# GROUND AND TIGER BEETLES (COLEOPTERA: CARABIDAE) FROM KERMAN AND KHORASAN PROVINCES OF IRAN

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ABSTRACT: As a result of a faunistic survey on Ground and tiger beetles which conducted mainly in agroecosystems in different localities of Kerman, Razavi and North Khorasan provinces of Iran, a total of 23 species were identified. Among them, 3 species, namely *Nebria xanthacra* Chaudoir, *Pheropsophus africanus* (Dejean), and *Poecilus nitens* (Chaudoir) are recorded for the first time in Iran. 21 species are new records for Kerman province. Also, 2 species are new for fauna of Khorasan provinces. Data regarding abundance, provincial and geographical distribution of reported species in this study are presented.

KEY WORDS: Carabidae, Fauna, New record, Iran.

Carabid beetles, an insect group containing ground and tiger beetles, are an incredibly diverse group of insects with over 40,000 species worldwide (Best & Beegle, 1977; Clark et al., 1994; Lövei & Sunderland, 1996). Members of this family are considered to be mostly opportunistic feeders that consume a variety of foods; however, the majority of species have been observed as primarily predatory, feeding on other insects and related organisms. Most species locate food by random search, although some diurnal species hunt by sight. A few species have also been observed to detect chemical cues from springtails, mollusks, and aphids (Lovei & Sunderland, 1996).

Carabids play a major role in agro ecosystems by contributing to the mortality of a variety of pest organisms including aphids, moth larvae, beetle larvae, mites, and springtails. They have also been used effectively to control slugs in greenhouses (Kromp, 1999). Several ground beetles also are phytophagous. Among the later group, those eat the seeds of troublesome weeds are of particular interest since they help regulate weed populations (Liebman & Gallandt, 1997). At \$27 billion per year in management costs, weeds are the most costly pest in North American agriculture (White et al., 2007). For this reason, weed seed consumption or predation by ground beetles is of great interest. Weed seed predation by arthropods such as ground beetles could potentially be used to lower costs associated with weed populations and to increase crop yield. Also, weed seed predators may alter the plant species composition in an area rather than eliminate a weed species. Changing the species composition could give crop species a better chance for success by reducing competition for resources such as light, nutrients, and water, thus increasing crop yields. Understanding weed seed preferences is critical to effectively utilizing weed seed predators in biological control programs.

Although carabid beetles can be found in nearly every available habitat, some species are associated with particular ecosystems, like meadows, woodlands, or crop fields. Because that, the types of carabid beetles found at a location can be a valuable biological indicator to assess the impacts of different habitat management and tillage practices.

Compared with the World fauna, the number of recorded carabid species from Iran is less than 1 percent (Löbl & Smetana, 2003; Mohammadzadeh Fard, 2008; Ghahari et al., 2009a,b & Ghahari et al., 2010; Namaghi et al., 2010). In other hand, the carabid fauna in Iran is insufficiently known. Reviewing published papers on carabidae family in Iran (Afshar, 1944; Khajehzadeh, 1998; Alichi & Minaei, 2002a,b; Fallahzadeh et al., 2005; Ghahhari et al., 2009a,b & Ghahari et al., 2010; Hejkal, 2000; Jaeger, 1990; Jaeger, 1992; Lassalle, 2001; Jaskuła, 2007; Magrini & Pavesi, 2003; Mohammadzadeh Fard, 2008; Mohammadzadeh Fard & Hojjat, 2005; Mohammadzadeh Fard & Hodjat, 2008; Namaghi et al., 2010), it is clear that many parts of Iran never been investigated in terms of Carabidae fauna. So, it is expected that further studies will add more information to the knowledge of this family in Iran. The objective of this study was to determine the species composition of ground and tiger beetles inhabiting agro ecosystems and surroundings in Kerman province of Iran. Also, specimens collected from Razavi and North Khorasan provinces were examined.

### MATERIALS AND METHODS

This study was conducted between 2009- 2010. The materials from Razavi and North Khorasan provinces were collected by the first author and those from Kerman province were collected by second author, where no detailed studies have been carried out. The majority of the collections were made using pitfall traps. Also, additional specimens collected directly by hands when walking through the agro ecosystems and the surroundings. Data, such as number of specimens, locations and dates were recorded. The majority of identifications were done by the third author.

The voucher specimens are deposited in the department of Plant Protection, College of Agriculture, Ferdowsi University of Mashhad, Iran. Also, a few paratypes are held in personal collection of the third author.

The nomenclature of the Carabidae is given follows the data base www.faunaeur.org and Löbl & Smetana (2003).

#### RESULTS

In this study, a total of 23 species of 17 genera and 10 subfamilies were recorded. They are as bellow list.

#### Subfamily Pterostichinae Bonelli, 1810

#### Anthia (Anthia) mannerheimii Chaudoir, 1842

Material: Razavi Khorasan (Mashhad), 59°, 40' E, 36°, 14' N, 2  $\Im$  and 1 $\Im$ , 10August 2008; Kerman (Bam), 58°, 20' E, 29°, 7' N, 1 $\Im$ , 30 Oct. 2009. Previous provincial records for Iran: Khorasan, (Afshar, 1944). General distribution: Iran, Turkmenistan (Löbl & Smetana, 2003).

#### Anthia (Thermophilum) duodecimguttata Bonelli, 1813

Material: Kerman (Bam), 58°, 20' E, 29°, 7' N, 2 $\bigcirc$ , 30 Oct. 2009. Previous provincial records for Iran: Mazandaran (Ghaemshahr), Semnan (Garmsar), (Ghahari et al., 2009a; Ghahari et al 2010). General distribution: Egypt, Iran, Iraq, Saudi Arabia, Yemen (Löbl & Smetana, 2003).

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### Amara aenea (DeGeer, 1774)

Material: Kerman, 57 °, 1′ E, 30 °, 3′ N, 1<sup>♀</sup>, 3 Sept. 2009.

Previous provincial records for Iran: Fars, Kohkeyloye and Boyer Ahmad Golestan, Khorasan (Mohammadzadeh Fard & Hodjat, 2008; Ghahari et al., 2009a). General distribution: Palearctic Region, North America, Caucasia (Löbl & Smetana, 2003).

### Poecilus nitens (Chaudoir, 1850)

Material: Kerman, 57 °, 1' E, 30 °, 3' N,  $2 \bigcirc \bigcirc$ , 21 Aug. 2009. Previous provincial records for Iran: new record for Iranian fauna. General distribution: Armenia, Russia south, Uzbekistan, Turkmenistan, Kazakhstan, Tadjikistan (Löbl & Smetana, 2003).

# Subfamily Harpalinae Bonelli, 1810

### Acinopus picipes (Olivier, 1795)

Material: Kerman (Jiroft), 58 °,3' E, 28 °,3' N,  $3^{\circ}_{\downarrow}^{\circ}_{\downarrow}$ , 30 Oct.2009; Kerman (Zarand), 57°, 03' E, 30, 81' N,  $1^{\circ}_{\downarrow}$ , 10 Oct. 2009.

Previous provincial records for Iran: Fars, Razavi Khorasan, Mazandaran (Alichi & Minaie, 2002; Namaghi et al., 2010).

General distribution: Azarbaijan, Albania, Armenia, Bosnia Herzegovina, Bulgaria, Croatia, France (incl. Corsica, Monaco), Georgia, Greece (incl. Crete), Hungary, Italy (incl. Sardinia, Sicily, San Marino), Malta, Macedonia, Moldavia, Portugal, Romania, Slovenia, Spain (incl. Gibraltar), Russia: South European Territory, Turkey, Ukraine, Serbia and Montenegro, Cyprus, Iran, Iraq, Israel, Syria, Turkey (Löbl & Smetana, 2003).

### Pseudoophonus rufipes (DeGeer, 1774)

Material: Kerman, 57<sup>°</sup>, 1′ E, 30<sup>°</sup>, 3′ N, 1<sup>♀</sup>, 21 Aug. 2009.

Previous provincial records for Iran: Tehran (Varamin), Ardabil (Dasht-e-Moghan), Mazandaran (Ghaemshahr), Fars (Darab), Razavi Khorasan (Kashmar and Mashhad), Semnan (Garmsar) (Ghahari et al., 2009a, 2010).

General distribution: Azerbaijan, Albania, Armenia, Austria, Azores, Belgium, Bosnia Herzegovina, Bulgaria, Byelorussia, Croatia, Russia: Central European Territory, Czech Republic, Denmark, Estonia, Finland, France, Great Britain, Germany, Georgia, Greece, Hungary, Ireland, Italy, Kazakhstan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Macedonia, Moldavia, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Russia: South European Territory, Sweden, Switzerland, Turkey, Ukraine, Serbia & Montenegro, Algeria, Morocco, Western Sahara, Tunisia, Afghanistan, Cyprus, Russia: East Siberia, Iran, Iraq, Kyrgyzstan, Kazakhstan, Tadzhikistan, Turkmenistan, Turkey, Uzbekistan, West Siberia, Xinjiang (Sinkiang), Nearctic Region (Löbl & Smetana, 2003).

### Pseudoophonus griseus (Panzer, 1796)

Material: Kerman (Baghin, Ghaemabad) (57° E, 30° N),  $2 \bigcirc \bigcirc$ , 11July2009; Jiroft (Dalfard)(57°E, 28°N),  $1 \bigcirc$ , 12 October 2009.

Previous provincial records for Iran: Mazandaran (Ghaemshahr), Golestan(Gonbad), Razavi Khorasan (Kashmar, Bardaksan, Mashhad, Dargaz, Serakhs), South Khorasan (Ghaenat, Ferdows) (Namaghi et al., 2010; Ghahari et al., 2009a, 2010).

General distribution: Russia, Moldova, Ukraine, Crimea, Azarbaijan, Daghestan, Armenia, Uzbekistan, Kazakhstan, Turkmenistan, Tajikistan, North and West Africa.

# Subfamily Scaritinae Bonelli, 1810

### Distichus planus (Bonelli, 1913)

Material: Kerman (Zarand), 57 °, 03' E, 30 °, 81' N, 200, 10 Oct. 2009.

Previous provincial records for Iran: Tehran, Razavi Khorasan(Mahvelat) (Ghahhari et al., 2009a; Namaghi et al., 2010).

General distribution: Azerbaijan, France, Georgia, Greece, Italy, Malta, Portugal, Spain, Turkey, Egypt, Morocco, Western Sahara, Tunisia, Iran, Iraq, Jordan, Kazakhstan, Pakistan,

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Saudi Arabia, Syria, Tadzhikistan, Turkmenistan, Turkey, Uzbekistan, Yemen (Löbl & Smetana, 2003).

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

Material: Kerman (Baft),  $56^{\circ}$ ,  $36' E 32^{\circ}$ , 17' N,  $4 \Im \Im$ , 14 Aug. 2009 and 21 Aug. 2009. Previous provincial records for Iran: Fars; Kohkeyloye and Boyer Ahmad (Mohammadzadeh Fard & Hodjat, 2008).

General distribution: Russia, Armenia, Kazakhistan, Turkmenistan, Uzbekistan, Mountains of Middle Asia, Syria and Israel (Löbl & Smetana, 2003).

# Subfamily Nebriinae Laporte, 1834

# Nebria xanthacra Chaudoir, 1850

Material: Kerman, 57 °, 1′ E, 30 °, 3′ N, 1♀, 3 Sept. 2008. Previous provincial records for Iran: this is a new record for fauna of Iran. General distribution: Asia: India, Turkmenistan (Löbl & Smetana, 2003).

# Subfamily Callistinae Laporte, 1834

### Chlaenius festivus (Panzer, 1796)

Material: Kerman, 57 °, 1' E, 30 °, 3' N, 1 $^{\circ}$ , 10 Sept. 2009. Previous provincial records for Iran: Kohkeyloye and Boyer Ahmad, Khozestan( Ahvaz), Golestan (Salikandeh), Razavi Khorasan (Kashmar), (Mohammadzadeh Fard& Hodjat, 2008; Shafiei et al., 2004; Ghahari et al., 2009).

General distribution: Middle Asia, Central and South Europe, Turkey, Caucasia, Transcaucasia, Iran (Löbl & Smetana, 2003).

# Pheropsophus africanus (Dejean, 1825)

Material: Kerman, 57 °,1' E, 30 °, 3' N,  $2 \bigcirc \& 1$ , 13 Sept. 2009. Previous provincial records for Iran: new record for fauna of Iran. General distribution: Africa: Algeria, Libya, Morocco, Tunisia, Asia: Israel, Egypt (Löbl & Smetana, 2003).

# Subfamily Broscinae Hope, 1838

# Broscus (Cephalotes) laevigatus Dejean, 1828

Material: Kerman, 57 °, 1′ E, 30 °, 3′ N, 2♀♀, 21 Aug. 2009.

Previous provincial records for Iran: Ardabil (Dasht-e-Moghan), Tehran (Varamin), Fars (Darab), East Azarbaijan (Arasbaran), Semnan (Garmsar) (Ghahari et al., 2009a).

General distribution: Armenia, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Russia central, Czech, Denmark, , Finland, France, Great Britain, Germany, Georgia, Hungry, Ireland, Italy, Latvia, Luxemburg, Norway, Poland, Romania, Slovak, Slovenia, Switzerland, West Russia, Turkey, West Siberia, Nearctic's region(Löbl & Smetana, 2003).

# Subfamily Carabinae Latreille, 1802

# Calosoma (Caminara) olivieri Dejean, 1831

Material: Kerman (Zarand), 57 °,03' E, 30 °,81' N, 1 $^{\circ}$ , 15Oct.2009; Kerman (Anar), 55 °, 35' E, 30 °, 32' N, 3 $^{\circ}$ , 29 July 2009; Kerman (Jiroft), 58 °,3' E, 28 °,3' N, 4 $^{\circ}$ , 24 Oct. 2008. Previous provincial records for Iran: Razavi Khorasan (Kashmar), Mazandaran (Behshahr), Golestan (Ramian), Khozestan (Ahvaz), (Ghahari et al., 2009a; Shafiei et al., 2004). General distribution: Russia, Tajikistan, Turkey, Turkmenistan and Uzbekistan (Löbl & Smetana, 2003).

# Calosoma (Callistriga) algiricum Géhin, 1885

Material: Kerman, 57 °, 1′ E, 30°, 3′ N, 2♀♀, 3 July 2009. Previous provincial records for Iran: East Azarbaijan (Arasbaran) (Ghahari et al., 2010). 190

General distribution: Italy (Sicilia), North Africa: Algeria, Libya, Morocco, Western Sahara, Tunisia, and Asia: Iran, Israel, Jordan, Saudi Arabia, and Turkmenistan (Löbl & Smetana, 2003).

# Subfamily Platyninae Bonelli, 1810

#### Sphodrus leucophthalmus (Linnaeus, 1758)

Material: Kerman, 57°, 1′ E, 30°, 3′ N, 2<sup>O</sup><sub>+</sub>, 3 Sept. 2009.

Previous provincial records for Iran: Golestan (Nokandeh), Khozestan (Ahvaz), (Ghahari et al., 2009a; Shafiei et al., 2004).

General distribution: North África, South and West Asia, Europe, Turkey, Caucasia, India and Canary Island (Löbl & Smetana, 2003).

#### Calathus (Neocalathus) cinctus Motschulsky, 1850

Material: Kerman (Baghin-Ghaemabad) (57° E, 30 °N), 299 & 233, 21 July 2009. Previous provincial records for Iran: Fars, Kohkeyloye & Boyer Ahmad (Mohammadzadeh Fard & Hodjat, 2008).

General distribution: Albania, Austria, Belgium, Bosnia and Herzegovina, Britain.Incl. Shetlands, Orkneys, Hebrides and Man Is., Bulgaria, Corsica, Crete, Croatia, Cyclades Is., Cyprus, Czech Republic, Danish mainland, Dodecanese Is., Estonia, European Turkey, French mainland, Germany, Greek mainland, Hungary, Ireland, Italian mainland, Latvia, Liechtenstein, Luxembourg, Macedonia, Malta, Moldova, Republic of, Northern Ireland, Norwegian mainland, Poland, Portuguese mainland, Romania, Russia East, Russia North, Russia Northwest, Russia South, Sardinia, Sicily, Slovakia, Slovenia, Spanish mainland, Sweden, Switzerland, The Netherlands, Ukraine, YugoslaviaIncl. Serbia, Kosovo, Voivodina, Montenegro, East Palaearctic, Near East: Asian Turkey, Caucasian Russian republics, Georgia, Armenia, Azarbaidjan, Lebanon, Syria, Israel, Jordan, Sinai Peninsula (Egypt), Arabian peninsula, Iran, Iraq, North Africa Not including Sinai Peninsula (www.faunaeur.org).

# Subfamily Lebiinae Bonelli, 1810

### Lebia (Lamprias) cyanocephalus Linnaeus, 1758

Material: Kerman (Baghin-Ghaemabad) (57° E, 30° N),  $3^{\circ}_{+} \stackrel{\circ}{_{+}} \& 1^{\circ}_{\circ}$ , 21 July 2009.

Previous provincial records for Iran: Fars, Kohkeyloye & Boyer Ahmad (Mohammadzadeh Fard & Hodjat, 2008).

General distribution: Albania, Austria, Balearic Is.Incl. Mallorca I., Menorca I., and Pityuses Is., Belarus, Belgium, Bosnia and Herzegovina, Britain Incl. Shetlands, Orkneys, Hebrides and Man Is., Bulgaria, Corsica, Croatia, Cyprus, Czech Republic, Danish mainland Incl. Borholm I., Dodecanese Is., Estonia, European Turkey, Finland, French mainland, Germany, Greek mainland, Hungary, Italian mainland, Kaliningrad Region, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Moldova, Republic of, Norwegian mainland, Poland, Portuguese mainland, Russia Central, Russia North, Russia Northwest and south, Sicily, Slovakia, Spanish mainland Incl. Alboran I., Sweden Incl. Gotland I, Switzerland, The Netherlands, Ukraine, Yugoslavia Incl. Serbia, Kosovo, Voivodina, Montenegro, East Palaearctic, Near East Asian Turkey, Caucasian Russian republics, Georgia, Armenia, Azarbaijan, Lebanon, Syria, Israel, Jordan, Sinai Peninsula (Egypt), Arabian peninsula, Iran, Iraq, North Africa Not including Sinai Peninsula

# Subfamily Cicindelinae Latreille, 1802

### Megacephala euphratica Dejean in Latreille & Dejean, 1822

Material: Kerman (Jiroft), 58 °, 3' E, 28 °, 3' N, 2009.

Previous provincial records for Iran: it has been reported from Iran, but the locality is unknown.

General distribution: Spanish mainland, Crete, Dodecanese Is., Cyprus, East Palaearctic, Near east: Asian Turkey, Caucasian Russian republics, Georgia, Armenia, Azerbaidjan,

Lebanon, Syria, Israel, Jordan, Sinai Peninsula (Egypt), Arabian peninsula, Iran, Iraq and North Africa: Egypt, Tunisia, Libya, Morocco, Algeria, Yemen (www.faunaeur.org).

#### Cicindela asiatica Audouin & Brullé, 1839

Material: North Khorasan (Bojnord), 57°, 20' E , 37°, 28' N,  $3 \bigcirc \bigcirc$ , 4May 2006. Previous provincial records for Iran: Khorasan (Kashmar), (Ghahari et al., 2009a). General distribution: Russia, Caucasia (Löbl & Smetana, 2003).

#### Cicindela clypeata Fischer von Waldheim, 1821

Material: Razavi Khorasan (Mashhad), 59°, 40' E, 36°, 14' N, 2, 2, 4, 3, 1 Sep. 2009. Previous provincial records for Iran: this species has been recorded for Iranian fauna, but the locality is unknown.

General distribution: Iran, Afghanistan, Kazakhstan, Uzbekistan, Tajikistan, Turkemmania(Löbl & Smetana, 2003) and Russia South (www.faunaeur.org).

#### Cicindela germanica (Linnaeus, 1758)

Material: Razavi Khorasan (Chenaran), 59°, 40' E, 36°,14' N, 2, $\bigcirc$ , 6 May 2009. Previous provincial records for Iran: Northern and Northwestern provinces of Iran (Afshar, 1944).

General distribution: Austria, Albania, Andorra, Yugoslavia Incl. Serbia, Kosovo, Voivodina, Montenegro, Ukraine, The Netherlands, Switzerland, Slovenia, Spanish mainland, Slovakia, SicilyIncl. adjacent Italian islands (Lipari Is., Ustica, Egadi Is., Pantelleria I., Pelagie Is.), Russia South, Russia North, Poland, Romania, Moldova, Republic of, Estonia, Macedonia, Luxembourg, Lithuania, Liechtenstein, Latvia, Italian mainland, Ireland, Hungary, Greek main land Incl. Andikithira I., Evvia I., Ionian Is., Samothraki I., Northern Sporades Is., French mainland, Germany, Finland, European Turkey, Czech Republic, Croatia, Bulgaria, Britain Incl. Shetlands, Orkneys, Hebrides and Man Is., Bosnia and Herzegovina, Belgium, East Palaearctic (www.faunaeur.org).

### Cicindela histrio (Tschitscherine, 1903)

Material: Kerman (Zarand), 57 °, 03' E, 30 °, 81' N, 2♀♀ & 1♂, 2 Aug. 2009.

Previous provincial records for Iran: according to Lobl & Smetana (2003), this species has been reported from Iran, but the locality is unknown.

General distribution: Amman, Saudi Arabia, Pakistan, Afghanistan, Iran, Arabian Emirates (Löbl & Smetana, 2003).

#### DISCUSSION

Studies on the structure of fauna of carabid beetles and abundance of particular species are important as this large taxon has an important role in sustainable agriculture. Many species of this family are considered as predators of other arthropods (Kromp, 1999; Clark et al., 1994; Best & Beegle, 1977). Some species consume a variety of weed seeds that can decrease costs associated with weed controls (Liebman & Gallandt, 1997). Carabid beetles can play a significant role in ecologically-based integrated pest management programmes that focus on avoidance or reduction of pest pressure through cultural practices and biological controls. Moreover, being well known both taxonomically and ecologically, carabids are extremely sensitive to several abiotic and biotic factors, respond quickly to habitat alteration and can be easily and cost-effectively collected. For these reasons, ground beetles are increasingly being used in ecological studies in order to evaluate the environmental impacts of man in terrestrial ecosystems (Avgin & Luff, 2010).

### CONCLUSSION

This study showed that the Carabidae fauna of Iran is much more than that has been reported and can be higher after more comprehensive works. Moreover, the economic importance and roles played by the carabid species occurring in different ecosystems of Iran is unclear. So in addition to further faunistic surveys, detailed biological and ecological studies are waiting to be carried out.

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