

## Scanning Electron Micrographs of two species of *Sturnophagoides* (Acari: Astigmata: Pyroglyphidae) mites in Malaysia

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**Abstract.** Scanning electron microscope (SEM) images of two dust mites, *Sturnophagoides brasiliensis* and *Sturnophagoides halterophilus*, are presented to provide an improved visualization of the taxonomic characters of these mites. *Sturnophagoides halterophilus* can be differentiated from *S. brasiliensis* by their expanded genu and femur of leg I. The differences in morphology of male and female *S. brasiliensis* are also discussed.

### INTRODUCTION

Worldwide, mites have been found inhabiting house dust. In Malaysia, one of the less common species found is *Sturnophagoides brasiliensis* Fain, 1967 (Ho & Nadchatram, 1984; Ho & Nadchatram, 1985; Mariana *et al.*, 2000). Usually *S. brasiliensis* is not the most abundant mite found, however in a survey of a students' hostel, it was the most common and abundant mite recovered (Ho & Mariana, 1994). Another species, *Sturnophagoides halterophilus* Fain & Feinberg 1970, was also collected in the same survey but in a much lower density. As many as 67–69 *S. brasiliensis* mites per gram of dust had been recovered from mattresses (Ho & Mariana, 1994; Mariana, 2002). *Sturnophagoides brasiliensis* has been reported to produce allergens responsible for asthma and rhinitis (Arlian, 1991; Chew *et al.*, 1999; Mariana, 2002).

The genus *Sturnophagoides* was first described (as a subgenus of *Dermaptophagoides*) by Fain (1967a). Amongst the species described under this genus are *S. brasiliensis* (Fain, 1967b) and *S.*

*halterophilus* (Fain & Feinberg, 1970). The genus was then further described by Fain (1971) and Wharton (1976). Illustration of *S. brasiliensis* and *S. halterophilus* by scanning electron micrographs (SEM) has not been widely reported. SEMs of these species are presented here to provide an improved visualization of the morphological characters of the mites.

### General morphology

*Sturnophagoides brasiliensis* is a minute mite, with idiosoma measuring about 0.18 to 0.25 mm in length and 0.07 to 0.14 mm in width (Figure 1). Gnathosoma of *S. brasiliensis* is composed of a pair of palps and chelicerae which are supported by a bulb (subcapitulum) (Figure 2). The palps are a simple two-segmented structure with sensory hairs. The chelicerae are three-segmented; the third segment is dentate.

Like other Pyroglyphids, the mite has a pair of long scapular external setae (*sce*) extending from the outer margin of the idiosoma and a pair of shorter scapular internal setae (*sci*) on the inner part of the idiosoma (Figure 3). The anterior of the

idiosoma is rounded (Figure 3). Two pairs of long setae ( $d_5$  and  $l_5$ ) are positioned at the posterior end of the idiosoma (Figure 4). The dorsal and ventral areas of the idiosoma are covered with fine striations, less than 5  $\mu\text{m}$  apart (Figure 5). A dorsal anterior shield (Figure 4) and posterior shield (Figure 6) is present in propodosomal and hysterosomal regions of the idiosoma, respectively.

Adult and nymph stages of *S. brasiliensis* possess 4 pairs of legs (Figure 7), whereas the larva has 3 pairs of legs (Figure 8). The first two pairs are attached to the propodosoma and the last 2 pairs (or 1 pair for larvae) to the hysterosoma. Genu and femur of leg I of *S. brasiliensis* adult males are slightly broader than the other segments (Figure 1); the same two segments

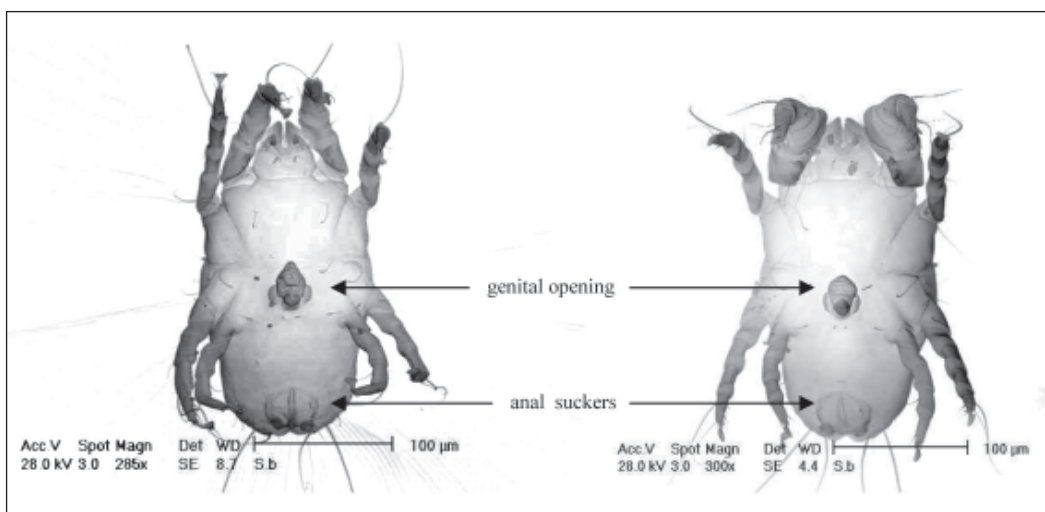


Figure 1. Ventral view of male *S. brasiliensis* (left) and *S. halterophilus* (right).

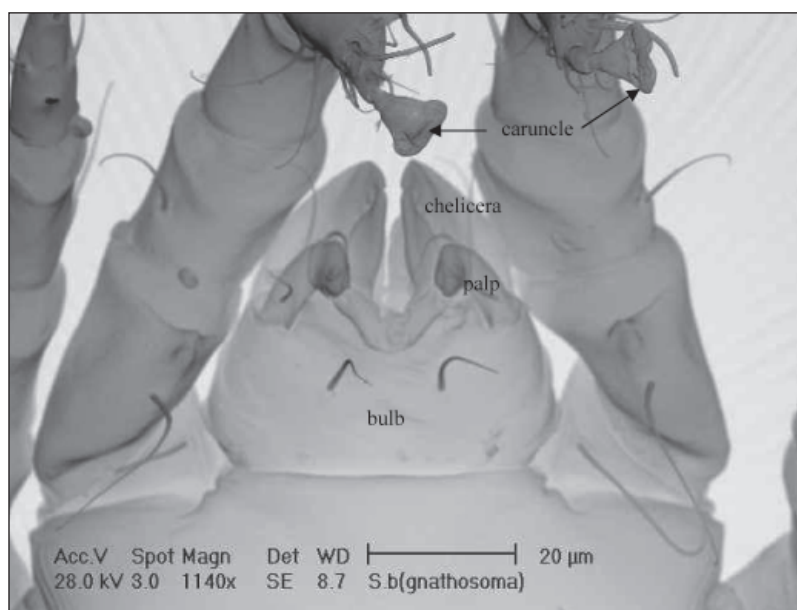


Figure 2. Anterior region of gnathosoma showing chelicera and palp.

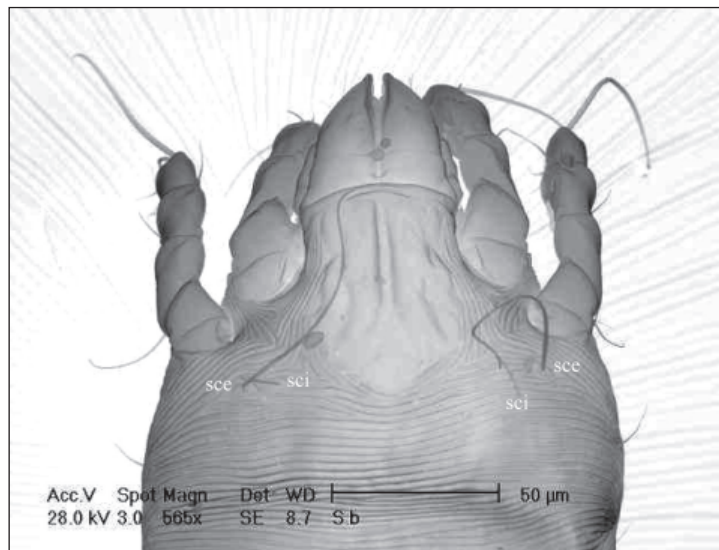


Figure 3. Rounded anterior of idiosoma.

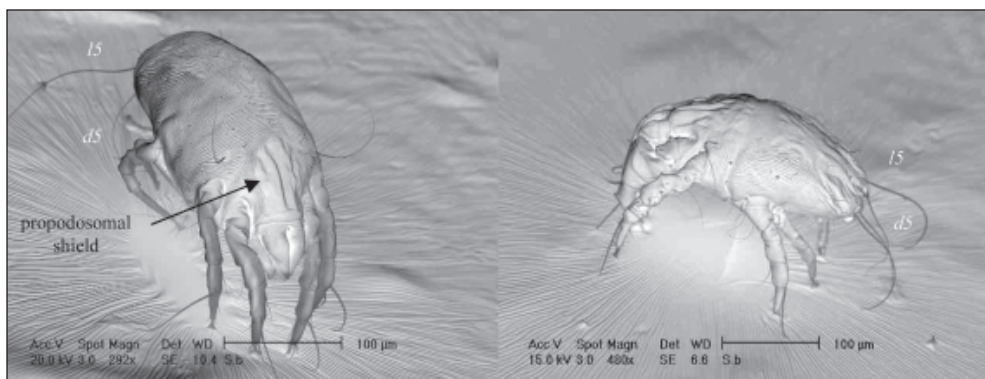


Figure 4. Long *d5* and *l5* setae of *S. brasiliensis* (left) and *S. halterophilus* (right).

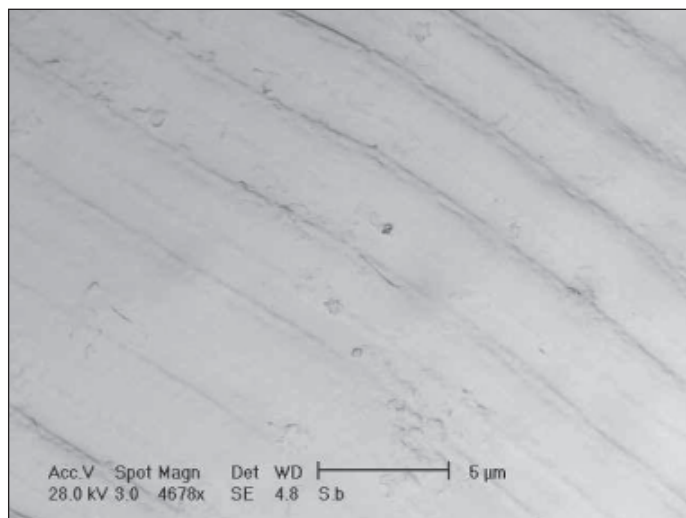


Figure 5. Idiosoma with fine body striations.



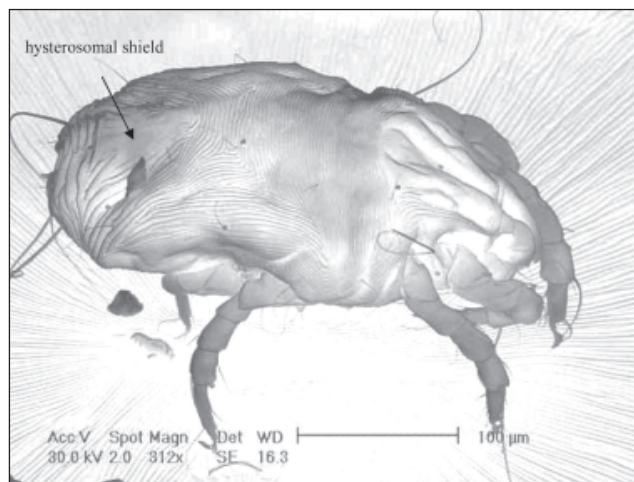


Figure 6. Posterior end of idiosoma showing hysterosomal shield.

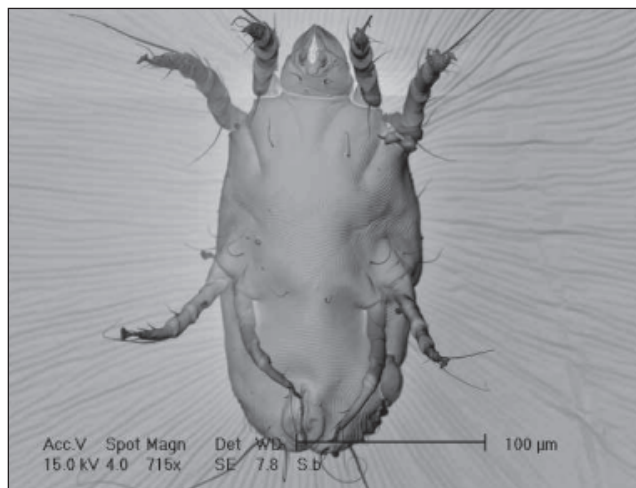


Figure 7. Nymph of *S. brasiliensis*.

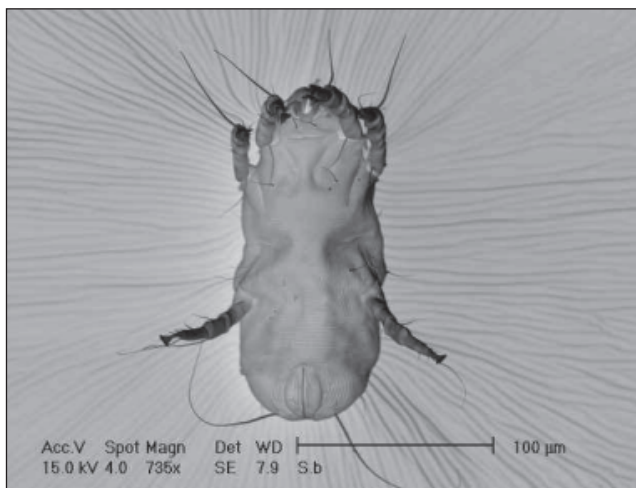


Figure 8. Larvae of *S. brasiliensis*.





of *S. halterophilus* are 3 to 4 times broader (Figure 9). All tarsi of *S. brasiliensis* and *S. halterophilus* end in caruncles.

### Sexual dimorphism

Male *S. brasiliensis* has a pair of ventral terminal anal suckers surrounded by an oval-

shaped chitinous arc (Figure 10). The shape of the arc is not unique to this species but is shared with *S. halterophilus* (Ho, 1986). All females possess a vulva lip and an external terminal opening (Figure 11).

Other than different internal sex organs, male and female *S. brasiliensis* mites also

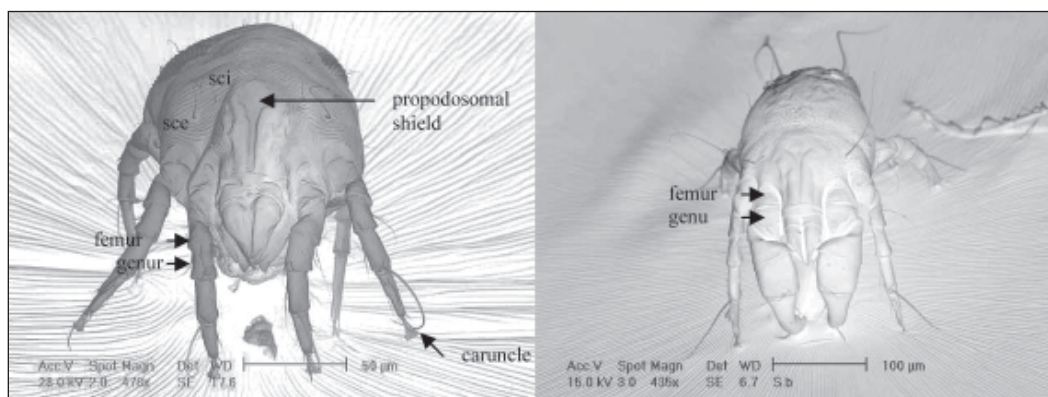


Figure 9. Anterior view of male *S. brasiliensis* (left) and *S. halterophilus* (right).

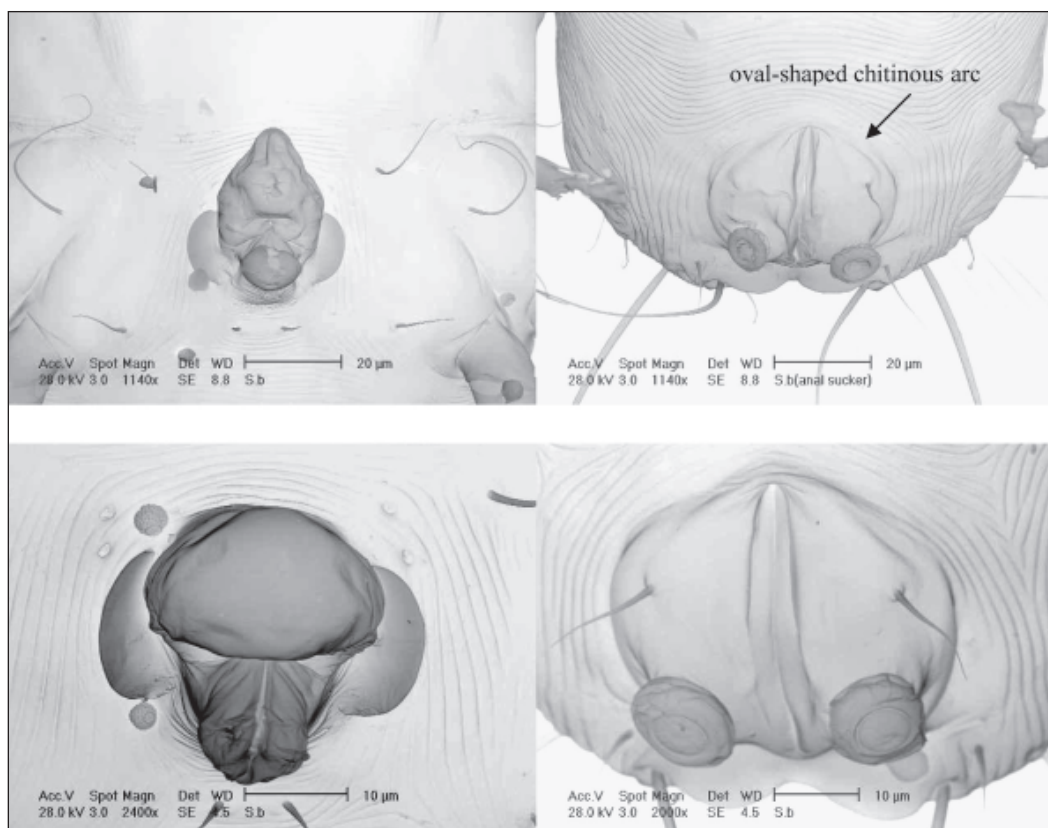


Figure 10. Ventral of male showing genital opening and the oval-shaped arc around anal suckers of *S. brasiliensis* (above) and *S. halterophilus* (bottom).

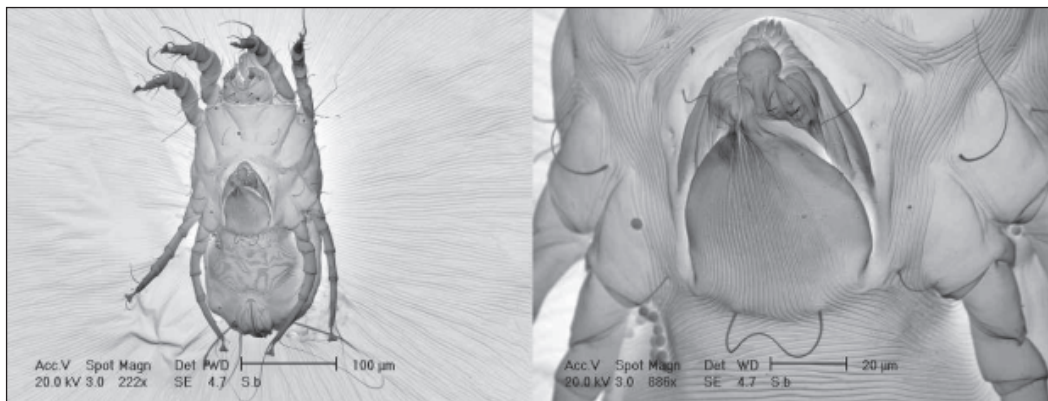


Figure 11. Ventral view of female *S. brasiliensis* mite showing genital opening.

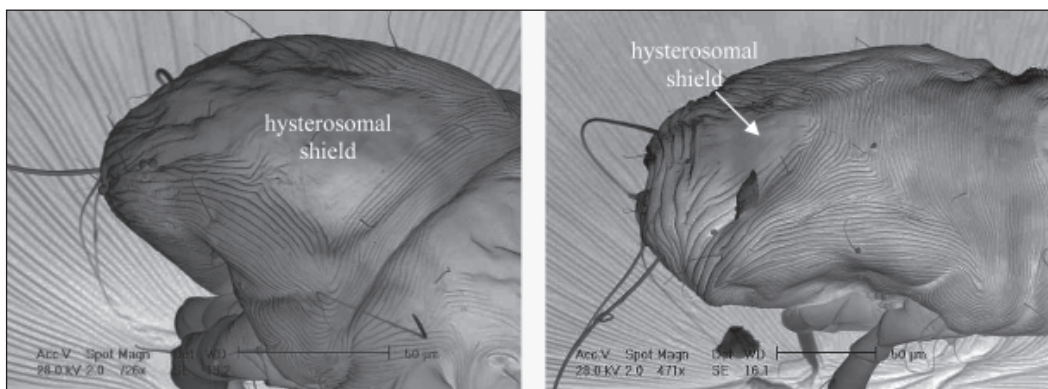


Figure 12. Posterior end of idiosoma of a male (left) and a female *S. brasiliensis*.

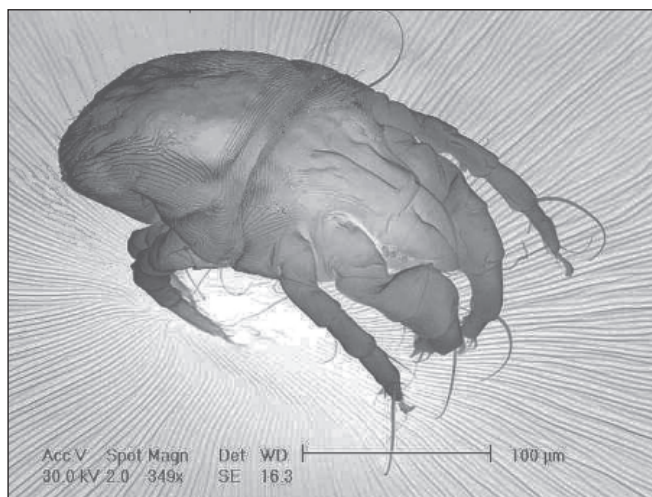


Figure 13. Dorsal hysterosomal shield of a male *S. halterophilus*.

differ in the size and shape of their dorsal hysterosomal shield (Figure 12). Females have a smaller shield compared to the males. It is cone-shaped and not reaching coxae IV.

The shield in males is much longer than wide and extending anteriorly above coxae IV. A shield of the same shape can also be seen in male *S. halterophilus* (Figure 13). The



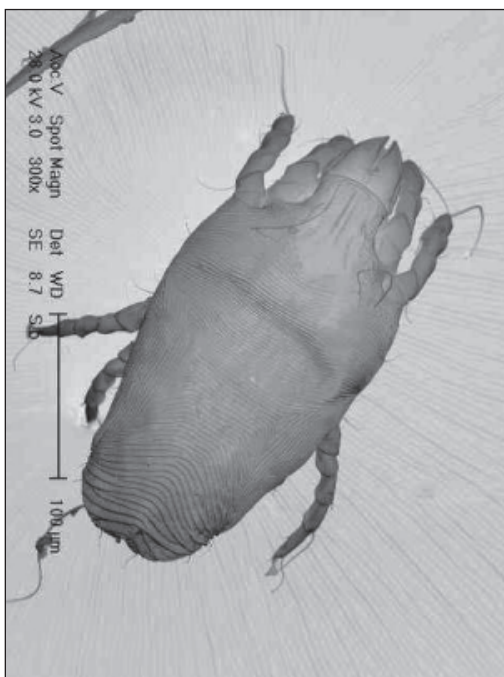


Figure 14. Striations in the dorsal hysterosomal area of a nymph *S. brasiliensis*.

striations in dorsal hysterosomal area are different for male and female *S. brasiliensis* (Figure 12). No comparison of the dorsal striations of different sexes of *S. halterophilus* mites is possible because until to date, no female *S. halterophilus* has been described. There are suggestions that perhaps *S. halterophilus* is a heteromorphic male of *S. brasiliensis* (Fain *et al.*, 1988, 1990). Dorsal striations are also seen in immature stages (Figure 14).

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## REFERENCES

- Arlian, L.G. (1991). House dust mite allergens: A review. *Experimental and Applied Acarology* **10**: 167-186.
- Chew, F.T., Lim, S.H., Goh, D.Y.T. & Lee, B.W. (1999). Sensitization to local dust mite fauna in Singapore. *Allergy* **54**(11): 1150-59.
- Fain, A. (1967a). Deux nouvelles especes de Dermatophagoidinae. Rattachement de cettessous-famille aux Pyroglyphidae (Sarcoptiformes). *Acarologia* **IX**(4): 870-881.
- Fain, A. (1967b). Le genre *Dermatophagoides* Bogdanov, 1864 son importance dans les allergies respiratoires et cutanees chez l'homme (Psoroptidae: Sarcoptiformes). *Acarologia* **IX**(1): 179-225.
- Fain, A. & Feinberg, J.G. 1970. Un nouvel acarien provenant des poussieres d'une maison a Singapour (Sarcoptiformes: Pyroglyphidae). *Acarologia* **XII**(1): 164-167.
- Fain, A. (1971). Genre *Sturnophagoides* Fain, 1967. *Buletin Insitut royal des Sciences naturelles de Belgique* **47**(8): 2.
- Fain, A., Guerin, B. & Hart, B.J. (1988). Acariens et allergies. *Varennnes-en-Argonne: Allerbio*.
- Fain, A., Guerin, B. & Hart, B.J. (1990). Mites and allergic disease. *Varennnes-en-Argonne: Allerbio*.
- Ho, T.M. & Nadchatram, M. (1984). Distribution of house dust mites in a new settlement in Jengka, Pahang, Malaysia. *Tropical Biomedicine* **1**: 49-54.
- Ho, T.M. & Nadchatram, M. (1985). Distribution of *Dermatophagoides pteronyssinus* (Astigmata: Pyroglyphidae) in Cameron Highlands, Malaysia. *Tropical Biomedicine* **2**: 54-58.
- Ho, T.M. (1986). Pyroglyphid mites found in house dust in Peninsular Malaysia. *Tropical Biomedicine* **3**: 89-93.



Ho, T.M. & Mariana, A. (1994). The efficacy of a vacuum cleaner for the control of dust mites in mattresses. *Tropical Biomedicine* **11(2)**: 135-8.

Mariana, A., Ho, T.M., Sofian-Azirun, M. & Wong, A.L. (2000). House dust mite fauna in the Klang Valley, Malaysia. *Southeast Asian Journal of Tropical Medicine and Public Health* **31(4)**: 712-721.

Mariana, A. (2002). The biology & distribution of allergen producing mites with particular reference to *Blomia tropicalis* (Acarina: Astigmata: Echimyopodidae) in the Klang Valley, Malaysia. PhD Thesis, University of Malaya, Kuala Lumpur, Malaysia.

Wharton, G.W. (1976). *Sturnophagoides*. *Journal of Medical Entomology* **12(6)**: 601.