) as *Ophryotrocha geryoncola*. Desportes et al. (1977) reported *O. geryoncola* from the western Mediterranean Sea. Recently, Gaston & Benner (1981) gave another redescription and recorded a new host for the most likely symbiotic species. These authors reestablished the original genus *Eteonopsis* mainly because the species is epizoic and not free-living like other *Ophryotrocha* species. Since all descriptions, given so far, were obviously based on preserved material a more detailed description of live specimens is provided. The size of the specimens (140 mm recorded by Wesenberg-Lund, 1938), the branched intestine and their epizoic mode of living clearly demonstrate that these animals belong to a species separated from the other known *Ophryotrocha* species. On the other hand, *O. geryoncola* shows all the main characters of the genus *Ophryotrocha*. Therefore it seems justifiable to leave this species within the genus *Ophryotrocha*.

INTRODUCTION

Ophryotrocha geryoncola seems to be a symbiotic species. There are five reports so far of *O. geryoncola* inhabiting the gill cavities of brachyuran crustaceans (*Geryon tridens*, *G. quinquedens*, *Cancer borealis*) (Esmark, 1874, 1880; Bidenkap, 1895; Wesenberg-Lund, 1938; Desportes et al., 1977; Gaston & Benner, 1981). The relationship between the crab and the polychaete is not yet understood. Gut analyses of Gaston & Benner (1981) failed to show what these worms feed on. Observations of live undisturbed specimens in their natural habitat are impossible. So all ideas about possible, parasitic or commensalic relationships have to remain speculative.

Since there are no data available about the life cycle of *O. geryoncola*, nothing can be said about how the worms infest crabs and how they manage to survive the moulting cycle of their host.

The confusion in the literature caused by the first description of *O. geryoncola* as *Eteonopsis geryoncola* (Esmark, 1874) was recently clarified by Gaston & Benner (1981). These authors reestablished the genus *Eteonopsis*. The present paper intends to give a new description of *O. geryoncola* and to point out that the species does belong to the genus *Ophryotrocha*.

MATERIAL AND METHODS

Ophryotrocha geryoncola was collected in September 1981 in the southern Skagerrak. Table 1 gives the relevant data. Some of the specimens were fixed for light and electron microscopy immediately after being collected. Others were brought to the laboratory in Berlin and kept alive for about twelve days. Specimens were kept in polystyrol boxes or in petri dishes with sterile seawater at 6°C in the dark. Some of the animals were fed on spinach or on killed nauplii of the brine shrimp, *Artemia salina*.

Table 1. Collecting data of *Ophryotrocha geryoncola* inhabiting *Geryon tridens*. Date September 25 and 26, 1981; ~ 8 °C; salinity > 30 ‰

Station	Depth	Specimens collected
58° 3.5'N 9°56.6'E	190 m	3 male <i>G. tridens</i> with 34 <i>O. geryoncola</i> 2 female <i>G. tridens</i> with 4 <i>O. geryoncola</i>
58° 8.0'N10° 8.0'E	190 m	1 female <i>G. tridens</i> with 10 <i>O. geryoncola</i>
58° 1.4'N 9°34.6'E	330 m	1 female <i>G. tridens</i> without <i>O. geryoncola</i>
58°11.5'N 9°58.0'E	200 m	1 female <i>G. tridens</i> without <i>O. geryoncola</i>

After about ten days, the animals showed histolytical processes most likely caused by bacteria. The addition of streptomycin and penicillin to the seawater did not stop histolysis and eventually all the worms died.

While still alive, the animals were studied by means of Zeiss Nomarski optics. The results of the histological findings will be published elsewhere.

DESCRIPTION OF *OPHRYOTROCHA GERYONCOLA*

The following description is based on observations of live specimens.

The size range of our material was 25 to 110 mm in length and 0.4 to 4 mm in width. The number of segments was 106 to several hundreds. The colour varied from white to yellow. The gut and its segmentally arranged branches were sometimes dark yellowish or brown.

The prostomium bears two long antennae (about 250 µm) and two palps of about the same length (Fig. 1a). Both antennae and palps are equipped with long sensory hairs. These hairs are composed of long cilia which form a rod. They are non-motile. Sensory hairs are also found on the anterior border of the prostomium (Fig. 1a), on the pygidial appendages (Fig. 1b) and on the parapodial cirri (Fig. 1d). There is a complete ring of cilia around the prostomium which is situated in front of the antennae (Fig. 1a). As in *O. puerilis* the rings are formed of cells with hexagonal surfaces each carrying about 250 cilia (Pfannenstiel, 1982). There are no eyes in *O. geryoncola*. Within the prostomium just beneath the antennae there are two kidney shaped bodies which are most likely glands (Fig. 1a). The overall shape of the prostomium is the same as in other *Ophryotrocha* species.

There are four nuchal pits located on the dorsal side of the prostomium. They are situated in the furrow demarcating the border between prostomium and following segment. The mouth opens in this furrow on the ventral side (Fig. 1a). The metastomium, the following segment without parapodia and all the body segments with parapodia each bear a complete ring of cilia (Fig. 1a, b).

The muscular pharynx with the jaw apparatus is located within the two apodous and asetigerous segments following the prostomium (Fig. 2 C). The maxillary carriers and the mandibles vary in size and appearance according to the size of the animals and the

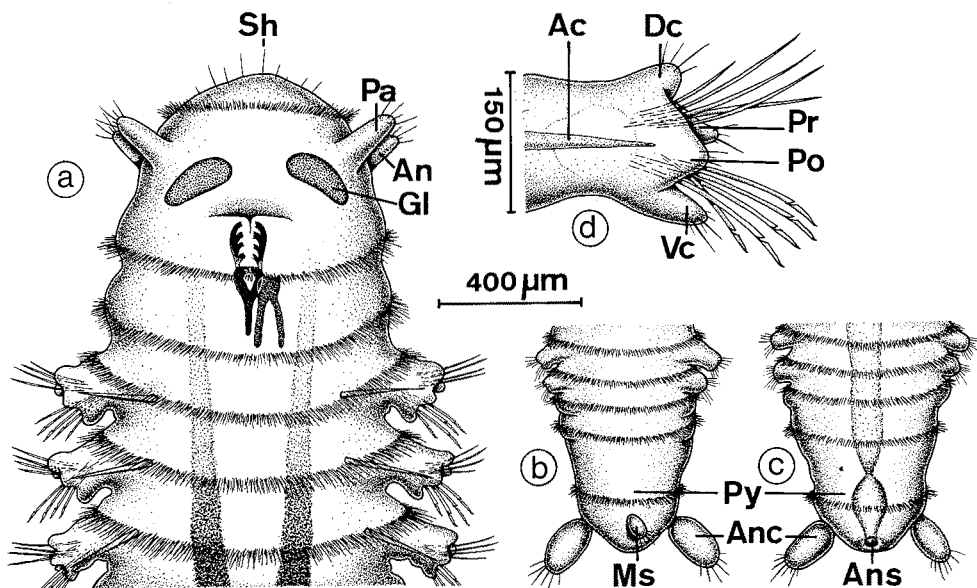
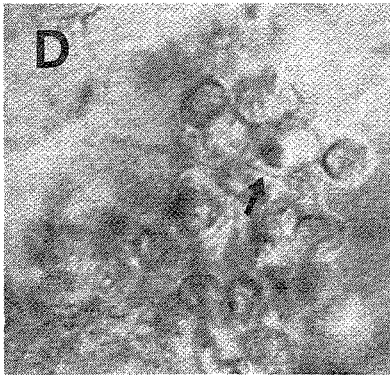
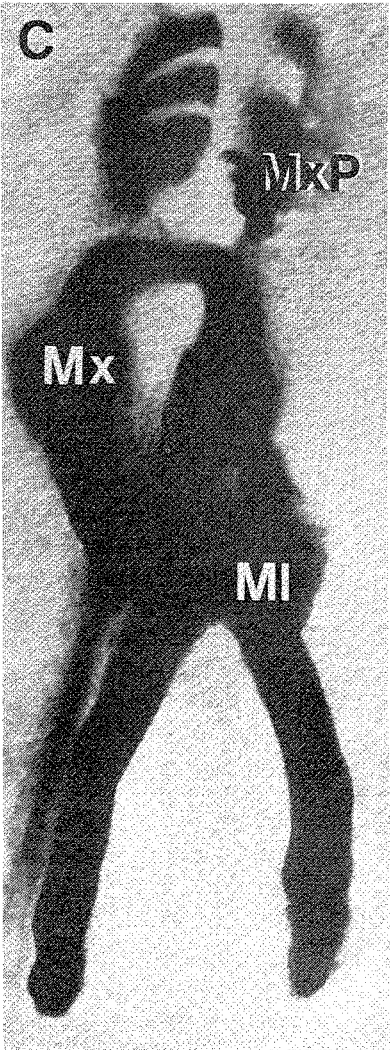
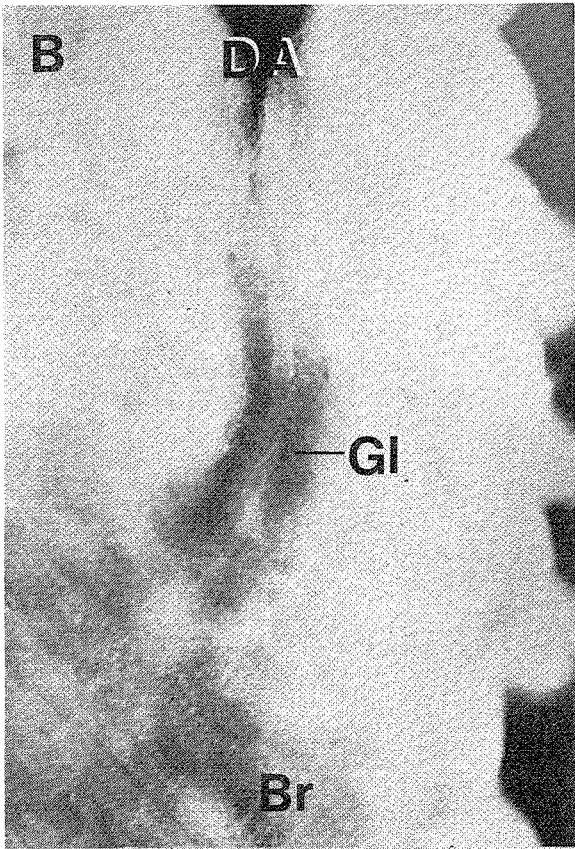
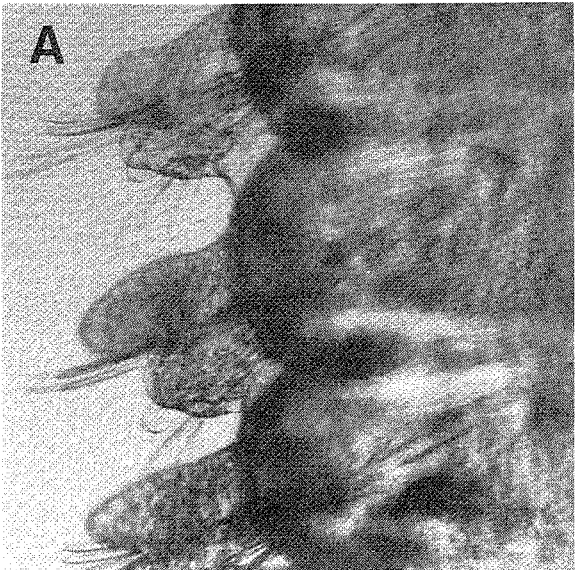


Fig. 1. *Ophryotrocha geryoncola*, 95 mm specimen; (a) Ventral view of anterior end; Sh = sensory hairs, Pa = palp, An = antenna, Gl = gland; (b) Ventral view of posterior end; Py = pygidium, Anc = anal cirrus, Ms = median stylus; (c) Dorsal view of posterior end; Ans = anus; (d) Parapodium of segment 4, right side; Ac = aciculum, Dc = dorsal cirrus, Pr = presetal lobe, Po = postsetal lobe, Vc = ventral cirrus

time of usage. Gaston & Benner (1981) in their Fig. 3 A which is Fig. 5 of Wesenberg-Lund (1938) depict the maxillae of two small specimens of *O. geryoncola* with two rows of maxillary plates. We believe that these small worms were fixed at a time when they were replacing their old maxillae and that the second row of dental plates belong to the newly developed dental apparatus. The smaller number of dental plates in older specimens is most likely due to abrasion and loss during usage. The structure and location of the dental apparatus is apparently the same as in other *Ophryotrocha* species.

The intestine is seen through the body wall. It stretches from the posterior border of the pharynx with the overlying oesophagus through the length of the body. There are two laterally extending branches of the gut in each segment (Fig. 2 B). These branches are missing in the youngest segments. Since circulatory systems besides the coelomic cavity are obviously missing, the branches of the gut are considered to be of adaptive



significance. Near the pharynx there are two gland like structures (Fig. 1a, Fig. 2 B), one on each side of the foregut. They are clearly seen through the dorsal body wall.

The parapodia are uniramous (Fig. 2 A). Fig. 1d represents a parapodium of the right side seen from the posterior. The setae are composed and distributed in a way which is very similar to the other *Ophryotrocha* species and which is within the variation range of the genus. There is one aciculum in each parapodium. The acicula are composite structures consisting of bundles of seta like strings.

The prostomium and the anterior body segments are relatively narrow whereas midbody segments are rather broad. The posterior segments gradually taper to the pygidium. There are up to three more or less undifferentiated segments without parapodia or at least without setae in front of the pygidium (Fig. 1b, c). The pygidium carries two anal cirri of about 180 μm and one short median stylus (100 μm) on the ventral surface which is not visible in dorsal view (Fig. 1b). The anus opens on the dorsal side of the pygidium (Fig. 1c). The anus as well as the hindmost part of the gut are ciliated on their inner surfaces. The pygidium is surrounded by a complete ring of cilia.

The oocytes in females float freely in the body cavity. The bigger oocytes (160 μm and more) are characterized by huge germinal vesicles (up to 30 μm). Germinal vesicle breakdown occurs shortly before or shortly after shedding. Ripe oocytes are 220 μm in diameter. Some of the females released large quantities of oocytes. These oocytes did not form egg masses or clusters such as in some other *Ophryotrocha* species. Most of the shed oocytes developed fertilization membranes but no further signs of development or even cleavage were observed. We do not know, however, whether the eggs were fertilized or not.

Spermatozoa are floating in the coelom. They show small filiform processes (Fig. 2 D) and are of the aflagellate type which is a common feature in the genus *Ophryotrocha* (Berruti et al., 1978; Troyer & Schwager, 1979). Sexes seem to be separated in *O. geryoncola*. There were no hermaphrodites present in our material and there are no reports of hermaphroditism so far.

The coelom in *O. geryoncola* is not divided into separate compartments by dissepiments but represents a uniform body cavity. This finding coincides with the situation in other *Ophryotrocha* species.

DISCUSSION

Claparède & Mecznirow (1869) established the genus *Ophryotrocha*. When Esmark (1874) gave his first description of *Eteonopsis geryoncola* he was unaware that the genus *Ophryotrocha* had been described only five years before. When Bideknapp (1895) presented his list of Norway's polychaete annelids he, also, did not realize the existence of the genus *Ophryotrocha*. Wesenberg-Lund (1938) was the first to show that the worms found by her colleagues under the carapace of *Geryon tridens* "belong to the Eunicid-genus *Ophryotrocha*". Gaston & Benner (1981) reestablished the old genus *Eteonopsis*, the only species of which is *geryoncola*, "to distinguish it from free-living species of

Fig. 2. *Ophryotrocha geryoncola*; (A) Parapodia (segments 29–31, left side, 95 mm specimen) \times 200; (B) Dorsal view of pharynx and gut; DA = dental apparatus, Gl = pharynx gland, Br = branch of intestine; \times 150; (C) Dental apparatus; MxP = maxillary plates, Mx = maxilla, Ml = mandible, \times 365; (D) Spermatozoa in coelom, filiform process (arrow); \times 1000

Ophryotrocha". They also stated that "the most conspicuous difference in the morphology of *Ophryotrocha* and *Eteonopsis* is the greater size of *Eteonopsis*". According to Fig. 2 A of Gaston & Benner (1981) their description was based on fixed specimens. This is why they did not see the segmentally arranged rings of cilia which are present in all *Ophryotrocha* species. Although Gaston & Benner (1981) analysed the gut contents, they did not mention that the intestine of *O. geryoncola* bears two lateral branches in each segment.

The epizoic manner of living, which may be an evolutionary prerequisite for the enormous size of up to 140 mm, and the existence of intestine branches are unique characters within the genus *Ophryotrocha*. These peculiarities qualify *O. geryoncola* as a species separated from the other known *Ophryotrocha* species.

The morphology of the prostomium and its appendages, the structure of the dental apparatus, the appearance of the uniramous parapodia and the setae, the form of the pygidium with its appendages and the existence of complete rings of cilia around each segment clearly demonstrate that this species belongs to the genus *Ophryotrocha*. In *O. puerilis*, palps on the prostomium and a median stylus on the pygidium are present. These structures are missing in *O. labronica* or *O. notoglandulata*. Nevertheless these species all belong to the genus *Ophryotrocha*. So *O. geryoncola* does not show a morphology which is beyond the normal range of the genus *Ophryotrocha*. The unique features mentioned above characterize the species *geryoncola*.

Reproduction in the genus *Ophryotrocha* is relatively different from species to species (Åkesson, 1975). There are gonochoric and hermaphrodite species and the appearance of the egg masses and larval morphology may differ to a great extent (Åkesson, 1973). On the other hand, species are sometimes identical from a morphological point of view but show differences in their reproductive pattern (Åkesson, 1978). It can be concluded, therefore, that the reproductive pattern of *O. geryoncola* which is likely to include a swimming stage for the infestation of new hosts does not separate *O. geryoncola* from the genus *Ophryotrocha*.

According to the description presented and to the comparison with other members of the genus *Ophryotrocha*, the present authors suggest that *O. geryoncola* is a member of the dorvilleid genus *Ophryotrocha*.

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