

SENSILLA AMPULLACEA ON THE ANTENNAE OF *CULICOIDES PARAENSIS*
(GOELDI, 1905) WITH NOTES ON OTHER *CULICOIDES* (DIPTERA:
CERATOPOGONIDAE)

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Only few studies mention the sensilla ampullacea on the antennae of insects. This type of sensillum is generally described in Hymenoptera as honey bees and ants (D. Schneider, 1964, *Annu. Rev. Entomol.*, 9: 103-122). Since the sensilla ampullacea are minute and difficult to localize in Diptera like mosquitoes and biting midges, they are poorly studied.

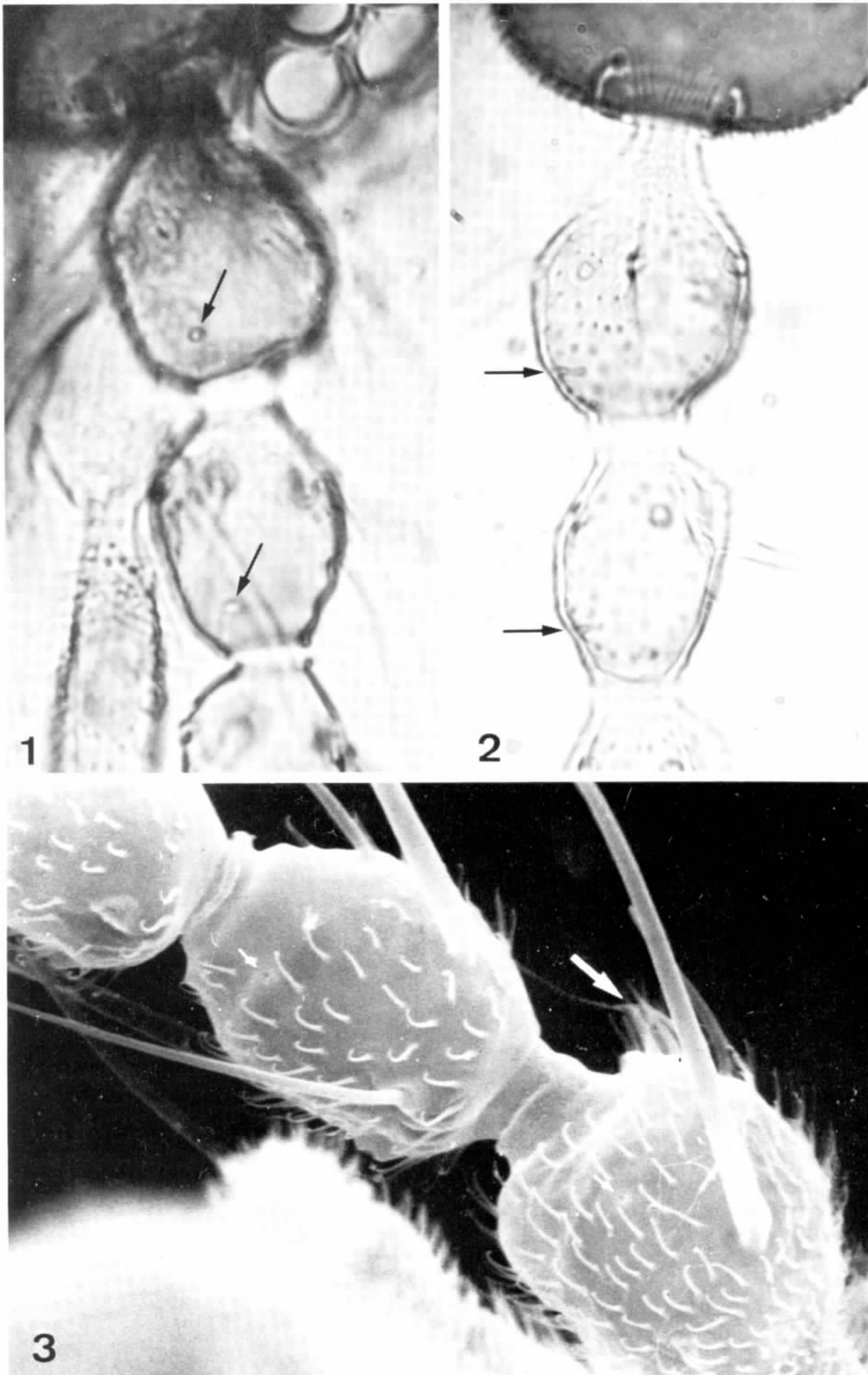
I. A. H. Ismail (1964, *Acta Trop.*, 21: 155-168, p. 157) described a type of sensilla in females of culicines and anophelines, which K. S. Boo & S. B. McIver (1975, *Can. J. Zool.*, 53: 262-266) interpreted as sensilla ampullacea. For the first time, K. S. Boo & S. B. McIver (*loc. cit.*) showed their fine structure in females of *Anopheles stephensi* and *Aedes aegypti* and K. S. Boo (1980, *Z. Parasitenkd.*, 61: 249-264) in males of *Anopheles stephensi*. The sensillum consists of a non-perforated, thick-walled peg located in a deep tube, innervated by three neurons (K. S. Boo & S. B. McIver, *loc. cit.*). Its ultrastructure is similar to the sensillum coeloconicum with thick walled, non grooved peg (K. S. Boo, *loc. cit.*). In both female mosquitoes this type of sensilla coeloconica is probable a thermoreceptor. Based on the fine structural similarities of sensilla coeloconica and sensilla ampullacea K. S. Boo & S. B. McIver (*loc. cit.*) propose an identical function.

In biting midges, W. W. Wirth & S. Navai (1978, *J. Med. Entomol.*, 15: 43-49) suggested that the sensilla ampullacea are present in *Culicoides*, but found it very difficult to localize then by light microscopy. They interpreted the "sensilla coeloconica" cited by J. A. Campbell & E. C. Pelham-Clinton (1960, *Proc. R. Soc. Edinburgh sect. B67*: 181-302), W. R.

Atchley (1970, *Univ. Kans. Sci. Bull.*, 49: 181-336) and M. Cornet (1974, *Cah. O. R. S. T. O. M., sér. Ent. méd. et Parasitol.*, 12: 221-229) as sensilla ampullacea, and the "olfactory pits" as sensilla coeloconica. J. A. Campbell & E. C. Pelham-Clinton (*loc. cit.*) found these "sensilla coeloconica" on the first and second antennal flagellar segments of all British species of *Culicoides*. They showed a diagram of the antenna of *C. odibilis* Austen with three sensilla on the first flagellomere and one on the second. In *Culicoides* of the subgenus *Selfia* the sensillum was present in both sexes, on the second flagellomere opposite the "olfactory pit". In *C. (S.) hieroglyphicus* Malloch only one sensillum is present (W. R. Atchley, *loc. cit.*). M. Cornet (*loc. cit.*) described the "sensilla coeloconica" as "profondes fossetes à ouverture étroite qui contiennent en leur centre un sensille bulbeux: au microscope ordinaire seul ce sensille bulbeux est visible sous la forme d'un batônnnet plus au moins pigmenté".

Scanning and transmission electron microscopical studies of the antennal sensilla of *C. furens* (Poey) were performed by T. Wu Chu-Wang et al. (1975, *Int. J. Insect. Morphol. & Embryol.*, 4: 132-149). Since this only ultrastructural study did not mention the sensilla ampullacea and since light microscopical investigation needed a verification, our study was performed using a medically important species.

Female specimens of *C. paraensis* (Goeldi) from Pará, Brazil, were collected biting on man and preserved in 70% ethanol. For light microscopy 10 specimens were mounted on slide in Berlese's medium. For scanning electron microscopy 10 specimens were dehydrated through graded series of ethanols, dried by critical point method, coated with gold in a vacuum evaporator and examined with a JEOL 25 SII scanning electron microscope.



First and second flagellomeres of the antenna of *Culicoides paraensis* showing the sensilla ampullacea. Fig. 1: light microscopical view of the sensilla ampullacea presenting as light points (arrows). 900X. Fig. 2: antenna lying in a position revealing the tubular structures of the sensilla ampullacea (arrows). 1000X. Fig. 3: scanning electron micrograph demonstrating the narrow orifices of the sensilla ampullacea (small arrow) in opposite to the sensillum coeloconicum (big arrow). 1900X.

Our study reveals structure on the antennae of the females of *C. paraensis* (Goeldi) which we interpreted as sensilla ampullacea. One is located on the first and one on the second flagellomere opposite to the sensillum coeloconicum. They are easier to detect, if the sensillum coeloconicum is mounted in a lateral position. The sensilla ampullacea appear as light points (Fig. 1) or as pigmented rods (Fig. 2) depending on the angle of observation. Scanning electron microscopy demonstrates the narrow opening of these sensilla (Fig. 3).

M. Cornet (*loc. cit.*) cited that "ce type de sensille se rencontre chez presque toutes les espèces et a donc peu d'intérêt en taxonomie". Also, the arrangement of the three sensilla on the first flagellomere of *C. odibilis* Austen seems to vary (J. A. Campbell & E. C. Pelham-Clinton, *loc. cit.*). However, 3 sensilla were found on the first and one on the second flagellomere of *C. odibilis* Austen (J. A. Campbell & E. C. Pelham-Clinton, *loc. cit.*), one on the first and one on the second of *C. paraensis* (Goeldi) in the present study, and only one on the second flagellomere of *C. (S.) hieroglyphicus* Malloch (W. R. Atchley, *loc. cit.*).

Therefore, more detailed studies on the sensilla ampullacea of *Culicoides* are necessary to analyse their possible taxonomic value.

Many ultrastructural aspects of the antennal sensilla of *C. furens* (T. Wu Chu-Wang et al., *loc. cit.*) are similar to the sensilla of mosquitoes. Therefore, the sensilla ampullacea in *Culicoides* might also function as thermoreceptors as described for mosquitoes. Further studies on these sensilla with transmission electron microscopy and electrophysiology are necessary to elucidate its morphology and function in *Culicoides*.

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