



RESEARCH ARTICLE

The first record of parasitic mite, *Leptus* sp. (Acari: Erythraeidae) associated with a necrophagous fly, *Chrysomya villeneuvei* Patton, 1922 (Diptera: Calliphoridae)

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ABSTRACT

This is the first documentation of parasitic mite, *Leptus* sp., found on a necrophagous blowfly, *Chrysomya villeneuvei* collected from a decomposing wild boar carcass placed in Taman Negara (National Park), Kuala Keniam, Pahang, Malaysia. Blowflies around the carcass were captured using an insect net before being examined under a stereomicroscope. Upon microscopic observation, we found a mite attached on the scutellum of *C. villeneuvei* adult. The mite was carefully removed and preserved in 70% ethanol subsequently. Then, the mite was cleared in lactophenol before being mounted in Hoyer's medium. The morphological identification of the mite was conducted and *Leptus* sp. was identified. The species belongs to the *phalangii* species group and the *aldonae* species subgroup. This study highlights the new association of *Leptus* sp. and *C. villeneuvei* for the first time.

Keywords: Taman Negara; Malaysia; forest; acarology; blowfly.

INTRODUCTION

Leptus sp. Latreille 1796 (Acari: Erythraeidae) is a parasitic mite whereby during its larval stage, it feeds on the haemolymph of its host before moulting into nymphal and adult stages. To date, more than 280 species have been described worldwide with 226 of them were described based on larval descriptions only (Mağol & Wohltmann, 2012; Bernard *et al.*, 2019; Haitlinger *et al.*, 2020a, b; Saboori *et al.*, 2020; Haitlinger & Šundić, 2020; Hakimitabar *et al.*, 2020, 2021). In Southeast Asia, 24 species from this genus have been recorded thus far and were either collected from environments or from various insect hosts such as coleopterans and orthopterans, while in Malaysia, only four species have been documented namely the free-living *Leptus hozumii* Shiba 1976, *Leptus cameronensis* Shiba 1976, *Leptus calidus* Shiba 1976 and one species collected from plants, *Leptus agenori* Haitlinger 1999 (Shiba, 1976; Haitlinger, 1990; Haitlinger, 1994; Haitlinger, 1998; Haitlinger, 1999; Saboori & Ostovan, 2000; Haitlinger, 2004; Haitlinger, 2006; Haitlinger, 2011; Haitlinger, 2013). *Leptus* sp. have been reported to parasitise on several forensically important blowflies' species in Panama and Brazil (Miranda & Bermudez, 2008; Pereira Sato *et al.*, 2018), but there are no records found on blowflies in Southeast Asia. Therefore, the aim of this work is to document the first finding of *Leptus* sp. parasitising the blowfly, *Chrysomya villeneuvei* Patton, 1922 (Diptera: Calliphoridae) collected from a decomposing wild boar carcass in Malaysia.

MATERIALS AND METHODS

Blowflies surrounding a wild boar carcass (*Sus scrofa* L.) at Taman Negara (National Park), Kuala Keniam, Pahang, Malaysia (4.317° N, 102.4016° E, 334 m above sea level) were caught using an insect net. The carcass was placed two days before the insect collection process. During the day of collection (Day-3 post-mortem), the carcass was at active decay stage of decomposition. The collected adult flies were then killed in a killing jar containing cotton balls soaked with acetone before placing them in 70% ethanol for preservation purpose. After careful examination under a stereomicroscope (Olympus SZ51, Japan) in the laboratory, a red-coloured mite was found attached on the scutellum of one of the blowflies (Figure 1). The blowfly specimen was then examined and identified using Greenberg & Kunich (2002). The mite was then gently removed from the body of the blowfly by using a fine brush and was cleared in lactophenol (60% lactic acid, 40% phenol) for seven days prior to mounting (Nadchatram & Dohany, 1974). Then, it was mounted in Hoyer's medium on a glass slide for morphological identification. The characteristics of the mite were observed under a compound microscope (Olympus BX53, Japan) and the identification process was performed based on two morphological keys (Krantz & Walter, 2009; Saboori *et al.*, 2020).

RESULTS

Approximately 150 blowflies were captured around the wild boar carcass. When examined, one blowfly was found to host a parasitic mite, *Leptus* sp. (Figure 2). The blowfly was identified as *C. villeneuvi*. This is the first finding of *Leptus* sp. on the scutellum of blowfly, *C. villeneuvi* in Southeast Asia.

Superfamily Erythroaeoidea
 Family Erythroaeidae
Leptus (*Leptus*) sp.

Diagnosis

The terminology and abbreviations were adapted from Saboori et al. (2009). Palpal femur with one seta, palpal genu with one seta, four setae between coxae II & III. BFe III without solenidion, TFe I without solenidion, Ge I with 1 solenidion, Ti I with 2 solenidia, Ti III with 1 solenidion, Ge II without solenidion, Ti II with 2 solenidia, TFe III with 1 seta, sensillary setae setulose in about distal half, ASens bases between AL and PL bases, solenidia on Ti II present, large microseta on Ge I-II & Ti I.

Measurements were given in Table 1.

DISCUSSION

The genus *Leptus* has been associated with dipteran hosts such as mosquitoes and flies (Williams & Proctor, 2002; de Castro Jacinavicius et al., 2019; Souza et al., 2019). As for necrophagous blowflies, Calliphoridae, a few studies have reported the finding of *Leptus* sp. on several blowfly species such *Chrysomya megacephala* (Fabricius, 1794), *Chrysomya rufifacies* (Macquart, 1842), *Cochliomyia macellaria* (Fabricius, 1775), and *Chrysomya albiceps* (Wiedemann, 1819) (Diptera: Calliphoridae), in both Central and South America (Miranda & Bermudez, 2008; Pereira Sato et al., 2018). Up to this point, there has been no record of *Leptus* sp. parasitizing *C. villeneuvi*. However, this is not the first time *C. villeneuvi* has been associated with mites. Previously, Azmiera et al. (2019), reported the finding of phoretic *Histiostoma* sp. (Astigmata: Histiostomatidae) on their abdomen which might serve as potential location marker in forensic acarology.

Leptus (*Leptus*) sp. belongs the *phalangii* species group and *aldonae* species subgroup of *Leptus* (*Leptus*) (see Saboori et al., 2020). There are two species in this subgroup: *L. (L.) cooremani* Fain, 1991 from Australia and *L. (L.) aldonae* Haitlinger, 1987 from Madagascar. This species is close to *L. (L.) cooremani* but there are a few different characters between them (see Table 1). Due to limited number of samples in this study, it is not possible to proceed or confirm the identification of *Leptus* sp. up to the species level. However, we think that this new report of its association with *C. villeneuvi* is a valuable record to be documented especially for a parasitic mite in Southeast Asia region. We hope that with the publication of this report, it will encourage more studies to understand the biology and distribution of *Leptus* sp. and its associated hosts in the future.

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Conflict of interest

The authors declared no competing interests.

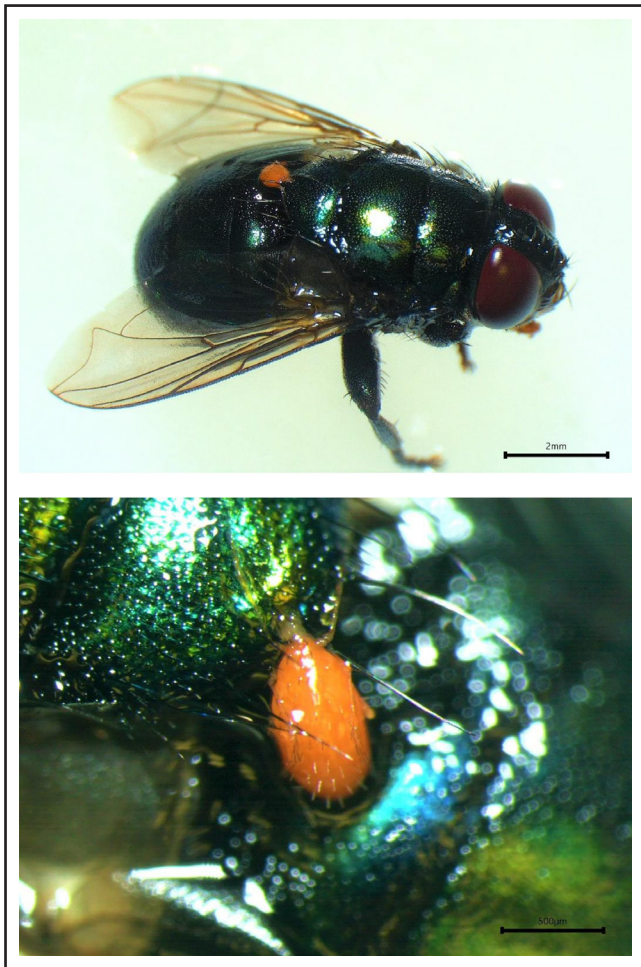


Figure 1. *Leptus* sp. firmly attached to the scutellum of *C. villeneuvi* under a stereomicroscope. (a) at 0.8x magnification, (b) at 3.2x magnification.



Figure 2. Ventral view of *Leptus* sp. mounted in Hoyer's medium at 4x magnification under a compound microscope. Note that the third left hind leg, tarsi 1 and 2 were broken.

Table 1. Comparison of metric data for *Leptus (Leptus) sp.* larvae. The terminology and abbreviations were adapted from Saboori et al. (2009)

Character	<i>Leptus sp.</i> (from this study)	<i>Leptus (L.) cooremani</i> (Fain, 1991)
SD	128	140
W	120	128
AW	88	96
PW	107	120
AA	14	18
SB	15	21
ISD	82	87
AP	24	30
AL	76	
PL	96	
ASBM	10	30
ASBa	36	42
AAS	39	
LX	32	
ASens	–	69
PSens	–	95
GL	253	240
aHy	7	
pHy	43	
1a	67	36
1b	72	
2a	59	40
2b	40	
3b	56	
DS	60-83	
Ta I (L)	–	204
Ti I	374	309
Ge I	261	195
TFe I	209	
BFe I	205	
Tr I	76	
Cx I	90	105
Leg I	–	1050
Ta II (L)	–	175
Ti II	323	270
Ge II	198	150
TFe II	170	
BFe II	195	
Tr II	70	
Cx II	106	
Leg II	–	900
TFe II	170	
BFe II	195	
Tr II	70	
Cx II	106	
Leg II	–	900
Ta III (L)	232	195
Ti III	529	370
Ge III	265	165
TFe III	262	
BFe III	252	
Tr III	71	
Cx III	111	
Leg III	1722	1120
IP	–	

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