

## Original Article

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# First report of brooding of eggs in the deep-sea genus *Anguillosyllis* (Annelida: Syllidae)

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## Abstract

The syllid genus *Anguillosyllis* is relatively rare and mainly restricted to deep waters. The phylogenetic position of the genus was only recently inferred, while its reproductive mode, an important trait in the classification of the Syllidae, remains unknown. We describe herein our finding of one specimen of *Anguillosyllis lanai* with fragile egg capsules dorsally attached to some parapodial lobes, the first observation to date providing information about reproductive aspects of animals of the genus, and discuss possible evolutionary and phylogenetic implications of this finding.

## Introduction

The family Syllidae Grube, 1850, is composed of relatively common annelids, frequently found in many marine environments, especially in shallow depths. Currently comprising ~700 species in 74 genera (San Martín & Aguado, 2014), the diversity and abundance of the family usually decreases below 1000 m depth, then represented by just a few genera and species. Particularly due to all the difficulties involved in obtaining samples from these depths, the diversity of syllids – as that of life in general – from these environments is poorly known.

*Anguillosyllis* Day, 1963 is a deep-water genus, with representatives most commonly found below ~200 m depth. The genus is composed of four species and is distributed worldwide, but its reproductive mode, a class of information considered useful in classification schemes of the family, has been considered unknown (Aguado & San Martín, 2008; Aguado *et al.*, 2012).

In this study we present the finding of one specimen with dorsally attached egg capsules, the first known report of brooding in the genus.

## Materials and methods

Material herein studied was obtained in the scope of the ‘MARSEAL Project – Environmental Characterization of Sergipe and Alagoas Basin’, a partnership among PETROBRAS/CENPES, the Federal Universities of Sergipe (UFS), Alagoas (UFAL) and Pernambuco (UFPE) and the Sergipe Research Foundation (FAPESSE), which sampled off Sergipe and Alagoas, in NE Brazil. The sample in which the specimen was found was collected in a transect close to the San Francisco canyon (10°39′59.184″S 35°55′58.001″W; 1900 m depth; bottom temperature: 3.7 °C; salinity 34.9; sediment composition: 18% clay, 72% silt, 10% sand) in March 2013, by the team of the RV ‘Seward Johnson’. Collections were done with van Veen grabs, sediment was sieved with 0.5 mm mesh; animals were sorted, fixed in 10% formalin and, a few weeks later, transferred to ethanol 70%. The material herein analysed is deposited in the Annelid collection of the Zoology Museum (MZUSP), University of São Paulo (São Paulo, Brazil).

## Results and discussion

*Anguillosyllis lanai* Barroso, Paiva, Nogueira & Fukuda, 2017 is a species recently described based on specimens from Campos and Espírito Santo basins, south-eastern Brazil (Barroso *et al.*, 2017).

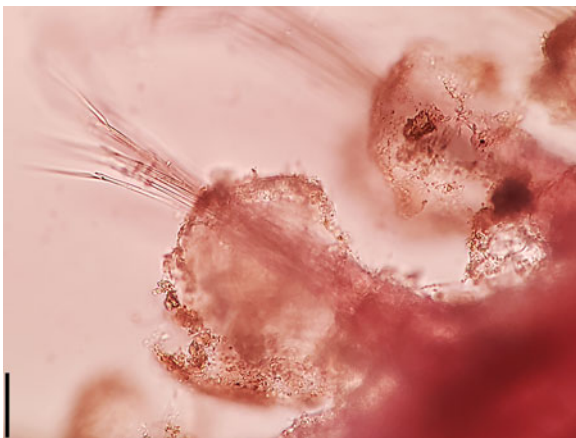
The specimen on which this report is focused (MZUSP 3531) was found with egg capsules dorsally attached to some parapodial lobes, from chaetigers 5–9, perhaps also with fragments of capsules on chaetigers 3–4 and 10 (Figure 1) – adults of *A. lanai* present a fixed number of 10 chaetigers. The nature of the attachment could not be verified with certainty (Figure 2); we could not observe capillary chaetae (as is the case of some genera in the subfamily Exononinae Langerhans, 1879, such as *Erinaceusyllis* San Martín, 2003), nor were the capsules attached to dorsal cirri (as occurs in *Nudisyllis* Knox & Cameron, 1970), since most cirri of the specimen were lost. One possibility is that the capsules may be attached to glandular areas of unknown nature frequently seen with fibrillar or granular material, located dorsally, distally, in parapodial lobes of at least some species of the genus, such as *A. palpata* (Hartman, 1967) and *A. lanai* (Figure 3; see Barroso *et al.*, 2017, Figures 13H and 14A, F–G).

Specimens of other genera that encompass animals with dorsal brooding of eggs, such as *Erinaceusyllis*, are occasionally found with egg capsules attached, with the same appearance





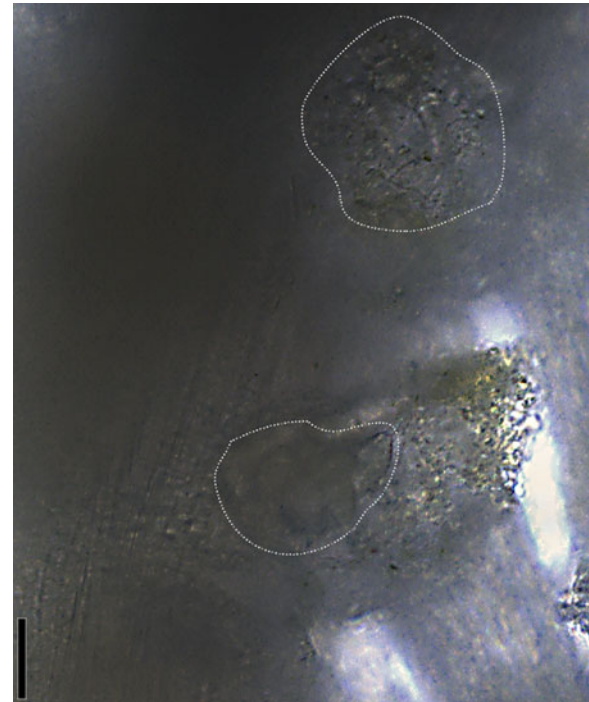
**Fig. 1.** *Anguillosyllis lanai* (MZUSP 3531) with dorsally attached egg capsules, entire body, dorsal view. Arrows pointing to empty capsules from chaetigers 6–9; C, copepod; F, foraminiferan shell. Scale bar: 170  $\mu$ m.



**Fig. 2.** *Anguillosyllis lanai* (MZUSP 3531), detail of egg capsules, chaetigers 8–9, dorsal view. Scale bar: 30  $\mu$ m.

as those found in the specimen here reported, however, these findings are not a particularly common event, since apparently the capsule easily detaches from the animal once the larva hatches. It is noteworthy that, despite one of us (MVF) having analysed more than 600 specimens of *Anguillosyllis* from the Brazilian coast, the present was the only one found with these attached egg capsules, which at least in part may be explained by the methodology used to collect the material (collections using Van Veen grabs from deep waters and sediments sieved to obtain the animals), which are perhaps too aggressive for the fragile nature of the attachment of the egg capsules.

Animals belonging to this genus posit a bit of a puzzle to the traditional division of the syllids in subfamilies according to morphological features, as *Anguillosyllis* presents a mixture of characters: absence of pharyngeal armature (trepan or tooth), as in the Anoplosyllinae Aguado & San Martín, 2009; smooth and long dorsal cirri, as in the Eusyllinae Malaquin, 1893; and only one pair of peristomial cirri, and ovate to papilliform antennae, as in the Exogoninae. Despite this, the genus was placed in the



**Fig. 3.** *Anguillosyllis lanai* (MZUSP 3531), detail of parapodial glands (delimited by dashed lines), chaetigers 4–5, dorsal view. Scale bar: 25  $\mu$ m.

Exogoninae upon its original description and in some later works (Day, 1963; Böggemann & Purschke, 2005). More recently, however, cladistic analyses of the family based on morphological characters (Aguado & San Martín, 2009) could not find a positioning of *Anguillosyllis* within any of the traditional subfamilies and, in fact, the genus was recovered as the sister-group of all the syllids in combined morphological and molecular analyses, thus being considered one of the *Incertae Sedis* genera of the Syllidae by Aguado *et al.* (2012).

Our finding represents another affinity of *Anguillosyllis* with the Exogoninae – where the genus was originally allocated, since this latter subfamily is composed, basically, of two groups of genera, both presenting brooding of eggs: in one group via ventral brooding of eggs and juveniles, and in the other, via dorsal brooding of eggs only, in a similar manner as that shown here. Nonetheless, brooding of eggs is not exclusive of the Exogoninae, as other genera (such as the eusylline *Nudisyllis* and the anoplosylline *Syllides* Örsted, 1845) also present this kind of phenomenon. In this way, considering the aforementioned positioning of *Anguillosyllis* as sister to the remaining Syllidae, the observation herein reported might indicate that this parental care, represented by the brooding of eggs, could also have emerged very early during the evolution of the family, as was already proposed to be the case of the epigamy (Aguado *et al.*, 2012).

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