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**Research Paper**

**A survey on bark and book lice fauna (Insecta: Psocoptera) in Mazandaran province with a new report from the Derasleh region**

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**Abstract**

The order Psocoptera (Insecta: Psocodea), commonly known as barklice and booklice, has so far received limited attention in faunistic and ecological studies in Iran. These arthropods are considered among the oldest living insects, usually living in the trunks, under the bark of trees, on worn walls, inside books, and feeding mainly on starch grains, fungi, algae, lichens, and other decaying organic matter. They play a role in the decomposition and creation of microhabitats in nature. To study the fauna of the order Psocoptera in Mazandaran Province, sampling was conducted in diverse ecosystems from 2022 to 2025. Ten species belonging to six families were identified, including a new report of the family Caeciliusidae Mockford, 2000, the genus *Valenzuela* (Navas, 1924), and the species *V. piceus* (Kolbe, 1882) for the country, as well as six new records of the species *Ectopsocopsis cryptomeriae* (Enderlein, 1907), *Ectopsocus vachoni* Badonnel, 1945, *Lachesilla quercus* (Kolbe, 1880), *Graphopsocus cruciatus* (Linnaeus, 1768), *Liposcelis decolor* (Pearman, 1925), and *L. bostrychophila* Badonnel, 1931, for Mazandaran Province. Among the collected specimens, the species *Trichopsocus dalii* (McLachlan, 1867) exhibited the highest abundance.

**Keywords:** biodiversity, northern Iran, Psocomorpha, Troctomorpha.

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## Introduction

The order Psocoptera, commonly known as booklice and barklice, comprises some of the oldest living insects. These insects typically inhabit tree trunks, spaces beneath the bark, deteriorating walls, and the bindings of books. Their diet consists primarily of starch grains, bookbinding glue, and microepiphytes such as fungi, algae, lichens, and decayed organic matter (Thornton, 1985; Smithers, 1991; Green & Turner, 2004). Approximately 6000 psocopteran species have been described worldwide. The order is traditionally divided into three suborders: Psocomorpha, Troctomorpha, and Trogiomorpha (Cranston & Gullan, 2009). Morphological and molecular phylogenetic evidence indicates that the parasitic lice (order Phthiraptera) evolved from within the psocopteran suborder Troctomorpha. This relationship renders Psocoptera a paraphyletic group, unless Phthiraptera is included, and together they form a monophyletic clade now often referred to as Psocodea (Johnson et al., 2004; Yoshizawa & Johnson, 2006; Yoshizawa & Lienhard, 2010). Research on Psocoptera in Iran has been limited and sporadic, resulting in significant gaps in our understanding of their diversity and distribution nationwide. The first documented report dates to Shah-Hosseini & Kamali (1988), who identified *Liposcelis divinatoria* (Müller, 1776) as a storage pest. After a 15-year hiatus, Ahadiyat (2004) reported a new species for Iran. Subsequent studies gradually expanded this knowledge: Jalalizand et al. (2005) reported four new species from Isfahan Province; Ahadiyat & Zangeneh (2007) added two species from Mazandaran and Golestan; and Jarayani et al. (2014) reported *L. paeta* Pearman, 1942 from Isfahan. Further contributions were made by Khandehroo et al. (2014, 2015), Gol et al. (2015), Aghadokht et al. (2015), Nikpay (2017), and Kahrarian (2017, 2018). Most recently, Mehrafrooz Mayvan et al. (2025) published a checklist of Iranian Psocoptera, adding two new species. Collectively, these studies have progressively enhanced our knowledge of psocopteran diversity in Iran. However, broader and more systematic research is still required to fully elucidate their distribution and ecology. To date, only 22 psocopteran species from 11 genera and 8 families have been recorded in Iran, with studies being concentrated in just nine provinces (Mehrafrooz Mayvan et al., 2025). Given Iran's considerable geographic and ecological diversity, the actual species richness of Psocoptera is likely much greater than currently known. This highlights the critical need for systematic faunal surveys in understudied regions to achieve a comprehensive understanding of this ecologically important group.

## Materials and Methods

This study was conducted in garden and forest ecosystems across Mazandaran Province between 2022 and 2024. Specimens of Psocoptera were collected primarily through direct sampling from vegetation by using an aspirator and fine brushes. The collected individuals were immediately preserved in 75% ethanol for subsequent morphological analysis. Specimen identification was performed by Dilian Georgiev using authoritative taxonomic keys all provided by Lienhard (1998). Voucher specimens have been deposited in the insect collection of the Entomology Laboratory, Sari Agricultural Sciences and Natural Resources University (SANRU), Iran, and in the collection of the Department of Ecology and Environmental Conservation, Faculty of Biology at Plovdiv University, Bulgaria.

**Abbreviations:** IO/D - interocular distance / antero-posterior diameter of the compound eye, PSG - sub genital plate, SI - humeral seta of pronotum.

## Results

A total of 10 species belonging to 6 families of the order Psocoptera were identified in Mazandaran Province, northern Iran. Among these, *Valenzuela piceus* represents the first record of both the genus and species in Iran, while *Ectopsocopsis cryptomeriae*, *Ectopsocus vachoni*, *Lachesilla quercus*, *Graphopsocus cruciatus*, and *Liposcelis bostrychophila* are also reported for the first time from Mazandaran. The most frequently collected species was *Trichopsocus dali*, indicating its widespread distribution in the region.

### Taxonomic hierarchy

**Class Insecta**

**Superorder Psocodea**

**Order Psocoptera**

**Suborder Psocomorpha Roesler, 1944**

**Family Caeciliusidae Mockford, 2000**

**Genus *Valenzuela* (Navas, 1924)**

1. *Valenzuela piceus* (Kolbe, 1882) (Fig. 1)

*Material examined.* Mazandaran province, Savadkuh county, Deraseleh village, collected on telka trees (*Pyrus boissieriana* Buhse 1860), 06/08/2022, 1♀.

*Distribution in Iran.* This is the first report of the genus and species from Iran.

*Diagnosis of Iranian specimens.* Females strongly brachypterous. General coloration shiny dark brown; head usually with a broad band of reddish-brown hypodermal pigment between the ocellar tubercle and antennal bases. Forewing heavily suffused with brown, lighter along the radial trunk and pterostigma, often with a dark brown poststigmatal border. IO/D♀ = 2.0. Labrum without styli. Posterior margin of paraproct with a dark brown protuberance but no marginal tubercle. Body length = 2.5 mm.

**Family Ectopsocidae Roesler, 1940**

**Genus *Ectopsocopsis* Badonnel, 1955**

2. *Ectopsocopsis cryptomeriae* (Enderlein, 1907) (Fig. 2)

*Material examined.* Mazandaran province, Babolsar County, Khoshk Rud village, collected on *Citrus aurantium* L., 1753, 10/10/2024, 2♀, 2♂, 1 nymph, 11/10/2024, 2♀, 1♂, collected on *C. reticulata* Blanco, 1837, 11/10/2024, 2♀, collected on *C. limetta* Risso, 1813, 10/10/2024, 1♀, 1 nymph; Babolsar County, Bahnemir city, collected on *C. aurantium*, 15/10/2024, 1♀, 1♂, 3 nymphs, 16/10/2024, 2♀, 1♂, 2 nymphs; Babolsar County, collected on *C. aurantium*, 16/10/2024, 2♀, 3♂, 1 nymph, 17/10/2024, 1♀, 4♂, 4 nymphs, collected on *C. limetta*, 10/10/2024, 1♀, 2♂, 1 nymph.

*Distribution in Iran.* This species is reported for the first time from Mazandaran province. It has been reported from Golestan



(Aghadokht et al., 2015).

*Diagnosis of Iranian specimens.* Both sexes macropterous. General coloration brown, sometimes rather light; terminalia dark brown. Wings slightly tinged with brown. In both sexes, paraprocts with a simple marginal cone. PSG with a V-shaped brown marking; subapical region with a weakly notched medio-dorsal lobe and squamoid sculpture. Female: 9th sternite with partially sclerotized membranes. Male: Hypandrium includes 8th sternite, with a truncated posterior margin. Phallosome with numerous small endophallic sclerites. Body length = 1.5 mm.

**Genus *Ectopsocus* McLachlan, 1899**

3. *Ectopsocus briggsi* McLachlan, 1899 (Fig. 3)

*Material examined.* Mazandaran province, Savadkuh county, Deraseleh village, collected on telka trees (*Pyrus boissieriana*), 06/08/2022, 1♀; Sari county, Sari Agricultural Sciences and Natural Resources University, collected on *C. aurantium*, 09/10/2024, 2♀.

*Distribution in Iran.* The species has been recorded before from Golestan and Mazandaran provinces (Ahadiyat & Zangeneh, 2007; Gol et al., 2015).

*Diagnosis of Iranian specimens.* Macropterous. General coloration light to medium brown; abdomen with reddish-brown banding. Wing pilosity very sparse. Clunium with a large median comb on the posterior margin, a smaller medio-basal comb, and on each side of it, a small field of papillae. Posterior lobes of PSG slightly curved medially, basally connected by a membranous area without a separating suture. Body length = 1.7-2.2 mm.

4. *Ectopsocus vachoni* Badonnel, 1945 (Fig. 4)

*Material examined.* Mazandaran province, Babolsar County, collected on *C. aurantium*, 02/12/2024, 1♀; Savadkuh county, Deraseleh village, collected on *Prunus cerasifera* Ehrh, 1784, 30/07/2022, 1♂.

*Distribution in Iran.* This species has been reported from Kermanshah province (Kahrarian, 2018)

*Diagnosis of Iranian specimens.* General coloration light brown (micropterous form) to dark brown (macropterous form); abdomen usually strongly pigmented with reddish-brown hypodermal pigment. Forewings of macropterous form slightly tinged with brown. Males always micropterous; females micropterous or, quite often, macropterous. Wing rudiments in micropterous form minute, without venation but bearing a few setae. Body length = 1.4-1.9 mm.

**Family Lachesillidae Karny, 1930**

**Genus *Lachesilla* Westwood, 1840**

5. *Lachesilla quercus* (Kolbe, 1880) (Fig. 5)

*Material examined.* Mazandaran province, Savadkuh county, Deraseleh village, on *P. boissieriana*, 06/08/2022, 1♂; Babolsar County, collected on *C. aurantium*, 02/12/2024, 1♀.

*Distribution in Iran.* This species is reported for the first time from Mazandaran province. It has been found in Golestan and Khorasan-e Razavi provinces (Gol et al., 2015).

*Diagnosis of Iranian specimens.* General coloration yellowish to dark brown; abdominal tergites usually with reddish-brown banding; terminalia yellowish to brown; wings hyaline. Both sexes macropterous. Pulvillus setiform, with slightly expanded apex. Male: Clunium without lobes. Paraprocts with a sclerotized hook. Epiproct with bilobed apex. Phallosome without distal bifurcation, but with a broad apical plate slightly notched at the tip. Gonapophyses relatively small. Body length = 1.3-1.9 mm.

**Family Stenopsocidae Kolbe, 1880**

**Genus *Graphopsocus* Kolbe, 1880**

6. *Graphopsocus cruciatus* (Linnaeus, 1768) (Fig. 6)

*Material examined.* Mazandaran province, Savadkuh county, Deraseleh village, collected on *P. boissieriana*, 2♂, 2 nymphs, collected on *Crataegus nigra* Waldst. & Kit., 1802, 1♂, 06/08/2022; Babolsar County, Khoshk Rud village, collected on *C. limetta*, 10/10/2024, 1♀; Neka county, Darvishan village, collected on *Eriobotrya japonica* Lindley, 1821, 01/11/2024, 1♀; Sari county, Sari Agricultural Sciences and Natural Resources University, collected on maple tree (*Acer* sp.), 13/10/2024, 1♀.

*Distribution in Iran.* This species is reported for the first time from Mazandaran province. It has been reported from Golestan province (Aghadokht et al., 2015; Gol et al., 2015).

*Diagnosis of Iranian specimens.* Males macropterous; females macropterous. General coloration yellowish to light brown; vertex with brown spots; pterothoracic tergites dark brown. Male eyes small but clearly larger than those of the female. Labrum with styli. Lacinia with a truncated apex and a few small rounded teeth. Antennae slightly shorter than forewings. Forewing veins with relatively short setae; pterostigma glabrous. Hindwing completely glabrous. Body length = 4.0-5.0 mm.

**Family Trichopsocidae Pearman, 1936**

**Genus *Trichopsocus* Kolbe, 1882**

7. *Trichopsocus dali* (McLachlan, 1867) (Fig. 7)

*Material examined.* Mazandaran province, Babolsar County, Bahnemir city, collected on *C. aurantium*, 15/10/2024, 4♀, 3 nymphs; Babolsar County, Khoshk Rud village, collected on *C. aurantium*, 10/10/2024, 4♀, 1 nymphs, 11/10/2024, 2♀, 5 nymphs, collected on *Citrus reticulata*, 11/10/2024, 1♀, 3 nymphs, collected on *C. limetta*, 10/10/2024, 2♀; Babolsar County, collected on *C. aurantium*, 16/10/2024, 2♀, 17/10/2024, 1♀, 11/11/2024, 1♂, 2 nymphs, collected on *C. limetta*, 10/10/2024, 1♀, 2 nymphs; Sari county, Sari Agricultural Sciences and Natural Resources University, collected on *C. aurantium*, 09/10/2024, 1♀, 1♂, 1 nymph, collected on *Olea europaea* Linnaeus, 1753, 26/10/2024, 5♀, 3 nymphs, collected on *Ligustrum vulgare* Linnaeus, 1753, 12/10/2024, 2♀, 1♂, 2 nymphs, collected on oak tree (*Quercus* sp.), 11/11/2024, 1♀, 2 nymphs; Babolsar County, collected on *C. aurantium*, 30/10/2024, 3♀, 1 nymph, 02/12/2024, 1♀, 2♂, 3 nymphs.

*Distribution in Iran.* This species has been recorded in Mazandaran province (Ahadiyat & Zangeneh, 2007).

*Diagnosis of Iranian specimens.* Ventral surface of the abdomen with an extensible adhesive vesicle present in both sexes (between sternites 6 and 7). Wing coloration mainly limited to very faint brown spots at the apex of veins; in the hindwing, the apical spot extends



on both sides of the vein. Phallosome distinctly larger than in other species of the genus; basal part of the frame weakly sclerotized or entirely membranous; inner parameres present and fused distally in the genital capsule. Body length = 1.5-2.3 mm.

8. *Trichopsocus* sp. (Fig. 8)

*Material examined.* Mazandaran province, Babolsar County, Bahnemir city, collected on *C. aurantium*, 16/10/2024, 1 nymph, 17/10/2024, 1♂; Savadkuh county, Deraseleh village, collected on *C. nigra*, 06/08/2022, 1 nymph. Remark: The specific body coloration and the presence of numerous setae on the body and antennae allowed us to assign this nymph to the genus. The absence of developed wings and genitalia did not permit species-level identification.

**Suborder Troctomorpha Roesler, 1944**

**Family Liposcelididae Enderlein, 1911**

**Genus *Liposcelis* Motschulsky, 1852**

9. *Liposcelis decolor* (Pearman, 1925) (Fig. 9)

*Material examined.* Mazandaran province, Savadkuh county, Deraseleh village, 06/08/2022, 1 ♀.

*Distribution in Iran.* The species has been reported from Isfahan, Kermanshah, and Khorasan-e Razavi provinces (Jalalizand et al., 2005; Kahrarian, 2017; Mehrafrooz Mayvan et al., 2025).

*Diagnosis of Iranian specimens.* The species of the genus *Liposcelis* are wingless. Sculpture: Vertex with fusiform areoles bearing small to medium-sized tubercles. Abdominal tergites with small to very large tubercles within fusiform or polygonal areoles, variably defined. Mesosternal setae: 6-10. Body length = 1.0-1.3 mm.

10. *Liposcelis bostrychophila* Badonnel, 1931 (Fig. 10)

*Material examined.* Mazandaran province, Sari county, Sari Agricultural Sciences and Natural Resources University, collected from Insect collection of Entomology laboratory, 03/12/2024, 12♀, 1 nymph.

*Distribution in Iran.* This species has been reported from Isfahan, Kermanshah, and Khorasan-e Razavi provinces (Jalalizand et al., 2005; Jarayani et al., 2014; Kahrarian, 2018; Mehrafrooz Mayvan et al., 2025). It is reported for the first time from Mazandaran province.

*Diagnosis of Iranian specimens.* Length of SI often approximately equal to the length of the short setae on the lateral lobe of the pronotum, and always less than twice that length. Mesosternal setae: 6-9. A characteristic feature of this species is that the abdominal apex bears only short setae, with only setae Md and Mv standing out next to each other, although they are of medium length. Body length = 1.0-1.3 mm.

## Discussion

This study expands the known distribution of Psocoptera in Iran, particularly within Mazandaran Province, by reporting six new species records for the province and one new species record for the country, *V. piceus*, which is reported from Iran for the first time. Given that the fauna of these insects has been poorly studied in northern Iran, further research, particularly in the region's humid forest ecosystems, is likely to yield discoveries of additional new species. The frequent occurrence of *T. dali* at collection sites suggests a high degree of adaptation to local environmental conditions. Furthermore, the new report of *L. bostrychophila*, a known pest of stored products, may have implications for local agriculture and storage practices. The potential for discovering more novel species in understudied habitats underscores the necessity for expanded taxonomic research on Psocoptera in Iran.

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**Figures 1-10.** Psocoptera species collected from Mazandaran province, Northern Iran: **1.** *Valenzuela piceus* (female); **2.** *Ectopsocopsis cryptomeriae* (male); **3.** *Ectopsocus briggisi* (male); **4.** *E. vachoni* (female); **5.** *Lachesilla quercus* (female); **6.** *Graphopsocus cruciatus* (female); **7.** *Trichopsocus dalii*; **8.** *Trichopsocus* sp. (nymph); **9.** *Liposcelis decolor* (female); **10.** *L. bostrychophila* (female) (40X).

