



A survey of the genus *Ceratina* Latreille (Hymenoptera: Apidae) in northern Iran, with three new records

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ABSTRACT. A field survey of the bee fauna was conducted in the north of Iran during 2009 to 2015. Special concern was given to the tribe Ceratinini (Hymenoptera; Apidae). Ten species of the genus *Ceratina* Latreille 1802 were collected and identified in the present study. Three species are recorded for the first time from Iran, including *Ceratina* (*Euceratina*) *chrysomalla* Gerstaecker 1869, *Ceratina* (*Euceratina*) *cyanea* (Kirby, 1802) and *Ceratina* (*Euceratina*) *gravidula* Gerstaecker, 1869. An updated checklist of Iranian Ceratinini with short description and figures of newly recorded species are provided. The host plants and distribution of each species are also given.

Key words: *Ceratina*, Apidae, Checklist, Iran.

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Introduction

The Iranian plateau is located in the Palearctic region bordering the Oriental and African zones, supports a particularly rich bee fauna (Warncke 1979, 1980, 1981, 1985). Apidae, with about 6000 species, is the most diverse family of bees worldwide, containing three subfamily, 33 tribes, 174 genera and 253 subgenera (Ascher and Pickering 2016; Michener 2007). All subfamilies (Apinae, Nomadinae and Xylocopinae) occur in Iran. Xylocopinae (Allodapini, Ceratinini, Manuelini and Xylocopini), with about 1000 species, is smallest subfamily in Apidae.

Three tribes belong to the subfamily Xylocopinae including Allodapini (1 species), Ceratinini (13 species) and Xylocopini (14 species), are present in Iran (Ascher and Pickering 2016). The Ceratinini are small solitary bees (3–15 mm), with generally shining, superficially nearly hairless bodies that vary from black to brilliant metallic green, rarely with the metasoma red or metallic red (Michener 2007; Terzo and Rasmont 2004). All species are typically nesting in pithy stems and forming relatively simple linear nests therein (Ali *et al.* 2016).

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Their nesting behaviour restrict their distribution to habitats rich in brambles (*Rubus* species) or in substitution plants (as *Verbascum* species). All the Palearctic and Oriental species belong to the genus *Ceratina* Latreille 1802. This genus is cosmopolitan and with 366 described species. Among the countries bordering Iran, the *Ceratina* fauna of Turkey with 28 species, is the most diverse. During the last century, foreign workers mainly studied the fauna and taxonomy of Iranian bees (Morice 1921; Popov 1967; Warncke 1979, 1980, 1981, 1985). This survey on the bees of tribe Ceratinini in the north of Iran follows the same approach as other previous main surveys of the Iranian

bee fauna in the last decade (Allahverdi *et al.* 2015, 2016 (in press); Dehghan *et al.* 2015; Nadimi *et al.* 2013a, b, 2014; Khodaparast and Monfared 2012; Khaghaninia *et al.* 2010, 2013). In the present work, we document the data on the Iranian species of Ceratinini including short descriptions and figures of newly recorded bees, their host plant associations, distributions and an updated checklist.

Material and methods

This study was conducted in the north of Iran, where situated at Alborz Range eco-region (Fig. 1).

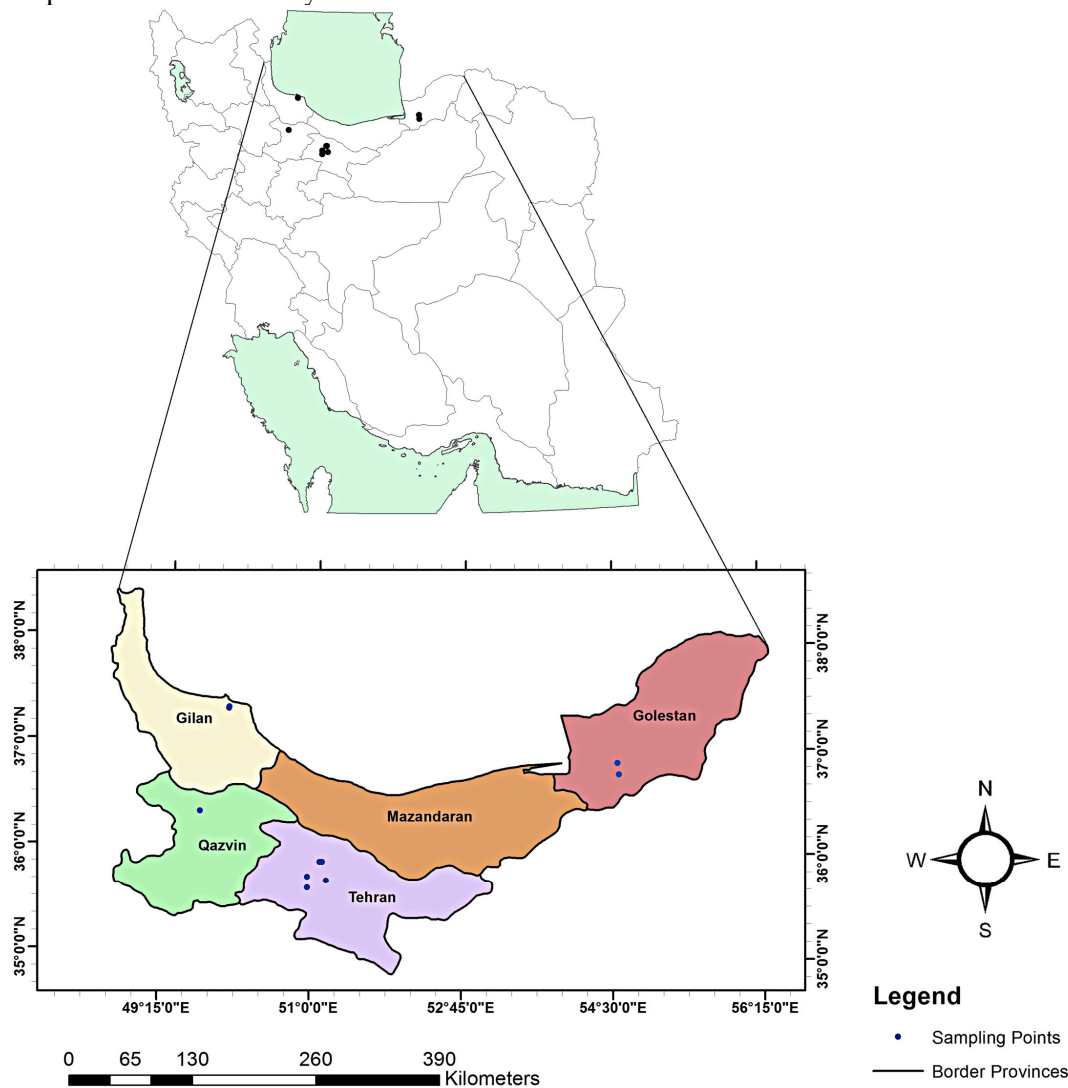


Figure 1. A field collection map of various localities of the north of Iran by GPS coordinates.

This area form diverse and vast regions of mountain, lush irrigated lowlands, wetland and desert with a great biodiversity of bees which is associated with the diverse flora, topographical irregularity and the xeric landscapes (Grace 2010). Samples were collected using both 32 Malaise traps and the sweep net from 2010 to 2015. Information for each specimen caught, such as location and altitude of the collection site, were recorded with a GPS device (Garmin GPS map 62s and Garmin geko 301). Specimens from Malaise traps were preserved in 70% ethanol. Bees were collected by insect nets, killed with ethyl acetate. Specimens were later pinned, prepared according to the standard methods and stored until their identification to species level. Specimens were examined under Olympus (SZ) stereomicroscope using major keys including Michener (2007), Terzo *et al.* (2007), Terzo (1998) and Schwarz (1998). The photographs were taken using an Canon Mark-II 5D (Canon Inc., Tokyo, Japan) camera assembled onto a stereomicroscope Leica 205C (Leica Microsystems, Wetzlar, Germany) and Helicon Remote 3.6.6.w software by the fourth author of this paper. As a mount was essentially not flat, a series of photographs was made at different focal depth. Then, they were compiled into one sharp image using Helicon Focus Pro 6.6.1 (Helicon Soft Ltd, Kharkov, Ukraine) software. For measurements used Quick-Photo Micro v2.3 (PROMICRA, s.r.o., Czech Republic) software. The morphological terminology were used in the descriptions follows Michner (2007). All specimens are deposited in Entomological Collection of Gorgan

University of Agricultural Sciences and Natural Resources (GUASNR).

Results

Of thirty collected specimens of the genus *Ceratina*, ten species are identified in the present study. Three species are recorded for the first time from Iran, including *Ceratina (Euceratina) chrysomalla* Gerstaecker 1869, *Ceratina (Euceratina) cyanea* (Kirby, 1802) and *Ceratina (Euceratina) gravidula* Gerstaecker, 1869. The bees are listed alphabetically and short descriptions are presented for the newly recorded species.

Ceratina (Euceratina) acuta Friese, 1896

Material examined: Guilan province, Astane-e Ashrafiye, Eshmankomachal, (N37°21'10.50", E 49°57'56.16"), 14 June 2009, 1 ♀, Malaise trap; Astaneh-e ashrafiye, (37°22'03.66"N, 49°57'57.84"E), 12 July 2010, 2 ♀♀, Malaise trap, leg. A. Nadimi.

General distribution: Iran, Turkmenistan, Kazakhstan, Armenia, Georgia, Lebanon, Crete, Turkey, AUT, Greece, European Russia, Ukrain, Romania (Terzo 1998; Ascher and Pickering 2016).

Ceratina (Euceratina) chalcites Germar, 1839

Material examined: Tehran province, Shahriar, (35°40'08.10"N, 50°56'56.64"E), 25 May 2010, 1 ♂, Malaise trap; Alborz province, Chalous road, Arange (35°46'08.88"N, 50°56'55.20"E), 29 June 2010, 3 ♀♀, Malaise trap; Qazvin province, Kuhin (36°22'14.22"N, 49°40'2.38'02.28"E), 20 June 2011, 1 ♀, Malaise trap, leg. A. Nadimi.

General distribution: Turkmenistan, Iran, Ukraine, Georgia, Turkey, Syria, Greece, European Russia, Croatia, Switzerland, Spain and Portugal (Terzo 1998; Ascher and Pickering 2016).

***Ceratina (Euceratina) chrysomalla*
Gerstaecker, 1869**

Material examined: Alborz Province, Chalous Road, Arangeh (35°55'07.20"N, 51°05'09.24"E); 29 June 2010, 1♂, Malaise trap; Karaj, Mohammadshahr (35°46'20.16"N, 50°56'44.94"E); 20 June 2010, 2♀♀, Malaise trap, leg. A. Nadimi.

General distribution: Azerbaijan, Ukraine, Romania, Bulgaria, Crete, Cyprus and Turkey (Schwarz 1998; Terzo 1998, Terzo *et al.* 1999, Ascher and Pickering 2016). New record for Iran.

Short description: Female. Cuticle with green metallic reflections; tergite 6 dark green (Fig. 2, 3); clypeus punctate, sparse impunctate in midline, with yellow pale mark (Fig. 3); supra-antennal areas, paraocular areas and mesoscutum densely punctate; length 11–12 mm.

Male. General coloration similar to female; head, thorax (except mesonotum), tergite 1–6 and sternites 1–5 golden metallic; mesonotum dark metallic; clypeus punctate, sparse impunctate in midline, with yellow pale mark (Fig. 4), supra-antennal areas, paraocular areas and mesoscutum densely punctate; tergite 7 bidentate, length 11.5 mm.

***Ceratina (Euceratina) cyanea* (Kirby, 1802)**

Synonyms: *Apis cyanea* Kirby, 1802; *Ceratina nitidula* Spinola, 1806; *Ceratina coerulea*; **homonym** Chevrier, 1872; *Ceratina chevrieri* Tournier, 1876; *Ceratina cyanea var imitatrix* Markowsky, 1938

Material examined: Alborz province, Chalous road, Sarziarat (35°55'10.38"N, 51°06'51.24"E), 6 July 2010, 1♀, Malaise trap, leg. A. Nadimi; Golestan province, Gorgan, Sorkhankalate (36°53'31.69"N, 54°34'6.23"E), 28 July 2015; 2♂♂, *Thymus vulgaris*, leg. M. Salarian.

General distribution: Turkmenistan, Kazakhstan, Libya, Azerbaijan, Georgia, Turkey, Creta, Algeria, Spain, European Russia, Ukraine, Hungary, Slovenia, Italy, Poland, Lithuania, Belgium, United Kingdom, Sweden (Terzo 1998; Ascher and Pickering 2016). New record for Iran.

Short description: Female: Forewing longer than 4.5 mm and cuticle, at least on terga 4–5, with metallic blue reflections (Fig. 5); clypeus and pronotal lobes black, clypeus very often completely punctate and pronotal lobes with or without pale mark (Fig. 6); fore tibia with a short basal pale mark, never extended to mid-length in female; hypostomal carina weakly developed and curved; at least wax mirror of sternum 2 inconspicuous, very short, and crescent moon shaped; punctation on frons, on each lower side of median ocellus, uniformly dense.

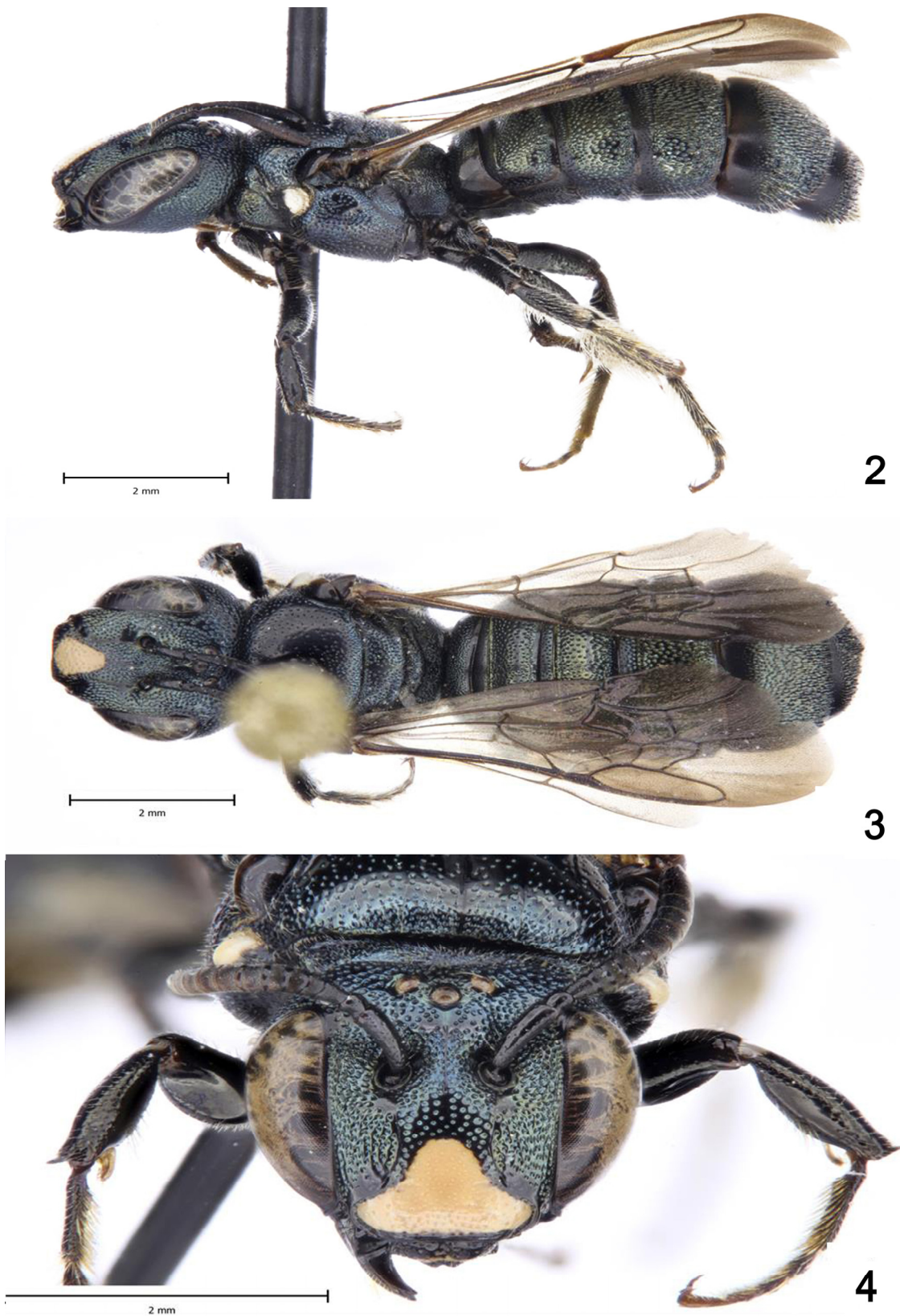
Male: clypeus completely pale (Fig. 7); hind tibia with ventral pubescence dense and longer than greatest width of tibia (Fig. 8); hypostomal carina weakly developed and curved; hind femur with ventral pubescence shorter than greatest width of femur; apex of tergite 7 with two close and acute teeth.

***Ceratina (Euceratina) gravidula* Gerstaecker, 1869**

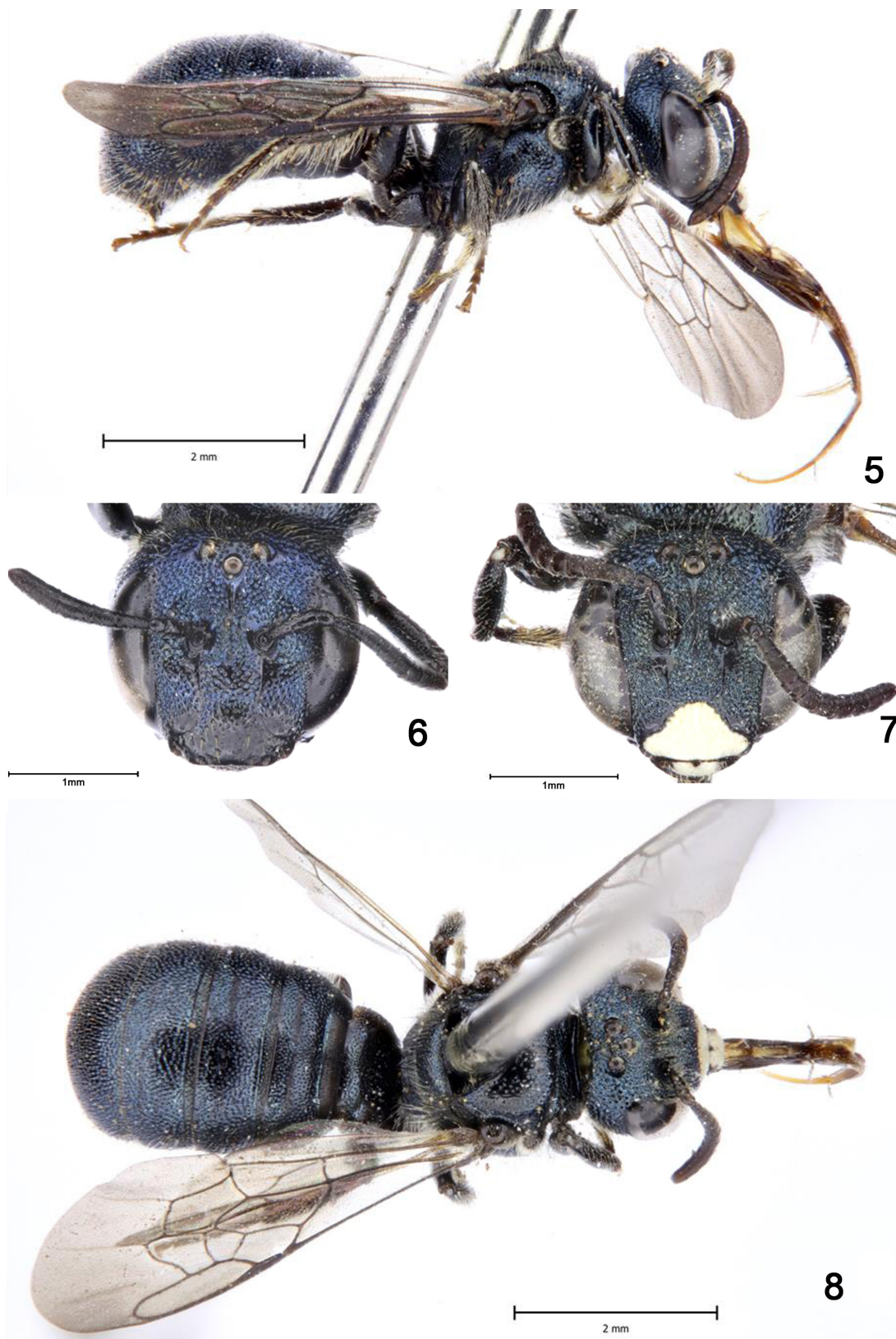
Material examined: Tehran province, Shahriar (35°40'03.06"N, 50°56'52.14"E), 1 June 2010, 1♂, Malaise trap, leg. A. Nadimi.

General distribution: Russia, Portugal, Spain, France, Germany, Italy, Slovenia, Moravia, Hungary, Montenegro, Greece, Bulgaria, Romania, Ukraine, Georgia and Turkey (Terzo and Rasmont 1996; Terzo and Ortiz-sanchez 2004, Ascher and Pickering 2016). New record for Iran.

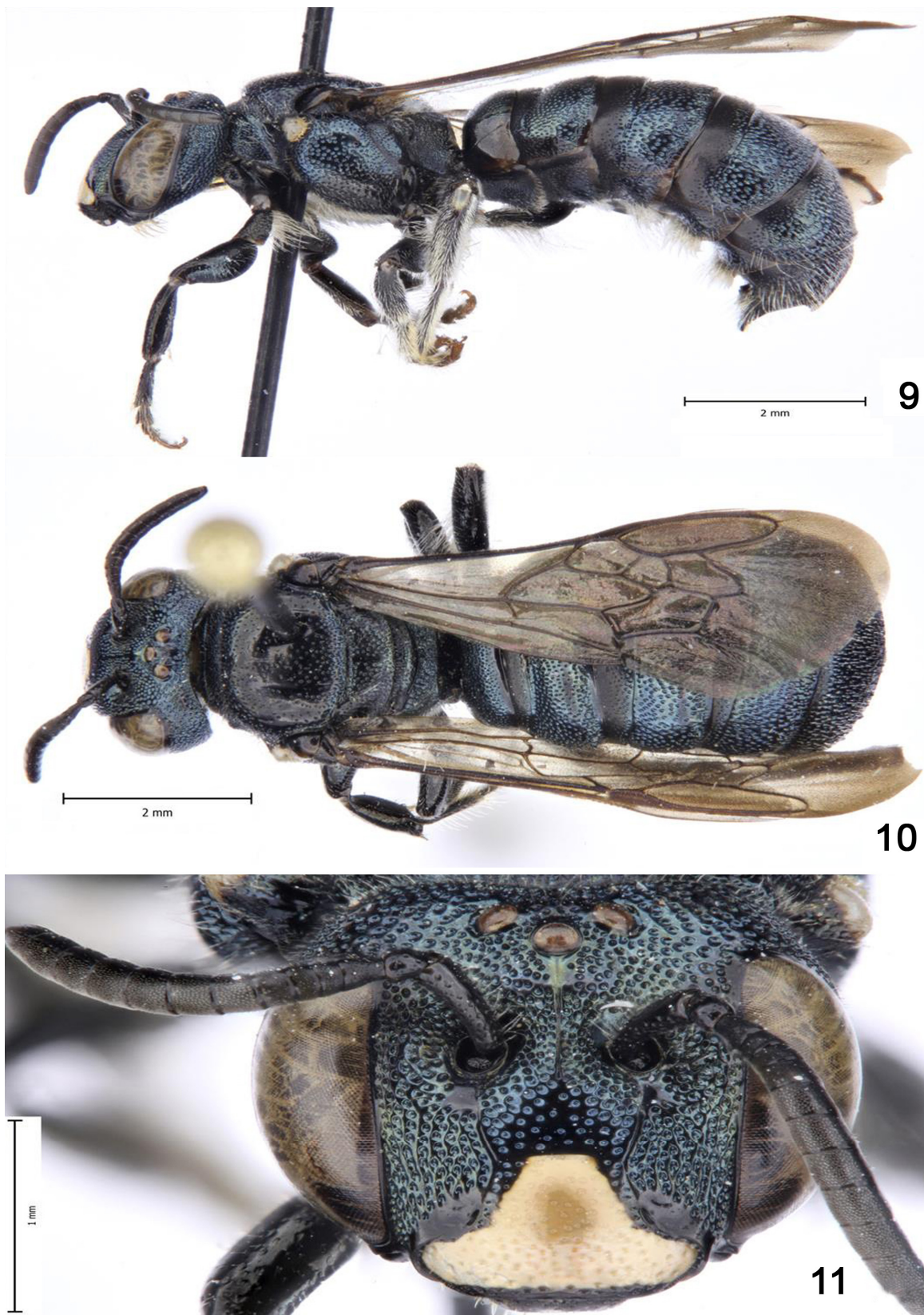
Short description: Male. General coloration is blue metallic and sternites black (Figs. 9, 10); mesonotum with scattered and orderly punctate (Fig. 10); labrum black; clypeus punctate and with longitudinal band impunctate in the middle (Fig. 11); sternites 2–5 hairless except short hairs at the central margin (Fig. 9); sternite 6 in the posterior margin with 3 middle lobe and a little short at the end; tergite 7 long and bilobe; posterior tarsus with spine in the first quarter and hairy.



Figures 2-4: *Ceratina (Euceratina) chrysomalla*; 2. General habitus in lateral view, 3. The same in dorsal view (female), 4. Head in frontal view (male).



Figures 5-8: *Ceratina (Euceratina) cyanea*; 5. Female general habitus in dorsal view, 6. Female head in frontal view, 7. Male head in frontal view, 8. Male general habitus in dorsal view.



Figures 9-11: *Ceratina (Euceratina) gravidula*; 9. General habitus in dorsal view, 10. the same in lateral view, 11. head in frontal view.

***Ceratina (Euceratina) laevifrons* Morawitz 1895**

Material examined: Tehran province, Shahriar (35°40'08.10"N, 50°56'56.64"E), 1 June 2010, 1 ♂, Malaise trap; Shahriar (35°40'03.06"N, 50°56'52.14"E), 25 May 2010, 2 ♂♂, Malaise trap, leg. A. Nadimi.

General distribution: India, Pakistan, Iran, Uzbekistan, Turkmenistan, Kyrgyzstan, Kazakhstan (Ascher and Pickering 2016).

***Ceratina (Euceratina) nigroaenea* Gerstaecker, 1869**

Material examined: Tehran province, Shahriar (35°40'08.10"N, 50°56'56.64" E), 25 May 2010, 1 ♂; 1 June 2010, 1 ♂; 8 June 2010, 1 ♀, Malaise trap, leg. A. Nadimi.

General distribution: Russia, Iran, Armenia, Georgia, Israel, Turkey, Crete, Greece (Terzo and Rasmont 1996; Ascher and Pickering 2016).

***Ceratina (Euceratina) tibialis* Morawitz, 1895**

Material examined: Tehran province, Peykanshahr, Faculty of Agricultural, Tarbiat Modares University (35°44'29.19"N, 51°09'58.88"E), 12 July 2009, 2 ♂♂, *Cirsium vulgare*, 14 July 2009, 1 ♀, *Salvia officinalis*, 7 September 2009, 1 ♂, *Malva* sp., leg. A. Nadimi.

General distribution: Uzbekistan, Turkmenistan, Iran, Azerbaijan, Turkey, Lebanon (Terzo 1998; Ascher and Pickering 2016).

***Ceratina (Euceratina) zwakhalsi* Terzo & Rasmont, 1997**

Material examined: Guilan province, Astane-e Ashrafiye, Eshmankomachal (37°22'03.66"N, 49°57'57.84"E), 4 June 2009, 1 ♀, *Malva* sp., Alborz province, Chalous road, Gach Sar, (35°46'20.16"N, 50°56'44.94"E), 12 June 2010, 1 ♂, Asteracea, leg. A. Nadimi.

General distribution: Russia, Kazakhstan, Turkmenistan, Iran, Azerbaijan, Georgia, Turkey, Lebanon (Terzo 1998; Ascher and Pickering 2016).

***Ceratina (Neoceratina) nigra* Handlirsch, 1889**

Synonym: *Ceratina nitidula* Morawitz, 1892; *Ceratina hladili* Kocourek, 1998; *Ceratina kocoureki* Schwarz, 1998

Material examined: Alborz province, Chalous road, Arangeh (N35°46'20.16", 50°56'44.94"E), 20 June 2010, 2 ♀♀, 1 ♂, Malaise trap, leg. A. Nadimi.

General distribution: Iran, Kazakhstan, Brazil, Turkmenistan, Tajikistan, Kyrgyzstan (Hirashima 1971, Terzo and Rasmont 1996; Terzo 1998; Ascher and Pickering 2016).

Discussion

Before the present study, 13 species of tribe Ceratinini were known in Iran. According to the results of this research, the number of recorded *Ceratina* species of Iran increased to 16 (Table1). *C. chrysomalla* is distributed in eastern and southeast Europe and also in all regions of Turkey, Cyprus and Azerbaijan (Terzo 1998; Ascher and Pickering 2016). The bee is polylectic and univoltine and with peak abundance between May and June (Terzo 1998). *Ceratina cyanea* is a European bee that also distributed in the Caucasus, Ural Mountains, Algeria and Tunisia (Terzo 1998; Ascher and Pickering 2016; Gogala, 2016). It is a polylectic and univoltine bee, flies from April to September and nests in hollow plant stems of *Sambucus* sp., *Euphorbia characias* L. and *Vitis vinifera* L. (Terzo 1998; Gogala 2016). Rust *et al.* (2003) showed also *C. cyanea* was one of numerically dominant species of *Ecballium elaterium* (L.) (Cucurbitaceae) that visited flowers later in the day. *C. gravidula* is a European bee that also distributed in Russia (Terzo 1998; Ascher and Pickering 2016). The bee is polylectic and univoltine and with peak abundance in July for females; males are regularly flying from May to September (Terzo 1998). Iran, with a great richness of flower species and plant communities, undoubtedly supports a rich diversity of

the bee species. Available data on the bees prompt more surveys to discover and clarify the composition of the Iranian bees, particularly Ceratinini. In the north of Iran, bees (same other beneficial insects) are threatened by factors such as habitat degradation, agricultural intensification

and the misuse of insecticides. The faunistic and taxonomic studies and knowledge of exact geographic distributions of the bees are a must to conserve or exploit them, and even to prevent a threat (e.g. spreading invasive species) to the new environment.

Table 1. Updated Checklist of genus *Ceratina* known from Iran.

	Species	Resources
1	<i>Ceratina (Euceratina) acute</i> Friese, 1896	Ascher and Pickering 2016; Current study
2	<i>Ceratina (Euceratina) chalcites</i> Germar, 1839	Terzo 1998; Grace 2010; Ascher and Pickering 2016; Current study
3	<i>Ceratina (Euceratina) chrysomalla</i> Gerstaecker, 1869 *	Current study
4	<i>Ceratina (Euceratina) chrystella</i> Terzo, 1998	Terzo 1998; Ascher and Pickering 2016
5	<i>Ceratina (Euceratina) cyanea</i> Kirby, 1802 *	Current study
6	<i>Ceratina (Euceratina) dalyi</i> Terzo, 1998	Terzo 1998; Grace 2010; Ascher and Pickering 2016
7	<i>Ceratina (Euceratina) gravidula</i> Gerstaecker, 1896 *	Current study
8	<i>Ceratina (Euceratina) laevifrons</i> Morawitz, 1894	Grace, 2010; Ascher and Pickering, 2016; Current study
9	<i>Ceratina (Euceratina) moricei</i> Friese, 1899	Kodaparast and Monfared 2012; Ascher and Pickering 2016
10	<i>Ceratina (Euceratina) nigroaenea</i> Gerstaecker, 1869	Kodaparast and Monfared 2012; Ascher and Pickering 2016; Current study
11	<i>Ceratina (Euceratina) sakagamii</i> Terzo, 1998	Terzo 1998; Grace 2010; Ascher and Pickering 2016
13	<i>Ceratina (Euceratina) tibialis</i> Morawitz, 1895	Terzo 1998; Grace 2010; Kodaparast and Monfared 2012; Ascher and Pickering 2016; Current study
14	<i>Ceratina (Euceratina) zwakhalsi</i> Terzo and Rasmont, 1997	Grace 2010; Ascher and Pickering 2016; Current study
12	<i>Ceratina (Neoceratina) nigra</i> Handlirsch, 1889	Grace 2010; Ascher and Pickering 2016; Current study
15	<i>Ceratina (Neoceratina) schwarzi</i> Kocourek, 1998	Terzo 1998; Grace 2010; Kodaparast and Monfared 2012; Ascher and Pickering 2016;
16	<i>Ceratina (Pithitis) tarsata</i> Morawitz, 1871	Kodaparast and Monfared 2012; Ascher and Pickering 2016; Current study

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مطالعه زنبورهای گرده افشان جنس *Ceratina* (Hymenoptera: Apidae) در شمال ایران، به همراه سه گزارش جدید

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۳ مرکز نظارت بر محیط زیست کلان‌شهرها و تحقیقات تنوع زیستی و موسسه موسسه جانورشناسی آکادمی ملی علوم، آکادمی لیدوف، کیف، اوکراین

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چکیده: در تحقیق گسترده‌ای که در سال‌های ۱۳۸۸-۱۳۹۴ انجام شد، فون حشرات گرده افشان جنس *Ceratina* Latreille 1802 (Hymenoptera: Apidae) در شمال ایران مورد بررسی قرار گرفت. در مطالعه حاضر ده گونه از جنس *Ceratina* جمع‌آوری و شناسایی شد. از بین آنها سه گونه شامل *Ceratina* (*Euceratina*) *chrysomalla* Gerstaecker 1869 و *Ceratina* (*Euceratina*) *cyanea* (Kirby, 1802) و *Ceratina* (*Euceratina*) *gravidula* Gerstaecker, 1869 برای اولین بار از ایران گزارش می‌شود. فهرست به روز گونه‌های جنس *Ceratina* در ایران همراه با توصیف کوتاه و تصاویر گزارش‌های جدید ارائه گردید. همچنین میزبان و پراکنش آنها به طور مختصر مورد بحث شده است.

واژگان کلیدی: *Ceratina*، زنبورهای گرده‌افشان، فون، ایران