

**NEW DATA ON THE STRUCTURE OF THE FLAGELLUM IN MALES
OF *PERITHOUS DIVINATOR* (ROSSI) (HYMENOPTERA,
ICHNEUMONIDAE, PIMPLINAE)**

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ABSTRACT : We studied the morphology of antennal tyloids in males of *Perithous divinator* (ROSSI) and *Perithous septemcinctorius* (THUNBERG) (Hymenoptera, Ichneumonidae, Pimplinae). SEM investigations revealed that tyloids are located between the 9th and 13th flagellar segments in *P. divinator* and between the 8th and 15th flagellar segments in *P. septemcinctorius*. The detected tyloids are described and illustrated. Tyloids of the two species are compared and their taxonomic importance was discussed.

KEY WORDS: *Perithous divinator*, *Perithous septemcinctorius*, Pimplinae, tyloids, Ichneumonidae

INTRODUCTION

Male specimens of many Ichneumonidae species have special formations – tyloids - on the lateral part of some segments of the antennal flagellum. Tyloids represent raised sections of the surface of the flagellar segment and have various, most frequently elongated-oval shapes.

Tyloids were initially defined as sensory patches of various shapes with a rough appearance present on intermediate segments of male antennae in some ichneumonids (BERTHOUMIEU, 1894). Much more recently, TOWNES (1969) described tyloids as a definite sensory area on some flagellum segments in male specimens, usually in the form of a longitudinally elliptic or linear raised area on the outer side of each of several segments near the midlength of the flagellum. This definition was later extended to ‘...any type of large raised, flattened or indented sensory area on a flagellar segment...’ (GAULD, 1991) and ‘... raised or sunken patches of distinctive sculpture...’ (QUICKE, 1997).

In many Ichneumonidae species, reliable identification of male specimens is often difficult. The

presence or absence of tyloids and their number, position, shape and structure may significantly reduce the difficulties in identification of males. Until now, tyloids have been reported in eight (GOKHMAN and KRUTOV, 1996) out of 39 (YU and HORSTMANN, 1997) subfamilies, and their taxonomic importance has been widely recognized (RICHARDS, 1956; TOWNES, 1969, 1983; FRILLI, 1974; KOLAROV, 1986, 2004; GAULD and BOLTON, 1988; GAULD, 1991; GOKHMAN and KRUTOV, 1996; QUICKE, 1997).

The presence of tyloids on the flagellum of only male specimens suggests that their function is connected with their being found and identified by female specimens of the same species. BIN *et al.* (1999) present evidence indicating that tyloids are release structures of male antennal glands involved in courtship behavior.

MATERIAL AND METHODS

Tyloids were examined with a 'Nikon C-PS' stereomicroscope. The scanned photographs attached herewith were taken with an SEM JSU-5600 instrument at 20 kV in the secondary electronic mode. Scanned flagella were preliminarily coated with a gold layer for 2 min using a Poloron SC 5600 device.

RESULTS AND DISCUSSION

Tyloids in *Perithous divinator* (Rossi) were found on the 9th to 13th flagellar segments (Fig. 1). These on the 9th to 12th segments occupied the entire, or almost entire, length of the flagellar segment and had the same shape and size. The tyloid on the 13th segment was developed only in the basal half of the segment. As in most ichneumonids, the antennal flagellum in males of the species examined has two basic types of sensilla – trichoid and placoid. As a rule, such sensillae are not developed on tyloids, except in the subfamily Ichneumoninae (GOKHMAN and KRUTOV, 1996). In the specimens examined by us, the presence of trichoid sensilla on tyloids was observed only as an exception. At a higher magnification (x 4500), it was possible to see that the tyloid surface had a granular structure and was covered with small pores (Fig. 3). ISIDORO *et al.* (1996) suggested that such pores are canals of glands that release secretions permitting recognition by the opposite sex of the same species.

Not so long ago, tyloids in the subfamily Pimplinae were known only in some species of the genus *Pimpla* FABRICIUS (*Coccygomimus* SAUSSURE auct.) (TOWNES, 1969). Later, KASPARYAN (1974 a, b; 1981) and GOKHMAN and KRUTOV (1996) reported that species of the genus *Strongyloopsis* BRAUNS also have tyloids. GUPTA (1982) added *Perithous septemcinctorius* (THUNBERG) and *P. townesorum* GUPTA to the list of species with developed tyloids. In our previous investigations (KOLAROV, 2004), we found tyloids on the flagellum of males in *Apechthis compunctor* (LINNAEUS), *A. rufata* (GMELIN), and *A. quadridentata* (THOMSON). It appears that more Pimplinae may have developed tyloids.

Tyloids of *Perithous divinator* were of a linear type (Figs. 1-3). In this respect they resemble the tyloids of *Pimpla rufipes* (MILLER) and species of the genus *Apechthis* FOERSTER and differ from those of *Strongyloopsis* species, which are shorter than the flagellum segments whereon they are situated. In connection with this, it is interesting to compare tyloids on the flagellum of *Perithous divinator* with those of the closely related species *Perithous septemcinctorius*. Tyloids of *P. septemcinctorius* are developed on the 8th to 15th flagellum segments and are rather oval in shape and of different sizes (Fig. 4). The tyloid on the 8th segment is developed only in the apical part of the segment. The one on the 9th segment is considerably widened apically. The largest tyloid is on the 10th segment (Figs. 4 and

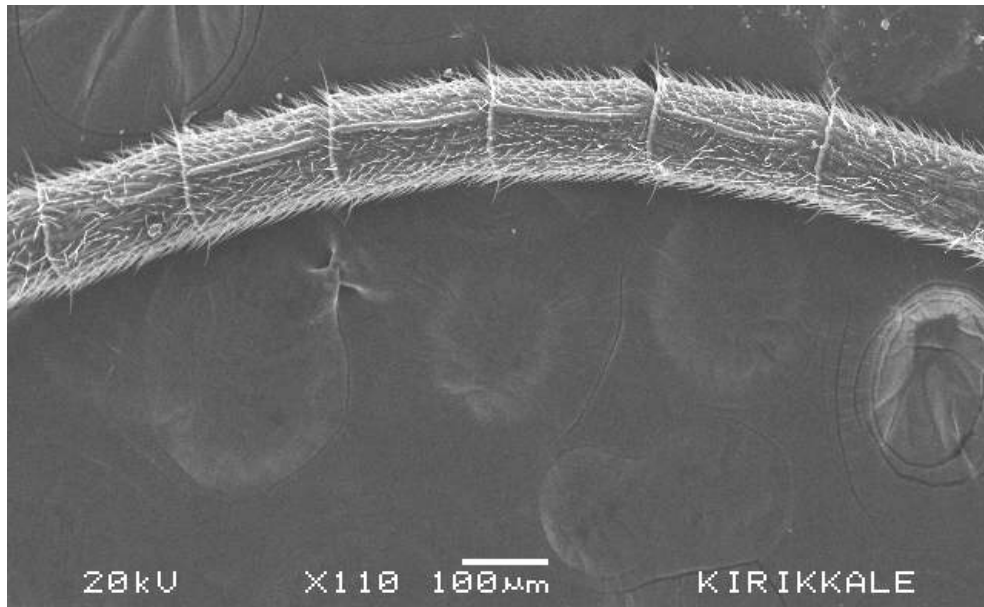


Fig. 1. *Perithous divinator* (Rossi) - 9th – 13th segments with tyloids.

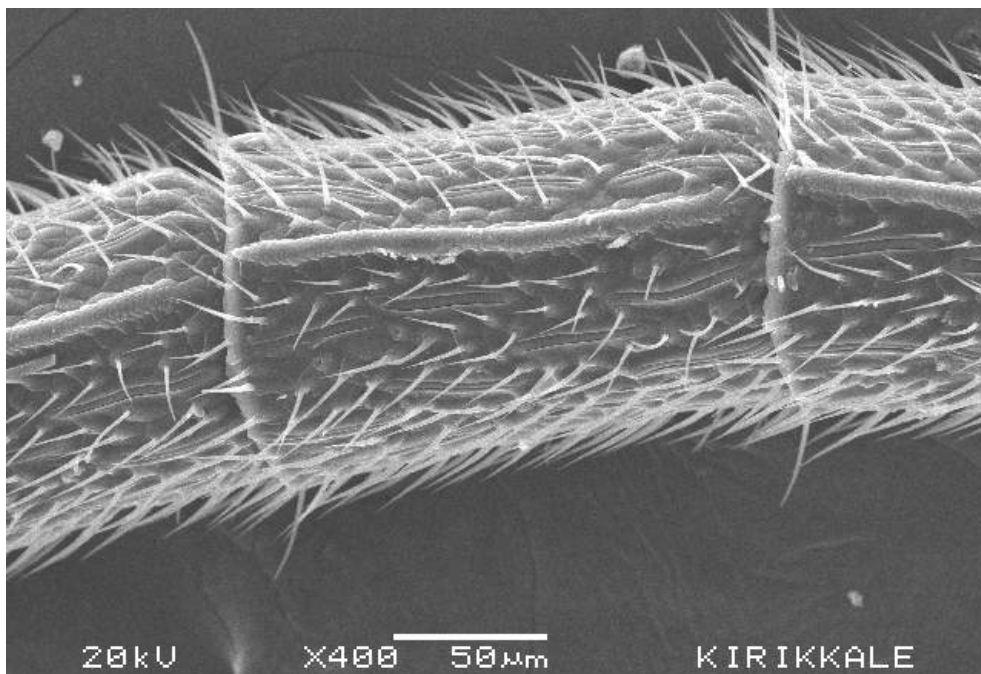


Fig. 2. *Perithous divinator* (Rossi) - 11th segment with tyloid.

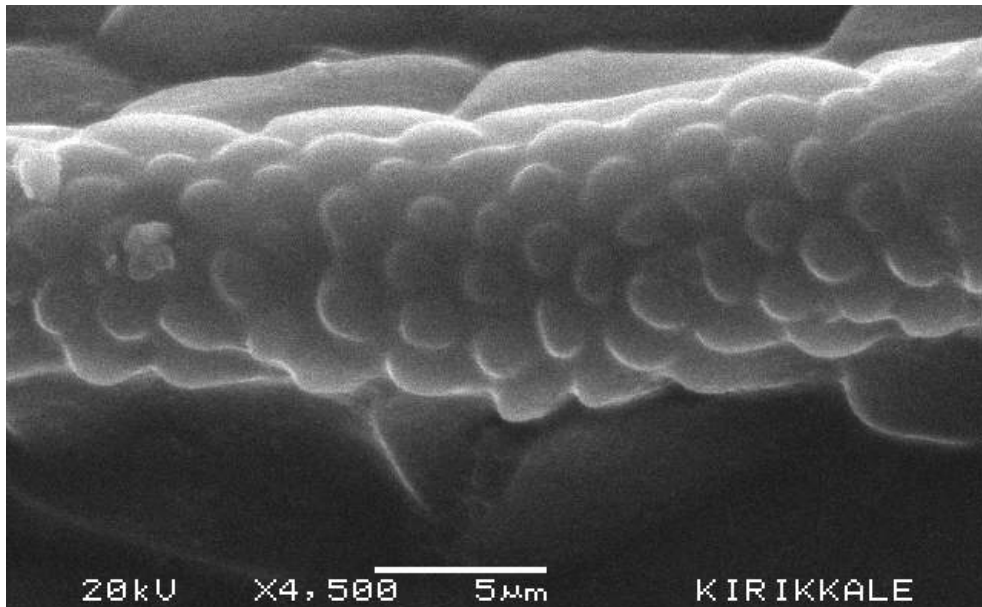


Fig. 3. *Perithous divinator* (ROSSI) - part of tyloid on 11th segment under high magnification (x 4500).

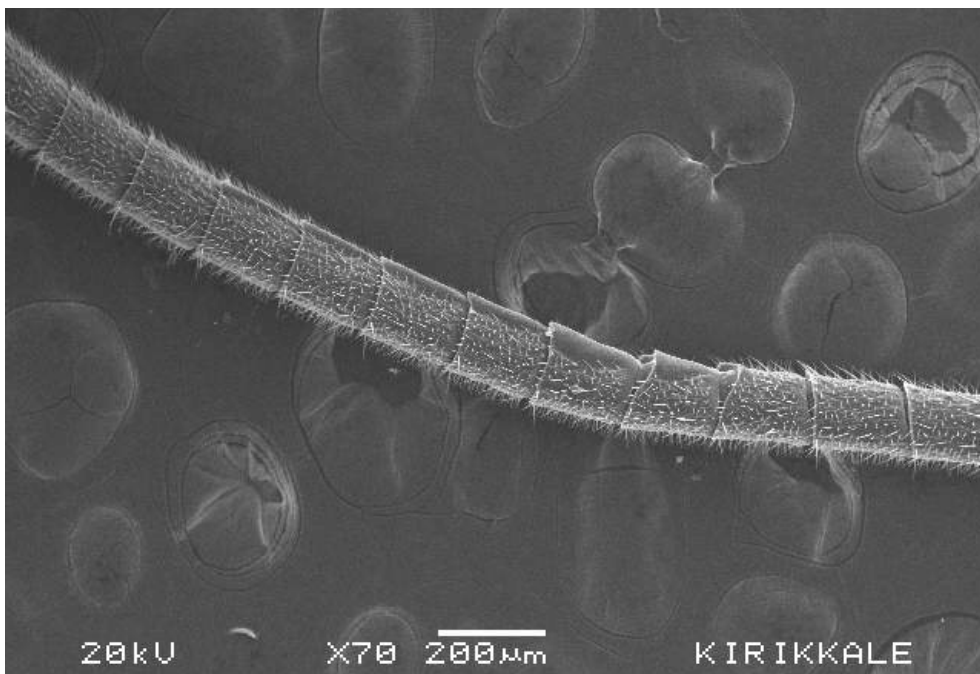


Fig. 4. *Hybomishos septemcinctorius* (THUNBERG) - 8th-15th segments with tyloids.

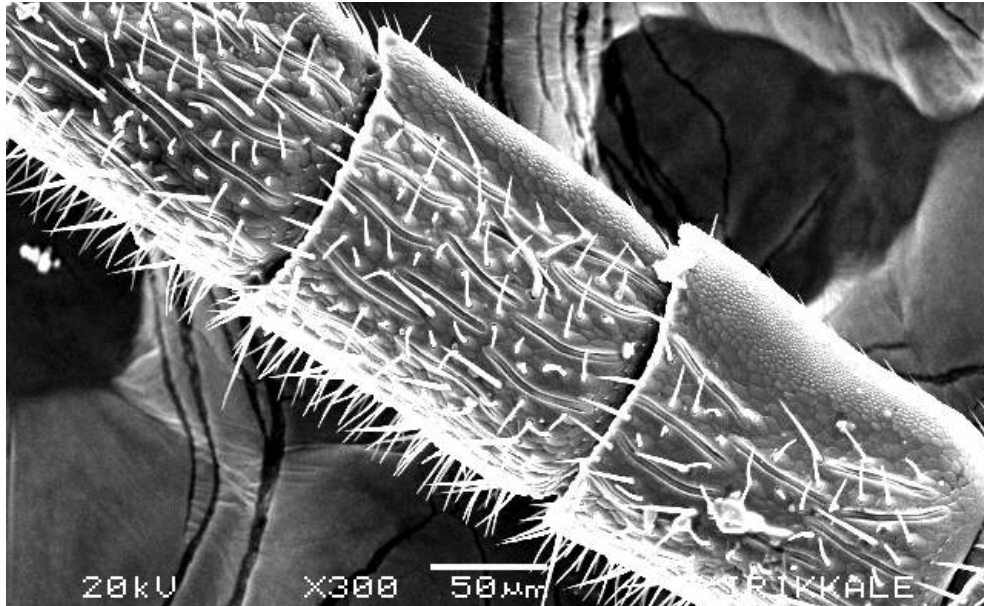


Fig. 5. 10th flagellar segment with tyloid.

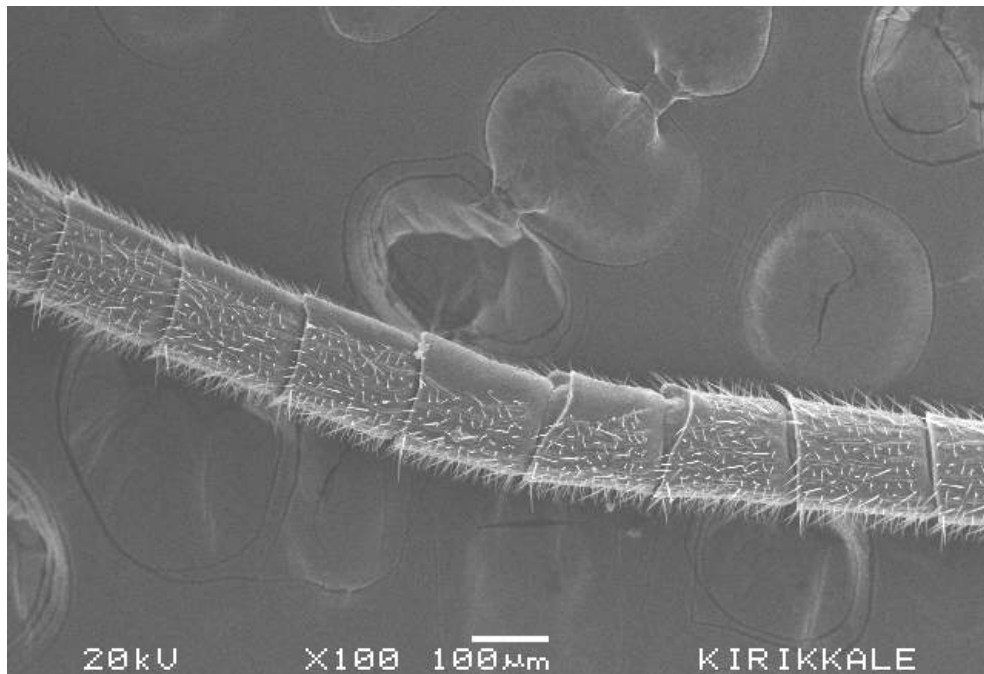


Fig. 6. Apical excavation on 8th – 9th flagellar segments.

5). The following ones are more slender, but of the same length. The tyloid on the 15th segment is weakly developed, present only in the middle of the segment, and not clearly visible on the figure. The 8th and 9th flagellar segments have an apical excavation near the apex of the tyloid (Fig. 6). It can be concluded that there is almost no similarity between the tyloids of *P. divinator* and *P. [Hybomischos sensu YU & HORSTMANN (1997)] septemcinctorius*.

The genus *Hybomischos* was described by BALTAZAR (1961) as a subgenus of *Perithous* HOLMGREN from the Philippines. AUBERT (1969) synonymized it with *Perithous*, while CONSTANTINEANU and PISICA (1977) and GUPTA (1982) treated it as a separate genus. Studying the monophyly and phylogeny of the ichneumonid clade Pimpliformes, WAHL and GAULD (1998) again synonymized *Hybomischos* with *Perithous*, removed the latter from the tribe Delomeristini, and erected a new tribe, Perithoini, for it. To their arguments it is possible to add the presence of tyloids in Perithoini and absence of them in Delomeristini.

The different length of the ovipositor sheath in females is a good distinguishing character for many Ichneumonidae species. But there are still some difficulties in distinguishing males of the *Perithous* (males of many *Perithous* are unknown). CONSTANTINEANU and CONSTANTINEANU (1968) use the ratio between length and width of metasomal tergites II and III, but the ratios may vary depending on how stiff the specimen is, etc. It would appear that tyloids can be of great taxonomic significance and further efforts to clarify it will no doubt be successful.

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**НОВИ ПОДАЦИ ЗА СТРУКТУРУ ФЛАГЕЛУМА КОД МУЖЈАКА
PERITHOUS SEPTEMCINCTORIUS (ROSSI) (HYMENOPTERA,
ICHNEUMONIDAE, PIMPLINAE)**

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ИЗВОД

Мужјаци многих Ichneumonidae имају специфичну формацију - тилоиде (*tyloids*) на латералном делу неких сегмената антеналног флагелума. Тилоиди представљају уздигнути део изнад површине флагеларног сегмента и имају различит облик, мада је најчешћи издужено – овалан.

Проучавана је морфологија антеналног тилоида код мужјака *Perithous divinator* (Rossi) и *Perithous septemcinctorius* (Thunberg) (Hymenoptera, Ichneumonidae, Pimplinae).

Тилоиди су испитивани помоћу стерео микроскопа 'Nikon C-PS'. Код *P. divinator* (Rossi) тилоиди су нађени од деветог до тринаестог флагеларног сегмента. (Сл. 1). Тилоиди код *P. divinator* су линеарног типа (Сл. 1-3). Код веома блиске врсте *P. septemcinctorius* тилоиди су развијени од осмог до петнаестог флагеларног сегмента и углавном су овалног облика и различите су величине (Сл. 4).

Упоређивани су тилоиди ове две врсте и објашњен је њихов таксономски значај.

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