

A preliminary study of the cleptoparasitic bees of the genus *Coelioxys* (Hymenoptera: Megachilidae) in northern Iran, with six new records

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Abstract: A survey on the megachilid bees (Hymenoptera: Megachilidae) fauna of northern Iran, between 2010 and 2011, led to the identification of eleven species of the genus *Coelioxys* Latreille belonging to subgenera *Allocoelioxys* (6 species), *Boreocoelioxys* (2 species), *Coelioxys* (2 species) and *Liothyrapis* (1 species). Of these, six species and one subgenus (*Liothyrapis*) are new to the fauna of Iran. Detailed illustrations of morphological characters, a key to the species of the genus *Coelioxys* and an updated checklist of Iranian species of *Coelioxys* are provided.

Keywords: *Coelioxys*, cleptoparasitic bee, Megachilidae, new record

Introduction

Coelioxys Latreille is a cosmopolitan genus of tribe Megachilini (Hymenoptera: Megachilidae) including cleptoparasitic bees related to the genus *Megachile* Latreille (Michener, 2007). With 6 subgenera and about 200 described species, the old world cleptoparasitic bee of the genus *Coelioxys* is a relatively diverse taxon (Warncke, 1992; Gupta, 1993; Nagase, 2006; Wu, 2006; Michener, 2007; Ascher and Pickering, 2013). The species of the genus *Coelioxys* are known as cuckoo bees, because the larvae grow up on food stolen from their hosts. Cleptoparasitism has been defined as an ecological interaction, in which the young of one species feed and develop with the food provided for the young of another species (Rozen, 2000). The megachilid bees of genus *Coelioxys* are generally cleptoparasitic on other megachilids, while a few species attack species

of *Anthophora*, *Centris*, *Euglossa* and *Tetralonia* (Michener, 2007). The genus has five subgenera including *Allocoelioxys*, *Boreocoelioxys*, *Coelioxys*, *Mesocoelioxys* and *Liothyrapis* in Eastern Mediterranean and Near East (Warncke, 1992; Grace, 2010). *Mesocoelioxys* is a monotypic subgenus and the only species, *Coelioxys argentea* Lepeletier 1841, distributed in Greece, Cyprus and Turkey (Warncke, 1992; Grace, 2010). *Coelioxys brevis* Eversmann, 1852, *Coelioxys elongata* Lepeletier, 1841 and *Coelioxys conoidea* (Illiger, 1806) have been reported first time from Iran by Morice (1921). Then, Alfken (1927, 1935) reported three species, namely *Coelioxys conoidea* (Illiger, 1806), *Coelioxys haemorrhoea* Förster, 1853 and *Coelioxys rufescens* Lepeletier & Audinet-Serville, 1825, from Iran. Warncke (1992) reviewed the thirty-three western Palaearctic *Coelioxys* species and reported *Coelioxys aurolimbata* Förster, 1853 and *Coelioxys iranica* Warncke, 1992 from Iran, which the latter species is endemic. Schwarz (2001) described a new species as *Coelioxys artemis* Schwarz, 2001 from Turkey some paratypes of which were selected from the specimens collected from Iran.

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Later, Schwartz and Gusenleitner (2003) described another endemic species, *Coelioxys warnckeii* Schwarz & Gusenleitner, 2003 based on specimens collected from Shiraz. Grace (2010) listed seven species of *Coelioxys* for Iran which includes two other species, *Coelioxys echinata* Förster, 1853 and *Coelioxys polycentris* Förster, 1853. Khaghaninia *et al.* (2010) during study of megachilid bees of Aynali forests in East Azarbaijan province, discovered *Coelioxys afra* Lepeletier, 1841 for the first time from Iran. The fauna of the genus *Coelioxys* has been poorly studied in Iran. Only twelve species have previously been recorded in hundred years (Morice, 1921; Alfken, 1927, 1935; Warncke, 1992; Schwarz, 2001; Schwarz and Gusenleitner, 2003; Grace, 2010; Khaghaninia *et al.*, 2010). Conservation of organisms and their habitats is related to knowledge of their exact geographic distribution. Geographic records of the cleptoparasitic bees can provide useful data for the conservation purposes because the bees play a stabilizing role within their communities, representing the apex of bee communities and first guild to respond to disturbances (Sheffield *et al.*, 2013). The present contribution to knowledge of the cleptoparasitic bees is based on new data and material collected from northern provinces of Iran.

Materials and Methods

Material was collected from different habitats of the northern Iran during 2010 and 2011, using Malaise traps and sweep net. The specimens were extracted from the traps and sorted weekly. After that, the collected specimens by Malaise traps were transferred to 96% ethanol for five minutes, followed by a soak in hexamethyldisilazane (HMDS) for 30 min and finally placed on a glass plate to dry. The dried specimens were pinned and labeled. The photographs were taken using an Olympus AX70 microscope and an Olympus SZX9 stereomicroscope equipped with a Sony CCD digital camera. Terminology of the morphological characters for the genus *Coelioxys* and its subgenera followed Michener (2007). Identification of species of the genus *Coelioxys*

was performed using Warncke (1992), Amiet *et al.* (2004) and Banaszak and Romasenko (1998). The specimens were deposited in the insect collection of the Department of Entomology, Tarbiat Modares University, Tehran.

Results

The research on the cleptoparasitic bee of genus *Coelioxys* revealed eleven species belonging to the four subgenera (*Allocoelioxys*, *Boreocoelioxys*, *Coelioxys* and *Liothyrapis*). Of these, we report here six species and one subgenus (*Liothyrapis*) for the first time from Iran. The newly recorded species are indicated by an asterisk (*).

Coelioxys (Allocoelioxys) acanthura (Illiger, 1806) *

Material examined: QAZVIN province-Kuhin, 26-vii-2011, 1♂, swept on *Centaurea* sp.

Distribution: Algeria, Europe, Morocco, Northern Asia, Palestine, Siberia, Turkey (Warncke, 1992; Banaszak and Romasenko, 1998; Ortiz-Sánchez *et al.*, 2009; Grace, 2010). Newly recorded from Iran.

Diagnosis: Male. Body squamous (Fig. 1), eyes hairy, fore coxa without spine, tergum II without fovea behind post-gradular groove (Fig. 28), tergum VI with eight teeth (two lateral, six apical), without emargination, with dense close-fitting pubescence of squamae basally, and a longitudinal mid-carina (Fig. 25), tergum VII with median tooth apically (Fig. 27), sternum VI spine-like extending below tergum VI.

Host: Cleptoparasite of subgenus *Chalicodoma* spp. (Hym., Megachilidae) (Warncke, 1992; Banaszak and Romasenko, 1998; Grace, 2010).

Coelioxys (Allocoelioxys) afra Lepeletier, 1841

Material examined: TEHRAN province-Malard, 08-vi-2010, 1♀; 13-vii-2010, 1♀; 31-viii-2010, 2♀; 07-ix-2010, 1♀; ALBORZ province-Karaj, 14-ix-2010, 1♀; Chalus road, Sarziarat, 07-ix-2010, 1♂, swept on *Medicago sativa* L.; GUILAN province-Astaneh Ashrafieh, Eshman Komachal, 12-vi-2010, 1♀; QAZVIN province-Qazvin, Barajin, 17-viii-

2011, 2♀; MAZANDARAN province-Noor, 13-vii-2011, 2♀.

Distribution: Caucasus, Europe, Iran, Northern Africa, Northern Asia, Turkey (Warncke, 1992; Banaszak and Romasenko, 1998; Amiet et al. 2004; Ortiz-Sánchez et al., 2009; Grace, 2010; Khaghaninia et al., 2010).

Diagnosis: Female. Body squamous (Fig. 2), eyes hairy, clypeus finely ruguloso-punctate, with a fulvous white apical fringe, antefrons and frons with a longitudinal mid-carina (Fig. 18), fore coxa without erect spine, tergum VI at apex and sternum VI entirely brownish-red, apical part of tergum VI and sternum VI broad and short, moderately narrowed, with a rounded emargination apically (Fig. 19), sternum VI wider than tergum VI. **Male.** Similar to female (Fig. 3) except antennae, legs and tergum VI black, genal spot 1/2 of genal wide (Fig. 30), post-gradular groove of tergum II medially broken, tergum II without fovea laterally (Fig. 31), tergum IV without median carina basally, tergum VI with eight teeth (two lateral, six apical) (Fig. 32), tergum VII without median tooth apically, abdominal sterna with broad apical bands broken in middle, with maculae of squamae at base.

Host: Cleptoparasite of *Megachile leachella* Curtis, 1828, *Megachile pilidens* Alfken, 1924 and *Megachile apicalis* Spinola, 1808 (Hym., Megachilidae) (Warncke, 1992; Banaszak and Romasenko, 1998; Amiet et al., 2004; Grace, 2010).

***Coelioxys (Allocoelioxys) brevis* Eversmann, 1852**

Material examined: TEHRAN province-Firoozkooh, 13-vii-2011, 1♂, swept on *Centaurea* sp.

Distribution: Caucasus, Europe, Iran, Northern Africa, Northern Asia, Palestine, Turkey (Morice, 1921; Warncke, 1992; Banaszak and Romasenko, 1998; Amiet et al., 2004; Ortiz-Sánchez et al., 2009; Grace, 2010).

Diagnosis: Male. Body squamous (Fig. 4), eyes hairy, tergum II with fovea behind post-gradular groove (Fig. 29), tergum VI with emargination and broad band of dense squamae

basally, without longitudinal median carina, with eight teeth (two lateral, six apical), tergum VII with median tooth apically.

Host: Cleptoparasite of *M. leachella*, *M. pilidens* and *M. apicalis* (Hym., Megachilidae) (Warncke, 1992; Banaszak and Romasenko, 1998; Amiet et al., 2004; Grace, 2010).

Coelioxys (Allocoelioxys) emarginata* Förster, 1853

Material examined: ALBORZ province-Chalus road, Hasanakdar, 18-vii-2010, 1♂, swept on *M. sativa*.

Distribution: China, Europe, Northern Africa, Russian Far East, Turkey (Warncke, 1992; Banaszak and Romasenko, 1998; Amiet et al. 2004; Wu, 2006; Ortiz-Sánchez et al., 2009; Grace, 2010). Newly recorded from Iran.

Diagnosis: Male. Body squamous (Fig. 5), eyes hairy, genal spot 1/3 of genal wide (Fig. 16), antefrons and frons without a longitudinal mid-carina, fore coxa without erect spine (Fig. 16), tergum II with a fovea laterally, tergal apical bands wide, tergum VI with squamae basally, with eight teeth, two lateral, six apical, without longitudinal median carina, tergum VII without median tooth apically, sternum V with triangular emargination apically, abdominal segments with broad unbroken apical bands.

Host: Cleptoparasite of *Megachile leucomalla* Gerstäcker, 1869 (Hym., Megachilidae) (Warncke, 1992; Amiet et al., 2004; Grace, 2010).

***Coelioxys (Allocoelioxys) haemorrhoea* Förster, 1853**

Material examined: TEHRAN province-Peykanshahr, 28-viii-2010, 1♂, swept on *Malva* sp.

Distribution: Europe, Iran, Northern Africa, Northern Asia, Turkey (Alfken, 1927; Warncke, 1992; Banaszak and Romasenko, 1998; Ortiz-Sánchez et al., 2009; Grace, 2010).

Diagnosis: Male. Body squamous (Fig. 6), eyes hairy, antennae, legs and tergum VI red (Fig. 33), antefrons and frons with a longitudinal mid-carina, genal spot 1.5 of genal wide, post-gradular groove of tergites 2 complete, tergum VI with median carina basally, tergum VI with eight teeth

red (two lateral, six apical), largely maculate (Fig. 33), with a longitudinal mid-carina basally, tergum VII without median tooth apically.

Host: Cleptoparasite of *Megachile rotundata* (Fabricius, 1787) (Hym., Megachilidae) (Grace, 2010).

Coelioxys (*Allocoelioxys*) *semenowi*
Morawitz, 1894*

Material examined: TEHRAN province-Malard, 20-viii-2010, 1♀, Malaise trap in orchard.

Distribution: Northern Asia (Warncke, 1992). Newly recorded from Iran.

Diagnosis: Body squamous (Fig. 7), head and thorax black, abdomen, mandibles and antennae red, eyes hairy, antefrons and frons without a longitudinal mid-carina, front coxa without erect spine, tegulae and legs red, post-gradular groove of tergites II complete, apical tergal bands wide, sternum VI pointed apically (Fig. 20).

Host: Unknown.

Coelioxys (*Boreocoelioxys*) *elongata*
Lepeletier, 1841

Material examined: ALBORZ province-Chalus road, Hasanakdar, 15-July-2010, 1♀, swept on *Centaurea* sp.

Distribution: Europe, Iran, Northern Africa, Siberia, Turkey (Morice, 1921; Warncke, 1992; Amiet *et al.*, 2004; Grace, 2010).

Diagnosis: **Female.** Body with hair, without squamous (Fig. 8), eyes hairy, fore coxa with erect spine, terga II-V with unbroken apical bands, tergum 6 broad rounded apically, sternum IV matt, punctuation finer than sternum III (Fig. 23), mid-tooth of sternum VI elongate oval, longer than its basal width, sternum VI with lateral subapical notch, length of sternum VI two times the length of median notch.

Host: Cleptoparasite of *M. leachella*, *Megachile bombycina* Radoszkowski, 1874, *Megachile centuncularis* (Linnaeus, 1758), *Megachile circumcincta* (Kirby, 1802) and *Megachile ligniseca* (Kirby, 1802) (Hym., Megachilidae) (Warncke, 1992; Amiet *et al.*, 2004; Grace, 2010).

Coelioxys (*Boreocoelioxys*) *inermis* (Kirby,
1802) *

Material examined: TEHRAN province-Peykanshahr, 26-vi-2010, 1♂; ALBORZ province-Chalus road, Shahrestanak, 13-vii-2010, 1♀; GUILAN province-Astaneh Ashrafieh, Eshman Komachal, 05-vii-2010, 1♀.

Distribution: Europe, Japan, Northern Africa, Northern Asia, Russian Far East, Turkey (Warncke, 1992; Banaszak and Romasenko, 1998; Amiet *et al.*, 2004; Nagase, 2006; Grace, 2010). Newly recorded from Iran.

Diagnosis: **Female.** Body covered with hair, without squamous (Fig. 9), eyes hairy, fore coxa with erect spine (Fig. 17), sternum IV shiny, punctuation similar to sternum III (Fig. 24), sternum VI with lateral subapical notch, length of sternum VI three times the length of median notch (Fig. 21). **Male.** Similar to female (Fig. 10) except terga II-V with unbroken apical bands, tergum II with sub-lateral fovea on each side behind post-gradular groove (Fig. 34), tergum VI with six teeth (two lateral, four apical), with white close-fitting pubescence basally, upper mid-teeth nearly rectangular, short, lower mid teeth long and narrow.

Host: Cleptoparasite of *M. centuncularis*, *Megachile alpicola* Alfken, 1924, *Megachile versicolor* Smith, 1844 and *Hoplitis papaveris* (Latreille, 1799) (Hym., Megachilidae) (Warncke, 1992; Banaszak and Romasenko, 1998; Amiet *et al.*, 2004; Grace, 2010)

Coelioxys (*Coelioxys*) *conoidea* (Illiger, 1806)

Material examined: QAZVIN province-Qazvin, Zereshk, 06-vii-2011, 1♀; 26-vii-2011, 3♀.

Distribution: Europe, Iran, Northern Africa, Turkey (Morice, 1921; Alfken, 1935; Warncke, 1992; Banaszak and Romasenko, 1998; Amiet *et al.*, 2004; Grace, 2010).

Diagnosis: **Female.** Body covered with hair, without squamous (Fig. 11), eyes hairy (Fig. 15), fore coxa with erect spine, terga I-V with triangular white maculae on each side, tergum VI with a triangularly flatten narrow apical band part, sternum VI without lateral notch (Fig. 21), somewhat wider than tergum VI, and moderately narrowed apically.

Host: Cleptoparasite of *Megachile maritima* (Kirby, 1802), *Megachile lagopoda* (Linnaeus,

1761) and *Megachile ericetorum* Lepeletier, 1841 (Hym., Megachilidae) (Warncke, 1992; Banaszak and Romasenko, 1998; Amiet et al., 2004; Grace, 2010).

Coelioxys (Coelioxys) quadridentata (Linnaeus, 1758) *

Material examined: MAZANDARAN province-Haraz Road, Polour, 29-vii-2011, 1♂, swept on *M. sativa*.

Distribution: China, Europe, Siberia, Turkey (Warncke, 1992; Banaszak and Romasenko, 1998; Amiet et al., 2004; Wu, 2006; Grace, 2010). Newly recorded from Iran.

Diagnosis: Male. Body covered with hair, without squamae (Fig. 12), eyes hairy, front coxa with long and blunt spine, outer calcars of hind tibiae curved, narrower, abdominal terga with apical bands, tergum II without fovea behind post-gradular groove (Fig. 35), tergum V without teeth laterally, tergum VI with six teeth, two lateral, four apical (Fig. 26).

Host: Cleptoparasite of *M. leachella*, *M. centuncularis*, *M. circumcincta*, *Megachile willughbiella* (Kirby, 1802) (Hym., Megachilidae), *Anthophora bimaculata* (Panzer, 1798) (Hym., Apidae) (Warncke, 1992; Banaszak and Romasenko, 1998; Grace, 2010).

Coelioxys (Liothyrapis) decipiens Spinola, 1838*

Material examined: TEHRAN province-Pishva, Mohammadabad, 15-vi-2011, 1♀, swept on *Onopordon* sp.

Distribution: China, Germany, Greece, India, Middle East, Northern Africa, Northern Asia (Warncke, 1992; Gupta, 1993; Wu, 2006; Grace, 2010). Newly recorded from Iran.

Diagnosis: Female. Body covered with hair, without squamae (Fig. 13), eyes bare (Fig. 14), first flagellar segment more than half as long as the second, tergum VI with carina ending in bare apical spine, with long erect hairs lateral to carina, sternum VI broad rectangular, its apex pointed, fringed.

Host: Cleptoparasite of *Megachile nigripes* Spinola, 1838 (Hym., Megachilidae) (Warncke, 1992).

Key to species of *Coelioxys* collected in this study

- 1- Flagellum 10-segmented, tergum VI without spine, female.....**2**
- Flagellum 11-segmented, tergum VI with spines, male.....**7**
- 2- Eyes bare (Fig. 14) (subgenus *Liothyrapis*), sternum VI broad rectangular, its apex pointed,**Coelioxys decipiens** Spinola, 1838
- Eyes hairy (Fig. 15), sternum VI pointed, its apex largely bare.....**3**
- 3- Body squamous, front coxa without erect spine (Fig. 16) (subgenus *Allocoelioxys*)..... **4**
- Body hairy, without squamous, fore coxa with erect spine (Fig. 17)..... **5**
- 4- Antefrons and frons with a longitudinal mid-carina (Fig. 18), sternum VI with median emargination apically (Fig. 19).**Coelioxys afra** Lepeletier, 1841
- Antefrons and frons without a longitudinal mid-carina, sternum VI pointed apically (Fig. 20).**Coelioxys semenowi** Morawitz, 1894
- 5- Sternum VI without lateral notch (Fig.21), tergal apical bands broadly broken (subgenus *Coelioxys*). ..**Coelioxys conoidea** (Illiger, 1806)
- Sternum VI with lateral subapical notch (Fig. 22), tergal apical bands 2-5 unbroken (subgenus *Boreocoelioxys*).**6**
- 6- Sternum IV matt, punctuation finer than sternite 3 (Fig. 24), length of sternum VI two times the length of median notch.**Coelioxys elongata** Lepeletier, 1841
- Sternum IV shiny, punctuation similar to sternum 3 (Fig. 24), length of sternum VI three times the length of median notch (Fig. 22).**Coelioxys inermis** (Kirby, 1802)
- 7- Tergum VI with eight teeth (two lateral, six apical) (subgenus *Allocoelioxys*)**8**
- Tergum VI with six teeth (two lateral, four apical)..... **12**
- 8- Tergum VII with median tooth apically (Fig. 27).**9**
- Tergum VII without median tooth apically.**10**
- 9- Tergum VI without emargination basally, with longitudinal median carina (Fig. 25), flagellum dark brown, tergum II without fovea

- behind post-gradular groove (Fig. 28).....
 *Coelioxys acanthura* (Illiger, 1806)
 - Tergum VI with emargination basally, without longitudinal median carina, flagellum red-orange, tergum II with fovea behind post-gradular groove (Fig. 29).
 *Coelioxys brevis* Eversmann, 1852
 10- Genal spot 1/3 of genal wide, antefrons and frons without a longitudinal mid-carina (Fig. 16). *Coelioxys emarginata* Förster, 1853
 - Genal spot 1/2 of genal wide (Fig. 31), antefrons and frons with a longitudinal mid-carina.11
 11- Post-gradular groove of tergites II medially broken, tergum 6 without median carina basally (Fig. 32), antennae, legs and tergum VI black.
 *Coelioxys afra* Lepeletier, 1841
 - Post-gradular groove of tergites II complete, tergum VI with median carina basally, antennae, legs and tergum VI red (Fig. 33). *Coelioxys haemorrhoea* Förster, 1853
 12- Tergum II with sublateral fovea on each side behind post-gradular groove (Fig. 34) (subgenus *Boreocoelioxys*).....
 *Coelioxys inermis* (Kirby, 1802)
 - Tergum II without fovea behind post-gradular groove (Fig. 35) (subgenus *Coelioxys*).
 *Coelioxys quadridentata* (Linnaeus, 1758)

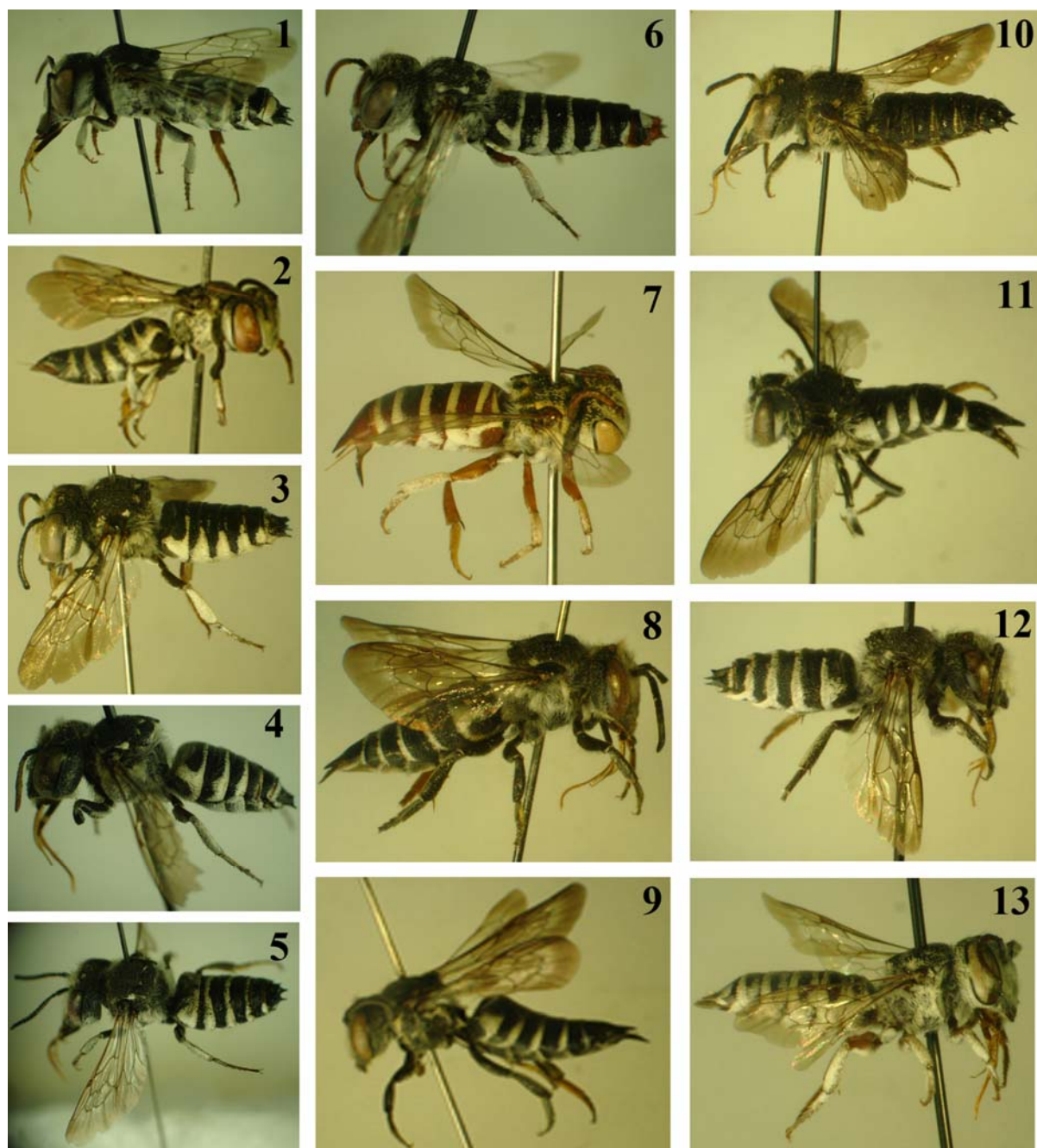
Discussion

Hitherto, twelve species of genus *Coelioxys* have been reported from Iran. Therefore, with six new records of the genus *Coelioxys* from Iran, the number of species increased to 18 (Table 1). The subgenus *Liothyrapis* and species *Coelioxys (Liothyrapis) decipiens* Spinola, 1838 is reported for the first time from Iran. As a result, four subgenera of the genus *Coelioxys* including *Allocoelioxys*, *Boreocoelioxys*, *Coelioxys* and *Liothyrapis* have been reported from Iran so far. *Allocoelioxys* is one of the large subgenera of genus *Coelioxys* with 75 described species and is numerically the most diverse in the world (Ascher and Pickering, 2013), including the Palaearctic region from Europe to China and Taiwan; to the south it occurs in all of Africa and southern Asia (Michener, 2007). With three new records, this

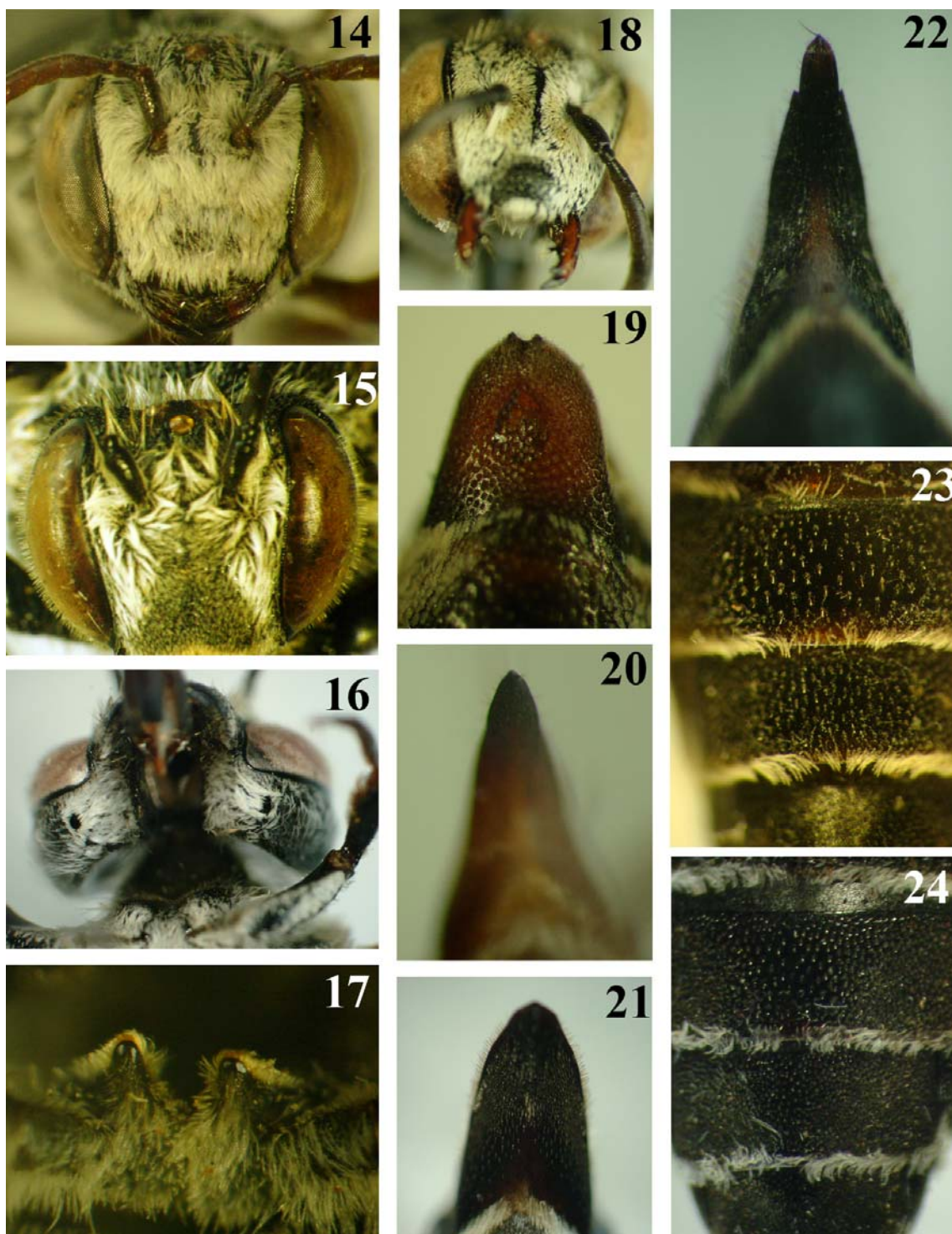
subgenus includes 12 species in Iran. Among them, *Coelioxys (Allocoelioxys) semenowi* has restricted distribution and occurs in the northern Asia (Warncke, 1992). The host of *C. semenowi* is unknown. The species was collected in Malard by Malaise trap where a large number of an unidentified species of genus *Megachile (Eutricharea)* also was captured at the same time. Hence, it seems that *C. semenowi* may parasitize *Megachile (Eutricharea)* sp.

The subgenus *Boreocoelioxys* has 37 described species in the world (Ascher and Pickering, 2013), including America (from northern Canada to Costa Rica, and from the Atlantic to the Pacific coast) and Eurasia (from Europe to Japan) (Michener, 2007). Unlike subgenus *Allocoelioxys* that occurs in the old world, subgenus *Boreocoelioxys* has a Holarctic distribution. Considering *Coelioxys (Boreocoelioxys) inermis* as new record species, this subgenus has three species in Iran. *Coelioxys (B.) inermis* has widely distributed from Europe to East Asia (Amiet *et al.*, 2004), where its hosts including *Megachile (Megachile) centuncularis* (Linnaeus, 1758), *Megachile (Megachile) versicolor* Smith, 1844, *Megachile (Megachile) alpicola* Alfken, 1924 and *Megachile (Megachile) lapponica* Thomson, 1872 are widely distributed (Ascher and Pickering, 2013). Two latter species are not reported for Iranian megachilid fauna. Henceforth, we expect to report the species from Iran, particularly *M. alpicola* that previously was reported from Turkey and Caucasus (Ascher and Pickering, 2013), the neighbor countries to Iran.

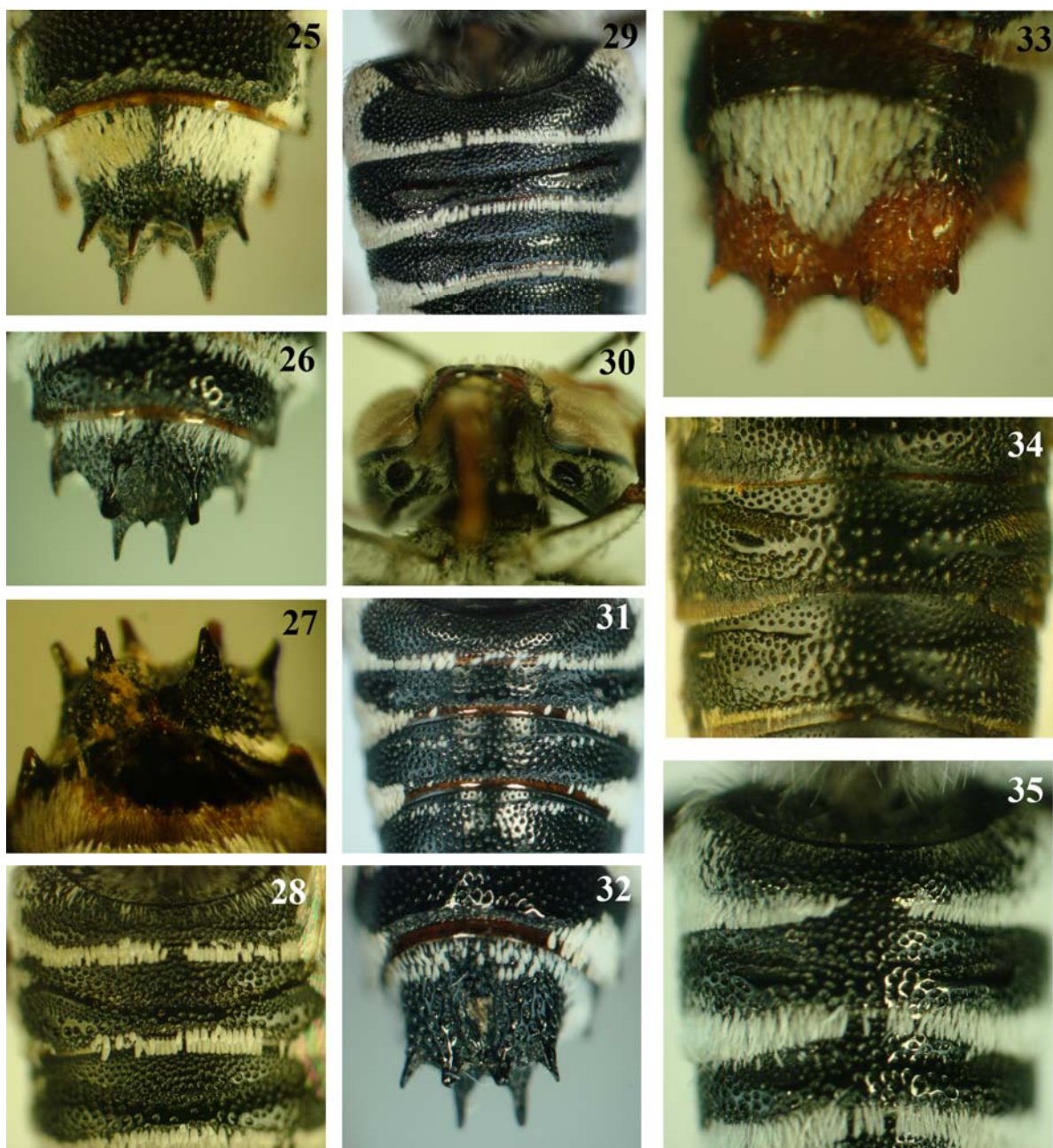
Ascher and Pickering (2013) listed 20 species of subgenus *Coelioxys* in the world. Like subgenus *Boreocoelioxys*, the subgenus is distributed in Holarctic region (Michener, 2007). With *Coelioxys (Coelioxys) quadridentata* as a new record species, this subgenus contains three species in Iran so far. Among its various host species, the anthidiine bee *Trachusa (Trachusa) byssina* (Panzer, 1798) is not reported for Iranian fauna (Ascher and Pickering, 2013). However, this host has previously been reported from Turkey and Armenia, at neighboring Iran. So, presence of *T. byssina* in Iran is expected.



Figures 1-13. Female and male lateral habitus: 1- *Coelioxys acanthura* (male), 2- *Coelioxys afra* (female), 3- *Coelioxys afra* (male), 4- *Coelioxys brevis* (male), 5- *Coelioxys emarginata* (male), 6- *Coelioxys haemorrhhoa* (male), 7- *Coelioxys semenowi* (female), 8- *Coelioxys elongata*, 9- *Coelioxys inermis* (female), 10- *Coelioxys inermis* (male), 11- *Coelioxys conoidea* (female), 12- *Coelioxys quadridentata* (male), 13- *Coelioxys decipiens* (female).



Figures 14-24. 14- *Coelioxys decipiens*: head in frontal view, 15- *Coelioxys conoidea*: head in frontal view, 16- *Coelioxys emarginata*: head in lower view, showing genal fossa and front coxa, 17- *Coelioxys inermis*: front coxa, 18-19- *Coelioxys afra*: 18- head in frontal view, 19- sternum VI, 20- *Coelioxys semenowi*: sternum VI, 21- *Coelioxys conoidea*: sternum VI, 22- *Coelioxys inermis*: sternum VI, 23- *Coelioxys elongata*: sternum III and IV, 24- *Coelioxys inermis*: sternum III and IV.



Figures 25-35. 25- *Coelioxys acanthura*: tergum VI, 26- *Coelioxys quadridentata*: tergum VI, 27-28- *Coelioxys acanthura*: 27- tergum VII, 28- tergum II, 29- *Coelioxys brevis*: tergum II, 30-32- *Coelioxys afra*: 30- genal fossa, 31- tergum II, 32- tergum VI, 33- *Coelioxys haemorrhhoa*: tergum VI, 34- *Coelioxys inermis*: tergum II, 35- *Coelioxys quadridentata*: tergum II.

Table 1 Updated checklist of *Coelioxys* species (Hym., Megachilidae) in Iran.

Species	References
<i>Coelioxys (Allocoelioxys) acanthura</i> (Illiger, 1806)	present study
<i>Coelioxys (Allocoelioxys) afra</i> Lepeletier, 1841	Khaghaninia <i>et al.</i> (2010), present study
<i>Coelioxys (Allocoelioxys) artemis</i> Schwarz, 2001	Schwarz (2001)
<i>Coelioxys (Allocoelioxys) brevis</i> Eversmann, 1852	Morice (1921), present study
<i>Coelioxys (Allocoelioxys) echinata</i> Förster, 1853	Grace (2010)
<i>Coelioxys (Allocoelioxys) emarginata</i> Förster, 1853	present study
<i>Coelioxys (Allocoelioxys) haemorrhoea</i> Förster, 1853	Alfken (1927), present study
<i>Coelioxys (Allocoelioxys) iranica</i> Warncke, 1992	Warncke (1992)
<i>Coelioxys (Allocoelioxys) polycentris</i> Förster, 1853	Grace (2010)
<i>Coelioxys (Allocoelioxys) semenowi</i> Morawitz, 1894	present study
<i>Coelioxys (Allocoelioxys) warncke</i> Schwarz & Gusenleitner, 2003	Schwarz and Gusenleitner (2003)
<i>Coelioxys (Boreocoelioxys) elongata</i> Lepeletier, 1841	Morice (1921), present study
<i>Coelioxys (Boreocoelioxys) inermis</i> (Kirby, 1802)	present study
<i>Coelioxys (Boreocoelioxys) rufescens</i> Lepeletier & Audinet-Serville, 1825	Alfken (1935)
<i>Coelioxys (Coelioxys) aurolimbata</i> Förster, 1853	Warncke (1992)
<i>Coelioxys (Coelioxys) conoidea</i> (Illiger, 1806)	Morice (1921), Alfken (1935), present study
<i>Coelioxys (Coelioxys) quadridentata</i> (Linnaeus, 1758)	present study
<i>Coelioxys (Liothyrapis) decipiens</i> Spinola, 1838	present study

Coelioxys (Liothyrapis) with 22 described species (Ascher and Pickering, 2013) is an old world subgenus that occurs throughout Africa, northward to the eastern Mediterranean basin, thence eastward to the Trans-Caspian region and through India to Southeast Asia and Indonesia (Michener, 2007). Only one species (i.e. *L. decipiens*) is reported from eastern Mediterranean and the Middle East (Grace, 2010). *Megachile (Pseudomegachile) nigripes* Spinola, 1838 as a host for the cleptoparasitic bee is not reported for Iranian megachilid fauna. With regard to presence of the host in Turkey, we expect that *M. nigripes* should be present in Iran.

Among 15 subgenera of genus *Coelioxys*, 6 subgenera including *Allocoelioxys*, *Boreocoelioxys*, *Coelioxys*, *Liothyrapis*, *Mesocoelioxys*, *Torridapis* occurred in eastern hemisphere (Michener, 2007). Although there are some species of first four subgenera in Iran, monotypic subgenus *Mesocoelioxys* merely are reported from eastern Mediterranean and *Torridapis* are distributed in Africa, Oriental and Australia (Warncke, 1992; Gupta, 1993; Wu, 2006; Grace, 2010).

Faunistic and taxonomic studies are first steps towards conservation of the bee fauna. Moreover, declines in bees have prompted much justified concern over the potential impacts on food production and ecosystem stability (Biesmeijer *et al.*, 2006). With regard to role of cleptoparasitic bees, recently Sheffield *et al.*, (2013) indicated that diversity and abundance of cleptoparasites in relation to all bees is indicative of status of the total bee and healthy communities. Therefore, studies of cleptoparasitic bees may closely track bee diversity and abundance.

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References

- Alfken, J. D. 1924. Beitrag zur Kenntnis einiger Bienen Finlands. *Notulae Entomologicae* (Helsinki), 4: 33-40.
- Alfken, J. D. 1927. Zur Erforschung des Persischen Golfes. *Mitteilungen aus dem Entomologischen Verein in Bremen*, 16: 148-152.
- Alfken, J. D. 1935. Beitrag zur Kenntnis der Bienenfauna von Persien. *Mitteilungen aus dem Entomologischen Verein in Bremen*, 23: 21-24.
- Amiet, F., Herrmann, M., Müller, A. and Neumeyer, R. 2004. *Apidae 4: Anthidium, Chelostoma, Coelioxys, Dioxys, Heriades, Lithurgus, Megachile, Osmia, Stelis*. *Fauna Helvetica*. Vol. 9. Centre Suisse de Cartographie de la Faune (CSCF)/Schweizerische Entomologische Gesellschaft (SEG), 274 pp.
- Ascher, J. S. and Pickering, J. 2013. *Discover life's bee species guide and world checklist*. Available on: <http://www.discoverlife.org> (accessed February 1, 2013).
- Banaszak, J. and Romasenko, L. 1998. *Megachilid Bees of Europe (Hymenoptera, Apoidea, Megachilidae)*. Bydgoszcz University, Bydgoszcz, 239 pp.
- Biesmeijer, J. C., Roberts, S. P. M., Reemer, M., Ohlemüller, R., Edwards, M., Peeters, T., Schaffers, A. P., Potts, S. G., Kleukers, R., Thomas, S. D., Settele, J. and Kunin, W. E. 2006. Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands. *Science*, 313 (5785): 351-354.
- Curtis, J. 1828. *British entomology*. Vol. 5. No. 222. Privately published, London.
- Eversmann, E. 1852. *Fauna hymenopterologica volgo-uralensis*. *Bulletin de la Société Impériale des Naturalistes de Moscou*, 25: 1-137.
- Fabricius, J. C. 1787. *Mantissa Insectorum*. Vol. 1. Proft, Copenhagen, 348 pp.
- Förster, A. 1853. *Eine Centurie neuer Hymenopteren*. Sechste bis zehnte Dekade. *Verh. naturh. Ver. preuss. Rheinland*, 10: 266-362.
- Gerstäcker, A. 1869. Beiträge zur näheren Kenntniss einiger Bienen-Gattungen. *Entomologische Zeitung (Stettin)*, 30:137-185, 315-367.
- Grace, A. 2010. *Introductory Biogeography to Bees of the Eastern Mediterranean and Near East*. Bexhill Museum, Sussex, United Kingdom: 284 pp.
- Gupta, R. K. 1993. *Taxonomic studies on the Megachilidae of North-western India (Insecta, Hymenoptera, Apoidea)*. India Council of Agricultural Research. New Dehli. [Reprint: 1999, Scientific Publishers (India) Jodhpur, 294 pp.
- Illiger, K. 1806. *William Kirbys Familien der bienenartigen Insekten mit Zusätzen, Nachweisungen und Bemerkungen*. *Magazin für Insektenkunde*, 5: 28-175.
- Khaghaninia, S., Güler, Y. and Mousavi, M. 2010. *Megachilids bees (Hymenoptera: Apoidea) of Aynali forests with four new records for Iran*. *Munis Entomology & Zoology*, 5: 890-895.
- Kirby, W. 1802. *Monographia Apum Angliae: An attempt to divide into their natural genera and families such species of the Linnean genus Apis as have been discovered in England*. Ipswich. Vol. 1, 258 pp. Vol. 2, 388 pp., 18 pls.
- Latreille, P. A. 1799. *Observation sur l'Abeille tapissière de Réaumur*. *Bulletin de la Société Philomathique de Paris*, 2: 33.
- Lepelletier, A. 1841. *Histoire Naturelle des Insectes. Hyménoptères*, vol. 2, Roret, Paris, 680 pp.
- Lepelletier, A. and Serville, A. 1825. [Articles] In: Diderot, M. et al. (Eds.) *Encyclopédie Méthodique, Histoire Naturelle. Insectes*. Vol. 10. Paris, 344 pp.
- Linnaeus, C. 1758. *Insecta Hymenoptera*. In: *Systema Naturae*. 10th edn. Vol. 1, 2. L. Salvii, Holmiae [Stockholm], pp. 574-579.
- Linnaeus, C. 1761. *Apis*. In: *Fauna Suecica*. 2nd edn. Vol. 2. pp. 419-426.
- McKinney, M. L. 1997. *Extinction vulnerability and selectivity: combining ecological and*

- paleontological views. *Annual Review of Ecology and Systematics*, 28: 495-516.
- Michener, C. D. 2007. *The Bees of the World*. Second edition. Baltimore: Johns Hopkins University Press, 953 pp.
- Morawitz, F. 1894. Supplement zur Bienenfauna Turkestans. *Horae Societatis Entomologicae Rossicae* (St. Petersburg), 28: 1-87.
- Morice, F. D. 1921. Annotated lists of Aculeate Hymenoptera (except Heterogyna) and Chrysidids recently collected in Mesopotamia and north-west Persia. II. *Journal-Bombay Natural History Society*, 28: 192-199.
- Nagase, H. 2006. Synopsis of the bee genus *Coelioxys* Latreille (Hymenoptera: Megachilidae) of Japan, with description of a new species. *Entomological Science*, 9: 223-238.
- Ortiz-Sánchez, F. J., Torres, F. and Ornos, C. 2009. Claves de identificación para las especies ibéricas del género *Coelioxys* Latreille, 1809 (Hymenoptera, Apoidea, Megachilidae). *Graellsia*, 65 (2): 155-170.
- Panzer, G. W. F. 1798. *Faunae insectorum germanicae initia; oder Deutschlands insecten gesammelt und herausgegeben von D. G. W. F. Pnzer*. Nürnberg, Germany.
- Rozen, J. G., Jr. 2000. Systematic and geographic distributions of neotropical cleptoparasitic bees, with notes on their modes of parasitism, In: M. M. G. Bitondi M. M. G. and Hartfelder, K. (Eds.), *Anais do IV Encontro sobre Abelhas*. Ribeirão Preto, Universidade de São Paulo, Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto, pp. 204-210
- Schwarz, M. 2001. Revision der Gattung *Radoszkowskiana* Popov 1955 und ein Beitrag zur Kenntnis der Gattung *Coelioxys* Latreille 1809 (Hymenoptera: Apidae: Megachilinae). *Linzer Biologische Beiträge*, 33 (2): 1267-1286.
- Schwarz, M. and Gusenleitner, F. 2003. Ergebnisse der Untersuchung von F. Morawitz beschriebener *Coelioxys*-Arten, so wie weiterer von Eversmann, Friese und Radoszkowski beschriebener Arten, nebst einigen Bemerkungen (Hymenoptera: Apidae: Megachilinae). *Linzer Biologische Beiträge*, 35 (2): 1221-1239.
- Sheffield, C. S., Pindar, A., Packer, L. and Kevan, P. G. 2013. The potential of cleptoparasitic bees as indicator taxa for assessing bee communities. *Apidologie* 44: DOI 10.1007/s13592-013-0200-2.
- Smith, F. 1844. Descriptions of the British Mason-bees (genus *Osmia* of Panzer) being a section of the dasygastres, or hairy-bellied bees of Latreille: With details of their economy. *The Zoologist* (London), 2: 737-748.
- Spinola, M. 1808. *Insectorum liguriae species novae aut rariores quas in agro ligustico nuper deterit*. Vol. 2, Gravier, Genuae [Genova], 262 pp., 5 pls.
- Spinola, M. 1838. *Compte rendu des Hymenopteres recueillis par M. Fischer pendant son voyage en Egypte*. *Annales de la Société Entomologique de France*, 7: 437-546.
- Thomson, C. G. 1872. *Hymenoptera Scandinaviae*. *Skandnaviens Hymenoptera*. Vol. 2, Berling, Lund, 286 pp., 1 pl.
- Warncke, K. 1992. Die westpaläarktischen Arten der Bienengattung *Coelioxys* Latr. (Hymenoptera, Apidae, Megachilinae). *Bericht der Naturf Gesellsch Augsburg*, 53: 31-77.
- Wu, Y. R. 2006. *Hymenoptera: Megachilidae, Fauna Sinica, Insecta*. Vol. 44. Science Press, Beijing, 474 pp.

مطالعه مقدماتی زنبورهای کلیتوپارازیت جنس *Coelioxys* (Hymenoptera: Megachilidae) در شمال ایران به همراه گزارش شش رکورد جدید

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چکیده: مطالعه فون زنبورهای خانواده Megachilidae در شمال ایران در سال‌های ۱۳۸۹-۱۳۹۰ منجر به شناسایی یازده گونه از جنس *Coelioxys* Latreille و از زیر جنس‌های *Allocoelioxys* (۶ گونه)، *Borecoelioxys* (۲ گونه)، *Coelioxys* (۲ گونه) و *Liothyrapis* (۱ گونه) شد. از میان آنها، شش گونه و یک زیرجنس (*Liothyrapis*) برای اولین بار از ایران گزارش می‌شود. ویژگی‌های مورفولوژیک افتراقی، کلید شناسایی گونه‌های جنس *Coelioxys* و لیست به‌روز شده کلیه گونه‌هایی که از ایران گزارش شده‌اند ارائه شده است.

واژگان کلیدی: *Coelioxys*، زنبور کلیتوپارازیت، Megachilini، Megachilidae، گزارش جدید، فون