

### Komunikasi Pendek/Short Communication

## Morphology of the Terminal Segments of *Megaselia scalaris* (Loew) (Diptera: Phoridae) using Scanning Electron Microscopy (Morfologi Segmen Akhir *Megaselia scalaris* (Loew) (Diptera: Phoridae) Menggunakan Mikroskop Elektron Imbasan)

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#### ABSTRACT

*Megaselia scalaris* (Loew) (Diptera: Phoridae) is a cosmopolitan scuttle fly of medical and forensic importance. This species is generally small, humpbacked and is a prominent decomposer of corpses indoors. Taxonomically, adult sexes can be distinguished based on the characteristics of the terminal segments of the abdomen. In this report, the terminalia of adult male and female *M. scalaris* were examined using scanning electron microscope (SEM). The terminal segment of an adult female is less complex compared to male, consisting of an ovipositor and cerci. In male, the hypopygium consists of epandrium, hypandrium, anal tube and penis complex. A pair of long and feathered setae was attached to the tip of the anal tube and tapered. The application of SEM to identify this species is useful and can be expanded to other species in this fly group.

**Keywords:** Phoridae; scuttle fly; scanning electron microscopy; forensic entomology; *Megaselia scalaris*

#### ABSTRAK

*Megaselia scalaris* (Loew) (Diptera: Phoridae) ialah lalat mencalai kosmopolitan yang mempunyai kepentingan perubatan dan forensik. Spesies ini bersaiz kecil, berbonggol dan serangga pebangkai yang kerap ditemui pada mayat di dalam rumah. Secara taksonomi, jantina lalat dewasa boleh dibezakan melalui ciri-ciri pada segmen terakhir abdomen. Dalam laporan ini, bahagian akhir lalat dewasa *M. scalaris* jantan dan betina diteliti menggunakan mikroskop electron imbasan (SEM). Segmen terakhir lalat dewasa betina kurang kompleks berbanding jantan, iaitu terdiri daripada ovipositor dan erkus. Pada lalat jantan, hipopigium terdiri daripada epandrium, hipandrium, tiub dubur dan kompleks penis. Sepasang seta panjang seperti pelepah bersambung dengan penghujung tiub dubur dan meruncing. Penggunaan SEM untuk mengenal pasti spesies ini amat berguna dan boleh diaplikasi terhadap spesies lain dalam kumpulan lalat ini.

**Kata kunci:** Phoridae; lalat mencalai; mikroskop elektro imbasan; entomologi forensik; *Megaselia scalaris*

Scuttle flies (Diptera: Phoridae) are a diversified group of insects with a wide spectrum of ecological backgrounds, habitats and feeding habits (Disney 1994). They belonged to a group of small-size flies, usually less than 2.0 mm, and includes the cosmopolitan species, *Megaselia scalaris* (Loew). In medical perspective, this species is an agent of urinary myiasis (Wakid 2008) and contaminant of food products (Brown & Oliver 2007; Nickolls & Disney 2001). In the context of forensic entomology, the immature stages of *M. scalaris* can be employed to determine minimum post mortem interval especially in crime cases conducted indoor and in enclosed environments (Campobasso et al. 2004; Reibe & Madea 2010).

Due to sexual dimorphic features of the scuttle flies, species identification commonly relies on the male description, particularly on the hypopygium or the modified terminal segment of the abdomen. Common techniques to identify the scuttle flies are based on chemical-dried specimens (hexamethyldisilazane) (Brown & Oliver 2008) and specimens mounted on slides (Disney 1994).

This report attempts to describe the terminal segments of both male and female *M. scalaris* using scanning electron microscopy (SEM) as a tool to facilitate identification of this species.

*Megaselia scalaris* colony was maintained in the Forensic Entomology Laboratory, School of Diagnostic and Applied Health Sciences, Faculty of Health Sciences, Universiti Kebangsaan Malaysia. An adult male and female obtained from the colony were killed by transferring the live specimens into vials containing 70% ethanol. Specimens were dehydrated by soaking them in ascending series of 80, 85, 90 and 95% ethanol for 40 minutes each, followed by three-times washing in 100% ethanol for 1 hour each. Specimens were subsequently transferred into a specimen basket and placed inside a critical point drier. This was followed by placing the specimens on stubs using double sided tape and coated with gold by using Sputter Coater. Specimens were finally viewed using Philips™ XL30 Scanning Electron Microscope under 100-3000× magnification.

Observation on hypopygium of male *M. scalaris* using scanning electron microscopy revealed a more detailed structure compared to light microscopy techniques. Common identification parts of the male hypopygium include epandrium (enlarged tergite 9), hypandrium, penis complex, anal tube and a pair of strong feathered bristles (Figure 1 & 2). On each lateral point of view, the surface of the epandrium consists of uniform hairs but slightly denser near the edge. There are 6-7 bristles of 20-25  $\mu\text{m}$  in length. On the lower part of the epandrium, and adjacent to the penis complex is a strong straight bristle, of 100  $\mu\text{m}$  in length, projected downward to the lower end of the penis complex. The cerci and proctiger are fused together to form the anal tube. In the case of *M. scalaris*, the proctiger usually could not be seen clearly using conventional light microscopy technique. It consists of short, irregular hairs with a few longer hairs dispersed on each side. On closer inspection (Figure 2), the penis complex is bare towards the center. A hairless, tongue-like structure, or the posterior

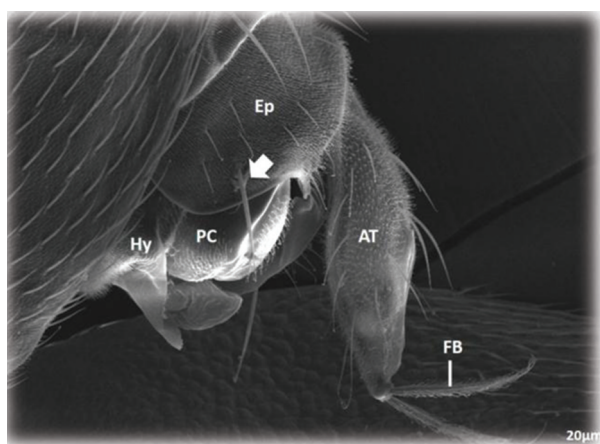


FIGURE 1. Lateral view of a male *Megaselia scalaris* (Loew); epandrium (Ep), hypandrium (Hy), penis complex (PC), anal tube (AT), featherd bristle (FB). A single prominent bristle was evident at the lower left side of epandrium (arrow)

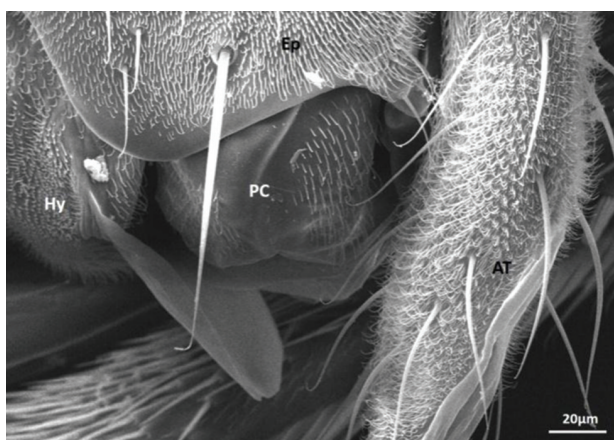


FIGURE 2. A post -lateral view of a male *Megaselia scalaris* (Loew) terminalia; epandrium (Ep), hypandrium (Hy), penis complex (PC), anal tube (AT)

lobes, could be observed spreading to the upper side of the hypandrium. A pair of bristles, from the end of the anal tube might look 'feathery' under the stereomicroscopic view but scanning electron microscopy displays a rather thorny appearance. The identification of a female *M. scalaris* commonly relies on the shape of the abdominal tergites. The sixth tergite is clearly shorter and broader than the fifth tergite. Compared to male, female terminal segment is simple and less elaborated. In female, the cerci are separated. When viewed laterally, the hairs on cercus are sparse and irregular (Figure 3). Bristles are more concentrated from midline to the lower part of the cercus. The ovipositor, which is projected posteriorly, is bare.

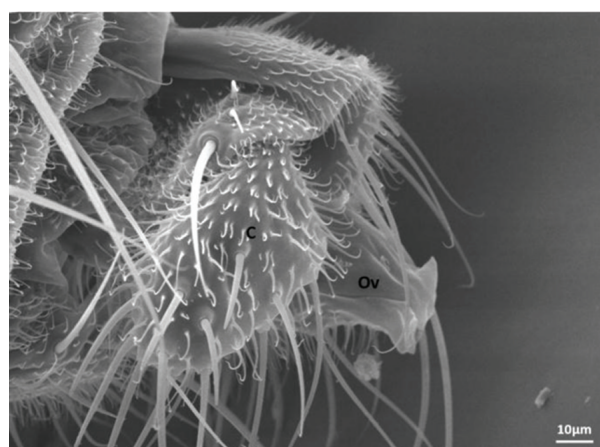


FIGURE 3. Lateral view of a female terminalia of *M. scalaris* was less complex compared to male terminalia, consisting of cercus (C), ovipositor (Ov)

Previous studies using scanning electron microscopy to describe *M. scalaris* include the description of eggs (Greenberg & Wells 1998), larvae (Boonchu et al. 2004; Sukontason et al. 2002), puparia (Sukontason et al. 2006), ommatrichia (Sukontason et al. 2005) and mouthparts (Sukontason et al. 2003). The observation of the hypopygium using scanning electron microscopy enhanced the appearance of *M. scalaris* to ultramicroscopic level. This technique provides a more accurate morphological description and helps to improve the identification based on taxonomic features of this species and its diversified group. It is hoped that this method can be extended to other species in the Phoridae family to aid identification process.

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