

## DESCRIPTION OF CANUELLID NAUPLII OF SÃO SEBASTIÃO CHANNEL (SOUTHEASTERN BRAZIL)

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### ABSTRACT

The six postembryonic stages of an unidentified marine copepod belonging to the Canuellidae family (Copepoda, Crustacea) are described and their relationship to other copepod nauplii discussed. The importance of knowing the different stages of development for correct conclusions about the systematic position of copepod species is stressed.

**Keywords:** Copepoda nauplii, Canuellidae, Coastal water, Brazil.

### INTRODUCTION

For biodiversity's sake it is necessary to register all the taxa living in a certain environment. The species of adult copepods in the plankton off São Sebastião have been identified and counted since 1982, during Summer courses held at the Center of Marine Biology. The nauplii have also been assessed. During these studies some nauplii of meroplanktonic species were noticed. Till now their adult forms have not been identified, but, as their nauplii are present in the plankton, they shall be described, so that the family to which they belong is registered for the region.

In this paper a very frequent planktonic nauplius is studied. It belongs to the family Canuellidae, which together with the Longipediidae, forms the suborder Polyarthra Lang 1948. The family Longipediidae is known in coastal waters off S. Paulo State since 1954 (Paiva Carvalho, 1954), but the Canuellidae had not yet been registered in our waters. The presence of their nauplii in the plankton shows that the adults also occur here.

### MATERIAL AND METHODS

The nauplii were collected from São Sebastião Channel waters since 1994, with plankton nets fitted with nylon gauze of 30 and 70  $\mu$ m mesh opening. The animals fixed in 4% formalin were studied in a mixture of formalin 4% and glycerine, two or three years after their fixation. This is necessary for the nauplii to become transparent or less opaque. The usual methods for clarifying adult copepods destroy the delicate nauplii. Drawings were made with a Lobophot Nikon microscope fitted with a camera lucida.

### DESCRIPTION OF THE NAUPLII

*Nauplius I* (NI; Figure 1) - *Length* : 0.130 – 0.144 mm, hook-shaped in profile. *Labrum* oval-shaped and with setules on right and left posterior margins, usually with a drop of secretion produced by a medial gland at the posterior margin. *Antennule* - 4-segmented with a seta per segment and three terminal setae on the last segment.

*Antenna* - coxopod with a hook-like masticatory spine armed with three setules; basipod with two setae; exopod, 6-segmented with six setae, endopod unsegmented with 2 terminal and 2 lateral setae. *Mandible* - coxobasipod with 2 setae; exopod 4-segmented with 5 setae of which one is longer, stronger and spinuled; endopod's first segment with a setuled and a glabrous seta; second segment with 2 terminal and 2 lateral setae. *Caudal armature* - with a very thin, transparent ventral process, tongue-like and setuled, and 2 terminal, posterior, divergent, strong and long spines. Long thin setules arm the spines proximally and short spinules cover the rest of the strong spines.

*N a u p l i u s* II ( NII; Figure 1) - *Length* 0.150 - 0.165 mm; shape hook-like. *Labrum* and *antennule* as in NI, excepting for two lateral setae more on the last antennular segment. *Antenna* with one terminal seta more on the endopod. *Mandible*- the coxopod with 1 seta, separated from the basipod with two setae; endopod with 5 setae on the terminal segment and 3 setae on the first segment; exopod unchanged. *Maxillules* - two long spinulose ventral spines. *Caudal armature* - unchanged, except for the ventral process, now hardly visible, as a ventral, posterior, small protuberance.

*N a u p l i u s* III ( NIII; Figure 1) – *Length* 0.180 - 0.190mm; shape unchanged. *Labrum* and *antennule*, unchanged. *Antenna* with 7 or 8-segmented exopod bearing 7 setae; endopod, unchanged. *Mandible* as in NII. *Maxillules* with spines inserted on two ventral lobes. *Caudal armature*: two series of setules on each side, one of them around the insertion of the 4 posterior long terminal spines. Two small, spinulose, terminal spines are added medially and the ventral process has disappeared completely.

*N a u p l i u s* IV ( NIV; Figure 2) *Length* 0.200 - 0.235mm. Shape, less hook-like. *Labrum* as in the preceding stage. *Antennule* with 3 terminal setae, 5 lateral setules on one margin and 2 small setules on the opposite margin of the last segment. *Antenna* with 2 setules on the masticatory process and 4 setules on the basipod; 8 segments in the exopod and 9 setae; endopod with 5 setae and 3 setules. *Mandible* as in NIII. *Maxillule* a flat bilobed structure with 3 or 4 setae on the external lobe and 4 setae on the internal lobe. *Caudal armature* with 2 external lateral, small spinulose spines (two on each side), two long and strong spinulose terminal spines and two medial small spinulose spines; a pre-terminal row of minute setules plus two terminal balancers ( one dorsal and one ventral very thin longish setae).

*N a u p l i u s* V ( NV; Figure 2) - *Length* 0.265mm. *Shape* and *labrum* as in NIV. *Antennule* and *antenna* as in the preceding stage. *Mandible* with 5-6 setae on the 4-segmented exopod, and the endopod bearing 5 setae on the second segment. *Maxillule* with both lobes bearing 4 setae each. *Maxillipeds*, 2 long medioventral setuled setae. *Caudal armature* as in NIV with two more medial spines.

*N a u p l i u s* VI ( NVI; Figure 2) - 0.295 mm long. *Shape*, *labrum* and *antennule* as in NV. *Antenna* with masticatory blade showing denticles and 2 lateral spinules; exopod as in NV; endopod with 3 terminal and 4 lateral setae. *Mandible* as in NV with 4 setae on the first segment of the endopod and 5 on the second segment. *Maxillule* with a coxopod and a basiendopod bearing 6 setae, and, an exopod with 5. *Maxilliped* as in NV. *First and second pairs of legs* represented by short, ventral, medial spines. *Caudal armature*, 4 short spines on each side and 2 long spinulose, terminal spines plus 2 balancers.

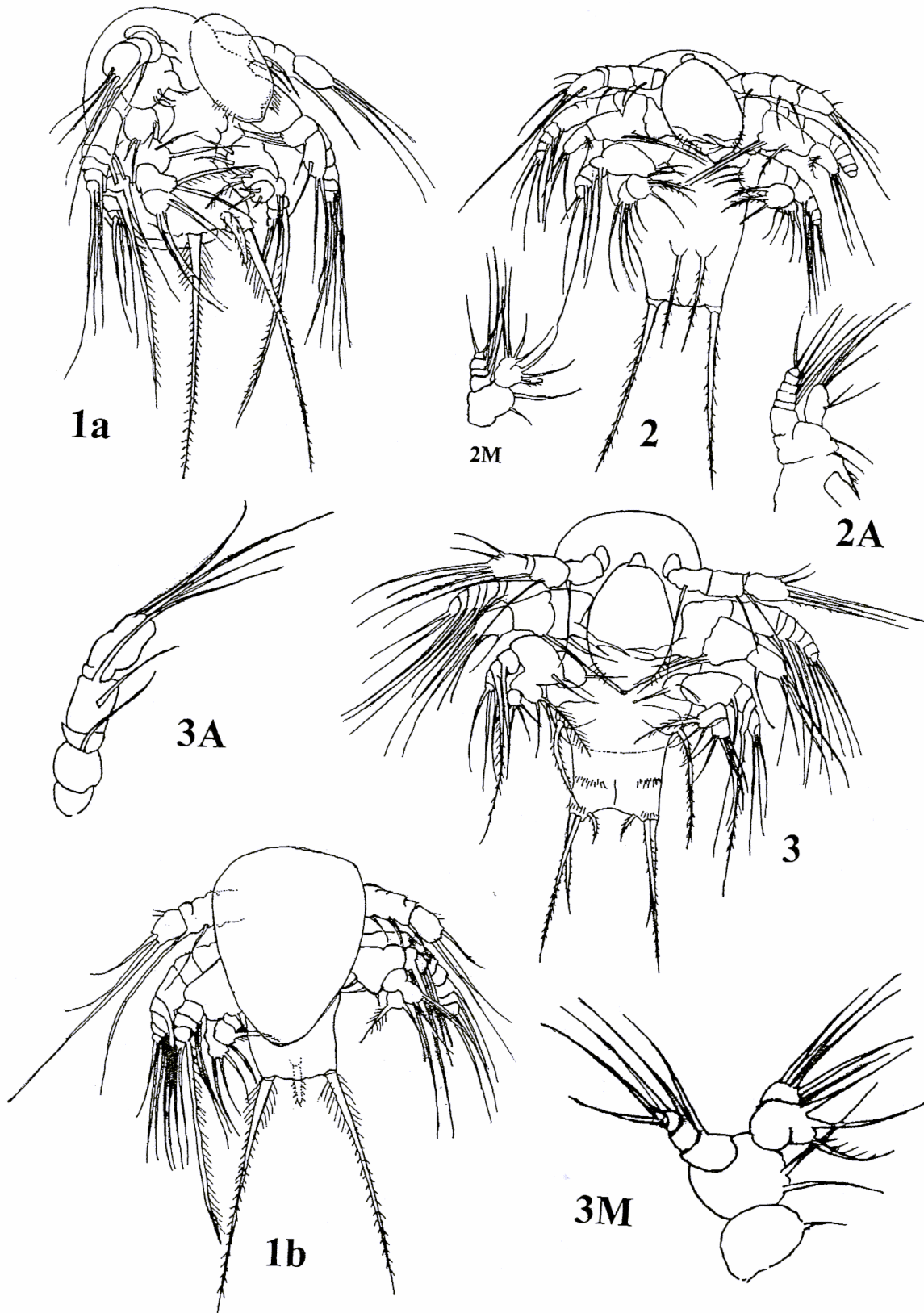


Figure 1. Canuellid nauplius I - NI - (0.140 mm): 1a - ventro-lateral view; 1b - dorsal view. 2 - Canuellid nauplius II - NII - (ventral) (0.165 mm); 2A - details of the antenna; 2M - details of the mandible. 3 - Canuellid nauplius III - NIII - (ventral) (0.180 mm); 3A details of the antennule; 3M - details of the mandible.

## DISCUSSION

These canuellid nauplii show an interesting mixture of features. They present most of the characteristics listed by Dahms (1990) for the Polyarthra nauplii plus features which are observed in the Cyclopoida-Poecilostomatoida and Calanoida nauplii. Their general aspect is very much like that of the Longipediidae, but in some features they diverge completely.

The characteristics of the Polyarthra nauplii listed by Dahms (1990) are: "antennule with more than 3 segments, antennal exopodite has more than 5 segments; the mandibular endopodite is distinctly 2-segmented; the labrum is furnished with fine spinules all over the anterior face; the caudal setae are stout and strong and heavily furnished with spinules at least in NI; the nauplii are suspension-feeders; the Anlagen of the post-maxillar appendages are situated medioventrally". I would add: lack of a maxilla.

The labrum of the nauplii here described has fine spinules on the right and left posterior margins, but not "all over the anterior face". This was also observed by Lang (1948) for the *Sunaristes* nauplius. Canuellidae diverge from the Longipediidae, with a posterior dorsal spine, in the possession of a ventral process, also registered by Izawa (1986) for some Poecilostomatoida nauplii, and for the absence of the posterior dorsal spine. Their muscles observed in profile, are like the muscles of the Cyclopoida nauplii (Björnberg, 1972; Dudley, 1966; Fanta, 1976). Their caudal armature in NV and NVI has 2 balancers, thin movable caudal setae, as those noticed in the Calanoida nauplii (Björnberg, 1972). The shorter spines of the caudal armature in NIV to NVI are very Calanoida-like, such as those observed in the *Centropages* nauplii. The 4-segmented antennule is similar to the troglodyte cyclopoid's antennule (Lescher-Moutoué, 1974). These Cyclopoida also have a 6-segmented exopodite in the antenna.

The movements of the Canuellid nauplius are by turning somersaults, a convergence with the somersaulting motion of the Calanidae, Paracalanidae and Clausocalanidae (Björnberg, 1972). In the Canuellidae this behavior is also the consequence of a short scutum, which confers a hook-like appearance to the top-heavy nauplius and causes the somersaulting behavior.

Lang (1948) reared *Sunaristes paguri* from the egg and referred to the "stark gewölbt" aspect of the larva seen in profile. Lang's (1948) figure (97 b, p. 141) is very much like my figure of nauplius I. It is quite possible that Lang overlooked the presence of the very thin and transparent ventral process, of difficult visualization.

No Canuellidae were found in the bottom sand of the channel, although *Longipedia* adults and copepodites were numerous. It is therefore possible that the adult Canuellidae are associated with some other invertebrate benthonic species. Por (personal communication) suggested *Sunaristes* as the genus to which these nauplii belong. Rearing from the nauplius to the copepodite failed.

All these observations call for certain revisions, as about the characteristics of the Polyarthra nauplii, also because of the existence of a benthonic nauplius collected recently, (Björnberg *et al.*, in press).

Considering the fragmentary knowledge about most postembryonic developmental stages of the copepod species, taxonomy still offers scientists an ample field for discussion and hypothesizing. Most of the conclusions arrived at about the relationship among copepod genera, families and orders (see chapter 4 with a revision of the subject in Huys and Boxshall, 1991) are still hasty. Much more should be known about the ontogenesis of the many copepod species. Considering that there are usually 12 developmental postembryonic stages in the cycle of a copepod, and that only the last

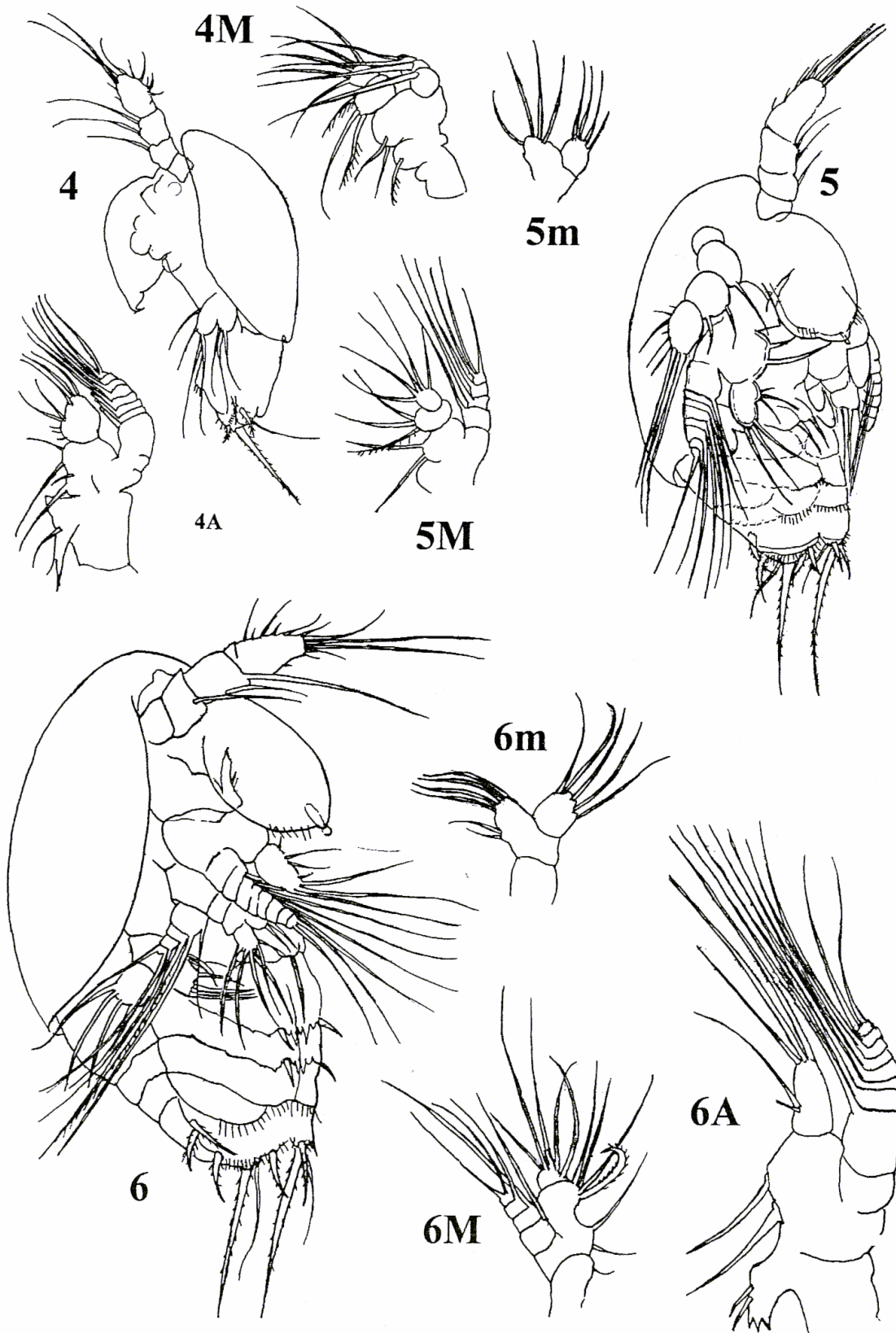


Figure 2. 4 - Canuellid nauplius IV - NIV - (profile) (0.210 mm); 4A - details of the antenna; 4M - details of the mandible (both not represented in the profile). 5 - Canuellid nauplius V - NV - (ventro-lateral) (0.295 mm). 5m - details of the maxillule; 5M - details of the mandible. 6 - Canuellid nauplius VI - NVI - (ventro-lateral) (0.295 mm); 6A - details of the antenna; 6m - details of the maxillule; 6M - details of the mandible.

stage is well known in most species, there is undoubtedly a considerable gap to be filled in the study of taxonomic affinities among copepods.

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