

LAMELLIFORM STRUCTURES ON THE PROBOSCIS OF *PENICULUS* AND *METAPENICULUS* (COPEPODA: PENNELLIDAE)

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Abstract. — Two pairs of laminae, at the proboscis base ventral surface were discovered in adult and chalimus IV female stage of *Peniculus* specimens. One pair of these structures is present at the proboscis base of the premetamorphosing female of *Metapeniculus*.

The laminae of *Peniculus* are narrow, those of *Metapeniculus* wide. These laminae are described and illustrated; their importance for the copepod and its taxonomy are discussed.

The taxonomy of the Pennellidae Burmeister, 1835 (Copepoda: Siphonostomatoida), which includes parasites on teleosts and some on Balaenoptera (e.g., *Pennella* Oken, 1816) has some problems at both the generic and specific levels. The problems are due to the lack of good discriminant characters, and to the fact that we do not possess accurate and detailed description of the appendages for the majority of pennellid species. The characters used at present (e.g., buccal appendages, leg armament) are more or less uniform throughout the family, and have little, if any discriminant value. The morphology of the anterior part of the body, one of the most commonly used taxonomic characters, shows great intraspecific variability according to the specific attachment site, as has been shown by Hogans (1986) for *Pennella instructa* Wilson, 1917 and by Bellwood (1981) for *Cardiodectes spiralis* Bellwood, 1981.

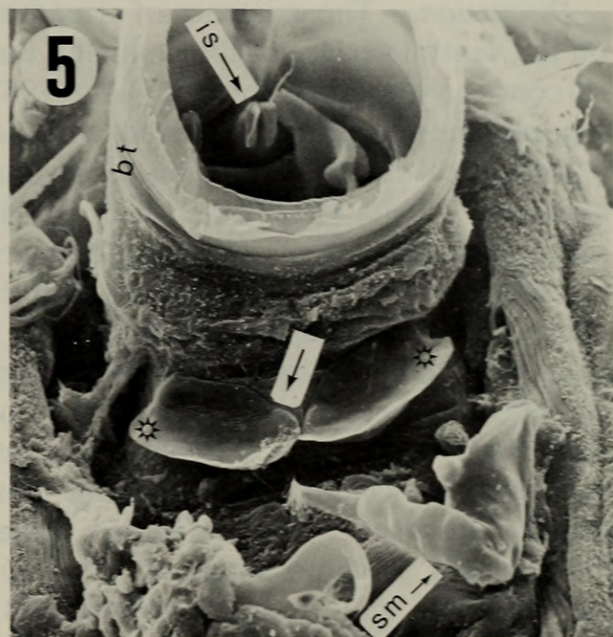
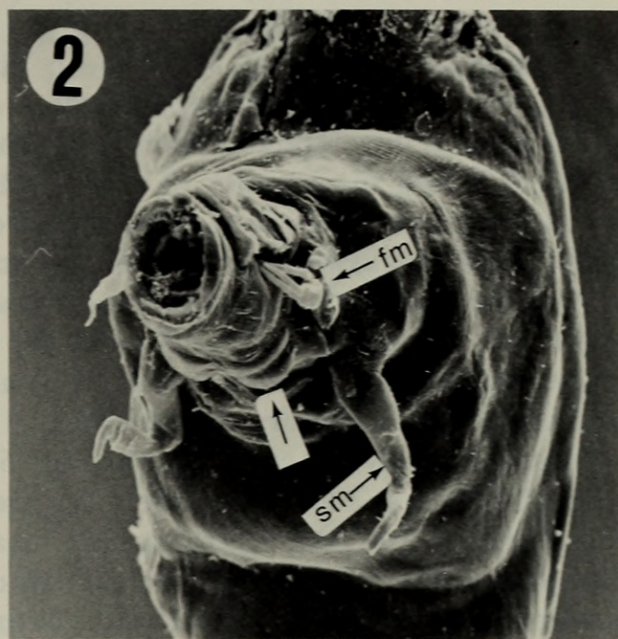
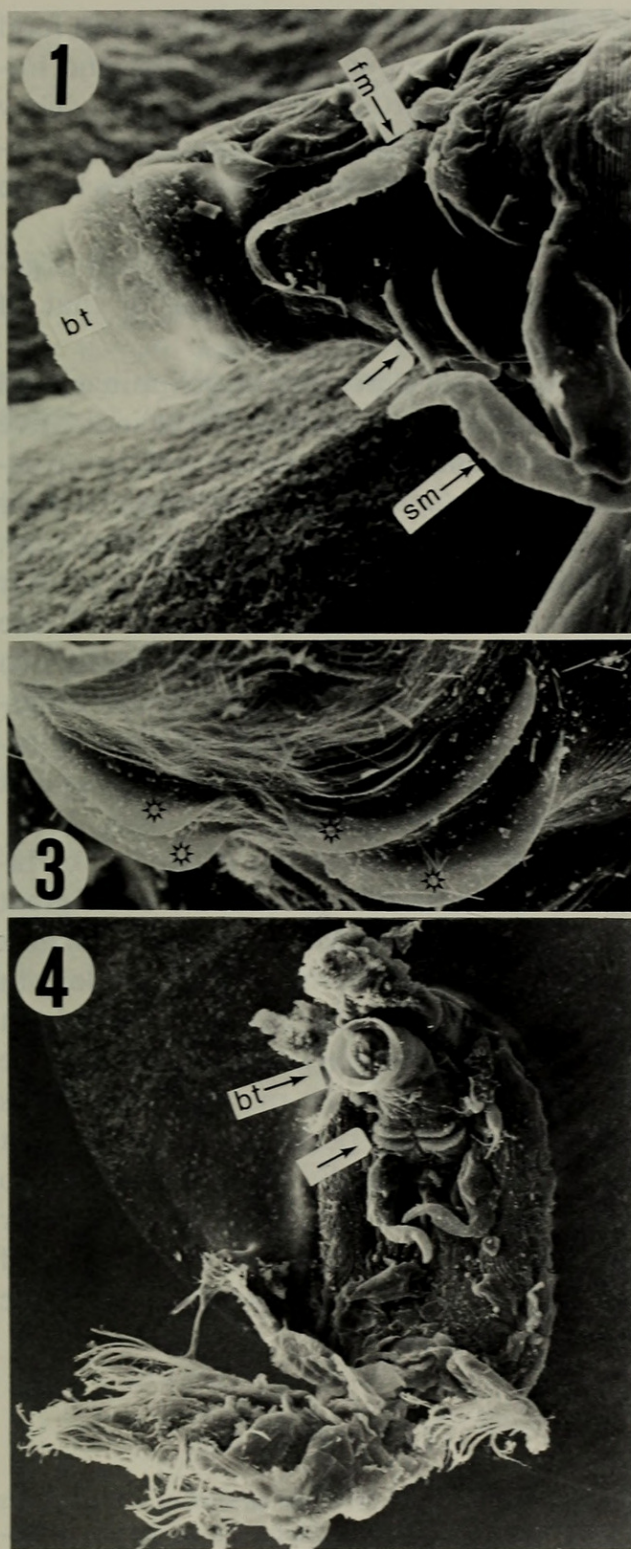
The taxonomy of *Peniculus* von Nordmann, 1832 is not clear, and is made more difficult by the lack of external characters that facilitate differentiation of the species and that indicate their relationships with other genera of the family, especially with *Metapeniculus* Castro & Baeza, 1985, which is very close morphologically. Kabata & Wilkes (1977) suggest that *P. fissipes* Wil-

son, 1917 is probably a synonym of *P. fistula* von Nordmann, 1832, this being only one example of the taxonomic problems within this genus.

We searched for new features that could be useful in clarifying the interspecific and intergeneric differences among the pennellids, as well as in establishing intergeneric relationships. We studied some specimens of *Peniculus* von Nordmann, 1832 and *Metapeniculus antofagastensis* Castro & Baeza, 1985, and discovered lamelliform structures on the ventral surface of the buccal cone of *Peniculus* and *M. antofagastensis*, which are illustrated, described, and their importance for the copepods and their taxonomy discussed.

Methods. — *Peniculus* specimens were taken from different host species; adult females from *Hemilutjanus macrophthalmus* (Tschudi, 1845), *Mugiloides chilensis* (Mol.), and *Sciaena fasciata* (De Buen); chalimus IV from *Eleginops maclovinus* (Val.). The premetamorphosing female of *M. antofagastensis* was collected from the type host *Anisotremus scapularis* (Tschudi).

The material was fixed and preserved in formalin (5%) and/or alcohol (70%). Some specimens, fixed as described above, were dehydrated by critical point drying, coated with gold, and examined under SEM Auto-



Figs. 1–5. *Peniculus* sp.: 1, Adult ♀ buccal area, lateral view, $\times 400$; 2, Adult ♀ cephalothorax, ventrofrontal view, $\times 200$; 3, Adult ♀ detail of laminae, $\times 800$; 4, *Chalimus* 4 ♀, ventral view, showing position of laminae on proboscis ventral surface, $\times 98$; 5, *Metapeniculus antofagastensis*, premetamorphosing ♀, ventral view, $\times 400$. Abbreviations: bt—buccal tube; fm—first maxilla; is—intrabuccal stylet; sm—second maxilla. Laminae indicated by arrows and asterisks.

scan at 20 Kv acceleration. To prevent possible damage to the copepod surface no special cleaning agents were used.

Results.—*Peniculus* sp. (Figs. 1–4): The female specimens examined, regardless of their stage of development (adult and chalimus IV), and the identity of their hosts, bear on the ventral surface, near the base of the buccal cone, two pairs of smooth, narrow laminae with rounded margins. The two pairs are separated from each other by a short gap, and the two members of each pair are slightly separated from each other.

Metapeniculus antofagastensis (Fig. 5): Free living, not metamorphosed, females examined bear on the ventral surface, near the base of the buccal cone, a single pair of laminae, smooth, wide, and with entire margins. The two members of the pair are separated from each other near the mid-ventral line.

Discussion.—The existence of armament on the ventral surface of the pennellid buccal cone is not widely known. Kabata (1963) reported the presence of “serrated lamellae” on the buccal cone of *Lernaeenicus sprattae*, and later Kabata (1979) modified this description to “denticles”. These findings were corroborated by Schram (1979). Similar denticles were found by Kabata (1965), in *Lernaeocera centropristi*. In the same paper, Kabata mentioned the presence of transverse “wrinkles” on the buccal cone of *Lernaeocera branchialis* (possibly long laminae). Thomsen (1949) found small “denticles” (“finisimos dientecitos”) in *Trifur tortuosus*, and Castro & Baeza (1985) confirmed his finding of “small squamiform sclerites”. We add to those records two pairs of long laminae in *Peniculus* and one such pair in *Metapeniculus*.

In view of these findings it is reasonable to assume that structures of this kind may be present in other genera of Pennellidae. The differences among them, in number, shape etc. might be adaptations to their respective microhabitats and to the function they have evolved to fulfil. The two pairs

of laminae in *Peniculus* might assist in food intake by collecting solid particles and liquid and facilitating their ingestion. They might also be of some assistance in the process of penetration of the host tissues by the buccal complex.

The same is true of *Metapeniculus*, a genus with microhabitat similar to that of *Peniculus*.

The reduction in number of laminae, and the increase in their size, could be indicative of a functional improvement of those structures in *Metapeniculus*, according to their similar microhabitat shared with *Peniculus*.

The lamelliform structures show a clear difference between *Metapeniculus* (with one pair of laminae) and *Peniculus* (with two pairs of laminae). This adds to the differences between these genera in their thoracopod number (four pairs in *Peniculus* and three in *Metapeniculus*).

Without any doubt the discovery of lamellae in these two genera will be of great help in separating specimens of *Peniculus* and *Metapeniculus* which are very close in external gross morphology, and will help in determining generic relationships within the family. The presence or absence of this structure and their possible variability must be studied for all the species assigned to *Peniculus*, which can give us a clue for species differentiation, and the validity of some *Peniculus* species whose taxonomic status is not clear.

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