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Checklists of Cucujidae, Laemophloeidae, and Silvanidae (Coleoptera: Cucujoidea) from Iran

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**Checklists of Cucujidae, Laemophloeidae, and Silvanidae
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Abstract. The Iranian fauna of Cucujidae, Laemophloeidae, and Silvanidae (Coleoptera: Cucujoidea) are summarized in this paper. In total 2 species of Cucujidae (1 genus: *Pediacus* Shuckard), 6 species of Laemophloeidae (3 genera: *Cryptolestes* Ganglbauer, *Laemophloeus* Dejean, and *Placonotus* MacLeay) and 7 species of Silvanidae (6 genera: *Uleiota* Latreille, *Psammoecus* Latreille, *Ahasverus* Gozis, *Nausibius* Lentz, *Oryzaepphilus* Ganglbauer, *Psammoecus* Latreille, and *Silvanus* Latreille) are listed in this paper. Synonymies and distribution data are given.

Introduction

Coleoptera (Insecta) represents one of the largest radiations of diversity on Earth. Four suborders, 24 superfamilies, 211 families, and over 350,000 described beetle species (Bouchard et al. 2011) reflect an astounding breadth of phenotypic diversity, and the order presents numerous taxonomic and classification challenges (McElrath et al. 2015).

The family Cucujidae (flat bark beetles) is one of the smallest families of Coleoptera and consists of 59 species distributed in four genera (Thomas and Leschen 2010a; Marris and Slipinski 2014). The family was formerly larger, with subfamilies Laemophloeinae, Silvaninae, and Passandrinae, but recent revisions have raised the subfamilies to family status (Pakaluk et al. 1994; Gueorguiev et al. 2008). Adults generally feed on fungi or decaying plant tissue; thus they are often found in leaf litter or under the bark of freshly-fallen hardwood trees. They also feed on animals such as the mites and smaller insects commonly found under bark. Passandrid larvae are parasitic on species of Cerambycidae (longhorned beetles) or Braconidae (braconid wasps) (Dimmock 1884; Fiske 1905; Gravely 1916).

The family Laemophloeidae (lined flat bark beetles) includes more than 430 described species in 37 described genera. It has not been classified into suprageneric taxa and recently (McElrath et al. 2015) subsumed the paraphyletic Propalticidae. Most species seem to be fungivorous but several genera are associated with scolytine curculionids and may be predacious on them (Thomas and Leschen 2010a).

The family Silvanidae (silvanid flat bark beetles) includes two subfamilies, Brontinae and Silvaninae, with about 58 genera and approximately 500 species throughout the world (Thomas and Leschen 2010b). Silvanidae are considered to be fairly primitive among the Cucujoidea, and most of its members seem to be fungivorous (Thomas 2002; Yoshida and Hirowatari 2014, 2015).

Iran forms a large part of the Iranian plateau, and covers an area of 1,623,779 km². It is bordered to the north by the Caucasus Mountains, Middle Asian natural regions, and the Caspian Sea (-27 m below sea level); to the west by the Anatolian and Mesopotamian regions; to the east by the eastern part of the Iranian plateau (Afghanistan and adjacent west Pakistan) and the Baluch-Sindian region; and finally to the south by the Persian Gulf and Gulf of Oman, which are connected by the latter to the Indian Ocean (Fig 1). Climatologically, Iran is a predominantly arid and semi-arid country, but the northern slopes of the Alburz ranges and the Caspian lowland receive 800 to 2000 mm annual rainfall, making them the most humid parts of the country. The Dasht-e Kavir and Dasht-e Lut deserts are the driest areas with an

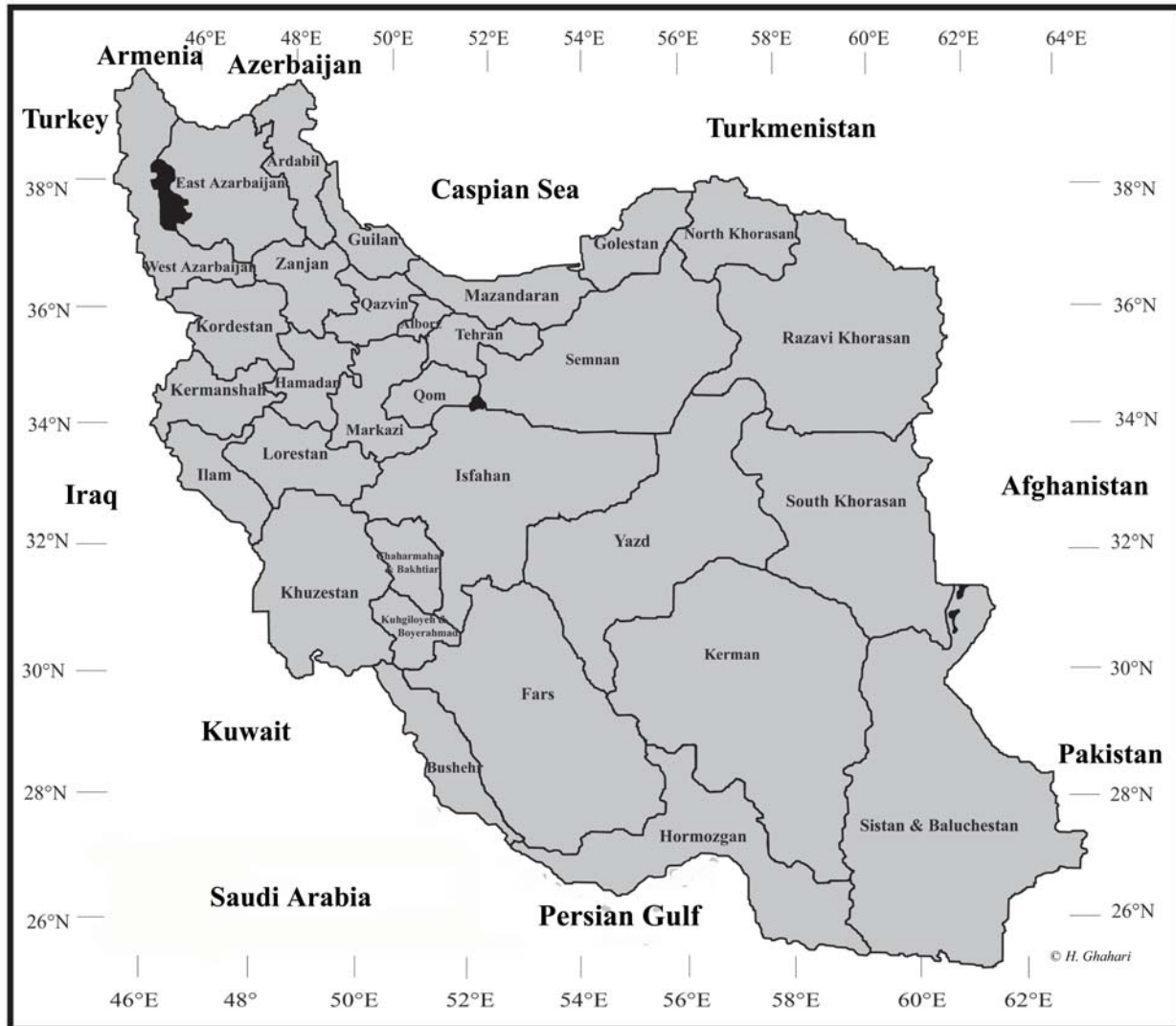


Figure 1. Map of Iran with boundaries of provinces.

annual precipitation of less than 150 mm. The highlands receive between 250 and 800 mm (Zehzad et al. 2002).

The goal of this paper is to catalog all the available data on Iranian Cucujidae, Laemophloeidae, and Silvanidae. It is a continuation of the series of checklists of Coleoptera of Iran (see Legalov et al. 2010: Curculionoidea; Lason and Ghahari 2013: Kateretidae and Nitidulidae; Bunalski et al. 2014: Scarabaeoidea; Bartolozzi et al. 2014: Lucanidae; Ghahari et al. 2015: Buprestidae; Novák and Ghahari 2015: Alleculinae; Ghahari and Háva 2015: Silphidae; Beaver et al. 2016: Platypodinae and Scolytinae).

Material and methods

The published data on distribution of the families Cucujidae, Laemophloeidae, and Silvanidae (Coleoptera) in Iran are summarized by province. Subfamilies, tribes, genera, and species are listed alphabetically. The following data are included in the catalog for each species: (1) valid name; (2) junior synonym(s) used in literature about Iran; (3) published Iranian records synthesized by province (classified by alphabetical order of Iranian province names) and the relevant references (classified by chronological order); (4) synthetic information on general distribution on a world scale and feeding habits; (5) about the new country records, number of species. Data about classification, nomenclature, and distribu-

tion are mainly based on Wegrzynowicz (2007, Cucujidae and Laemophloeidae) and Halstead et al. (2007, Silvanidae). When accurate data about local distribution in Iran are lacking in a quoted reference, the mention "Iran (no locality cited)" is used. The provinces of Iran are represented in Fig. 1. A photograph of a representative species of each genus is provided as an aid to recognition. Habitus photos were taken through a Leica Z16 APO microscope equipped with a JVC KY-F75U 3-CCD camera and controlled by Syncroscopy AutoMontage® software.

Results

In this checklist 2 species of Cucujidae, 6 species of Laemophloeidae, and 7 species of Silvanidae are listed as the fauna of Iran. *Pediacus dermestoides* (Fabricius, 1792) (Cucujidae) and *Cryptolestes corticinus* (Erichson, 1846) (Laemophloeidae) are new records for the fauna of Iran.

Family Cucujidae Latreille, 1802

Genus *Pediacus* Shuckard, 1839

Pediacus dermestoides (Fabricius, 1792) Fig. 3

Material examined. Ardabil province, Aslan-Dooz, Palangloo, 39°25'N 47°25'E, 1 ex, 16.viii.2006. New record for Iran.

General distribution. Caucasus, Europe, Turkey (Asiatic).

Pediacus smirnovi Nikitsky and Belov, 1979

Distribution in Iran. Iran (no locality cited) (Thomas 2003).

General distribution. Azerbaijan, Iran (Thomas 2003).

Family Laemophloeidae Ganglbauer, 1899

Genus *Cryptolestes* Ganglbauer, 1899

Cryptolestes corticinus (Erichson, 1846)

Synonymy. *Laemophloeus corticinus* Erichson, 1846: 327; *Laemophloeus krüperi* Reitter, 1879:87.

Material examined: East Azarbaijan province, Marand, Arbatan, 45°43'N 38°29'E, 1 ex, 26.vii.2009.
New record for Iran.

General distribution. Europe, Turkey (Asiatic).

Cryptolestes ferrugineus (Stephens, 1831) Fig. 4

Synonymy. *Cucujus ferrugineus* Stephens, 1831: 223; *Laemophloeus alluaudi* Grouvelle, 1906: 120; *Laemophloeus carinulatus* Wollaston, 1877: 44; *Laemophloeus concolor* Smith, 1851: 6; *Laemophloeus emgei* Reitter, 1887: 286; *Laemophloeus exilis* Rey, 1899: 36; *Cucujus monilicornis* Stephens, 1831: 223; *Laemophloeus obsoletus* Smith, 1851: 7; *Laemophloeus perplexus* Rey, 1889: 35; *Laemophloeus testaceus* Paykull, 1799: 168.

Distribution in Iran. Tehran (Farahbakhsh 1961 as *Laemophloeus ferrugineus* (Stephens, 1828)), generally distributed (Modarres Awal 1997), Iran (no locality cited) (Wegrzynowicz 2007).

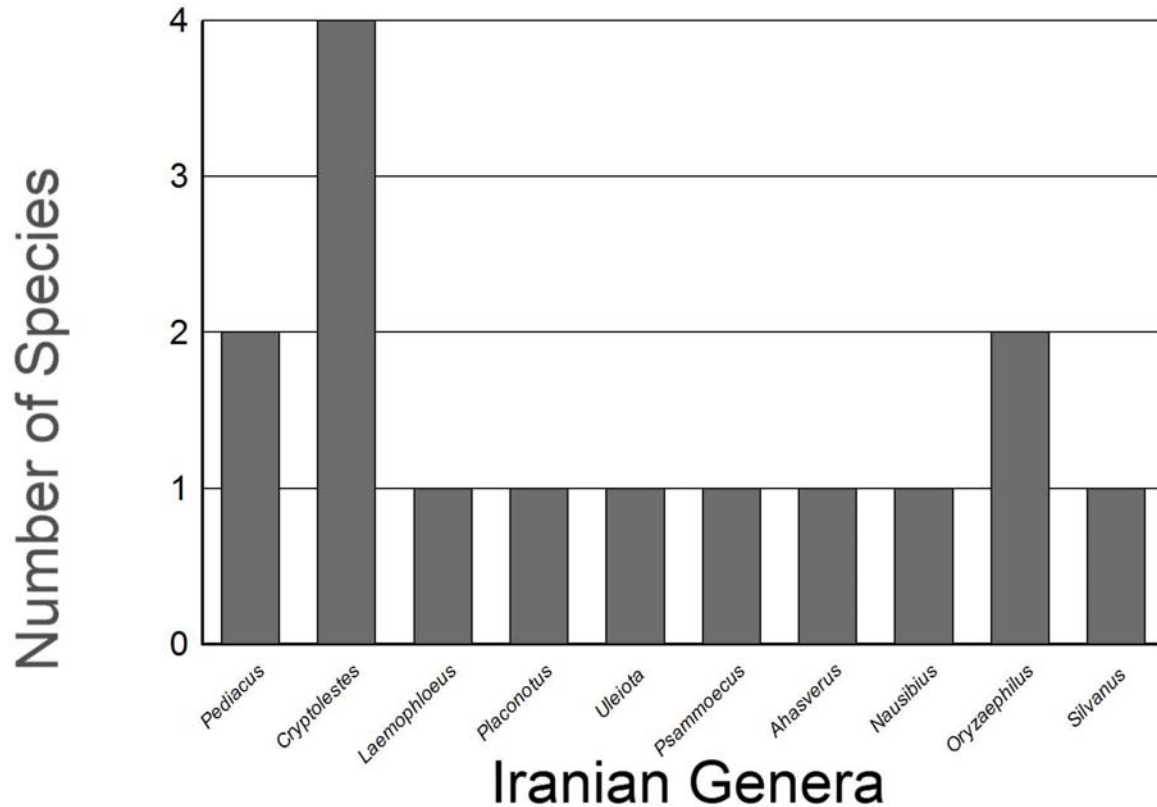


Figure 2. Species diversity of genera of Iranian Cucujoidea.

Hosts. Adults and larvae feed on cake and seeds (Farahbakhsh 1961); on cotton, wheat, in granary (Farahbakhsh 1961; Modarres Awal 1997).

General distribution. Worldwide in stored products.

***Cryptolestes pusillus* (Schönherr, 1817)**

Synonymy. *Cucujus pusillus* Schönherr, 1817: 55; *Loemophloes* [sic] *brevis* Fairmaire, 1850: 56; *Cucujus crassicornis* Waltl, 1839: 225; *Cryptolestes fuscus* Lefkovitch, 1967: 312; *Laemophloeus longicornis* Mannerheim, 1843: 303; *Cucujus minutus* Olivier, 1791: 243; *Laemophloeus parallelus* Smith, 1851: 7; *Laemophloeus pauper* Sharp, 1899: 530; *Cucujus testaceus* Stephens, 1831: 224.

Distribution in Iran. Isfahan, Tehran (Farahbakhsh 1961 as *Laemophloeus pusillus* (Schönherr, 1817)); Modarres Awal 1997 as *Laemophloeus minutus* (Olivier, 1791).

General distribution. Worldwide in stored products.

Hosts: On rice, wheat, other cereals and their products, in granary (Farahbakhsh 1961; Modarres Awal 1997).

***Cryptolestes turcicus* (Grouvelle, 1876)**

Synonymy. *Laemophloeus turcicus* Grouvelle, 1876: xxxiii; *Laemophloeus immundus* Reitter, 1874: 519; *Laemophloeus truncatus* Casey, 1884: 93.

Distribution in Iran. Tehran (Farahbakhsh 1961 as *Laemophloeus turcicus* Grouvelle, 1876), generally distributed (Modarres Awal 1997), Iran (no locality cited) (Wegrzynowicz 2007).

General distribution. Worldwide in stored products.

Hosts. On cacao, cotton (Modarres Awal 1997), wheat, rice, other cereals and their products, in granary (Farahbakhsh 1961; Modarres Awal 1997; Bagheri-Zenouz 2010).

Genus *Laemophloeus* Dejean, 1835

***Laemophloeus monilis* (Fabricius, 1787) Fig. 5**

Synonymy. *Cucujus monilis* Fabricius, 1787: 166; *Cucujus bimaculatus* Olivier, 1795: 6; *Cucujus bipustulatus* Panzer, 1792: 13; *Laemophloeus bucephalus* Ganglbauer, 1899: 610; *Silpha denticulatus* Preysslner, 1791: 117; *Laemophloeus talyschensis* Fursov, 1935: 91; *Laemophloeus tunisiana* Dajoz, 1981: 208.

Distribution in Iran. Ardabil (Samin et al. 2016).

General distribution. Europe east to Uzbekistan; North Africa.

Genus *Placonotus* W. J. MacLeay, 1871

***Placonotus testaceus* (Fabricius, 1787) Fig. 6**

Synonymy. *Cucujus testaceus* Fabricius, 1787: 166; *Laemophloeus degener* Rey, 1889: 35; *Laemophloeus notatithorax* Obenberger, 1917: 25; *Laemophloeus stepensis* Motschulsky, 1845: 91; *Laemophloeus suberis* Lucas, 1849: 479.

Distribution in Iran. East Azarbaijan (Samin et al. 2016).

General distribution. Europe, North Africa, temperate Asia.

Family Silvanidae Kirby, 1837

Subfamily Brontinae Erichson, 1845

Tribe Brontini Erichson, 1845

Genus *Uleiota* Latreille, 1797

***Uleiota planatus* (Linnaeus, 1761) Fig. 7**

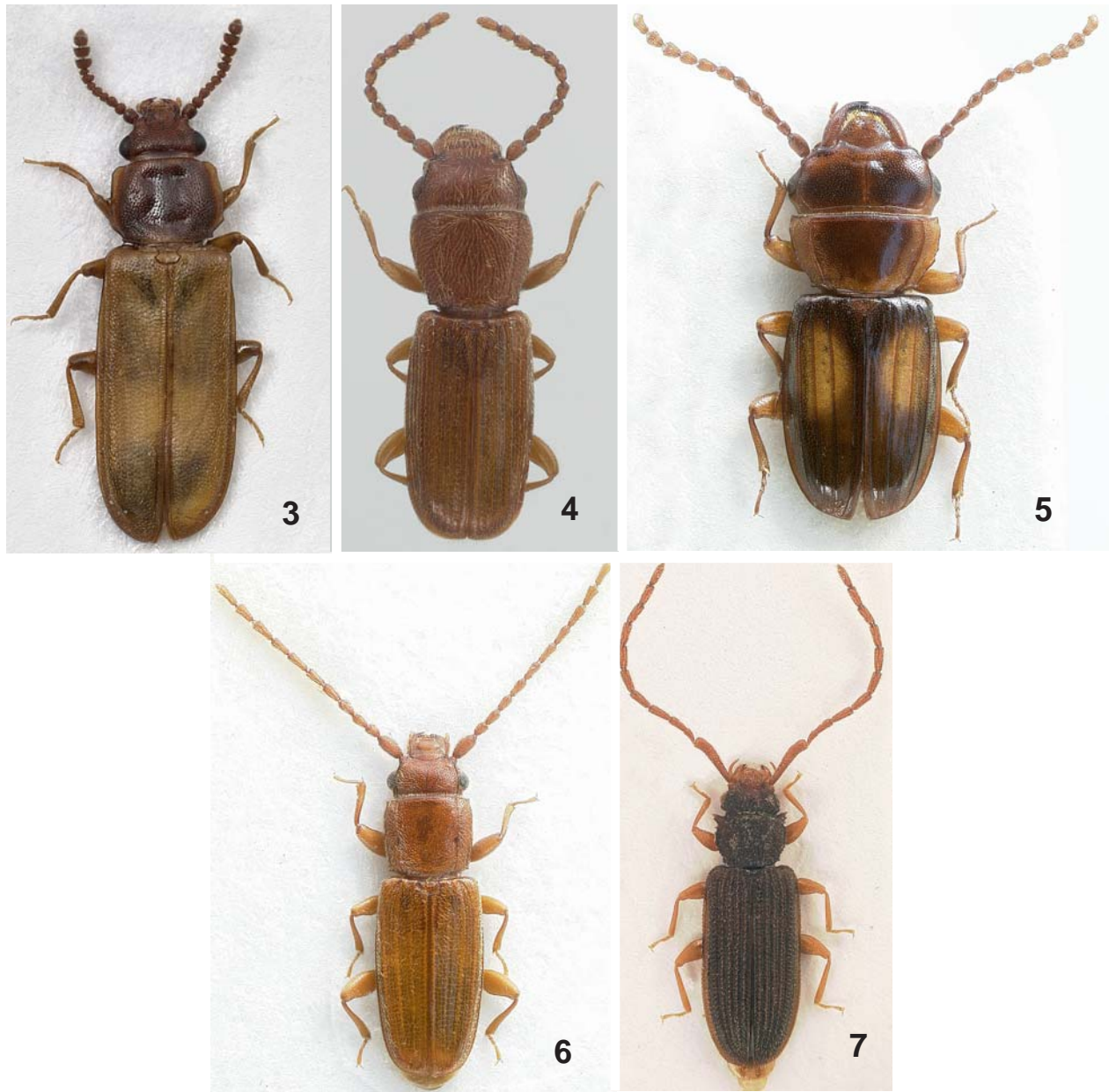
Synonymy. *Cerambyx planatus* Linnaeus, 1761: 186; *Scarites arabs* Fabricius, 1792: 97; *Cerambyx compressus* Geoffroy, 1985: 76; *Cucujus flavipes* Fabricius, 1792: 95; *Uleiota humeralis* Faldermann, 1837: 259; *Cucujus pallens* Fabricius, 1792: 96.

Distribution in Iran. Iran (no locality cited) (Dajoz 1967; Halstead et al. 2007; Danielsson 2010; Ratti and Nardi 2011).

General distribution. Europe, North Africa, northern Asia (but not Japan (Yoshida and Hirowatari 2015)).

Tribe Telephanini LeConte, 1861

Genus *Psammoecus* Latreille, 1829



Figures 3–7. Species of Iranian Cucujoidea. **3)** *Pediacus dermestoides*. **4)** *Cryptolestes ferrugineus*. **5)** *Laemophloeus monilis*. **6)** *Placonotus testaceus*. **7)** *Uleiota planatus*.

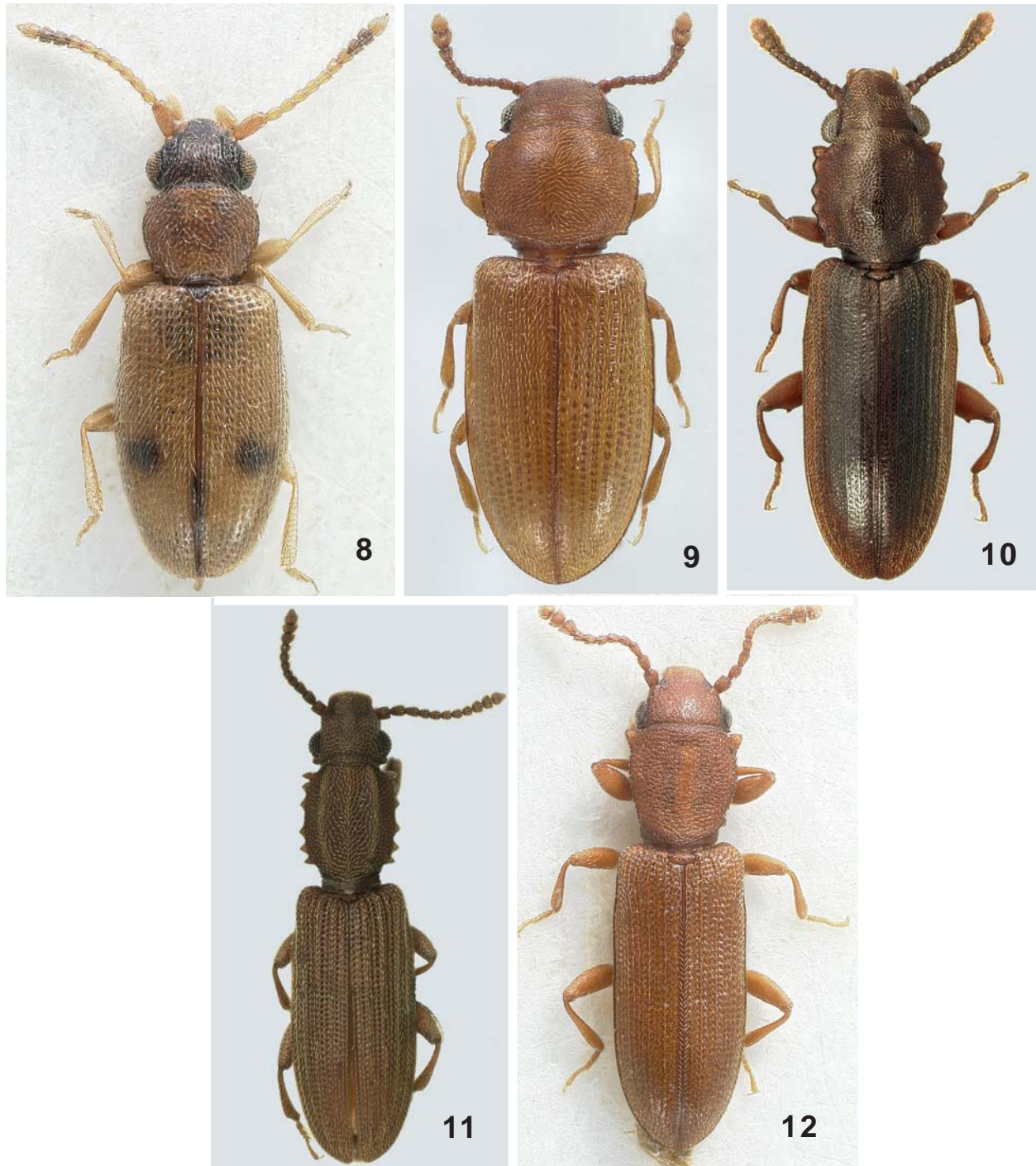
***Psammoecus bipunctatus* (Fabricius, 1792) Fig. 8**

Synonymy. *Notoxus bipunctatus* Fabricius, 1792: 212; *Psammoecus algericus* Pic, 1920: 9; *Psammoecus boudieri* Lucas, 1843: 147; *Psammoecus latior* Pic, 1894: 44; *Psammoecus nigrinus* Pic, 1894: 44; *Psammoecus pallidus* Pic, 1894: 44.

Distribution in Iran. Iran (no locality cited) (Telnov 2004; Halstead et al. 2007; Ivinskis et al. 2009; Ratti and Nardi 2011).

General distribution. Europe.

Subfamily Silvaninae Kirby, 1837



Figures 8–12. Species of Iranian Cucujoidea. **8)** *Psammoecus bipunctatus*. **9)** *Ahasverus advena*. **10)** *Nausibius clavicornis*. **11)** *Oryzaephilus mercator*. **12)** *Silvanus unidentatus*.

Genus *Ahasverus* Gozis, 1881

***Ahasverus advena* (Waltl, 1834) Fig. 9**

Synonymy. *Cryptophagus advena* Waltl, 1834: 169; *Cryptophagus angustatus* Lucas, 1646: 221; *Cryptophagus guerinii* Allibert, 1847: 12; *Lathridius musaeorum* Ziegler, 1844: 270; *Cryptophagus striatus* Rouget, 1877: cvii.

Distribution in Iran: Guilan (Modarres Awal 1997).

General distribution. Worldwide in stored products.

Hosts. On grain and other stored products (Modarres Awal 1997).

Genus *Nausibius* Lentz, 1857

***Nausibius clavicornis* (Kugelann, 1794) Fig. 10**

Synonymy. *Cucujus clavicornis* Kugelann, 1794: 571; *Corticaria dentatus* Marsham, 1802: 108; *Sylvanus denticulatus* MacLeay, 1825: 46; *Silvanus intermedius* Smith, 1851: 16; *Silvanus latus* Fairmaire, 1850: 53; *Rhyzophagus parallelus* Walker, 1858: 206.

Distribution in Iran. East Azarbaijan (Modarres Awal 1997).

General distribution. Worldwide in stored products.

Hosts. On entomological collections, cereals and their products, dried fruits, nuts, seeds, sugar, candy, dried meat, tobacco, raisin, in granary (Modarres Awal 1997).

Genus *Oryzaephilus* Ganglbauer, 1899

***Oryzaephilus mercator* (Fauvel, 1889) Fig. 11**

Synonymy. *Silvanus mercator* Fauvel, 1889: 132; *Silvanus gossypii* Chittenden, 1897: 13.

Distribution in Iran. Generally distributed (Modarres Awal 1997).

General distribution. Worldwide in stored products.

Hosts. Dried apricot, raisin, date-palm, other storage products, in granary (Modarres Awal 1997; Bagheri-Zenouz 2010), rice (Bagheri-Zenouz 2010; Khoobdel et al. 2011).

***Oryzaephilus surinamensis* (Linnaeus, 1758)**

Synonymy. *Dermestes surinamensis* Linnaeus, 1758: 357; *Silvanus bicornis* Erichson, 1846: 337; *Tenebrio frumentarius* Fabricius, 1775: 62; *Anobium sexdentatus* Herbst, 1783: 31; *Dermestes sexdentatus* Fabricius, 1792: 232.

Distribution in Iran. Golestan (Khormali et al. 2002), Razavi Khorasan (Akbari Asl et al. 2009), generally distributed (Farahbakhsh 1961; Modarres Awal 1997), Iran (no locality cited) (Abivardi 2001; Khaleghizaden and Sehhatiasabet 2006; Valizadegan et al. 2009; Bagheri-Zenouz 2010; Hosseinzadeh et al. 2010; Ratti and Nardi 2011).

General distribution. Worldwide in stored products.

Hosts. *Oryzaephilus surinamensis* (Sawtoothed grain beetle) is a cosmopolitan species which damages several stored products. On rice, flour and other cereals and their products, date-palm, nuts, seeds, sugar, candy, tobacco, almond, dried meat, dried apricot, dried fig and other dried fruits, in granary (Farahbakhsh 1961; Modarres Awal 1997; Bagheri-Zenouz 2010), wheat, corn, barley, wheat flour, bran, pasta, bread, oil seeds, dried herbs, and natural history collections (Bagheri-Zenouz 2010; Zarei et al. 2015). Additionally this pest causes damage not only by feeding but also with its feces-contamination, severely reducing the quality of the infested commodity (Mollaie et al. 2011).

Comments. The parasitoid wasp, *Cephalonomia tarsalis* (Ashmead, 1893) (Hymenoptera: Bethylinidae) was recorded as the parasitoid of *O. surinamensis* from Iran (Mohajery and Azimi 1995; Ghahari and Lim 2012).

Genus *Silvanus* Latreille, 1804

Silvanus unidentatus (A.G. Olivier, 1790) Fig. 12

Synonymy. *Ips unidentatus* Olivier, 1790: 9; *Silvanus gratiosus* Motschulsky, 1863: 501; *Colydium planus* Herbst, 1797: 285; *Silvanus siculus* Stierlin, 1864: 147.

Distribution in Iran. Ardabil (Samin et al. 2016).

General distribution. Europe, northern Asia, North America

Discussion

Cucujoidea of Iran including the families Cucujidae, Laemophloeidae, and Silvanidae have been studied in this paper. Fifteen species from 12 genera are listed as the fauna of Iran. Among the 12 genera, *Cryptolestes* (Laemophloeidae) with four species is more diverse than the other genera (Fig. 2).

Iran is comprised of 31 provinces but specimens have been recorded only from seven provinces: Ardabil, East Azarbaijan, and Tehran with three reported species have the highest diversity (the majority of faunistic surveys were done in these provinces); followed by Golestan, Guilan, Isfahan, Razavi Khorasan (all with one recorded species) arranged sequentially. No species have been reported thus far from the other 24 provinces because they have not been systematically sampled. Iran is a large country incorporating various geographical regions and climates and we expect that a large number of species remain to be discovered. To find new species and distributional records, more studies should be conducted on this insect group in Iran.

Some laemophloeid and silvanid species are serious pests of stored products, but studies of their ecology are rare. Most recent cucujoid studies have focused on the biology and control of the economically important stored product pest, *O. surinamensis*. Cucujoids, as with most other agricultural pests, have natural enemies, especially parasitoids of the genus *Cephalonomia* (Hymenoptera: Bethylinidae) and entomopathogenic fungi (Flinn 1991; Lord 2001; Throne and Lord 2004). Only one species of Bethylinidae (*Cephalonomia tarsalis* (Ashmead, 1893) (Mohajery and Azimi 1995; Ghahari and Lim 2012)), and 2 species of entomopathogenic fungi, (*Beauveria bassiana* (Balsamo) (Hyphomycetes: Moniliales) and *Metarhizium anisopliae* (Metchnikoff) Sorokin (Ascomycota: Hypocreales) (Mahdeshin et al. 2009; Latifian et al. 2011; Khashaveh and Sakenin Chelav 2013)) have been recorded so far in Iran in association with *O. surinamensis*. Parasitoids of other stored products pests have been rarely studied in Iran. Generally, establishment of biological control agents in stored products is difficult and this is the reason for limited research in this area of biological control involving stored product pests (e.g. Bostrichidae, Bruchinae, Curculionidae, Dermestidae, Tenebrionidae, etc.). However faunistic surveys are necessary to find new cucujoids and their natural enemies in the various stored products in Iran.

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