

# Phoretic uropodine mites (Acari: Mesostigmata) associated with the red palm weevil, *Rhynchophorus ferrugineus* (Coleoptera: Curculionidae) in Iran

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## Abstract

During an investigation on phoretic mite associates of the red palm weevil, *Rhynchophorus ferrugineus*, in Sistan and Baluchestan Province of Iran, two uropodine species were collected and identified as *Centrouropoda almerodai* (Uropodidae) and *Uroobovella marginata* (Dinychiidae). This is the first record of the genus *Centrouropoda* from Iran and the first record of phoretic mites associated with this weevil from the country.

## Introduction

The red palm weevil, *Rhynchophorus ferrugineus* (Olivier, 1790), is considered as an important pest of palm trees in some Asian and European countries (Murphy & Briscoe, 1999; Faleiro, 2006; Longo & Ragusa, 2006). It is an internal quarantine pest in Saravan region of Sistan and Baluchestan Province, Iran (Avand-Faghih, 2007). Many organisms, including viruses, bacteria, fungi, nematodes, mites, insects and vertebrates, have been found in association with the red

palm weevil (Mazza *et al.*, 2014). Among them, mites are considered as one of the most inadequately studied group (Dilipkumar *et al.*, 2015), with 26 identified species of different taxa (Kontschán *et al.*, 2014; Dilipkumar *et al.*, 2015). So far, 11 known and four unidentified species of the cohort Uropodina have been found to be related to this beetle from different Asian and European countries (Kontschán *et al.*, 2014; Dilipkumar *et al.*, 2015).

Nearly two years ago, eight adult beetles of the red palm weevil carrying phoretically attached uropodine mites were collected in Sistan and Baluchestan Province of Iran. The aim of this paper is to introduce uropodine mite associates of this weevil in Iran, comment them and contribute to the present knowledge of phoretic associates of the beetle in Eurasia.

## Materials and methods

Adult beetles of the red palm weevil (a total of 80 individuals) were collected by pheromone traps situated in an orchard of date palm (*Phoenix dactylifera* Linnaeus, 1753) during March-April 2014 with 5-15 day intervals for sampling. Mite specimens were taken from some parts of the bodies, deposited into vial containing 75% of ethanol, cleared by Nesbitt's fluid and mounted in Hoyer's medium (Walter & Krantz, 2009). All measurements are given in micrometers (µm). All the specimens are deposited at the Acarological Collection of the Department of Entomology, College of Agriculture and Natural Resources, Science and Research Branch, Islamic Azad University, Tehran, Iran.

## Results

Among 80 adult weevils collected using pheromone traps, eight specimens were bringing deutonymphs of phoretic mites under elytra, snout or on femur (Table 1). Two species belonging to the cohort Uropodina, *Centrouropoda almerodai* and *Uroobovella marginata*, and one unidentified astigmatine species were observed (Table 1).

### *Centrouropoda almerodai* Hiramatsu & Hirschmann (Uropodidae)

(Figures 1, 3A, 4A, 5A, 6A and 7)

*Centrouropoda almerodai* Hiramatsu & Hirschmann, 1992 in Wiśniewski *et al.*, 1992: 313.

*Material examined.* Four deutonymphs, Mehrestan City, Sistan and Baluchestan Province, latitude: N 27° 08', longitude: E 61° 40', alti-

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Key words: Faunistic; Uropodina; phoresy; taxonomy.

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tude: 1180 m a.s.l., on *Rhynchophorus ferrugineus*, 29 March 2014; 12 deutonymphs, from the same location and beetle species, 8 and 14 April 2014. All collected by Mohammad Azim Dehviri.

**Notes.** Deutonymphs of this species were adhered by anal pedicels to the under surfaces of elytra of adult weevils, as the only location for adhering, in high abundance. Anal pedicels were very short, broad and dark brown in color (Figure 3A). The average number of deutonymphs of this species under elytra per infested beetle individual was 44.63 (Table 1). The maximum number of this mite on one beetle was 89.

### *Uroobovella marginata* (C. L. Koch) (Dinychiidae)

(Figures 2, 3B, 4B, 5B, 6B, 8 and 9)

*Notaspis marginatus* C. L. Koch, 1839: 27.

*Fuscuropona marginatus* - Schweizer, 1961: 195.

*Uroobovella marginata* - Hirschmann & Zirngiebl-Nicol, 1962: 59, 75; Karg, 1989: 134–142, 150; Mašán, 2001: 220–222.

**Material examined.** Ten deutonymphs, Mehrestan City, Sistan and Baluchestan Province, latitude: N 27° 08', longitude: E 61° 40', altitude: 1180 m a.s.l., on *Rhynchophorus ferrugineus*, 29 March 2014; 14 deutonymphs, from the same location and beetle species, 8 and 14 April 2014. All collected by Mohammad Azim Dehviri.

**Notes.** Deutonymphs of this species were adhered by anal pedicels to the weevils' legs and snouts in almost middle abundance. Anal pedicels were medium to long in size, slender and pale brown in color (Figures 3B and 9). The average number of deutonymphs of this species on the body per adult beetle was 16.75 (Table 1). The maximum numbers of this species under snout and on femur of one beetle were 34 and 11, respectively.

## Discussion

*Centrouropoda almerodai* is firstly recorded in Iran and also the genus *Centrouropoda* Berlese, 1916 has not been recorded previously in this country. In association with *R. ferrugineus*, the species has been previously recorded from Egypt, Italy, Malaysia, Malta, the Philippines and UAE (Dilipkumar *et al.*, 2015). Porcelli *et al.* (2009) found phoretic deutonymphs of *C. almerodai* on some parts of adult red palm weevils, including underside of the elytra, rarely on wings and first abdominal tergum. Ragusa *et al.* (2009) collected the mites on membranous wings and under elytra. Mazza *et al.* (2011) found it settling preferentially under the elytra. We found it in high abundance under elytra (273 individuals) of the weevil bodies (Table 1).

**Table 1. Numbers of mite deutonymphs associated with *Rhynchophorus ferrugineus* (eight adult specimens)**

Mite species	Location on beetle	Number of phoretic mites on beetle	Number of mites in alcohol sediments	Total number of mites	Percent of total mites found	Average number of mites per beetle individual
<i>Centrouropoda almerodai</i>	Under elytra	273	84	357	72.71	44.63
<i>Uroobovella marginata</i>	Under snout On femur	74 28	32	134	27.29	16.75
Total	-	375	116	491	100	61.38
Unidentified Astigmatina	Under elytra	19	Numerous	-	-	-



**Figure 1. Deutonymphs of *Centrouropoda almerodai* under elytra of *Rhynchophorus ferrugineus*.**



**Figure 2. Deutonymphs of *Uroobovella marginata* on femur of *Rhynchophorus ferrugineus*.**

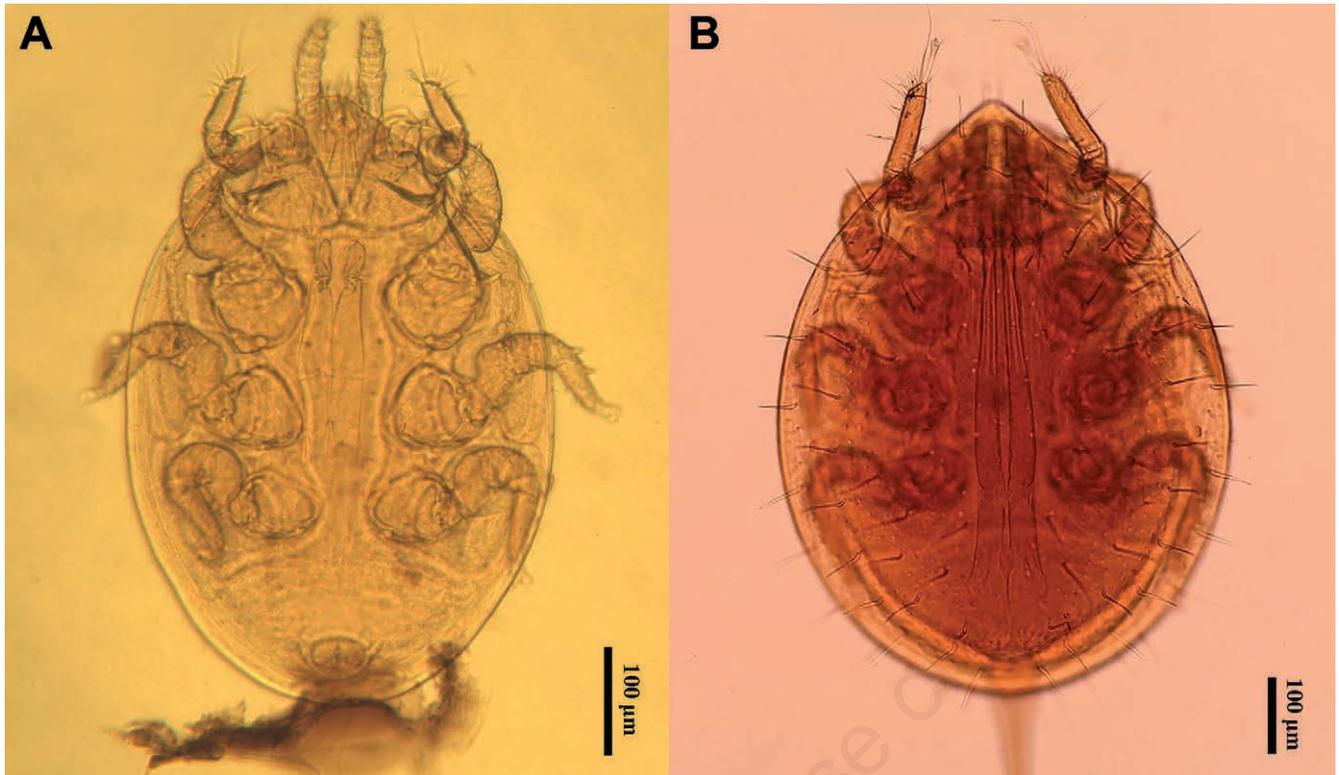


Figure 3. Idiosomal aspect of *Centrouropoda almerodai* (A) and dorsal idiosoma of *Uroobovella marginata* (B).



Figure 4. Peritremes and marginal areas of *Centrouropoda almerodai* (A) and *Uroobovella marginata* (B).

This recent case most probably influences beetle biological activities, especially beetles' flight, since Al-Deeb *et al.* (2011) believe that excessively large number of phoretic mites on *R. ferrugineus* may limit the insect's flight ability. Mazza *et al.* (2011) also found phoretic deutonymphs of this mite species associated with *R. ferrugineus* in all the sampled sites in Italy, with a great prevalence rate, and showed that the lifespan of mite-infested weevils was decreased in comparison with not infested specimens and caused a cost on beetle activities.

Hitherto, four identified species of the genus *Uroobovella* Berlese, 1903 have been reported in association with the red palm weevil, mostly in Asian countries, namely *U. assammarginata* Hiramatsu & Hirschmann, 1979, *U. javae* Wiśniewski, 1981, *U. krantzi* Zaher & Afifi, and *U. marginata* (Dilipkumar *et al.*, 2015). In this paper, the first record of *U. marginata* in association with *R. ferrugineus* in Iran is introduced. On *R. ferrugineus*, this mite has been previously found in Egypt, Italy, Malta, Turkey and UAE (Dilipkumar *et al.*, 2015). We found that this mite species was adhered to the legs and snout in nearly middle abundance (28 and 74, respectively). Other authors detected *U. marginata* also on some other parts of the weevil's body: on the snout, prothorax, inter-segmental cuticle and ventral abdomen (Mesbah *et al.*, 2008), beneath the elytra (Atakan *et al.*, 2009), mainly on the sternum, pygidium, thorax and head, and rarely on legs and tarsi (Porcelli *et al.*, 2009), and on the head, thorax, terminal part of the abdomen and legs (Ragusa *et al.*, 2009).

Moreover, unknown species of hyperphoretic fungi were observed on the leg segments, especially around coxae and leg grooves II and III, and the setae located at the posterior margin of idiosoma in some specimens of both mite species (Figures 10A and B). The fungal conidia were oval or rod-like in shape with one to four cells. The role of mites in fungal dispersal and potential plant-pathogenicity of these fungi are still unclear. Hassan *et al.* (2011) found individuals of *U. marginata* in association with undetermined fungi in the case of dead

pupae of the red palm weevils. Porcelli *et al.* (2009) found conidia of the fungus *Curvularia* sp. on some parts of the bodies in both here discussed species.

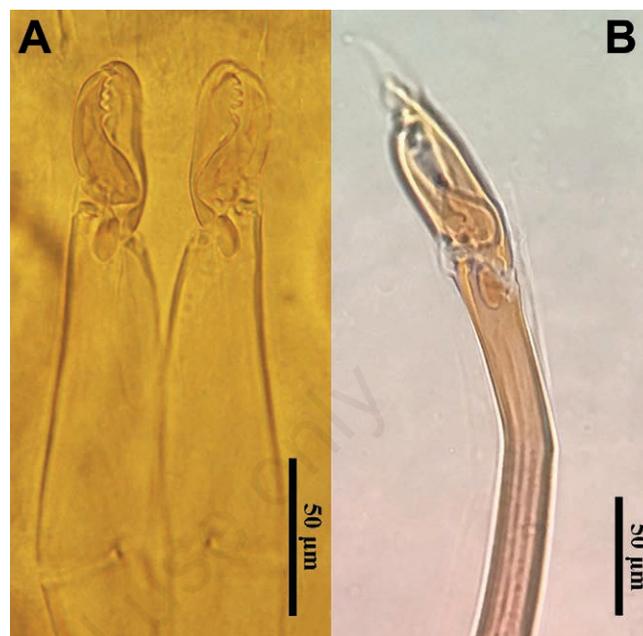


Figure 5. Chelicerae of *Centrouropoda almerodai* (A) and *Uroobovella marginata* (B).

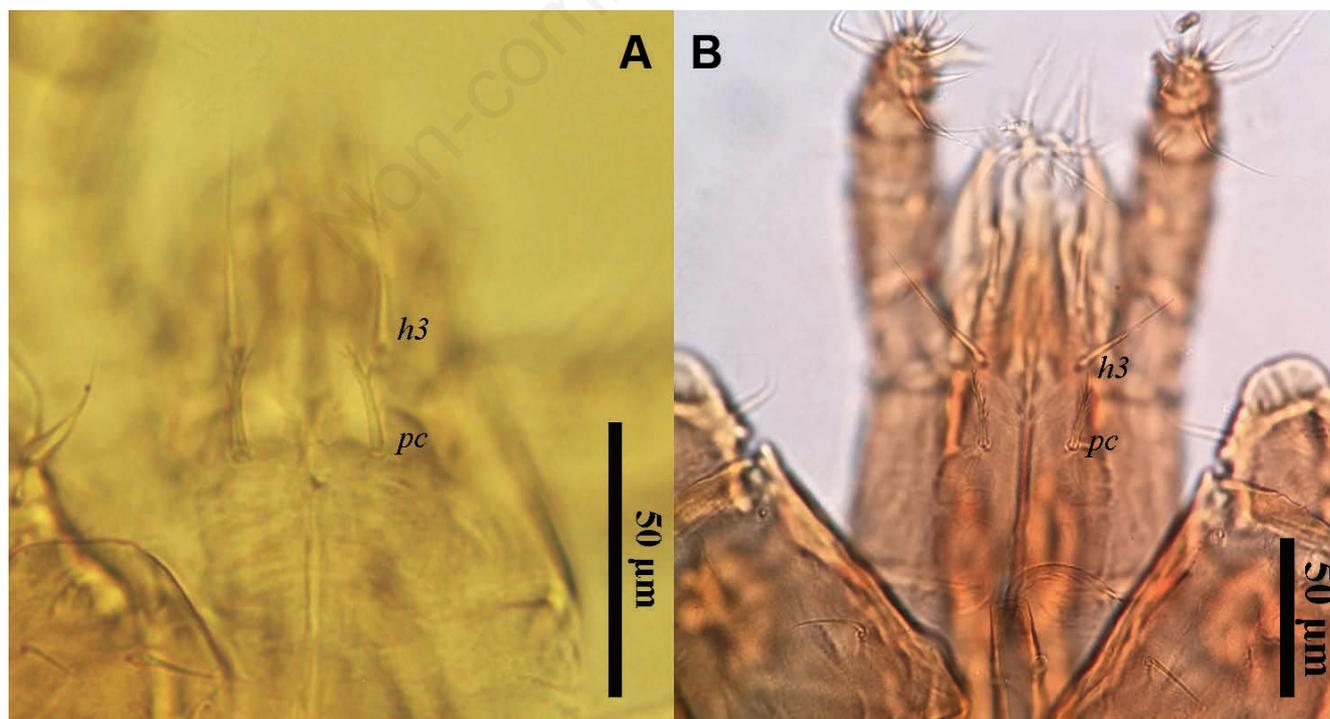


Figure 6. Subcapitulum and hypostomal setae *h3* and palpcoxal setae *pc* in *Centrouropoda almerodai* (A) and *Uroobovella marginata* (B).

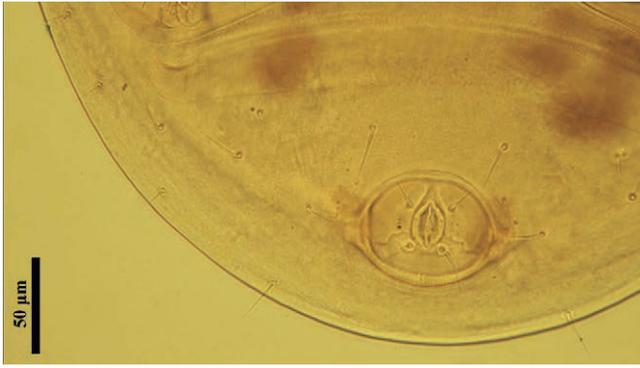


Figure 7. Ventrianal region of *Centrouropoda almerodai*.

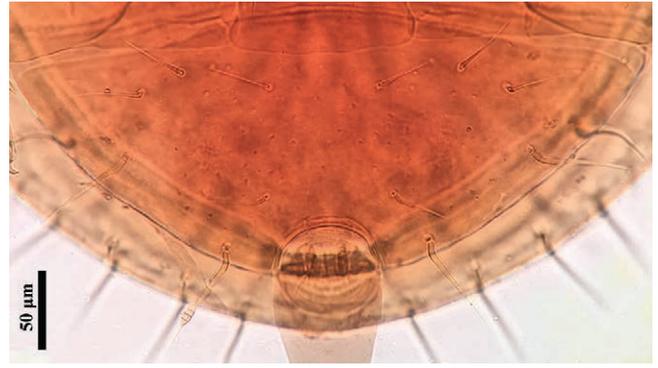


Figure 8. Ventrianal region of *Uroobovella marginata*.



Figure 9. Long anal pedicel in deutonymph of *Uroobovella marginata*.

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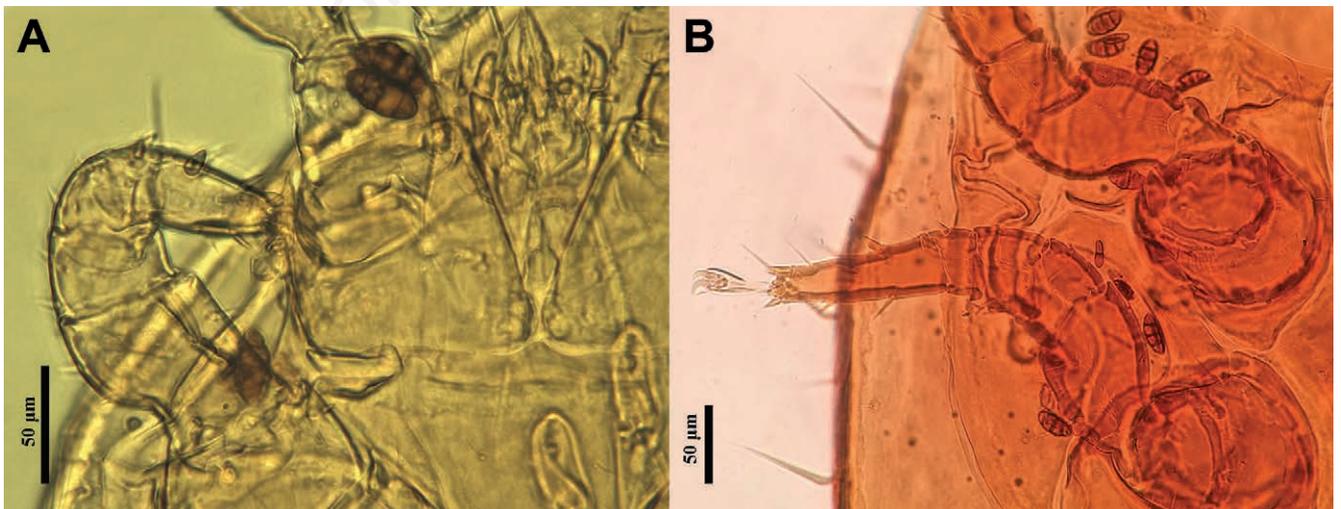


Figure 10. Unknown hyperphoretic fungi attached to the leg segments of *Centrouropoda almerodai* (A) and the leg segments and foveae pedales of *Uroobovella marginata* (B).

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