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***Pyemotes johnmoseri* (Khaustov) (Acari: Pyemotidae)
as a Parasitoid of Xylophagous Insects from Aydin, Turkey**

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Abstract: *Pyemotes johnmoseri* (Khaustov) (Acari: Pyemotidae) was collected from *Hypoborus ficus* (Erichson) and *Hesperophanes griseus* Fab. (Col.: Cerambycidae) in fig (*Ficus carica* cv. Calymirna) orchards in Aydin, Turkey during 2003-2004. We describe and illustrate the male and female of *P. johnmoseri* as a new record for the Turkish fauna.

Key words: Acari, Pyemotidae, *Pyemotes johnmoseri*, *Hypoborus ficus*, *Hesperophanes griseus*, *Ficus carica*, Turkey

Introduction

Mites of the genus *Pyemotes* are important as: 1) predators of various insects, 2) have medical importance to man and 3) have unusual life histories and morphologies (Cross and Moser, 1975). Two species groups of *Pyemotes* are recognized a) *scolyti* group; including *P. scolyti* (Oudemans), *P. parviscolyti* Cross and Moser and *P. dimorphus* Cross and Moser b) *ventricosus* group; containing the rest of the species (Cross *et al.*, 1981).

Most members of both groups have wide-spread geographic distributions and many species of both groups are cosmopolitan. Some species of the *ventricosus* group are documented to possess venom, attack many host species, but are recorded most frequently with stored grain insects, or in laboratory insect cultures (Cross and Moser, 1975). In contrast, members of the *scolyti* group are only associated with various bark beetle species. No species of the *scolyti* group are known to attack adults; whereas at least some species of the *ventricosus* group do so regularly. For this reason, phoretic adult females of *scolyti* called phoretomorphs, ride their host beetles without harming them. The phoretomorphic female is a specialized stage designed for phoresy in pyemotids and some related families. The phoretomorph claw on leg 1 is very large and their body form is much more compact and sclerotized than the normal form (Cross and Moser, 1975).

Pyemotes of the *ventricosus* group, such as *Pyemotes herfsi* (Oudemans) (*P. zwoelferi* Krczal) and *Pyemotes tritici* (Lagreze-Fossat and Montane) (*P. ventricosus* (Newport)) are not known to be phoretic and do not possess phoretomorphs. Both of these species are common in Turkey. *Pyemotes herfsi* was reported to prey on young larvae of *Euproctis chrysorrhoea* L. (Lep.: Lymantriidae) on fruit trees in Aegean Region (Turkey) (Öncüler *et al.*, 1977) *Pyemotes tritici* was found on parasitoid of *Callosobruchus maculatus* L. (Col.: Bruchidae) in stored products in Southeast Anatolia Regions (Özer and Yücel, 1989) and on *Pectinophora gossypiella* Saunders

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(Lep: Gelechiidae) in cotton in Aegean Region (Turkey) (Kavut *et al.*, 1974). Also, *Pyemotes* sp. was observed in stored products in Izmir (Özer *et al.*, 1989) and attacking thrips in vegetable areas of Sanliurfa (Çikman *et al.*, 1996).

Pyemotes johnmoseri, a member of the *scolyti* group, is a new record for the mite fauna of Turkey and was found attacking *Hypoborus ficus* (Erichson) (Col.: Scolytidae) and *Hesperophanes griseus* Fab. (Col.: Cerambycidae) in Aydin, Turkey in 2003-2004.

Materials and Methods

The mite samples were preserved in 70% ethyl alcohol. After cleaning the mite samples in lactophenol solutions, they were mounted in Hoyer's medium. Identification was done by A.A. Khaustov (Department of Agroecology, Nikita Botanical Gardens National Scientific Center, Yalta 98648, Crimea, Ukraine). All measurements are given in micrometers (µm). The terminology used in the description follows that of Lindquist (1986). The samples have been deposited in the collection of the senior author in University of Adnan Menderes, Plant Protection Department, Aydin.

Results

Pyemotidae Berlese

Pyemotes (Amerling, 1982)

Pyemotes females are parasitoids of all developmental stages of holometabolous insects, especially on those of subcortical beetles and stored product insects. When the female sucks the haemolymph of the host, her posterior opisthosoma becomes greatly swollen due to developing eggs (physogastric female) (Fig. 1) (Moser *et al.*, 1987). The distended opisthosoma of the physogastric female may produce over 200 offspring, most of which are females; males remain in the vicinity to fertilize emerging females (Hoschele and Tanigoshi, 1993). Eggs hatch within the female. Males are born first, sequentially piercing the swollen opisthosoma of their mother with their mouthparts for sustenance and then remain situated above the opening of the birth canal. Here they use their modified legs 4 to assist with the birth of the females, copulating with each as they emerge. Copulation triggers searching behavior in females, which immediately leave the area to attack a suitable host (Moser *et al.*, 1978).

Pyemotes johnmoseri (Khaustov, 2004)

Synonyms: *Pyemotes moseri* (Khaustov, 1998)

Pyemotes moseri was described by Khaustov (1998) associated with *Hypoborus ficus* (Col.: Scolytidae) from Ukraine. The name was preoccupied by *Pyemotes moseri* (Yu and Liang, 1996). Therefore, according to article 52 of the International Code of Zoological Nomenclature (Anonymous, 1999), Khaustov (Khaustov, 2004) proposed a new replacement name for *Pyemotes moseri* (Khaustov, 1998) as *Pyemotes johnmoseri* (Khaustov, 2004).

Female

Body: Length 281 (238-350); width 76 (63-100) (Fig. 2).

Gnathosoma: Length 28 (25-33); width 25 (23-28).

Dorsum

Propodosoma longer than width and with four pairs of setae; sc_1 oval and a cup-shaped pseudostigma; sc_2 longest and plumose; v_1 longer than v_2 . Hysterosoma includes four dorsal plates.



Fig. 1: Physogastric females of *Pyemotes johnmoseri*

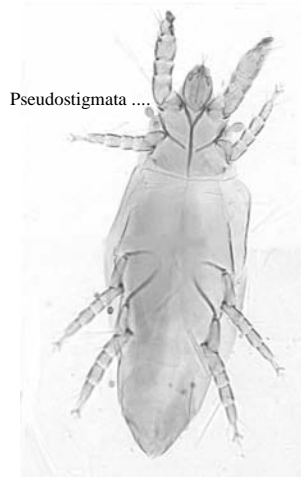


Fig. 2: Female of *Pyemotes johnmoseri*

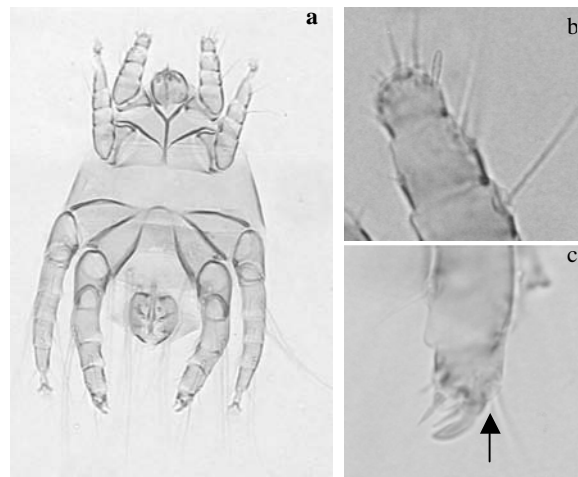


Fig. 3: *Pyemotes johnmoseri*: male; a) ventral view, b) solenidion tibia I, c) without solenidion tibia IV

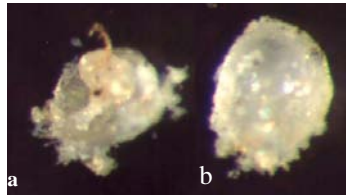


Fig. 4: a) Egg of *Hypoborus ficus* killed by *Pyemotes johnmoseri* b) Undamaged egg



Fig. 5: Larva of *Hesperophanes griseus* killed by *Pyemotes johnmoseri*

Setae c_2 slightly longer than c_1 and placed on plate C. Plate D, includes one pair of setae (d) and one pair of cupules (ia). Plates EF, with two pairs of setae (ef) and one pair of cupules (im); setae e about 1/5 as long as setae f. The tip of setae f longer posterior margin of hysterosoma. Plate H with two pairs of setae; setae h_1 almost twice length h_2 . Lengths of dorsal setae; v_1 9 (6-11), v_2 7 (6-8), sc_1 18 (15-20), sc_2 61 (53-66), c_1 25 (21-27), c_2 26 (20-35), d 19 (15-22), e 10 (8-12), f 52 (42-65), h_1 20 (15-25), h_2 10 (7-13).

Ventrum: Apodeme I-II obvious and connecting with anterior sternal apodeme. Apodeme III-IV obvious. Setae 3a longer than 3b. The length of ventral setae: 1a 7 (4-9), 1b 6 (4-8), 2a 9 (6-13), 2b 9 (6-12), 3a 17 (10-22), 3b 9 (6-12), 3c 11 (8-12), 4a 12 (6-15), 4b 15 (12-20).

Legs: Leg I 91 (85-100) long, sturdy and with one strong claw. Tarsus I with a solenidion. Tibia I with two solenidia. Leg II 60 (55-63), III 82 (65-88) and IV 90 (79-105) long, each with a pair of small claws and a long median empodium.

Male

Body: Length 139 (128-153); width 106 (88-125) (Fig. 3a).

Gnathosoma: Length 21 (18-23); width 25 (23-30).

Dorsum: Propodosoma almost square shaped, with four pairs of setae. Setae v_1 and v_2 very short. Setae sc_1 almost reach the margin of propodosoma. Hysterosoma dorsally with three plates. Plate CD separate and distinct. Setae c_1 longer than setae c_2 and setae e longest. Plates EF small with two pairs of setae. Lengths of dorsal setae; c_1 17 (12-20), c_2 14 (7-17), d 127 (100-180), e 135 (81-180), f 104 (70-150).

Ventrum: Apodeme I-V obvious. Apodeme I and II connecting with anterior sternal apodeme. Lengths of ventral setae; 1a 6 (2-10), 1c 4 (2-6), 2a 14 (12-17), 2c 7 (4-14), 3a 4 (4-4), 3b 10 (6-12), 3c 15 (12-17), 4a 14 (7-25), 4b 7 (3-14).

Legs: Leg I 59 (45-75), II 63 (55-70), III 118 (100-155) and IV 127 (108-170) have very strong hook-shaped claw. Tibia I with a solenidion (Fig. 3b). Tibia IV without a solenidion (Fig. 3c).

Material Examined

İncirliova-Aydin, 22.02.2003 (5♀, 2♂) 27.06.2003 (15♀, 5♂), 23.09.2003 (2♀, 3♂), 06.10.2003 (7♀, 2♂), 20.02.2004 (6♀, 2♂), 18.06.2004 (5♀, 1♂), 17.07.2004 (20♀, 6♂), 18.08.2004 (10♀, 4♂), 15.09.2004 (12♀, 5♂) on *Hypoborus ficus* and 12.06.2004 (2♀, 5♂) *Hesperophanes griseus* in fig trees.

In Aydin, we observed that *P. johnmoseri* was widespread in fig trees during 2003-2004 and that it fed on eggs (Fig. 4), larvae and pupae of *H. ficus*. In subsequent surveys, it was also found on fig trees as a parasitoid of a few larvae of *Hesperophanes griseus* (Col.: Cerambycidae) (Fig. 5). Some members of the *scolyti* group are specific to flying adults of a single species, whereas others, such as *Pyemotes scolyti* are specific to flying adults within a single genus. It is important to note here that specific refers only to the phoretic host range and not to the range of insects that *Pyemotes* females will attack, which often is quite large. At this time the phoretic host range of *P. johnmoseri* is unknown except for that of flying adults of *H. ficus* (Cross *et al.*, 1981; Moser *et al.*, 1978). Hence, at this writing it is unknown if *P. johnmoseri* is truly phoretic on *H. griseus*, or if the mite accidentally happened to crawl from galleries of *H. ficus*, into the galleries of *H. griseus*, where the parasitoids attacked and developed on the brood of *H. griseus*.

Distribution

Ukraine (Khaustov, 1998).

Discussion

Pyemotes johnmoseri is very similar to *P. scolyti*. *P. johnmoseri* differs from *P. scolyti* in that *P. johnmoseri* lacks a solenidion on the male tibia IVi (Khaustov, 1998). *P. johnmoseri* was first collected in the Ukraine associated with *Hypoborus ficus*. All of Khaustov's measurements are in agreement with our material from Turkey.

Most of *Pyemotes* species have high reproductive capacity, short life-cycle and, due to all the development stages that occur within the mother's ophisthosomal sac, they don't need any intermediate hosts or alternate food source. All offspring are born as sexually mature adults. Only females are parasitoids and represent about 90-95% of the mite progeny. Females mate immediately at birth, begin host-seeking activity and their populations are easily reared in the laboratory condition (Bruce, 1989). For this reason, their potential for biological control on insects has recently been investigated. Although pyemotid mites of the *venticosus* group can cause severe dermatitis on people, some species e.g., *Pyemotes tritici* belonging to the *ventricosus* group, have shown potential as a biological control agent for a number of different insects (Bruce and Wrensch, 1990). However, *P. johnmoseri*, which belongs to the *scolyti* group, has no such toxic effects. The phoretic mite guilds associated with the various fig beetles should be investigated in further studies by trapping of flying beetles in fig orchards.

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