

First report of *Labrorostratus caribensis* (Annelida, Oeononidae) as endoparasite of *Haplosyllis rosenalesssoae* (Annelida, Syllidae) from Brazil

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ABSTRACT

In this study, we report the second endoparasitic relationship for the oeonid *Labrorostratus caribensis*, previously described parasitizing a nereid polychaete. The new host is the syllid *Haplosyllis rosenalesssoae*, in which it occupies 2/3 of its body cavity host. This is the second endoparasitic relationship between polychaetes and the first between both partners in known for Brazil, as well as the first record of the parasite outside the type locality (Caribbean) and of the host in the State of Bahia. We discuss on the interest of the finding of these kind of parasitic relationships and provide an identification key to all known species of *Labrorostratus*.

1. Introduction

Polychaetes are mostly free living, but facultative or obligatory symbiotic relationships occur in 490 species of commensal polychaetes distributed by 33 families (Martin and Britayev, 2018). Parasitic relationships are so far known to be present in 128 polychaete species belonging to 16 families (Martin and Britayev, 2018). Parasitism occurs mainly among Spionidae (59.4%), which are bores, followed by non-bores Oeonidae (7.7%), mostly endoparasites of other polychaetes, Fabriciidae (7.52%) and Syllidae (6.27%) (Pettibone, 1957; Hernández-Alcántara et al., 2015; Martin and Britayev, 2018). Less than a half of the currently known parasitic polychaetes (about 43%) infest a single host species, while 16 out of the 17 oeonids rare known to be parasites were found only once and only in one host (Hernández-Alcántara et al., 2015). An exception was *Labrorostratus parasiticus* Saint-Joseph, (1888), which is known from six host species, all them Syllidae (Hernández-Alcántara et al., 2015).

Polychaetes parasitize 284 hosts of different taxa, the most common being molluscs (118 spp; gastropods and bivalves), decapod crustaceans (41 spp.), themselves polychaetes (34 spp.), cnidarian (24 spp.) and sponges (18 spp.) (Martin and Britayev, 2018). As for host polychaetes, they commonly belong to the families Aphroditidae, Ampharetidae, Eunicidae, Glyceridae, Nereididae, Onuphidae, Spionidae, Syllidae, Terebellidae and Thrichobranhidae (Hernández-Alcántara et al., 2015;

Martin and Britayev, 2018).

Although they are usually smaller, some may be of the same size or even larger than their host, as in the case of some oeonids. Parasitic polychaetes often show morphological adaptations in the arrangement, shape and size of chaetae, as well as in the mandibular apparatus (Poulin, 2001; Hernández-Alcántara et al., 2015; Martin and Britayev, 2018). In general, little is known about their development and reproduction and, for endoparasitic oeonids in particular, no mature specimens have been reported to date (Martin and Britayev, 1998), while it is assumed that the infestation starts during the juvenile stages (Cauullery and Mesnil, 1916).

The polychaetes of the family Oeonidae are represented by 20 genera and 93 species, including parasites and free-living species (Read and Fauchald, 2020), with eight genera and 13 species being recorded in Brazil (from Rio Grande do Norte to Rio Grande do Sul states) (Amaral et al., 2013). Despite this relatively high number of species, the relationships in which they are involved are poorly known. *Labrorostratus prolificus* Amaral, (1977) is the only species of the genus described for Brazil (Ubatuba, São Paulo), as endoparasite in the body cavity of the nereidid *Perinereis cultrifera* (Grube, 1855) (Amaral, 1977), where it may have at least five stages of development (Steiner and Amaral, 2009).

In the present paper, we report on the presence of a second species of *Labrorostratus* in Brazilian waters, *L. caribensis* Hernández-Alcántara

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et al., (2015) living inside the body cavity of a Syllidae, *Haplosyllis rosenalessoae* Paresque and Nogueira, (2014). Moreover, we provide an identification key for all species of *Labrorostratus* described to date.

2. Material and methods

The polychaetes were collected in August 2015, in the rocky shore of Morro de Pernambuco (14°48'21.90"S, 39°01'29.71"W), near the mouth of the Cachoeira River, Southern Ilhéus (Bahia, Brazil), among banks of *Chaetomorpha antennina* (Bory) Kützing, 1847 (Chlorophyta, Ulvophyceae, Cladophoraceae) and *Modiolus americanus* (Lattig and Martin, 2009) (Mollusca, Bivalvia, Mytilidae) during the development of the project "MEBEN - Benthic Macroecology of shallow coastal waters subjected to different impact levels (Alagoas to Espírito Santo states, Brazil)" from the Universidade Estadual de Santa Cruz – UESC (Ilhéus, BA).

In the Benthic Ecology Laboratory/UESC, polychaetes were sorted from the algae and bivalves, fixed in 4% formaldehyde, preserved in 70% ethanol and then transported to the Invertebrate Zoology Laboratory of the State University of Rio de Janeiro/UERJ, where they were identified at the species level using a stereomicroscope and Nikon Eclipse E200MV R an optical binocular microscope Nikon C-Leds. Images of the polychaetes were taken using a confocal optic photomicroscope (Nikon Eclipse 50i). All specimens were deposited in the Polychaeta collection, of the Instituto de Biologia Roberto Alcântara Gomes – IBRAG/UERJ.

3. Results

Oeonidae Kinberg, 1865.

Labrorostratus Saint-Joseph, 1888.

Type species. *Labrorostratus parasiticus* Saint-Joseph, (1888): 221, pl. IX, Figs. 77–85.

Diagnosis (based on Hernández-Alcántara et al., 2015). Prostomium without antennae, with four eyes along posterior margin. Peristomium with two apodous rings. One or two pairs of small maxillary plates, sometimes reduced to one pair of broad plates without teeth, or maxillary plates absent. One pair of long maxillary carriers, partially or completely fused, sometimes with an additional unpaired one. Mandibles well developed, wing-shaped, narrowly joined along median line. Parapodia uni- or sub-biramous. Chaetae simple, geniculate with smooth margin; simple modified ventral chaetae present or absent. Pygidium rounded, with up to four small anal cirri.

Labrorostratus caribensis Hernández-Alcántara et al., (2015) (Fig. 1A, C–D)

Labrorostratus caribensis Hernández-Alcántara et al., (2015): 133–135, Figs. 1 and 2A–D.

Examined material. IBRAG/UERJ (6996): one specimen living in the body cavity of *H. rosenalessoae*, Ilhéus, Bahia (14°48'21.90"S, 39°01'29.71"W), Aug/2015, intertidal, rock shore, coll. E.C.G. Couto.

Description. Incomplete specimen with 27 segments (of which 25 chaetigers), 4 mm long and 0.4 mm wide (median region, at about chaetiger 10), not including chaetae (Fig. 1A left, C). Body slender, cylindrical. Light yellow to brown, except prostomium and anterior region, whitish (preserved). Prostomium conical, longer than wider, with anterior margin round, without appendages (Fig. 1C). Two pairs of black eyes near posterior margin of prostomium, arranged in transversal row, outer pair twice as large as inner ones. Peristomium with two apodous and achaetous subequal segments. Mandibles dark, well developed, lacking teeth, strong, wing-shaped, narrowly joined along median line (Fig. 1E). Maxillary apparatus with one pair of maxillary carriers fused, elongated, rod-like, dark red, twice as long as mandibles; fangs or distinct maxillary plates absent. Parapodia well developed throughout, with prechaetal rudimentary lobes, and bluntly conical postchaetal lobes. First parapodia small, then progressively increasing in size. Aciculae yellow, large, one per parapodium, not projecting

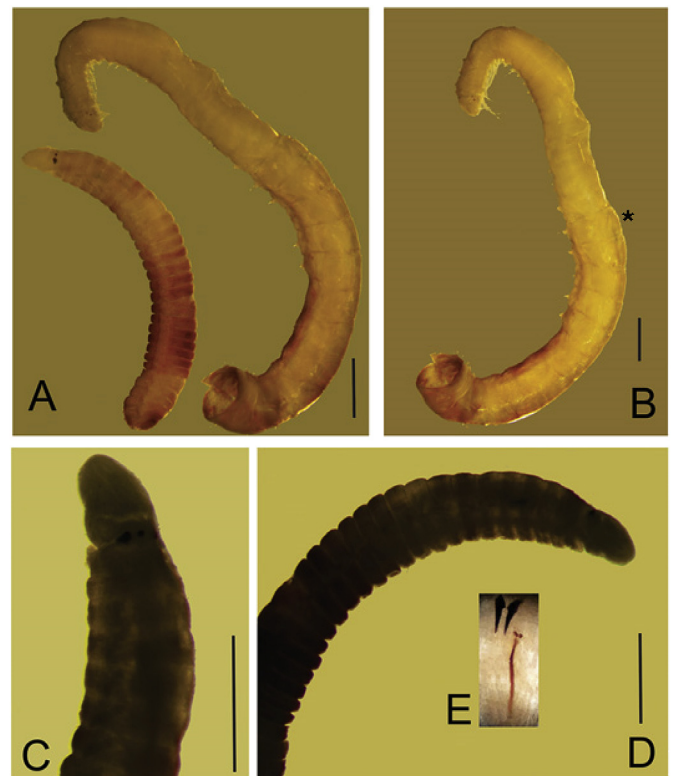


Fig. 1. A. *Labrorostratus caribensis* (parasite on the left) and *Haplosyllis rosenalessoae* (host on the right), lateral view; B. *H. rosenalessoae*, lateral view (* = enlarged region); C. *L. caribensis*, anterior region, lateral view; D. *L. caribensis*, lateral view; E. Mandibles and maxillae. (Scale bar: A, B, C, D: 0.5 mm; E: x400).

outside postchaetal lobe. Chaetae simple, geniculate, with smooth asymmetric wings, tapering to fine tips, usually up to three per parapodium; superior chaetae slightly longer than others. Pygidium not seen. Oocytes or sperm not seen.

Remarks. The parasite was occupying about $\frac{3}{4}$ of the body cavity of the host, being housed after the proventriculus of the syllid.

Host. The host specimen was an incomplete anterior/median region with 35 chaetigers, and measuring 8 mm long and 0.3–0.6 mm wide. The median region was slightly enlarged due to the presence of parasite (Fig. 1A at right, B). Our fragment agrees with the description of *H. rosenalessoae*, which is characterized by having the midbody to posterior body wall with internal iridescent and granulose inclusions, arranged irregularly across the chaetigers, initially at the base of the parapodia, but progressively reaching the dorsal mid-line. It has one or two bidentate chaetae per parapodium, different only in size. The chaetae have a long pointed main fang, with about same width as the shaft and the 2 min apical teeth arranged at an angle of 90° and similar in size. They have two to three aciculae in each parapodium, slightly curved distally and midbody dorsal cirri shorter than body width which alternate between long (8–13 articles), and short (4–8 articles) and had the basal article twice as long as the others. *Haplosyllis rosenalessoae* has been recorded in the Paraíba and Pernambuco states (Brazilian Northeast) by Paresque and Nogueira (2014). It is the first occurrence of *H. rosenalessoae* in the state of Bahia.

Habitat (host). *H. rosenalessoae*, found in rock bottoms, among banks of *C. antennina* and *M. americanus*.

Geographic distribution of the parasite. Atlantic Ocean: Chinchorro Bank, Mexican Caribbean (type locality) and Brazil (Bahia; new occurrence).

Key to species of *Labrorostratus*:

1 Hooded acicular chaetae present; one acicula per parapodium	2	
- Hooded acicular chaetae absent; > 1 acicula per parapodium	4	
2(1) Mandibles with two pieces fused medially; maxillae I and II fused, unique	3	<i>L. caribensis</i> Hernández-Alcántara et al., (2015) Caribbean Sea
- Mandibles with two pieces not fused medially; maxillae I and II free	3	
3(2) Maxillae I and II small, with three teeth; outer edges of mandible irregular		<i>L. jonicus</i> Tenerelli, (1961) Mediterranean Sea
- Maxilla I large, with teeth anvil-shaped and maxilla II small, with four teeth; outer edge of mandible smooth		<i>L. luteus</i> Uebelacker, (1978) Caribbean Sea
4(1) Mandibles with two pieces fused medially by a transversal bar	5	
- Mandibles with two pieces not fused medially	6	
5(4) Maxillae I and II small, with four teeth; 4–6 limbate chaetae, smooth; three aciculae per parapodium		<i>L. parasiticus</i> Saint-Joseph, (1888) France
- Maxillae I and II small, with two teeth; 1–3 limbate chaetae, crenulated; two aciculae per parapodium (one large, one small)		<i>L. sp.</i> San-Martín and Sardá, (1986) Spain
6(4) Maxillae I and II with long shaft, fused, without teeth		<i>L. prolificus</i> Amaral, (1977) Brazil
- Maxilla I larger than maxilla II; maxilla I with one large tooth and five small ones; maxilla II with one thick tooth in one margin and two thick teeth and four small in median area		<i>L. zaragozensis</i> Hernández-Alcántara and Solís-Weiss, 1998 Gulf of California

4. Discussion

Labrostratus caribensis was described based on a single individual parasitizing a species of *Nereis* sp. (Nereididae) from the Mexican Caribbean (Hernández-Alcántara et al., 2015). Its congeneric, *L. prolificus*, was also described as parasite of a nereidid, *Perinereis cultrifera* from Brazil (Amaral, 1977), in which up to 33 specimens infested a single host, being thus the known species having the largest number of parasites per host with various stages of development (Steiner and Amaral, 2009). In most parasitic relationships between polychaetes, there is a single endoparasite living within a single host and it usually occupies a large part of its body cavity (Martin and Britayev, 1998, 2018).

Overall, it is not clear if there are some specificity between the parasite and the host, once the majority of findings are sporadic. So, it is not possible to infer from these findings that there is a host specificity, although the most parasitic oeononids are hosted on a single host species (Hernández-Alcántara et al., 2015). Conversely, *L. parasiticus* has already been found parasitizing at least six species belonging to various genera of syllids, but not to *Haplosyllis* (i.e. Saint-Joseph, 1888; Caullery, 1914, Caullery and Mesnil, 1916; Fauvel, 1923; Wu et al., 1982). *Haplosyllis spongicola* (Grube, 1855) appeared to be the only species of this genus that was parasitized by an oeononid, *Labrostratus luteus* (Uebelacker, 1978). However, this partnership was reported from Grand Bahamas Island and the host must be another species of *Haplosyllis*, as the distribution of *H. spongicola* is restricted to the Mediterranean Sea (Lattig and Martin, 2009).

This is the second record of an endoparasitism among polychaetes in the Brazilian coast and the first between *L. caribensis* and *H. rosenaltesoae*, which is the second known host of the oeononid. Previous studies aimed at finding endoparasitic relationships in polychaetes involved huge sampling efforts to while effectively gave rise to new findings

(Hernández-Alcántara et al., 2015). Thus, any record, even if it is punctual or based in a single individual (as in our case), its important and contributes to the understanding of these relationships, and to define as well as their geographical distribution and, in some cases, the reproductive aspects of the species involved.

Declaration of competing interest

There is no conflict of interest.

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