

## GROUND BEETLES (COLEOPTERA: CARABIDAE) FROM ILAM AND LORESTAN PROVINCES OF IRAN

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[Гахари Х., Кесдек М. Жужелицы (Coleoptera: Carabidae) из провинций Илам и Лорестан Ирана]

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**Ключевые слова:** *Coleoptera, Carabidae, Жужелицы, Илам, Лорестан, Иран*

**Summary.** Ground beetles are a large group of insects, many of which are important bio-indicators and have significant role in biological control of agricultural and forest pests. The fauna of these beneficial insects was studied in two Iranian provinces including, Ilam and Lorestan. Totally 64 species and subspecies from 32 genera and 14 tribes belonging to nine subfamilies were collected from different regions of the mentioned provinces.

**Резюме.** Жужелицы – многочисленная группа насекомых, которые являются важными биоиндикаторами и играют важную роль в биологическом контроле лесных и сельскохозяйственных вредителей. Фауна этих полезных насекомых исследовалась в двух иранских провинциях – Илам и Лорестан. Приводится 64 вида и подвида из 32 родов и 14 триб, принадлежащих девяти подсемействам, собранных в различных точках упомянутых провинций.

### INTRODUCTION

Carabidae is a huge, worldwide distributed beetle family which is an exceptionally interesting object of various biological observations. There are over 40.000 species known in the world. Primary importance of the family lies in the variety and the location of the food they consume. The carabid beetles (both larva and adult) are usually predators and occupy very different ecological niches [Avgin and Özdikmen, 2007]. While some species are omnivorous, and some phytophages, most of them are carnivorous [Löbl and Smetana, 2003; Larsen et al., 2003; Avgin and Emre, 2007].

Ilam province is located in the south-west of Iran, bordering Iraq, and covering an area of 19,086 square kilometers. It neighbors Khuzestan province in the south, Lorestan province in the east, Kermanshah province in the north and Iraq in the west with 425 kilometers of common border. Ilam province is among the warmest regions of Iran, although the mountainous areas of north and north eastern Ilam are relatively cold. The average annual rainfall is 578 mm. Ilam's highest point is the peak Kabir Kuh at 2790 m, part of the Zagros mountains.

Lorestan is an area of 28,392 km<sup>2</sup> comprising a province and a historic territory of western Iran amidst the Zagros Mountains. The terrain consists chiefly of mountains, with numerous ranges, part of the Zagros chain, running northwest to southeast. The highest point of the province is peak at 4,050 m, and the low-lying areas being in the southernmost sector of the province, are approximately 500 m above sea level. The climate is generally sub-humid continental with winter precipitation, a lot of which falls as snow. Because it lies on the westernmost slopes of the Zagros Mountains, annual precipitation in Lorestan is among the highest anywhere in Iran south of the Alborz Mountains. The average annual precipitation

totals 530 millimetres of rainfall equivalent, whilst up to 1270 millimetres may fall on the highest mountains. Temperatures vary widely with the seasons and between day and night. Summer temperatures typically range from a minimum of 12°C to a hot maximum of 32°C. In winter, they range from a minimum of -2°C to a chilly maximum of 8°C.

Some important studies on Iranian Carabidae were made by Jaeger [1990], Jaeger [1992], Hejkal [2000], Lassalle [2001], Aliche & Minaei [2002a, b], Heinz [2002], Magrini & Pavesi [2003], Fallahzadeh et al. [2005], Mohammadzadeh Fard and Hojjat [2005], Jaskuła [2007], Toledano & Marggi [2007], Mohammadzadeh Fard [2008], Ghahari et al. [2009a, b, c, 2010]. But the fauna of these natural enemies of pests was not studied in Ilam and Lorestan provinces perfectly. The objective of this paper is determining of carabids fauna in western regions of Iran.

### MATERIALS AND METHODS

The specimens were collected from fourteen different regions of Ilam and Luristan provinces, Iran. Plastic pitfall traps, 10×15 cm (diameter × depth) and light traps were the main methods for collecting the specimens. The pitfall traps installed at 50 m intervals in different apple orchards were part-filled with ethanol 80%. The traps were emptied weekly within three crop seasons (spring - fall) and the fallen beetles were collected. In addition to the pit fall and light traps, sweeping nets were used randomly in different ecosystems of the mentioned provinces. The information concerning locality, altitude (in brackets) and date of collection, and number of specimens (in brackets) is noted for each species. The nomenclature of Carabidae is given sensu Löbl and Smetana [2003].

## RESULTS

In a total 64 species and subspecies from 32 genera and 14 tribes belonging to nine subfamilies (including Brachininae, Callistinae, Carabinae, Harpalinae, Lebiinae, Pterostichinae, Nebrinae, Scaritinae, Cicindelinae) of Carabidae were collected and determined from Ilam and Luristan provinces. The list of species is given below.

Subfamily **Brachininae** Bonelli, 1810

Tribe **Brachinini** Bonelli, 1810

Genus **Pheropsophus** Solier, 1833

**Pheropsophus africanus** (Dejean, 1825)

**Material examined:** Ilam province: Mehran (162 m), (2), March 2008.

Subfamily **Callistinae** Laporte de Catelneau, 1834

Tribe **Chlaeniini** Brullé, 1834

Genus **Chlaenius** Bonelli, 1810

**Chlaenius festivus** (Panzer, 1796)

**Material examined:** Ilam province: Mehran (162 m), (5), March 2008.

**Chlaenius vestitus** (Paykull, 1790)

**Material examined:** Lorestan province: Pol-e-Dokhtar, (635 m), (3), August 2006. Ilam province: Saleh Abad (619 m), (1), April 2008.

Subfamily **Carabinae** Latreille, 1802

Tribe **Carabini** Latreille, 1802

Genus **Calosoma** Weber, 1801

**Calosoma (Campalita) maderae tectum** Motschulsky, 1844

**Material examined:** Lorestan province: Sarab Doreh, (1176 m), (1), July 2005. Ilam province: Ilam (987 m), (3), October 2007.

**Calosoma (Campalita) olivieri** Dejean, 1831

**Material examined:** Ilam province: Ilam (1428 m), (2), September 2007.

Genus **Carabus** Linnaeus, 1758

**Carabus convexus** Fabricius, 1775

**Material examined:** Lorestan province: Khorramabad, (1045 m), (1), May 2009.

**Carabus coriaceus** Linnaeus, 1758

**Material examined:** Ilam province: Darrehshahr (712 m), (4), July 2008.

Subfamily **Cicindelinae** Latreille, 1802

Tribe **Cicindelini** Sloane, 1906

Genus **Cephalota** Dokhtouroff, 1883

**Cephalota (s. str.) chiloleuca** (Fischer, 1820)

**Material examined:** Lorestan province: Khorramabad, (1045 m), (2), May 2009.

**Cephalota (Taenidia) circumdata** (Dejean, 1822)

**Material examined:** Lorestan province: Alashtar, (1255 m), (4), August 2006.

**Cephalota (Taenidia) deserticola** (Faldermann, 1836)

**Material examined:** Ilam province: Ilam (987 m), (2), October 2007.

**Cephalota (s. str.) turcica** (Schaum, 1859)

**Material examined:** Lorestan province: Darreh-Asbar (1670 m), (1), September 2006.

Genus **Cicindela** Linnaeus, 1758

**Cicindela asiatica** Audouin and Brullé, 1839

**Material examined:** Lorestan province: Dorood, (1683 m), (2), October 2006.

**Cicindela campestris** Linnaeus, 1758

**Material examined:** Ilam province: Ilam (987 m), (2), October 2007.

**Cicindela clypeata** Fischer von Waldheim, 1821

**Material examined:** Ilam province: Pahle (715 m), (1), June 2008.

**Cicindela desertorum** Dejean, 1825

**Material examined:** Ilam province: Mehran (162 m), (3), March 2008.

**Cicindela monticola** Ménétries, 1832

**Material examined:** Lorestan province: Sarab Doreh, (1176 m), (1), June 2006.

Genus **Cylindera** Westwood, 1831

**Cylindera (Eugrapha) arenaria** Fuessly, 1775

**Material examined:** Lorestan province: Khorramabad, (1045 m), (3), August 2005. Ilam province: Moosiyar (141 m), (1), July 2008.

**Cylindera (Eugrapha) contorta** (Fischer, 1828)

**Material examined:** Ilam province: Saleh Abad (619 m), (1), April 2008. Eyvan (1168 m), (2), October 2008.

**Cylindera (s. str.) germanica** (Linnaeus, 1758)

**Material examined:** Lorestan province: Aligoodarz, (2015 m), (5), September 2006. Ilam province: Abdanan (897 m), (2), May 2008.

**Cylindera (Eugrapha) trisignata** (Dejean, 1822)

**Material examined:** Lorestan province: Sarab Doreh, (1176 m), (2), June 2006. Lorestan province: Borujerd, (1588 m), (3), April 2007.

Genus **Homodela** Rivalier, 1950

**Homodela ismenia** (Gory, 1833)

**Material examined:** Ilam province: Loomar (795 m), (3), July 2008.

Genus **Lophyridia** Jeannel, 1946

**Lophyridia aphrodisia aphrodisia** Baudi, 1864

**Material examined:** Lorestan province: Khorramabad, (1045 m), (1), August 2005.

**Lophyridia concolor** (Dejean, 1822)

**Material examined:** Lorestan province: Darreh-Asbar (1670 m), (2), September 2006.

**Lophyridia fischeri** (Adams, 1817)

**Material examined:** Ilam province: Ilam (987 m), (1), October 2007.

**Lophyridia hilariola** (Bates, 1874)

**Material examined:** Ilam province: Saleh Abad (619 m), (2), April 2008.

**Lophyridia littoralis nemoralis** (Olivier, 1790)

**Material examined:** Lorestan province: Alashtar, (1255 m), (2), August 2006.

Tribe **Megacephalini** Csiki, 1906

Genus **Megacephala** Latreille, 1802

**Megacephala euphratica** Dejean, 1822

**Material examined:** Lorestan province: Sarab Doreh, (1176 m), (1), June 2006. Ilam province: Moosiyan (141 m), (1), July 2008.

Subfamily **Harpalinae** Bonelli, 1810  
Tribe **Harpalini** Bonelli, 1810  
Genus **Acinopus** Dejean, 1821

*Acinopus (s. str.) laevigatus laevigatus* Ménétriés, 1832

**Material examined:** Ilam province: Ilam (1428 m), (1), September 2007. Ilam province: Loomar (795 m), (1), July 2008.

*Acinopus (s. str.) picipes* (Olivier, 1795)

**Material examined:** Lorestan province: Borujerd, (1588 m), (3), April 2007.

Genus **Diachromus** Erichson, 1837

*Diachromus germanus* (Linnaeus, 1758)

**Material examined:** Ilam province: Dehloran (290 m), (4), August 2008. Lorestan province: Azna, (1875 m), (1), July 2008.

Genus **Harpalus** Latreille, 1802

*Harpalus (s. str.) affinis* (Schrank, 1781)

**Material examined:** Lorestan province: Khorramabad, (1008 m), (3), May 2009.

*Harpalus (s. str.) distinguendus* (Duftschmid, 1812)

**Material examined:** Ilam province: Abdanan (897 m), (3), May 2008. Ilam province: Eyvan (1168 m), (1), October 2008.

*Harpalus (s. str.) honestus honestus* Duftschmid, 1812

**Material examined:** Ilam province: Dehloran (290 m), (4), August 2008.

*Harpalus (s. str.) smaragdinus* Duftschmid, 1812

**Material examined:** Lorestan province: Azna, (1875 m), (1), July 2008.

Genus **Ophonus** Dejean, 1821

*Ophonus laticollis* (Mannerheim, 1825)

**Material examined:** Ilam province: Ilam (987 m), (2), October 2007. Ilam province: Loomar (795 m), (3), July 2008.

Genus **Pseudoophonus** Motschulsky, 1844

*Pseudoophonus rufipes* (DeGeer, 1774)

**Material examined:** Lorestan province: Azna, (1875 m), (3), July 2008. Ilam province: Darrehshahr (712 m), (2), July 2008.

Genus **Stenolophus** Stephens, 1827

*Stenolophus paulinoides* Heiden, 1891

**Material examined:** Lorestan province: Aligoodarz, (2015 m), (3), September 2006.

*Stenolophus steveni* Krynicki, 1832

**Material examined:** Ilam province: Moosiyan (141 m), (4), July 2008.

Subfamily **Lebiinae** Bonelli, 1810

Tribe **Anthiini** Bonelli, 1810

Genus **Anthia** Weber, 1801

*Anthia (Thermophilum) duodecimguttata* Bonelli, 1813

**Material examined:** Ilam province: Dehloran (290 m), (4), August 2008.

Tribe **Dryptini** Bonelli, 1810

Genus **Drypta** Latreille, 1796

*Drypta dentata* (Rossi, 1790)

**Material examined:** Lorestan province: Alashtar, (1255 m), (4), August 2006. Ilam province: Ilam (987 m), (1), October 2007.

Tribe **Lebiini** Bonelli, 1810

Genus **Cymindis** Latreille, 1806

*Cymindis (s. str.) andreae* Ménétriés, 1832

**Material examined:** Ilam province: Loomar (795 m), (2), July 2008.

*Cymindis (s. str.) lineata* (Quensel, 1806)

**Material examined:** Lorestan province: Borujerd, (1588 m), (3), April 2007.

Genus **Lebia** Latreille, 1802

*Lebia (Lamprias) cyanocephala* Linnaeus, 1758

**Material examined:** Ilam province: Mehran (162 m), (3), March 2008.

*Lebia festiva* Faldermann, 1836

**Material examined:** Lorestan province: Dorood, (1683 m), (5), October 2006.

Subfamily **Nebriinae** Laporte, 1834

Tribe **Nebriini** Laporte, 1834

Genus **Leistus** Fröhlich, 1799

*Leistus (s. str.) caucasicus* Chaudoir, 1867

**Material examined:** Ilam province: Ilam (1428 m), (2), September 2007. Ilam province: Loomar (795 m), (2), July 2008.

*Leistus (Pogonophorus) spinibarbis rufipes* Chaudoir, 1843

**Material examined:** Lorestan province: Alashtar, (1255 m), (4), August 2006.

Genus **Nebria** Latreille, 1802

*Nebria (s. str.) alpicola* Motschulsky, 1866

**Material examined:** Lorestan province: Sarab Doreh, (1176 m), (1), June 2006.

*Nebria (s. str.) hemprichi* Klug, 1832

**Material examined:** Lorestan province: Alashtar, (1255 m), (2), August 2006.

*Nebria (Eunebria) xanthacra* Chaudoir, 1850

**Material examined:** Ilam province: Dehloran (290 m), (2), August 2008.

Subfamily **Pterostichinae** Bonelli, 1810

Tribe **Amarini (Zabrini)** Bonelli, 1810

Genus **Amara** Bonelli, 1810

*Amara (s. str.) aenea* (DeGeer, 1774)

**Material examined:** Ilam province: Eyvan (1168 m), (3), October 2008.

*Amara (s. str.) proxima* Putzeys, 1866

**Material examined:** Lorestan province: Noor Abad, (1756 m), (4), September 2006.

Genus **Zabrus** Clairville, 1806

*Zabrus corpulentus* Schaum, 1864

**Material examined:** Ilam province: Abdanan (897 m), (2), May 2008.

*Zabrus tenebrioides* (Goeze, 1777)

**Material examined:** Lorestan province: Borujerd, (1588 m), (4), April 2007.

Tribe **Platynini** Bonelli, 1810

Genus **Agonum** Bonelli, 1810

*Agonum viridicupreum* (Goeze, 1777)

**Material examined:** Ilam province: Arkvaz-e-Malek Shahi (1337 m), (3), May 2008.

Genus **Calathus** Bonelli, 1810

*Calathus (Calathus) fuscipes fuscipes* (Goeze, 1777)

**Material examined:** Ilam province: Arkvaz-e-Malek Shahi (1337 m), (1), May 2008.

*Calathus (Neocalathus) melanocephalus* (Linnaeus, 1758)

**Material examined:** Lorestan province: Borujerd, (1588 m), (3), April 2007. Ilam province: Moosiyani (141 m), (3), July 2008.

*Calathus (Neocalathus) cinctus* Motschulsky, 1850

**Material examined:** Ilam province: Mehran (162 m), (2), March 2008.

Genus **Dolichus** Bonelli, 1810

*Dolichus halensis* (Schaller, 1783)

**Material examined:** Lorestan province: Darreh-Asbar (1670 m), (2), October 2006. Ilam province: Ilam (987 m), (1), October 2007.

Genus **Sphodrus** Clairville, 1806

*Sphodrus leucophthalmus* (Linnaeus, 1758)

**Material examined:** Lorestan province: Borujerd, (1588 m), (4), April 2007.

Tribe **Pterostichini** Bonelli, 1810

Genus **Poecilus** Bonelli, 1810

*Poecilus (s. str.) cupreus cupreus* Linné, 1758

**Material examined:** Lorestan province: Dorood, (1683 m), (3), October 2006.

*Poecilus (s. str.) punctulatus* Schaller, 1783

**Material examined:** Ilam province: Abdanan (953 m), (1), May 2008. Ilam province: Eyvan (1168 m), (1), October 2008.

Genus **Pterostichus** Bonelli, 1810

*Pterostichus (Melanius) elongatus* Duftschmid, 1812

**Material examined:** Ilam province: Mehran (162 m), (3), March 2008.

Subfamily **Scaritinae** Bonelli, 1810

Tribe **Scaritini** Bonelli, 1810

Genus **Distichus** Motschulsky, 1857

*Distichus (s. str.) planus* (Bonelli, 1913)

**Material examined:** Ilam province: Arkvaz-e-Malek Shahi (1337 m), (3), May 2008.

Genus **Scarites** Fabricius, 1775

*Scarites (Parallelomorphus) eurytus* (Fischer von Waldheim, 1825)

**Material examined:** Lorestan province: Alashtar, (1255 m), (1), August 2006.

## DISCUSSION

The results of this research indicated that there is a diverse fauna of Carabidae in two provinces Ilam and Lorestan, western Iran. Ground beetles are considered beneficial arthropods in agriculture, because they are natural enemies of several agricultural and forest pests and also represent a food source for species at other trophic levels [Luff 1987; Patil and Sathe, 2003]. Being normally abundant, and not dependent on only one prey species, they may provide a good buffer against pests as their populations may be more stable than specific predators [Helenius 1990; Huusela-Veistola, 1996]. With attention to the efficient role of carabid beetles in biological control, conserving of these efficient predators is necessary for successful biological control of pests. Conserving natural enemies often requires modification of production practices that are similar to changes in practices recommended by IPM principles (e.g. increase diversification of crops, reduction in pesticide use, etc.). The use of thresholds to make decisions, common to IPM systems, is closely tied to the impact of natural enemies whose density, composition and impact on pest dynamics (and damage) are dependent on the crop cultivation practices and environmental milieu. The interdependence of farming practices, pest dynamics and the impact of natural enemies often requires farmers to modify practices. As such, farmer education is a key to success. Examples of farmer education span a number of extension approaches that include bulletins, field days, grower meetings, electronic media and farmer field schools. Two case studies illustrate the importance of farmer education in conservation biological control, as well as the opportunities to use this method in pest management in subsistence crops [Gates, 1994; Maredia et al., 2003; Peshin and Dhawan, 2009].

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