

## Morphology of the mouth parts of adult *Mystacides azurea* Linnaeus, 1761

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### Abstract

In this study the mouth apparatus of adults of *Mystacides aurea* (Trichoptera Leptoceridae) was observed using scanning electron microscopy.

The principal characters of every part and the morphology and microstructures were examined and described. The antennae were also examined.

**Keywords:** *Mystacides azurea*, mouth apparatus, ultrastructure

### Introduction

The Leptoceridae is the fourth largest family of the order Trichoptera in Italy and is composed of 33 species and 9 genera.

The adults are slender and about 5 – 17 mm in length. They are called “ long – horn “ because of their antennae which are threadlike and extremely long, approximately twice the length of the body.

The larvae of many species are characterised by natatorial legs with long hairs.

*Mystacides azurea* is a holarctic species and is the most widespread of the 3 species of *Mystacides* found in Italy.

It is present throughout the Italy, except in Sicily, from 30 to 1500m a. s. l. (Plate I: Fig. 4)

The aquatic stages are found in shallow marginal areas of lakes and ponds or in the slowly - moving tracts of streams. They are omnivorous feeding on plant detritus as well as other arthropods.

The adult of *M. azurea* is about 6-7 mm long and has blackish- blue wings which have a characteristic fold at the distal extremity (Plate I: Figs. 1, 3) and a small notch at the point of inflexion (Plate I: Fig. 2) . The males have distinctly larger eyes than the females (MALICKY 1978; PETERSSON & SOLEM 1987) (Plate. I: Figs. 5, 6) and ocelli are absent.

*M. azurea* performs a swarming flight with vertical zig zag movements (GULLEFORS & PETERSSON 1993).

A female, when approaching a swarm, is caught by a male which holds her around the abdomen with its long maxillary palps and both use their wings to fly in tandem to the shore where they copulate. PETERSSON (1987) observes that male copulatory success may be due to individual differences in flight capacity, female detection ability and, indirectly, age. Age associated decline in flight performance is linked to the fact that adults have rarely been observed feeding.

### Material and methods

The specimens were collected in two Umbrian rivers (River Tevere and Nestore) and in Lake Trasimeno.

For scanning electron microscopy the adults were fixed for 2 hours in 3% glutaraldehyde in 0.1 M cacodylate buffer pH 7.2, rinsed in the buffer, dehydrated in graded alcohols, gold-coated and examined in a Philips SEM 501.

### Results

The mouth apparatus of the Trichoptera is characterized by a protrusible structure named haustellum, an organ apparently adapted for lapping, formed from a fusion of the hypopharynx and labium . The mandibles are reduced and the maxillae are single-lobed with elongated palpi.

The adults do not feed. Some take liquid food such as nectar and in some species reproductive activities are accompanied by adult feeding (HOFFMANN 1999).

Microscopic observation of the ultrastructure of the mouth apparatus (Plate II: Fig. 1) revealed an elongate *labrum* (Plate I: Fig. 8), clothed with sensilla trichodea, chaetica and, on the anterior border, basiconica (Plate I: Fig. 9). The distal part of the *labrum* is membranous and flexible (Plate I: Fig. 10, 11). The epipharyngeal face is slightly rough with a double row of sensilla basiconica (Plate I: Figs. 11, 12).

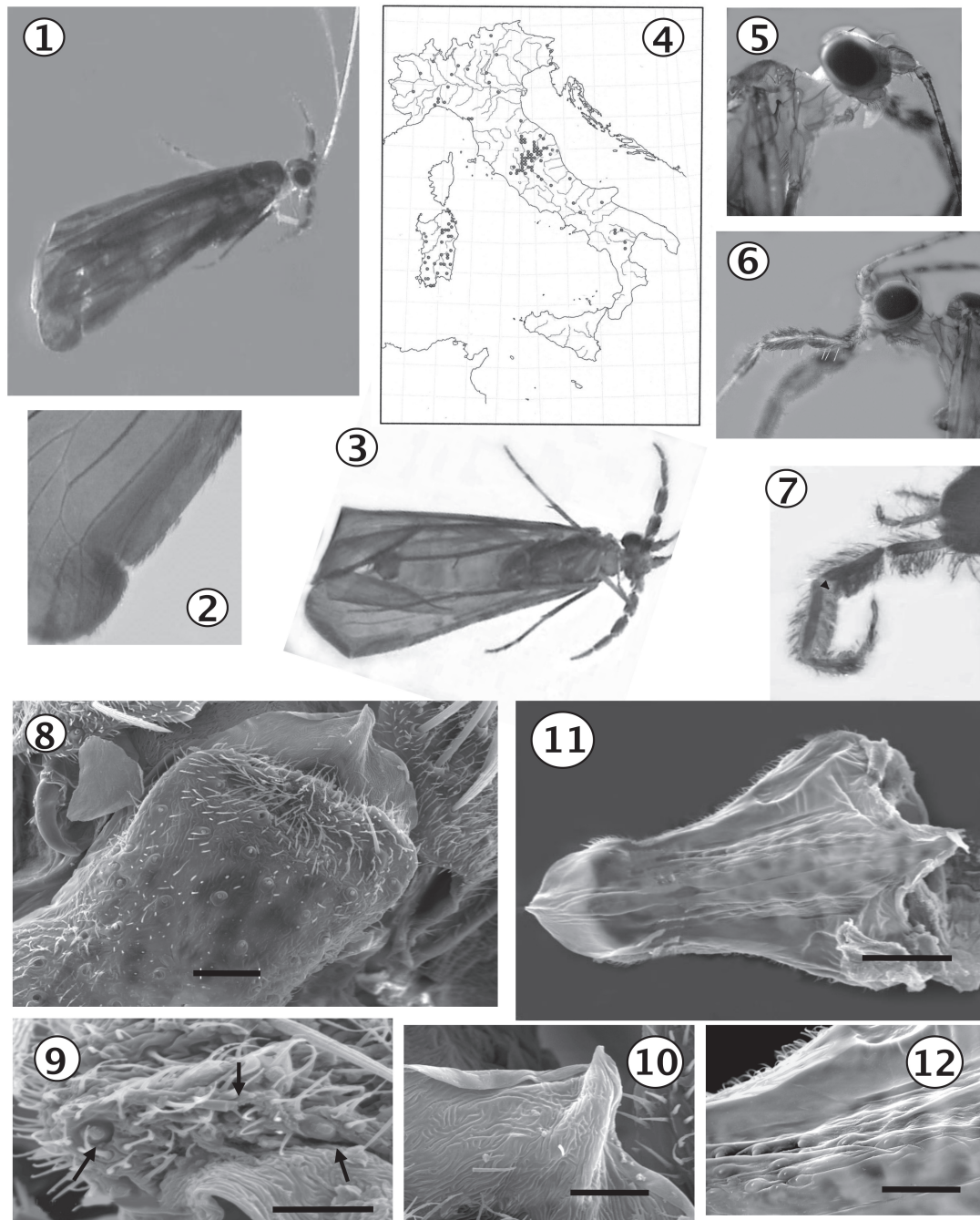
The mandibles are sclerotized, slender and slightly curved with some sensilla basiconica along the external edge (Plate II: Figs 11, 12).

Differences were observed between male and female in the length of the maxillary palps.

They have 5 very large and pubescent cylindrical segments (Plate IV: Fig. 1), but, on average, the male maxillary palps are longer and have more developed IV and V segments (Table 1). These are very flexible and often curved inwards like pliers (Plate II: Fig.7).

**Table 1**

segments	Length of the maxillary palps	
	♂	♀
I	425	424
II	437	452
III	615	613
IV	580	377
V	562	358



**Plate I**

**Fig. 1** - Adult ♀: wings in repose, small notch on the costal margin; **Fig. 2** - Detail: small notch on the costal margin; **Fig. 3** - Adult ♂: maxillary palps extended and apices of the wings strongly inflexed; **Fig. 4** - Distribution in Italy up to 2005; **Fig. 5** - ♂ compound eye; **Fig. 6** - ♀ compound eye; **Fig. 7** - ♂ maxillary palp inflexed; **Fig. 8** - Labrum (bar = 20 µm); **Fig. 9** - Labrum: sensilla basiconica (arrows) and trichodea (bar = 10 µm); **Fig. 10** - Labrum: distal part membranous and flexible (bar = 10 µm); **Fig. 11** - Double row of sensilla on epipharyngeal surface (bar = 50 µm); **Fig. 12** - Detail: sensilla basiconica (bar = 20 µm)

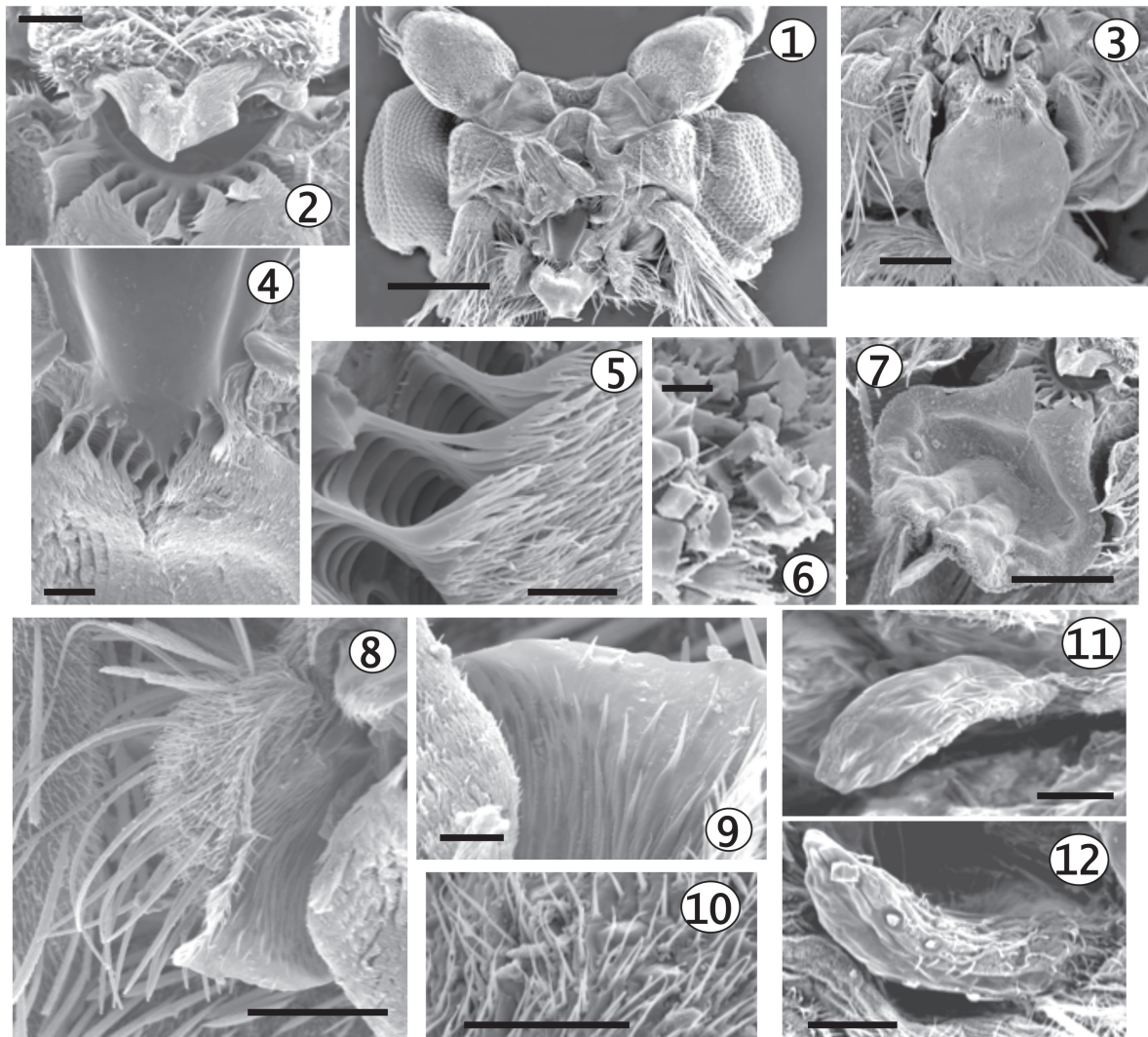
The maxillary palps have hairs, sensilla trichodea and chaetica arranged in two series (Plate IV: Figs. 2, 3).

DENIS and LE LANNIQUE (1991) have also described the presence of the sensilla << en batonnet >>, small sensilla which have pointed extremities.

The segment joints are very large (Plate IV: Fig. 4).

The maxillary lobes are oval with an anterior face covered by numerous setae, sensilla chaetica, trichodea and campaniformia (Plate III: Figs. 8, 10), whereas the posterior face has an inner lamina covered by bristles (Plate III: Fig. 9).

*Haustellum* is wide, of ovoidal form and with a dense covering of pectinate hairs that almost hides



## Plate II

**Fig. 1** - Adult ♂: mouthparts (bar = 200  $\mu$ m); **Fig. 2** - Labrum and channels leading to the sitophore (bar = 20  $\mu$ m); **Fig. 3** - Haustellum (bar = 100  $\mu$ m); **Fig. 4** - Sitophore and channels (bar = 20  $\mu$ m); **Fig. 5** - Pectinate hairs (bar = 10  $\mu$ m); **Fig. 6** - Pectinate hairs encrusted with small crystals ( bar = 2  $\mu$ m); **Fig. 7** - Apex of the haustellum (bar = 50  $\mu$ m); **Fig. 8** - Maxillary lobe with the inner lamina. (bar = 50  $\mu$ m); **Fig. 9** - Inner lamina covered by bristles (bar =  $\mu$ m 10); **Fig. 10** - Setae and sensilla campaniformia on the surface of the maxillary lobe (bar =  $\mu$ m 20); **Fig. 11** - Elongated mandibole (bar = 20  $\mu$ m); **Fig. 12** - Mandible with some sensilla basiconica (bar = 20  $\mu$ m)

the presence of the small sensilla basiconica (Plate III: Fig. 3).

The pectinate hairs (Plate III: Fig. 5) form ten channels which converge on the sitophore (Plate III: Fig. 2). This is sclerotized, concave and thoroughly smooth (Plate III: Fig. 4).

In some individuals, the haustellum is encrusted with a substance which could be small crystals of nectar (Plate III: Fig. 6).

The labial palps have the same covering as the maxillary palps (Plate IV: Figs. 5, 6).

The antennae are long in the ♂ with a wide and bulbous scape and short pedicel with several setae, sensilla chaetica and trichodea (Plate IV: Fig. 7).

The segments of the antennal *flagellum* are covered with squamiform setae (Plate IV: Figs. 8, 9) and there are many sensilla chaetica together with

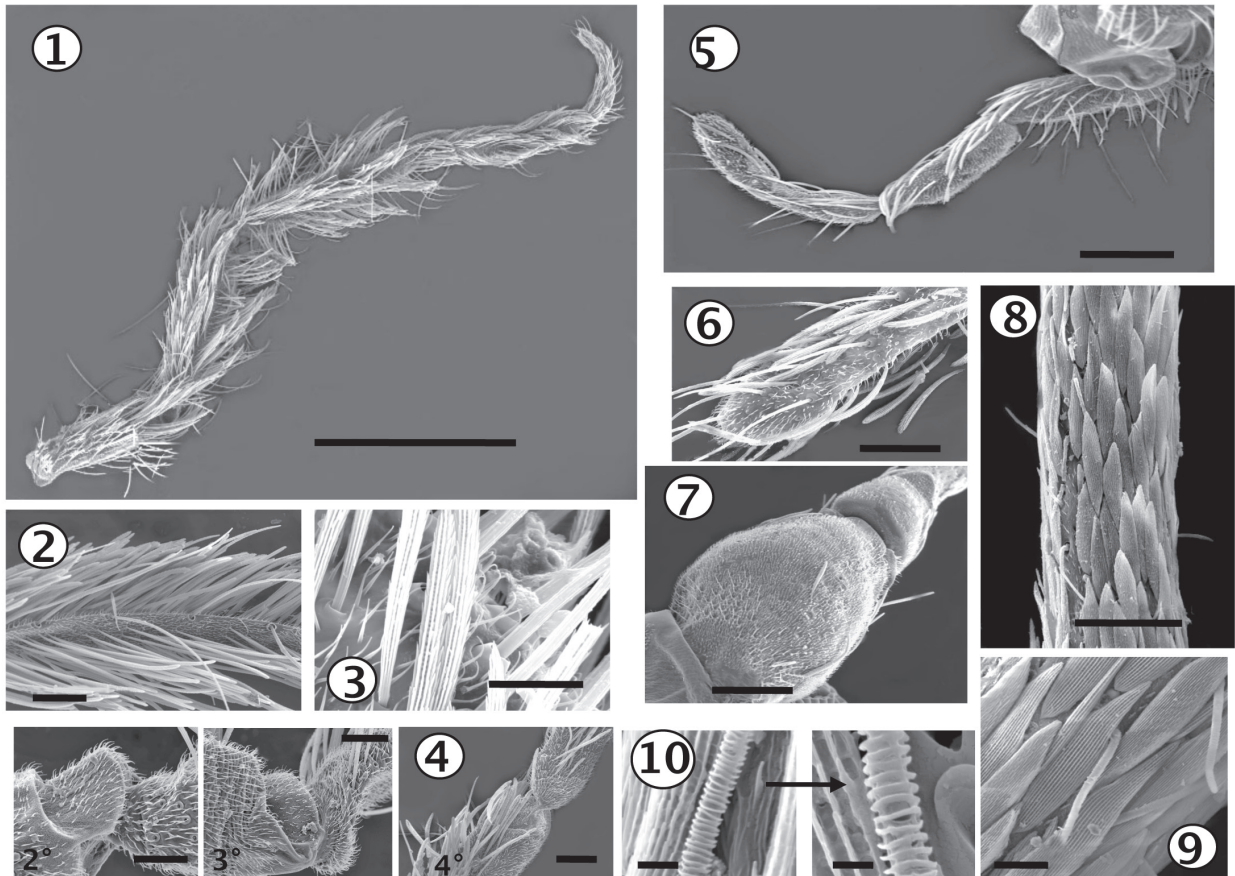
characteristic presumed sensilla composed of superimposed rings (Plate IV: Fig. 10).

## Discussion

The mouthparts of *Mystacides azurea* are mainly characterized by the maxillary palps. They are very long, extended in repose and in the male the two last segments are flexed to grab the female.

Maxillary and labial palps are covered with dense hairs and sensilla.

The presence of material in the haustellum, shows that these insects assume food possibly nectar. It will be interesting to study the antennae, maxillary and labial palps using transmission electron microscopy for a better knowledge of the various types of sensilla.



### Plate III

**Fig. 1** - Maxillary palp (bar = 500 µm); **Fig. 2** - Maxillary palp: hairs arranged in two series (bar = 20 µm); **Fig. 3** - Detail hairs (bar = 10 µm); **Fig. 4** - Maxillary palps: second (bar = 20 µm), third (bar = 20 µm), fourth bar = 50 µm) segment joint; **Fig. 5** - Labial palp (bar = 100 µm); **Fig. 6** - Labial palp apex (bar = 20 µm); **Fig. 7** - Antenna, scape (bar = 100 µm); **Fig. 8** - Antenna, flagellum (bar = 50 µm); **Fig. 9** - Detail of the flagellum (bar = 10 µm); **Fig. 10** - Flagellum: presumed sensilla composed of superimposed rings (bar = 2 µm), arrow detail bar = 1 µm).

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