Contribution to the knowledge of darkling beetles (Coleoptera: Tenebrionidae) from Iranian rice fields and surrounding grasslands

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ABSTRACT. Darkling beetles (Coleoptera: Tenebrionidae) are one of the most numerous and diverse family of beetles, present in almost all agroecosystems. The fauna of these beneficial insects in chain foods of ecosystems was studied in Iranian rice fields and surrounding grasslands. The results show a total of 21 tenebrionid species of 16 genera including, Zophosis LATREILLE, Dailognatha ESCHSCHOLTZ, Tentyria LATREILLE, Eustagnia REITTER, Phymatiotris SOLIER, Pachyscelis SOLIER, Pimelia FABRICIUS, Dendarus DEJEAN, Colpotus MOLSAN et REY, Gonocephalum SOLIER, Opatroides BRUILLÉ, Blaps FABRICIUS, Cephalostenus SOLIER, Probaticus SEIDLITZ, Euboeus BOIELDIEU and Tribolium MACLEAY. Altogether, members of 3 subfamilies (Pimeliinae, Opatrinae, Tenebrioninae) were collected from Iranian rice fields and surrounding grasslands. Four genera and 14 species are new records for Iran.

KEY WORDS: Tenebrionidae, rice field, fauna, new records, Iran.

INTRODUCTION

Tenebrionids are mostly rather large, flightless beetles, although a few species living in rotten wood and in stored products are small. With more than 15,000 known species, darkling beetles are one of the most common members of the beetle, or coleopteran, community (SOLDATI & SOLDATI 2003). Darkling beetles can be found in desert or semidesert regions all over the world. They burrow under stones, bark and leaf litter. Some species
even move through sand, "swimming" with their legs. The darkling beetles that inhabit the most torrid deserts can withstand temperatures of 50 °C. They have long legs that keep their bodies at a safe distance from the burning sand and enable them to move at high speed. Many are excellent burrowers and can bury themselves in sand very quickly in order to avoid the scorching sun (SCHAWALLER 1996, BOUCHARD et al., 2005).

They live mainly in the soil, under logs, or in leaf litter, and feed on dead organic matter. Certain species infesting stored foodstuff are called 'flour beetles', and the larvae of others are called 'mealworms'. Because mealworms are easily reared in large numbers they are a popular and nutritious form of food for insect-eating animals kept in captivity. Tenebrionids have a sophisticated system for retaining water in the body which enables them to live in drier habitats than most other beetles (KULZER 1954, MATTHEWS & BOUCHARD 2008).

Most species of darkling beetles are active above ground from spring to late fall. Also, most of them are nocturnal, with the exception of some species that inhabit sandy beaches. In contrast, many overseas tenebrionids are active during the daytime. With the onset of winter weather, some species seek shelter below ground in burrows of other animals and remain there until warmer weather returns in the spring. Other species of darkling beetles do not live through the winter as adults. They lay eggs in the soil during warm weather and die with the onset of freezing. Their eggs hatch into larvae when warm weather returns. These larvae live in the soil for up to two years before the adults emerge to eat and reproduce (DOYEN & LAWRENCE 1979, WATT 1992). Darkling beetles are probably useful as indicators of environmental quality, in that their presence signifies that the place is relatively undisturbed. The great majority of these insects are scavengers. In nature, they are quite content to feed on dried or rotting plant residue. Man has made many a darkling beetle's day by storing vast quantities of grain products (WATT 1974, SCHAWALLER 1996).

MATERIALS AND METHODS

The specimens were collected through recent years (2000-2005) under stones by hand, sweeping of vegetation and pitfall trap methods from the different rice and cotton fields of Iran. In addition to collecting the materials, several specimens of different insect collections of Iranian universities were checked and their data have also been included in this paper. Subfamilies and tribes were given in phylogenetic order and species were listed alphabetically within each tribe. The information concerning specific name, describer and description date, locality, altitude (in brackets) and date of collection, place/plant on which the species were collected, determinant and number of species (in brackets) was given. Classification and nomenclature of darkling beetles suggested by LAWRENCE & NEWTON (1995), IWAN (2001), SOLDATI & SOLDATI (2003) have been followed.
RESULTS

In this study, 21 species in 16 genera belonging to 3 subfamilies of Tenebrionidae were collected from Iranian rice fields and surrounding grasslands. Of these, four genera and fourteen species are newly recorded from Iran. The list of species with their synonymies, distributional data and plants on which the specimens were collected from them are given below.

**Family Tenebrionidae LATREILLE 1802**

**Subfamily Pimeliinae LATREILLE 1802**

**Tribe Zophosini SOLIER 1834**

**Genus Zophosis LATREILLE 1807**

*Zophosis (Oculus) dilatata DEYROLLE 1867*

Distribution: Greece, Turkey, Syria, Lebanon.

*Zophosis (Oculus) punctata punctata BRULLÉ 1832*


Distribution: South Europe, North Africa, Middle East, Asia Minor, Iraq, Iran, Pakistan, Central Asia, West China.
Material: Isfahan province, Lenjan, around the rice field (1), Najaf-Abad, on the ground (2), July 2000.

**Tribe Tentyriini ESCHSCHOLTZ 1831**

**Genus Dailognatha ESCHSCHOLTZ 1829**

*Dailognatha caraboides* (ESCHSCHOLTZ 1831)

Distribution: Bulgaria, Greece, Turkey, Syria, Armenia, Georgia, Azerbaijan, Iran, Iraq.

*Dailognatha pumila* (BAUDI 1874)

Synonym: *humeralis* (DESBOUCHERS 1881).
  Distribution: Armenia, Turkey.
  Material: Mazandaran province, Savadkooh, on the ground (1), September 2001. **New record for Iran.**

**Genus Tentyria LATREILLE 1802**

*Tentyria (Tentyria) rotundata* BRULLÉ 1832

  Distribution: Balkans, Turkey, Iran.

**Tribe Stenosini LACORDAIRE 1859**

**Genus Eutagenia REITTER 1886**

*Eutagenia smyrnensis* (SOLIER 1838)

  Distribution: Bulgaria, Greece, Turkey, Syria, Jordan.

**Tribe Pimeliini LATREILLE 1802**

**Genus Phymatiotris SOLIER 1836 (=Graecopachys SKOPIN 1968)**

*Phymatiotris quadricollis* (BRULLÉ 1832)

Synonyms: *cyladica* (REITTER 1893), *porphyrea* (SOLIER 1836).
  Distribution: Greece, Turkey.
  Material: Mazandaran province, Savadkooh, on the ground (2), Summer 2000. Mazandaran province, Behshahr, rice field (3), May 2004. **The genus is new record for Iran.**
Genus *Pachyscelis* SOLIER 1836

*Pachyscelis (Parapachyscelis) villosa* (DRAPIEZ 1820)


Distribution: Greece, Turkey, Iraq, Syria, Israel, Egypt.

Material: Guilan province, Roodsar, on the ground (1), June 2004. **New record for Iran.**

Genus *Pimelia* FABRICIUS 1775

*Pimelia (Camphonota) akbesiana* FAIRMAIRE 1884

Distribution: Turkey, Syria.

Material: Mazandaran province, Amol, pitfall trap (3), September 2004. **New record for Iran.**

*Pimelia (Pimelia) bajula* KLUG 1830

Synonyms: *cylindrica* SOLIER 1836, *mulsanti* REICHE 1861.

Distribution: Turkey, Cyprus, Iran.

Material: Isfahan province, Lenjan, around the rice field (1), Isfahan (Borkhar), on the ground (2), July 2000.

Subfamily Opatrinae BRULLÉ 1832

Tribe Dendarini ESPAÑOL 1945

Genus *Dendarus* DEJEAN 1821

*Dendarus (Pandarinus) foveolatus* SEIDLITZ 1893

Distribution: Turkey, Armenia.

**Dendarus (Pandarinus) tenellus (Mulsant et Rey 1854)**

Distribution: Greece, Turkey, Iraq.
Material: East Azarbayjan province, Kaleibar, on the snow, (2), November 2001. **New record for Iran.**

**Tribe Pedinini Eschscholtz 1829**

**Genus Colpotus Mulsant et Rey 1853**

*Colpotus vogti Koch 1948*

Distribution: Greece, Turkey.
Material: Guilan province, Rasht, on the ground (1), August 2003. **The genus and species are new recorded for Iran.**

**Genus Pedinus Latreille 1796**

*Pedinus (Pedinus) strabonis Seidlitz 1893*

Distribution: Turkey, Azerbaijan, Armenia, Iran.

**Tribe Opatrini Brullé 1832**

**Genus Gonocephalum Solier 1834**

*Gonocephalum (Gonocephalum) rusticum (Olivier 1811)*

Synonyms: *errans* (Wollaston 1854), *femalicum* (Küster 1849), *fuscum* (Herbst 1793), *modestum* (Küster 1849), *obductum* (Gebler 1860), *pulverulentum* (Olivier 1811), *rusticum* (Brüllé 1832), *setulosum* Küster 1849, *substriatum* (Besser 1832), *terrosum* (Küster 1845), *trichopterum* (Gemmingen 1870), *tricostatum* (Fischer-Waldheim 1844), *vestitum* (Küster 1849), *vicinum* (Gemmingen 1870), *villosum* (Steven 1829).

Distribution: S. Europe, N. Africa, Middle East, Turkey, Iran, Iraq, Central Asia, Mongolia, China.
Material: Khuzestan province, Ahwaz, on the ground (2), October 2000.
Genus *Opatroides* **BRULLE 1832**

*Opatroides punctulatus* **BRULLE 1832**

Distribution: S. Europe, N. Africa, Arabia, Middle East, Transcaucus, Afghanistan, Central Asia.


**Subfamily Tenebrioninae LATREILLE 1802**

**Tribe Blaptini LEACH 1815**

Genus *Blaps* **FABRICIUS 1775**

*Blaps (Blaps) ocreata* **ALLARD 1880**

Distribution: Greece, Turkey.


**Tribe Scaurini BILLBERG 1820**

Genus *Cephalostenus* **SOLIER 1836**

*Cephalostenus elegans* (**BRULLE 1832**)  

Synonym: *dejeanii* **SOLIER 1838**.

Distribution: Greece, Turkey.

Material: Mazandaran province: Behshahr, rice field (2), July 2001. The genus and species are new recorded for Iran.

**Tribe Helopini LATREILLE 1802**

Genus *Probaticus* **SEIDLITZ 1896**

*Probaticus (Pelorinus) tenebricosus* (**BRULLÉ 1832**)  

Distribution: Balkans, Turkey.

Tribe Cylindronotini ESPAÑOL 1956

Genus Euboeus BOIELDIEU 1865

Euboeus mimonti BOIELDIEU 1865

Distribution: Bulgaria, Greece, Turkey.
Material: Mazandaran province: Kiakola, rice field (1), April 2002. The genus and species are new recorded for Iran.

Tribe Triboliini GISTEL 1848

Genus Tribolium MACLEAY 1825

Tribolium castaneum (HERBST 1797)

Synonyms: bifoveolatum (DUFTSCHMID 1812), ferrugineum (FABRICIUS 1787), testaceum (FABRICIUS 1798).
Distribution: Cosmopolitan.

DISCUSSION

The fauna of Iranian Tenebrionidae was poorly studied so far. Since 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 important insect group in Iran.

Rice fields are very important because they are environmental buffers. They are a dynamic ecosystem that helps balance temperature and wind. They provide a moderating effect on the surroundings. One can feel the refreshing coolness of rice fields as opposed to the oppressive heat in the concrete jungle of the city. Rice plants produce oxygen during the day, and air moving in rice fields helps circulate the oxygen produced and hastens carbon dioxide exchange. Places with or near rice fields have cooler, fresher air compared with crowded and polluted locations where the air is hot and dirty (BAMBARADENIYA et al. 1998, BAMBARADENIYA & AMERASINGHE 2003). Arthropods are the main terrestrial invertebrates of rice fields. The arthropod community in rice fields consists mainly of insects and spiders that largely inhabit the vegetation (rice plants and weeds) and soil surface. With respect to rice cultivation and based on the inter relationships between populations, the terrestrial arthropod communities can be further divided into rice pests, their natural enemies (predators and parasitoids) and neutral forms. In rice fields the composition of the terrestrial ar-
thropod communities are known to change with the growth of the rice crop (BARRION & LITSINGER 1994, GHAHARI et al. 2008).

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