

# Morphology and arrangement of the labial sensilla of the water bugs

Jolanta BROŻEK

University of Silesia, Department of Zoology, Katowice, Poland

## Abstract

The apical lobes of the labium in Nepomorpha bear different sensilla. There are 4 main types of labial sensilla described as short stout peg sensilla (PeS = basiconic sensilla), papillae sensilla (PaS), ribbon-like sensilla (RS) and pit sensilla (PT). Before the apical tip there are a long hair and bristle sensilla (BS = sensilla chaetica) that are arranged in a bundles in some families. Sensilla chaetica cover the terminal segment or all the labium. The most number of bristle sensilla appears in Corixidae. Sensilla on the tip of labium form a special pattern different in particular families. Sensilla on the tip occur in two groups, one group on each apical lobe. The number of sensilla of the apical tip is different in the families. Corixidae has completely different pattern of distribution and number of the apical sensilla from remaining families of the Nepomorpha.

**Key words:** Heteroptera, Nepomorpha, morphology, labial sensilla, arrangement.

## Introduction

The apical segment of the labium in Nepomorpha is tripartite. It consists of two lateral lobes and a middle lobe on the ventral side. In the water bugs the tip of the lateral lobes has receptors, (Cobben, 1978). In Nepomorpha the labial surface bears many long setae as well as other hairs, which have a sensory function too. A greater attention was focused on the sensory structures of the mouthparts in Corixidae (Benwitz, 1956; Lo and Acton, 1969). These sensorial labial organs in Corixidae are localised in six transverse bands. They were described as peg sensilla, which are numerous, over 2,500. Probably these sensilla are chemoreceptive and osmoregulatory (Lo and Acton, 1969). The function of the apical sensilla of the rostrum remains obscure (Bernard, 1974). Some authors (Herzog, 1967; Schoonhoven and Henstra, 1972; Khan, 1972) suggested that sensilla, which are placed on the tip of the labium in *Dysdercus* sp. (Pentatomomorpha) are chemosensilla. The small hairs and the long bristles on the entire labial surface, especially preapical bristles of the terminal rostral segment are mechanosensilla (Bernard, 1974). The labial sensilla present in all Nepomorpha at the tip and on each side of the labium are very variable and might carry some phylogenetic meaning (Y. Popov; personal communication). Studies on morphology, arrangement and number of the labial sensilla in Nepomorpha have not been made collectively. Moreover, labial sensilla have not been considered in their taxonomic and phylogenetic meaning.

The aim of this paper was to investigate a new set of characters not previously studied in Nepomorpha, i.e. the labial sensilla. Objective was to find various morphological characters and divergence in arrangement and number of the labial sensilla in different families.

## Materials and methods

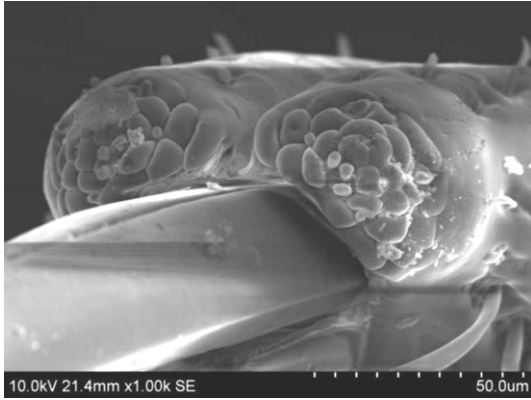
The study was based on dry specimens. Material was obtained from the collections of the Zoological Museum of

the Moscow State University. The research has been conducted at a family level in the Nepomorpha. SEM photographs were made in 20 species of 10 families. The specimens were gold-coated and photographed with SEM - Hitachi.

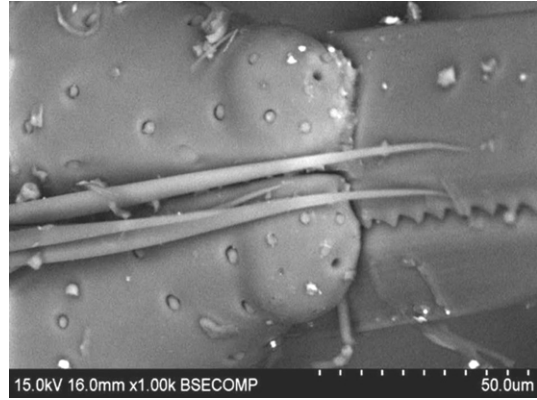
## Results

The shapes of the lateral lobes of the apical segment are different in particular families. On the apical lateral lobes there are probably chemosensilla. There are 4 main types of the apical labial sensilla described as short stout peg sensilla (PeS = basiconic sensilla), papillae sensilla (PaS), ribbon-like sensilla (RS) and pit sensilla (PT). Chemosensilla are symmetrically arranged on the lobes. The number of his sensilla variable in different families. The apical lateral lobe in Helotrephidae has 10 papillae sensilla as well as in Pleidae and Apheloceridae. In Corixidae there are a great number of peg sensilla (in *Corixa* sp. 2,500 ribbon-like and peg sensilla). Other families have 12 papillae sensilla (Nepidae, Belostomatidae, Gelastocoridae, Ochteridae, Notonectidae, Naucoridae). On the lateral lobe there is one-pit sensillum. The pit sensilla are not found only in few families (Gelastocoridae, Ochteridae, Corixidae). The pit sensillum is placed in a central position in Helotrephidae, Pleidae, Naucoridae, Notonectidae, Apheloceridae or lateral in Belostomatidae and Nepidae. Cuticular folds (figure 1) envelop the papillae sensilla in Gelastocoridae, Ochteridae, Notonectidae. The apical surface of the lateral lobes is smooth and papillae sensilla are not enveloped (figure 2) in Belostomatidae, Nepidae, Helotrephidae, Pleidae, Naucoridae and Apheloceridae. In Corixidae the peg and ribbon-like sensilla are on a special line localised below the cuticular surface or these sensilla are placed irregularly on the tip as in Cymatinae (figure 3). Mechanosensilla appear in a great number and they cover generally all the labium. These sense organs exist as mechanosensitive hairs and long bristles.

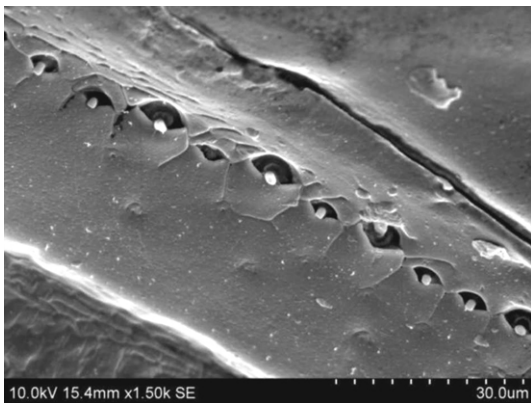
The singular and long bristles were observed on the ven-



**Figure 1.** Lateral lobes of the apical labium with chemosensilla in *Notonecta glauca* L.. Peg sensilla are enveloped by the cuticle.



**Figure 2.** Lateral lobes of the apical labium with chemosensilla in *Lethocerus deyrollei* (Vuillefroy). Peg sensilla are not enveloped by the cuticle.



**Figure 3.** Labial chemosensilla in *Diaprepocoris zealandiae* Hale. Peg sensilla are below the cuticular surface.



**Figure 4.** Tip of the labium with mechanosensilla in *L. deyrollei*.

tral side of the apical segment of the rostrum in Gelastocoridae and Ochteridae. The peg sensilla are on surface of the segments of the labium too.

In Belostomatidae the apical segment bears three groups of bristles (figure 4). One group is on the dorsal side and two on the ventral side before the apex. In these bundles, mechanosensitive bristles are numerous. In Nepidae bristles are numerous and cover the apical segment and do not form tufts.

In Helotrephidae and Pleidae bristles are not numerous and scattered on the terminal segment. In Naucoridae two groups of mechanosensitive bristles were observed near the apex of the rostrum. In Notonectidae there is one pair of bristles on the dorsal side and three pairs of bristles on the ventral side before the apex. A great number mechanosensitive bristles and hairs are found in Corixidae. These sensory structures in Corixidae form distinct bundles on the ventral and lateral side. Mechanosensitive hairs in most families are numerous and cover all labium. Only in Aphelocheridae the mechanosensitive long hairs or bristles on the labium are lacking.

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**Author's address:** Jolanta BROZEK (jolanta.brozek@us.edu.pl), University of Silesia, Department of Zoology, Bankowa 9, 40-007 Katowice, Poland.