

**A study of the genus *Orthocentrus* (Hymenoptera: Ichneumonidae, Orthocentrinae) in Gilan and Tehran provinces of Iran, with first records of seven species and one subspecies**

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**Abstract**

In this survey, the genus *Orthocentrus* Gravenhorst, 1829 (Hymenoptera: Ichneumonidae, Orthocentrinae) was studied in Tehran and Gilan provinces of Iran. A total of 154 specimens of the genus were collected using Malaise traps during 2010. The genus *Orthocentrus* and its seven species and one subspecies are new records for the fauna of Iran: *O. asper* (Gravenhorst, 1829), *O. castellanus* Ceballos, 1963, *O. hirsutor* Aubert, 1969, *O. protervus* Holmgren, 1858, *O. sannio* Holmgren, 1858, *O. strigatus* Holmgren, 1858, *O. winnertzii* Forster, 1850 and *O. winnertzii planator* Aubert, 1978. Seasonal abundance, emergence period, distribution and altitudinal changes in *Orthocentrus* fauna on two slopes of the Alborz Mountains are provided. Keys for identification of *Orthocentrus* species found in Gilan and Tehran provinces are presented based on males and females.

**Key words:** Ichneumonidae, *Orthocentrus*, new records, identification key, Iran.

***Orthocentrus* (Hymenoptera: Ichneumonidae, Orthocentrinae)**



*Orthocentrus* Gravenhorst, 1829 (Hymenoptera: Ichneumonidae, Orthocentrinae)

*Orthocentrus*

*O. hirsutor* Aubert, 1969 *O. castellanus* Ceballos, 1963 *O. asper* (Gravenhorst, 1829)

*O. winnertzii* Forster, 1850 *O. strigatus* Holmgren, 1858 *O. sannio* Holmgren, 1858 *O. protervus* Holmgren, 1858

*O. winnertzii planator* Aubert, 1978

*Orthocentrus*

*Orthocentrus*

*Orthocentrus* Ichneumonidae :

## Introduction

The subfamily Orthocentrinae Förster, 1869 (Hymenoptera: Ichneumonidae) contains approximately 460 species in about 29 genera in the World (Yu *et al.*, 2005). Based on larval morphological evidences (Wahl, 1990) and phylogenetic analysis (Wahl and Gauld, 1998), most of Townes's Microleptinae genera (Townes, 1971) were transformed to an expanded current Orthocentrinae. The species of the subfamily Orthocentrinae so far as is known are larval endoparasitoids of nematoceros fungivores of the families Mycetophilidae and Sciaridae (Insecta: Diptera) (Bechev, 1986, Wahl and Gauld, 1998) and thereby can be found in damp locations and dank forests (Jonaitis and Rimsaite, 2002; Townes, 1971). Townes's Orthocentrinae (Townes, 1971) and Orthocentrini sensu Humala (Humala, 2007) are now known as the *Orthocentrus* genus-group, which includes seven genera (*Orthocentrus*, *Batakomacrus*, *Stenomacrus*, *Neurateles*, *Plectiscus*, *Picrostigeus* and *Chilocyrtus*) comprising a monophyletic distinctive group within this subfamily (Broad, 2010). The genus *Orthocentrus* Gravenhorst, 1829, with about 63 described species, is the third most specious genus and spread globally (Yu *et al.*, 2005). *Orthocentrus* species can be identified readily by the convex lower edge of the clypeus, so the labrum is not exposed, and short mandibles, hardly overlapping and with vestigial dentition (Broad, 2010).

Gilan and Tehran provinces provide good climatic conditions and water supplies for a great variety of vegetation, natural biomes and also agricultural areas. These two provinces are located on the northern and southern slopes of the Alborz Mountains which are the most suitable places for orthocentrines within Iran. *Megastylus flavopictus* (Gravenhorst, 1829) is the only species of the subfamily that has so far been reported, from Golestan province in the north of Iran (Ghahari and Jussila, 2010). This paper provides new distributional data as well as a key with reasonable pictures for seven species of the genus *Orthocentrus* collected using Malaise traps during 2010 in this region. With this large scale sampling, seasonal adult emergence period, abundance, habitat preference and altitudinal faunal changes on two slopes of the Alborz Mountains can also be discussed.

## Materials and Method

**Studying sites:** The present study was carried out in 16 localities in Gilan and Tehran provinces (35°40' 51" N and 37°22' 61" E) in the central north of Iran during 2010 (Fig. 1). The Alborz Mountains separate the Caspian Sea area (Gilan and Mazandaran provinces) from Tehran province. The Alborz Mountains provide different types of vegetation at various altitudes in addition to the Caspian coast flora. The known natural biome of this region is the Caspian Hyrcanian mixed forests but coastal plains have been almost completely converted to urban sites and rice paddies. As the elevation increases, the flora gradually differentiates and diversifies from humid forests below 700 m above sea level (a.s.l.) to pure oriental Beech or mixed forests at middle altitude (700-1500 m a.s.l.). Shrub lands and steppes occur in the upper mountains and the highest elevations are covered with Alpine tundra and meadows (Marvie Mohajer, 2006). Tehran province is located on the southern slopes of the Alborz Mountains with various vegetations and climates.

**Collecting specimens:** Material for the present study was collected using Malaise traps with alcohol as a killing and preservation agent during 2010. Sampling was carried out from March to November at four localities in each province (Tehran and Gilan). Two Malaise traps were placed in each locality. The Malaise traps were placed in different habitats such as forests, pastures and orchards. The geographical and main floristic characteristics of each location are presented in Table 1. Sampling procedures were similar at different localities. The specimens were extracted from the Malaise traps and sorted weekly. They were then preserved in 70% ethanol or card-mounted and labeled. Photographs were taken using an Olympus SZX9 stereomicroscope equipped with a Sony 8.1 digital camera. Image stacking was done with Combine ZP software (see Combine Z Yahoo Group) and additional photo editing with Adobe Photoshop software. The species of *Orthocentrus* were identified using the taxonomic keys of Aubert (1978). All specimens are deposited in the insect collection of the Department of Entomology, Tarbiat Modares University, Tehran, Iran.

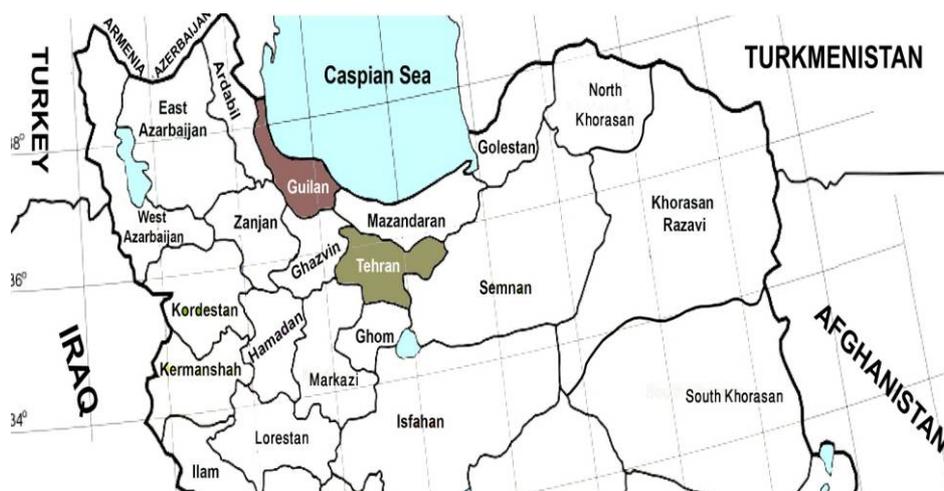


Fig. 1. Map of Iran with collection localities (Tehran and Gilan) during 2010

Table 1. Geographical and floristic characteristics of sampling locations in Gilan and Tehran provinces during 2010

| Localities                          | Latitude and longitude               | Altitude (m) | Habitat                        |
|-------------------------------------|--------------------------------------|--------------|--------------------------------|
| Shahryar, Tehran province           | N= 35° 40' 13.5"<br>E= 50° 56' 94.4" | 1168         | Rosaceous Orchard              |
| Karaj, Tehran province              | N= 35° 46' 33.6"<br>E= 50° 56' 79"   | 1278         | Rosaceous Orchard              |
| Arangeh, Tehran province            | N= 35° 55' 12.0"<br>E= 51° 5' 15.4"  | 1891         | Rosaceous Orchard              |
| Sarziarat, Tehran province          | N= 35° 55' 17.3"<br>E= 51° 6' 85.4"  | 1980         | Rosaceous Orchard              |
| Shahrestanak, Tehran province       | N= 35° 57' 58.3"<br>E= 51° 22' 32.9" | 2305         | Rosaceous Orchard and pasture  |
| Astaneh-e-Ashrafieh, Gilan province | N= 37° 22' 61"<br>E= 49° 57' 96.4"   | -1           | humid forest                   |
| Ziaz, Gilan province                | N= 36° 52' 57.4"<br>E= 50° 13' 29.0" | 537          | Hazelnut                       |
| Orkom, Gilan province               | N= 36° 45' 73.9"<br>E= 50° 18' 19.8" | 1201         | Deciduous forests and hazelnut |
| Ghazichak, Gilan province           | N= 36° 45' 95.9"<br>E= 50° 19' 58.7" | 1803         | hazelnut and pasture           |

## Results and Discussion

A total of 72 (32 ♂♂, 40 ♀♀) and 82 (21 ♂♂, 61 ♀♀) specimens of the genus *Orthocentrus* were collected from Tehran and Gilan provinces, representing 7 species and 1 subspecies which the genus and all species are new records for the fauna of Iran.

**Taxonomy:** Genus *Orthocentrus* Gravenhorst, 1829:

Type-species: *Orthocentrus anomalus* Gravenhorst, 1829.

**Synonyms:** *Atmetus* Forster, 1869, *Phaenosemus* Forster, 1869, *Tapinops* Förster, 1869, *Exochiscus* Walsh, 1873, *Pachyonyx* Viereck, 1914 [homonym], *Orthocentrus* Benoit, 1954.

**Diagnosis:** The genus *Orthocentrus* belongs to the *Orthocentrus* genus-group within Orthocentrinae, defined by the uniformly convex face (no noticeable division from the clypeus), long antennal scape, more than twice as long as apically wide and small, narrow mandibles. Within this group of genera, *Orthocentrus* can be identified by the combination of following characters: 1) lower edge of clypeus convex, labrum not exposed (Fig. 2 B, C), 2) mandibles short, hardly overlapping, dentition vestigial, 3) hind wing vein cu-a frequently reclivous and 4) fore wing areolet, if present, often rather elongate pentagonal (Fig. 7D) (Broad, 2010)

**Key to species of *Orthocentrus* of Iran based on females:** The identification key of *Orthocentrus* prepared in French by Aubert (1978) which is also modified here by using some new characters:

- 1- Face coarsely punctate; antenna with first flagellomere transverse (Fig. 2 B, 5 B, 9 B) ..... 2
  - Face smooth or coriaceous or finely punctate (Fig. 3 E, 7 B) or striate (Fig. 6 B) ..... 5
- 2- Face with frontal orbits (above antennae) yellow (Fig. 2 B); eyes converging dorsally; antennae gradually thinned; metasoma with apical margin of all tergites straight (Fig. 2 A) ..... *asper*
  - Face with frontal orbits black or only with a spot between base of antennae and eyes (Fig. 5 B, 9 B); metasoma with apical margins of tergites 4 onward concave (Fig. 5 C, 9 D) ..... 3
- 3- Metasoma with tegite 3 and following smooth; first tergite bicarinate; legs light red (Fig. 5) ..... *protervus*
  - Metasoma with tergite 3 and following coriaceous at least at base..... 4
- 4- First metasomal tergite bicarinate; legs red, coxae red and posteriorly brown..... *winnertzii*
  - First metasomal tergite lacking median dorsal carinae (Fig. 9) ..... *winnertzii planator*
- 5- Face with yellow markings on vertical orbits (Fig. 3 E) ..... 6
  - Face lacking yellow marking on vertical orbites ..... 7
- 6- Face with frontal orbits black; eyes with conspicuous and dense pubescence ..... *hirsutor*
  - Face with frontal orbits yellow; eyes without any pubescence; antenna with first flagellomere more than 2 x as

long as wide and the rest longer than wide (Fig. 3 F); face red-brown, metasoma with tergites 5 and 6 apically concave; tergites 1, 2 and base of 3 coriaceous (Fig. 3 B, C, F)

- .....*castellanus*
- 7- Face with frontal orbits yellow at base (Fig. 6 B); antenna with first flagellomere 1.2 x as long as apical width (Fig. 6 C); second abscissa of Rs absent (Fig. 6 A) ..... *sannio*
  - Face coriaceous and finely punctate (Fig. 7 B), with frons entirely black; metasoma with tergites 1 and 2 strongly striate (Fig. 7 C) ..... *strigatus*

**Key to species of *Orthocentrus* of Iran based on males:**

- 1- Fore wing with pterostigma swollen and enlarged with Rs vein originating beyond the middle (Fig. 8 B); parameres extremely large (Fig. 8 C); face coarsely punctate (Fig. 8 A) ..... *winnertzii*
  - Fore wing with normal pterostigma and Rs vein originating at the middle of pterostigma; parameres not so large (Fig. 3 A, 4 A) ..... 2
- 2- Face only coarsely punctate (Fig. 2 C) ..... *asper*
  - Face finely punctate or smooth (Fig. 3 D, 4 B, 7 E).... 3
- 3- Face and vertex black; face finely punctate (Fig. 7 E); metasomal tergites 1 and 2 striate (Fig. 7 C) ..... *strigatus*
  - Face with white markings on vertical and frontal orbits (Fig. 4 B, C) ..... 4
- 4- Eyes with dense and conspicuous pubescence (Fig. 4 B); metasoma with tergite 3 partly or completely yellow, differs from the rest (Fig. 4 D); mesonotum mostly with yellow longitudinal bands but sometimes these bands completely absent (Fig. 4 C) ..... *hirsutor*
  - Eyes bare (Fig. 3 D); metasoma with apical margins of tergites 2 and 3 yellow (Fig. 3 A); 2nd abscissa of Rs very small so the areolet appears square; face finely striate-punctate; frons yellow; first flagellomere more than 2 x as long as apical width ..... *castellanus*

***Orthocentrus asper* (Gravenhorst, 1829)** (Fig. 2)

Synonyms: *O. discolor* Holmgren, 1858; *Phaenosemus sitkensis* Ashmead, 1902.

**Material examined:** Gilan province: Astaneh-e-Ashrafieh 1♀, 13.III-5. IV.2010; Orkom: 2♀♀, 7-14.VI.2010, 1♀, 26.VII-2.VIII.2010, Ghazichak: 1♀, 10-17.V.2010, 1♂, 7-

14.VI.2010, leg. M. Kheirandish; Tehran province: Shahryar: 1♂, 26.IV-3.V.2010, 2♀♀, 10-17.V.2010, 1♀, 17-24.V.2010, 3♂♂1♀, 24-31.V.2010, 1♂1♀, 1-7.VI.2010, 6♂♂1♀, 7-14.VI.2010, 2♂♂1♀, 14-21.VI.2010, 1♂, 21-28.VI.2010, 1♂, 5-12.VII.2010, 1♀, 30.VIII-6.IX.2010; Karaj: 1♀, 10-17.V.2010, 2♀♀, 10-17.V.2010, 1♀, 1-7.VI.2010, Arangeh: 1♀, 10-17.V.2010, 1♀, 17-24.V.2010, 1♀, 24-31.V.2010, 2♀♀, 1-7.VI.2010, 3♀♀, 7-14.VI.2010, 3♀♀, 5-12.VII.2010, 1♀, 2-9.VIII.2010, 1♀, 4-11.X.2010, 1♂, 11-17.X.2010, Sarziarat: 3♀♀, 1-7.VI.2010, 3♀♀, 7-14.VI.2010, 1♀, 28.VI-5.VII.2010, 1♀, 5-12.VII.2010, Shahrestanak: 1♀, 14-21.VI.2010, leg. A. Mohammadi-Khoramabadi.

**General distribution:** Europe (Austria, Bulgaria, Czech Republic, Czechoslovakia, Finland, France, Germany, Hungary, Latvia, Lithuania, Netherlands, Norway, Poland, Romania, Russia, United Kingdom), Nearctic (Canada, U.S.A), Western Palearctic (Broad, 2010; Jonaitis and Rimsaite, 2002; Kazmierczak, 2004; Kolarov, 1986; Yu *et al.*, 2005), Iran (new record).



**Fig. 2.** *Orthocentrus asper*; (A) general habitus of female in lateral view, (B) head of female in frontal view, (C) head of male in frontal view (original)

**Comments:** *Orthocentrus asper* can clearly be recognized by the characters noted in the key. However, the presence of just a yellow frontal orbit between the basal antennae and ocelli (Fig. 2 B) in the female and completely yellow frons (Fig. 2 C) in the male, and coarsely punctate face in both sexes, can easily separate this species from others. It was the most abundant species with about 36% of all specimens. Collection data showed that 89% of specimens

were captured from Tehran province (40% Shahryar, 7% Karaj, 26% Arangeh, 14% Sarziarat, 2% Shahrestanak) and 11% from Gilan province (2% Astaneh-e-Ashrafieh, 5.5% Orkom and 3.5% Ghazichak). Sex ratio (male: female) was 0.44:1. The first specimen of *O. asper* was captured in the period of 13 March- 5 April in Astaneh-e-Ashrafieh and the last ones in the period of 4-17 October, that may indicate the species overwinters as adults (Jonaitis and Rimsaite, 2002; Yu *et al.*, 2005). Collecting dates for Tehran province specimens spanned late April to mid October as follows: May 26%, June 46%, July 9%, August 2%, September 2%, October 4%) and for Gilan province: March-April 2%, May 1%, June 5%, July 1%). *Orthocentrus asper* is distributed in Astaneh-e-Ashrafieh (altitude: -1 m b.s.l.) adjacent to the Caspian Sea with rain forests, humid climate and structurally covered by dense grasses, shrubs and trees, in Orkom (altitude: 537 m a.s.l.) and Ghazichak, Gilan (1800 m a.s.l.) with cooler climates and lower humidity and mainly shrubs and trees, and in orchards of Shahryar to Shahrestanak, Tehran (altitude: 1100 - 2305 m a.s.l.) in central Alborz Mountains where the climatic conditions are very different and vary from semi-arid steppe in Shahryar and Karaj to alpine climate in Shahrestanak. It seems that this species is capable to spread in the upper half of Iran in different ecosystems wherever the host species are present. However, further studies are necessary to investigate the wide distribution of this species and its biology.

***Orthocentrus castellanus* Ceballos, 1963** (Fig. 3)

**Material examined:** Tehran province: Shahrestanak: 1♂, 1♀, 1-7.VI.2010, leg. A. Mohammadi-Khoramabadi

**General distribution:** Europe (Bulgaria, Spain), Western Palearctic (Kolarov, 1986, Yu *et al.*, 2005), Iran (new record).

**Comments:** *Orthocentrus castellanus* is similar to *O. hirsutor* in having yellow bands on the vertex, but differs in yellow colouration of the frontal orbits (Fig. 3 E) and absence of pubescence on the eyes. Males have the gena, propleuron, pronotum, fore coxa, tegula and anterior corner of the mesopleuron below the tegula white (Fig. 3A). Other important characters as in the key. This species is distributed in the high altitude and cool climate habitats of the southern slopes of Alborz Mt. The only two specimens of this species

were captured in rosaceous orchards of high altitude regions, Shahrestanak (2305 m a.s.l.), of Tehran province.

***Orthocentrus hirsutor* Aubert, 1969** (Fig. 4)

**Material examined:** Gilan province: Ziaz: 1♀, 24.X-1.XI.2010, 1♂1♀, 20-27.IX.2010; Orkom: 1♂, 3-10.V.2010, 1♀, 1-7.VI.2010, 2♀♀, 19-26.VII.2010, 1♀, 26.VII-2.VIII.2010; Ghazichak: 1♂, 5-12.IV.2010, 3♂♂1♀, 12-19.IV.2010, 1♂, 26.IV-3.V.2010, 1♂, 3-10.V.2010, 5♂♂, 10-17.V.2010, 1♀, 17-24.V.2010, 2♂♂1♀, 24-31.V.2010, 5♂♂2♀♀, 1-7.VI.2010, 1♀, 7-14.VI.2010, 4♀♀, 19-26.VII.2010, 1♀, 30.VII-6.IX.2010, leg. M. Kheirandish.

**General distribution:** Europe (Bulgaria, Finland, France, Lithuania, Switzerland), Western Palearctic (Jonaitis and Rimsaite, 2002; Kolarov, 1986, Yu *et al.*, 2005), Iran (new record).

**Comments:** The main characters for identifying *O. hirsutor* are densely hirsute eyes and yellow bands on the vertex. Aubert (1987), in his key to the males of this species, mentioned that there are longitudinal yellow bands on the mesoscutum (Fig. 4 C), but in our specimens these bands reduced and sometimes disappear completely on the mesoscutum, so we place more emphasis on an easy distinguishable, always differently coloured tergite 3 in the key to males which mostly or completely have yellow coloration compared with the remaining black tergites (Fig. 4D). All the specimens of *O. hirsutor* were captured in Gilan province of Iran. It was the second most abundant species with 24% of the total number of captured specimens. Sex ratio (male: female) was 1.17: 1. Flight period of adults began from early April and ended in November. It seems that this species overwinters as adults. Collecting dates indicated that May, with 29% of captured specimens, was the most abundant period of adult emergence. June with 24%, April and July with 18%, September with 8% and finally October with 3% were the following rankings. Ghazichak, at an elevation of 1800 m a.s.l. and ecologically at the ecotone of shrubland-steppe, was the most preferred site for this species as 78% of specimens were captured here. In other locations like Ziaz (altitude: 500 m) and Orkom (altitude: 1200 m) only 8% and 13% of specimens were captured and no specimens were found in Astaneh-e-Ashrafieh. *Orthocentrus hirsutor* were sampled

from 500 m upwards, where humid forests gradually differentiate to mixed forests.

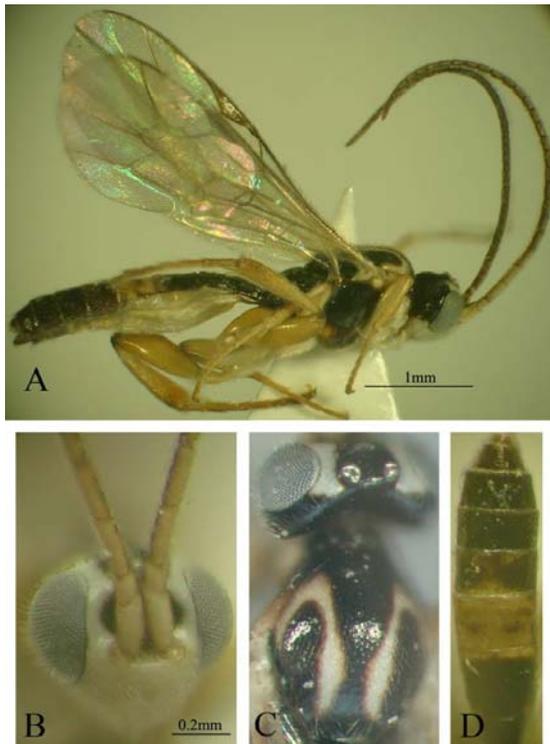
***Orthocentrus protervus* Holmgren, 1858** (Fig. 5)

**Material examined:** Gilan province: Astaneh-e-Ashrafieh 1♀, 13.III-5. IV.2010; Ziaz: 1♀, 14-21.VI.2010; Orkom: 2♀♀, 12-19.IV.2010, 1♀, 7-14.VI.2010, 1♀, 12-19.VII.2010; Ghazichak: 1♀, 24-31.V.2010, 1♀, 7-14.VI.2010; Tehran province: Shahryar: 1♀, 3-10.V.2010, 4♀♀, 10-17.V.2010, 1♀, 17-24.V.2010, 1♀, 24-31.V.2010, 1♀, 1-7.VI.2010, 2♀♀, 7-14.VI.2010, 3♀♀, 14-21.VI.2010, 1♀, 21-28.VI.2010, 1♀, 5-12.VII.2010, 1♀, 12-19.VII.2010, 1♀, 20-27.IX.2010, 1♀, 11-17.X.2010; Karaj: 1♀, 7-14.VI.2010, 1♀, 9-16.VIII.2010; Arangeh: 1♀, 10-17.V.2010, leg. A. Mohammadi-Khoramabadi.

**General distribution:** Europe (Austria, Belgium, Bulgaria, Finland, France, Germany, Lithuania, Norway, Poland, Romania, Sweden, United Kingdom), Western Palearctic (Broad, 2010; Kaźmierczak, 2004; Kolarov, 1986; Yu *et al.*, 2005), Iran (new record).



**Fig. 3.** *Orthocentrus castellanus*; (A) general habitus of male, (B) general habitus of female, (C) metasomal tergites of female in dorsal view, (D) head of male in frontal view, (E) head of female in frontal view, (F) antenna of female (original)



**Fig. 4.** *Orthocentrus hirsutor* male; (A) general habitus, (B) head in frontal view, (C) mesoscutum and vertex in dorsal view, (D) metasomal tergites in dorsal view (original)

**Host:** *Sciophila hirta* (Diptera: Mycetophilidae) (Yu *et al.*, 2005).

**Comments:** *Orthocentrus protervus* and *O. winnertzii* are very similar. The main diagnostic character is the sculpture

of tergite 3, which is smooth in *O. protervus*, as in the key. The third most abundant *Orthocentrus* species of northern Iran was *O. protervus* with 20% of captured specimens. This species, like *O. asper*, was more abundant in Tehran province as 73% of specimens were captured there. All captured specimens were females. Males of *O. protervus* has rarely been reported in populations (Aubert, 1978, Jonaitis and Rimsaite, 2002). Collecting site data showed that *O. protervus* is found on both slopes of the Alborz Mountains up to around 1800 m a.s.l., in different climate conditions and habitats. The flight period was from April to July in Gilan and May to October in Tehran provinces. The most abundant period for *O. protervus* was May-June.

***Orthocentrus sannio* Holmgren, 1858** (Fig. 6)

Synonyms: *O. histrio* Holmgren, 1858

Material examined: Gilan province: Astaneh-e-Ashrafieh 1♀, 13.III-5. IV.2010; Tehran province: Arangeh 1♀, 17-24.V.2010, Shahrestanak: 1♀, 12-19.VII.2010, leg. A. Mohammadi-Khoramabadi.

General distribution: Europe (Austria, Belgium, Bulgaria, Czech Republic, Czechoslovakia, Finland, France, Germany, Hungary, Latvia, Lithuania, Netherlands, Norway, Poland, Russia, Romania, Sweden, Switzerland, United Kingdom), Eastern and Western Palearctic (Broad, 2010; Kaźmierczak, 2004; Kolarov, 1986; Yu *et al.*, 2005).



**Fig. 5.** *Orthocentrus protervus* female; (A) general habitus in lateral view, (B) Head in frontal view, (C) metasoma in lateral view (original)

**Comments:** *Orthocentrus sannio* can be identified principally by characters in the key. The species is commonly distributed across Europe (Aubert, 1978) but it was the second least abundant *Orthocentrus* species in the north of Iran. One interesting point is the wide distributional range across the Alborz Mountains as one specimen was found in Astaneh-e-Ashrafieh at an elevation of -1 m b.s.l., with humid forests, dense vegetations and humid subtropical climate, and two others at elevations of 1900-2300 m. a.s.l. in orchards and alpine climate. Only females were found during March-April in Gilan and May-July in Tehran provinces.

***Orthocentrus strigatus* Holmgren, 1858 (Fig. 7)**

Material examined: Gilan province: Astaneh-e-Ashrafieh 1♂, 5-12.IV.2010, 1♀, 1-7.VI.2010, 1♀, 7-14.VI.2010, 1♀, 19-26.VII.2010, 1♀, 4-11.X.2010; Ziaz: 1♂, 5-12.IV.2010, 1♀, 3-10.V.2010, 1♀, 15-22.XI.2010; Ghazichak: 1♀, 10-17.V.2010; Tehran province: Shahryar: 1♂, 17-24.V.2010; Aragneh: 1♀, 26.VI- 3.V.2010, 1♀, 5-12.VII.2010, leg. A. Nadimi

General distribution: Europe (Austria, Lithuania, Poland, Sweden), Western Palearctic (Kazmierczak, 2004, Yu *et al.*, 2005), Iran (new record).

**Comments:** The sculpture of two first metasomal tergites in both sexes (Fig. 7 C) and finely punctate face with coriaceous background (Fig. 7 B, E) clearly separate *O. strigatus* from other species in northern Iran. The species was mainly distributed in Gilan province, with 75% of captured specimens, up to 1900 m.a.s.l. on both slopes of the Alborz Mountains. The adult flight period was from April to November (Table 2). A total of 12 specimens were captured of which three specimens were males (25%).

***Orthocentrus winnertzii* Forster, 1850 (Fig. 8)**

**Synonyms:** *O. stigmaticus borealis* Roman, 1915; *O. stigmaticus meridionator* Aubert, 1960; *O. stigmatias* Walsh, 1873; *O. stigmaticus* Holmgren, 1858

**Material examined:** Gilan province: Astaneh-e-Ashrafieh: 1♀, 19-26.VII.2010; Ziaz: 1♂, 1-7.VI.2010; Orkom: 2♂♂, 12-19.IV.2010, 2♂♂, 24-31.V.2010, 1♂, 7-14.VI.2010, 2♂♂, 21-28.VI.2010; Ghazichak: 1♂, 1-7.VI.2010; Tehran province: Shahryar: 1♂, 17-24.V.2010, 1♂, 24-31.V.2010; Karaj: 1♂, 3-10.V.2010, 1♀, 10-17.V.2010, leg. A. Mohammadi-Khoramabadi



**Fig. 6.** *Orthocentrus sannio* female; (A) general habitus in lateral view, (B) head in frontal view, (C) antenna (original)



**Fig. 7.** *Orthocentrus strigatus*; (A) general habitus of female in lateral view, (B) face of female in frontal view, (C) metasoma of male in dorsal view, (D) fore and hind wing of female, (E) face of male in frontal view (original)

**General distribution:** Europe (Austria, Bulgaria, Czechoslovakia, Denmark, Finland, France, Germany, Greece, Greenland, Hungary, Lithuania, Netherlands, Norway, Poland, Romania, Russia, Sweden, United Kingdom), Nearctic (Canada, U.S.A.), Palearctic (Broad, 2010; Kaźmierczak, 2004; Kolarov, 1986; Kolarov, 2007; Yu *et al.*, 2005), Iran (new record).

Host: *Sciophyla rufa* (Diptera: Mycetophilidae) (Bechev, 1986).

**Comments:** The females of *O. winnertzii* and *O. protervus* share the 4<sup>th</sup> tergite onwards with concave apical margins (Fig. 5 A, C), but they differ in the sculpture of the 3<sup>rd</sup>

metasomal tergite, which is coriaceous in *O. winnertzii*. Males of *O. winertzii* can easily be recognized by the large swollen pterostigma (Fig. 8 B) and parameres (Fig. 8 C). Specimens were captured on two slopes of the Alborz Mountains but were more abundant in Gilan province. The majority of captured specimens were male (71%). Adults emerged from April to July in Gilan province with a high percentage (70%) appearing in late May-July. However, in Tehran province adults were captured only in late May. In Gilan province they were captured in all collecting sites but in Tehran they were present only up to 1300 m.a.s.l.

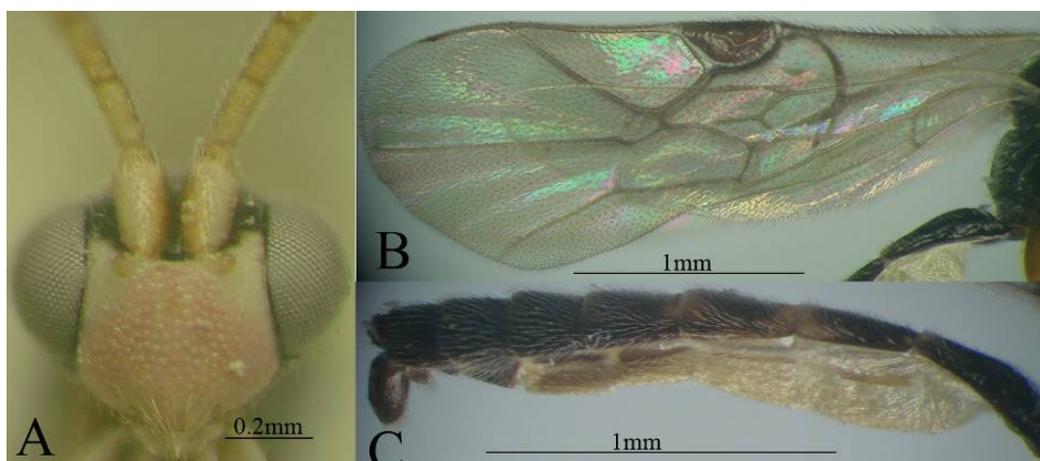


Fig. 8. *Orthocentrus winnertzii* male; (A) face in frontal view, (B) wing, (C) metasoma in lateral view (original)

***Orthocentrus winnertzii planator* Aubert, 1978** (Fig. 9)

**Material examined:** Gilan province: Astaneh-e-Ashrafieh 1♀, 17-24.V.2010, leg. M. Kheirandish

**General distribution:** Europe (France), Western Palearctic (Aubert, 1978, Yu *et al.*, 2005), Iran (new record).

**Comments:** The median dorsal carinae of the first metasomal tergite is absent in *O. winnertzii planator*. This subspecies was only recorded from France and here we report it from Iran for the first time. Characteristics of the collecting site of the subspecies showed that regions of high humidity are preferred by this subspecies.

This study showed that seven species and one subspecies of the genus *Orthocentrus* (Hym.: Ichneumonidae, Orthocentrinae) inhabit the Alborz Mountains in northern Iran. Two species, *O. hirsutor* and *O. winnertzii planator*, were

found only in Gilan province on the northern slopes of the Alborz Mountains and *O. castellanus* only on southern slopes and high altitudes of Tehran province. The most abundant and common species was *O. asper* followed by *O. hirsutor*, *O. protervus*, *O. winnertzii*, *O. strigatus*, *O. sannio*, *O. castellanus* and finally *O. winnertzii planator*. Only females of *O. protervus*, *O. sannio* and *O. winnertzii planator* were captured. The sex ratio was strongly skewed towards males in *O. winnertzii*. These data were in agreement with the results of Jonaitis and Rimsaite (2002) and Kolarov (1986). Furthermore a good collection of the genus *Orthocentrus* was made in Iran for future studies with adult flight period and detailed distributional data (Table 2).

**Table 2.** Adult emergence of *Orthocentrus* species in the north of Iran during 2010

| Sampling date     | <i>Orthocentrus</i> species |                    |                       |                     |                     |                  |                      |                       |
|-------------------|-----------------------------|--------------------|-----------------------|---------------------|---------------------|------------------|----------------------|-----------------------|
|                   | <i>O. asper</i>             | <i>O. hirsutor</i> | <i>O. castellanus</i> | <i>O. protervus</i> | <i>O. strigatus</i> | <i>O. sannio</i> | <i>O. winnertzii</i> | <i>O. w. planator</i> |
| 13 March-5 April  | *                           |                    |                       | *                   |                     |                  | *                    |                       |
| 5-12 April        |                             | *                  |                       |                     | *                   |                  |                      |                       |
| 12-19 April       |                             | *                  |                       | *                   |                     |                  |                      | *                     |
| 19-26 April       |                             |                    |                       |                     |                     |                  |                      |                       |
| 26 April-3 May    | *                           | *                  |                       |                     | *                   |                  |                      |                       |
| 3-10 May          |                             | *                  |                       | *                   | *                   |                  | *                    |                       |
| 10-17 May         | *                           | *                  |                       | *                   | *                   |                  | *                    |                       |
| 17-24 May         | *                           | *                  |                       | *                   | *                   | *                | *                    | *                     |
| 24-31 May         | *                           | *                  |                       | *                   |                     |                  | *                    |                       |
| 1-7 June          | *                           | *                  | *                     | *                   |                     |                  | *                    |                       |
| 7-14 June         | *                           | *                  |                       | *                   |                     |                  | *                    |                       |
| 14-21 June        | *                           |                    |                       | *                   |                     |                  |                      |                       |
| 21-28 June        | *                           |                    |                       | *                   |                     |                  | *                    |                       |
| 28 June-5 July    | *                           |                    |                       |                     |                     |                  |                      |                       |
| 5-12 July         | *                           |                    |                       | *                   | *                   |                  |                      |                       |
| 12-19 July        |                             |                    |                       | *                   |                     | *                |                      |                       |
| 19-26 July        |                             | *                  |                       |                     | *                   |                  | *                    |                       |
| 26 July-2 August  | *                           | *                  |                       |                     |                     |                  |                      |                       |
| 2-9 August        | *                           |                    |                       |                     |                     |                  |                      |                       |
| 9-16 August       |                             |                    |                       | *                   |                     |                  |                      |                       |
| 16-23 August      |                             |                    |                       |                     |                     |                  |                      |                       |
| 23-30 August      |                             |                    |                       |                     |                     |                  |                      |                       |
| 30 Aug.-6 Sep.    | *                           | *                  |                       |                     |                     |                  |                      |                       |
| 6-13 September    |                             |                    |                       |                     |                     |                  |                      |                       |
| 13-20 September   |                             |                    |                       |                     |                     |                  |                      |                       |
| 20-27 September   |                             | *                  |                       | *                   |                     |                  |                      |                       |
| 27 Sep.-4 October |                             |                    |                       |                     |                     |                  |                      |                       |
| 4-11 October      | *                           |                    |                       |                     | *                   |                  |                      |                       |
| 11-17 October     | *                           |                    |                       | *                   |                     |                  |                      |                       |
| 17-24 October     |                             |                    |                       |                     |                     |                  |                      |                       |
| 24 Oct.-1 Nov.    |                             | *                  |                       |                     |                     |                  |                      |                       |
| 1-8 November      |                             |                    |                       |                     |                     |                  |                      |                       |
| 8-15 November     |                             |                    |                       |                     |                     |                  |                      |                       |
| 15-22 November    |                             |                    |                       |                     | *                   |                  |                      |                       |



**Fig. 9.** *Orthocentrus winnertzii planator* female; (A) general habitus in lateral view, (B) face in frontal view, (C) forewing venation, (D) metasomal tergites in lateral view (original).

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