

A Preliminary Study of the *Macrocentrus* Curtis, 1833 (Hymenoptera: Braconidae: Macrocentrinae) Fauna of Turkey, with Zoogeographical Remarks

Ahmet BEYARSLAN

Mitat AYDOĞDU

Trakya University, Faculty of Sciences, Department of Biology, 22030 Edirne, TURKEY,
e-mails: abeyars@trakya.edu.tr, maydogdu75@hotmail.com

ABSTRACT

Thirteen species of *Macrocentrus* are reported from Turkey based on literature records and specimens collected from various localities of Turkey. Seven species [*M. blandus* Eady and Clark, 1964; *M. buolianae* Eady and Clark, 1964; *M. flavus* Vollenhoven, 1878; *M. equalis* Lyle, 1914; *M. infirmus* (Nees, 1834); *M. kurnakovi* Tobias, 1976; *M. pallipes* (Nees, 1811)] are new addition to the *Macrocentrus* fauna of Turkey. For each taxon, the paper includes zoogeographical remarks and chorotype information.

Key words: Hymenoptera, Braconidae, *Macrocentrus*, zoogeographical, Turkey.

INTRODUCTION

The Macrocentrinae Foerster, 1862 (Hymenoptera: Ichneumonoidea: Braconidae) of Turkey are still largely unknown. Therefore, it was not surprising to find new Macrocentrinae species records among the material assembled and sorted by the authors. This subfamily is represented in Palaearctic with 6 genera, *Macrocentrus* being the most diversified one (Yu *et al.*, 2006). The members of Macrocentrinae can be identified by the following characters; the presence of a spine on the 2nd segment of the trochanter (Tobias, 1986), the comparatively high insertion of the metasoma on the propodeum, and the convexity of the middle lobe of the mesocutum (Achterberg, 1990); the latter may be less distinct in males and is poorly developed in both sexes of some species of the genus *Macrocentrus* (Achterberg, 1993).

The genus *Macrocentrus* Curtis, 1833 is large and has a world-wide distribution. van Achterberg, (1993) and Tobias, (1986) gave the recognition of the subfamily Macrocentrinae and a key to the Palaearctic genera of *Macrocentrus*. Species of *Macrocentrus* are endoparasitic koionobionts of larvae of Lepidoptera (e. g. Arctiidae, Epermeniidae, Coleophoridae, Depressariidae, Dilobidae, Drepanidae, Gelechiidae, Gracillariidae, Lasiocampidae, Lymantridae, Lyonetiidae, Oecophoridae, Noctuidae, Pyralidae, Sessidae, Tineidae, Tortricidae, Yponomeutidae and Zygaenidae), and very rarely ordo of Hymenoptera and Coleoptera (Yu *et al.*, 2006).

Six species of *Macrocentrus* (*M. cingulum*, *M. collaris*, *M. marginator*, *M. sylvestrellae*, *M. tessulatanae* and *M. thoracicus*) were previously known in the

fauna of Turkey (Achterberg, 1993, 2001; Beyarslan *et al.*, 2006; Ural *et al.*, 1973; Yu *et al.*, 2006). The authors of the manuscript studied on the *Macrocentrus* fauna of Turkey. Thirteen species of *Macrocentrus* as inhabitants of Turkey are given. A total of 8 species were determined, and 7 of them are new addition to the *Macrocentrus* fauna of Turkey. For each taxon, the manuscript includes zoogeographical remarks and chorotype information.

MATERIAL AND METHODS

The material of *Macrocentrus* were collected from various localities of Turkey between 1979-2009 (Fig.1). Sweeping nets and light traps were used to obtain samples on grass-type plants. The specimens were then pinned and labelled according to taxonomic rules and regulations. The preparation process was done under the stereomicroscope. All specimens have been deposited in Zoology Museum Collection, Trakya University.

Pertinent literature was used for identification of species (Achterberg, 1990, 1993, 2001; Tobias, 1986). The general distribution data for each species are presented in this paper (Achterberg, 1993; Yu *et al.*, 2006).

Species and station data was analysed by COMM (Progam for Computer-Aided Analyses of ecological field data) (Piepenburg and Piatkowski, 1992).

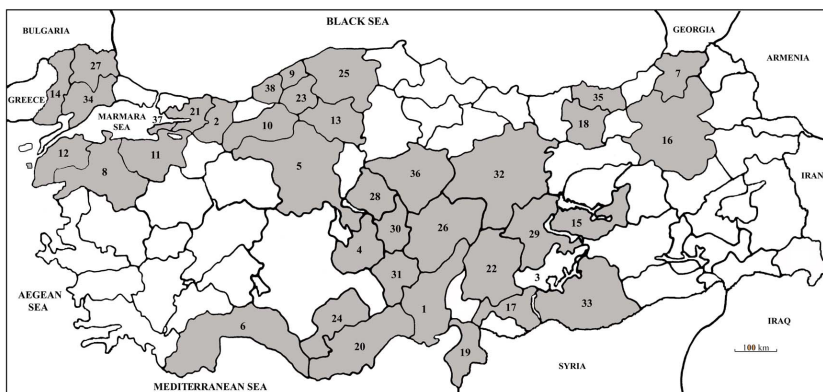


Fig. 1. Collecting places of *Macrocentrus* species in Turkey: 1-Adana, 2-Adapazarı, 3-Adiyaman, 4-Aksaray, 5-Ankara, 6-Antalya, 7-Artvin, 8-Balıkesir, 9-Bartın, 10-Bolu, 11-Bursa, 12-Çanakkale, 13-Çankırı, 14-Edirne, 15-Elazığ, 16-Erzurum, 17-Gaziantep, 18-Gümüşhane, 19-Hatay, 20-İçel, 21-Izmit, 22-Kahramanmaraş, 23-Karabük, 24-Karaman, 25-Kastamonu, 26-Kayseri, 27-Kırklareli, 28-Kırşehir, 29-Malatya, 30-Nevşehir, 31-Niğde, 32-Sivas, 33-Şanlıurfa, 34- Tekirdağ, 35-Trabzon, 36-Yozgat, 37-Yalova, 38-Zonguldak.

RESULTS

A list of the species is given below along with the location, collection dates, altitude and habitats, specimen numbers of each sex, collector, general and Turkey distributions. New recorded species are marked by an asterisks in the list.

MACROCENTRINAE**Genus : *Macrocentrus* Curtis, 1833*****Macrocentrus blandus* Eady and Clark, 1964***

Material examined: Gümüşhane, Kelkit, Yeniköy, 29.VIII.2004, 1474 m, orchard, pasture, 1 ♂, leg. M. Yurtcan; Kastamonu, Ilgaz mountains, 30.VIII.2004, 2100 m, fir forests, pasture, 1 ♀, leg. Ö. Çetin; Malatya, Akçadağ, Darıca, 05.VI.2007, 1543 m, crop field, pasture, 3 ♀♀, leg. M. Aydoğdu; Doğanşehir, Takaz, 08.VI.2008, 1286 m, orchard, pasture, 1 ♀, leg. A. Beyarslan.

General Distribution: Palaearctic (Austria, Bulgaria, former Czechoslovakia, Finland, France, Germany, Ireland, Japan, Kazakhstan, Korea, Lithuania, Moldova, Mongolia, Netherlands, Norway, Russia, Sweden; Switzerland, United Kingdom).

Chorotype: Asiatic-European.

Macrocentrus buolianae* Eady and Clark, 1964

Material examined: İzmit, Sapanca, Kurtköy, 27.VI.2001, 80 m, orchard, pasture, 1 ♀, leg. M. Yurtcan; Kastamonu, Daday, Ballıdağ, Kelebek Yaylası, 01.VII.2001, 1600 m, fir forest, pasture, 1 ♀, leg. M. Aydoğdu; Yalova, Safran Deresi, 19.VIII.2001, 15 m, pasture, 1 ♀, leg. M. Ağaoğlu.

General Distribution: Palaearctic (former Czechoslovakia, Germany, Hungary, Japan, Korea, Poland, Slovakia, Switzerland).

Chorotype: Asiatic-European.

***Macrocentrus cingulum* Brischke, 1882**

Distribution in Turkey: Eastern Black Sea Region (Ural *et al.*, 1973).

General Distribution: Nearctic, Oriental, Palaearctic (Azerbaijan, Belarus, Bulgaria, China, former Czechoslovakia, France, Georgia, Germany, Hungary, Italy, Japan, Korea, Lithuania, Moldova, Netherlands, Poland, Russia, Slovakia, Switzerland, Turkey, United Kingdom).

Chorotype: Holarctic.

***Macrocentrus collaris* (Spinola, 1808)**

Material examined: Adana, Feke, 02.X.1990, 543 m, pasture, 2 ♀♀, leg. A. Beyarslan; Feke, Efkel, 04.X.1979, 578 m, 2 ♀♀, leg. A. Beyarslan; Pozantı, 26.V.1984, 924 m, pasture, 1 ♀, leg. A. Beyarslan; Tufanbeyli, 03.X.1979, 1410 m, pasture, 1 ♂, leg. A. Beyarslan; Adapazarı, Karasu, 08.VII.1993, 50 m, clover field, 1 ♂, leg. F. İnanç; Adıyaman, Besni, Sofraz, 18.X.2005, 844 m, pasture, 1 ♂, leg. A. Beyarslan; Samsat, 18.VII.1985, 601 m, pasture, 2 ♀♀, leg. A. Beyarslan; Aksaray, Eskil, Bozcamağmut, 10.IX.2006, 985 m, pasture, 1 ♀, 2 ♂♂, leg. M. Aydoğdu; Ankara, Kızılcahamam, Özbekler, 17.IX.2006, 970 m, poplar grove, pasture, 1 ♀, 1 ♂, leg. A. Beyarslan; Antalya, 05.VIII.1980, 56 m, pasture, 1 ♀, leg. A. Beyarslan; Balıkesir, Manyas, Karacaköy, 15.VII.1993, 300 m, pasture, 1 ♀, leg. M. Yurtcan; Susurluk, Aksu, 28.IX.1992, 420 m, orchard, 1 ♀, leg. M. Yurtcan; Bursa, Cumalıkızık, 18.IX.1992, 70 m, orchard, 2 ♀♀, leg. F. İnanç; İnegöl, Cerrah, 10.VII.1993, 313 m, pasture, 1 ♀, leg. M. Yurtcan; İnegöl, Mezitli, 11.VII.1993, 1273 m, mixed forest, 1 ♀, leg. F. İnanç; Karacabey, Kulakpınar, 12.VII.1993, 75 m, pasture, 1 ♂, leg. A. Beyarslan; Çanakkale, Biga, 16.VII.1993, 50 m, clover field, orchard, pasture, 2 ♀♀, leg. A. Beyarslan; Bozcaada, 06.VI.1996, 54 m, clover field, pasture, 1 ♀, leg. Ö. Çetin; Bozcaada, Amerikan Çeşme, 06.VI.1996, 45 m, pasture, 1 ♀, leg. F. İnanç; Çankırı-Ilgaz, Derbent Motel, 20.VIII.2001, 1820 m,

fir forest, pasture, 3 ♀♀, leg. M. Aydoğdu, A. Beyarslan; Edirne, Birinci Kent, (light trap), 21.VI.2001, 69 m, pasture, crop field, 1 ♀, leg. A. Beyarslan; Hacıumur, 13.VI.1987, 65 m., pasture, 2 ♀♀, leg. F. İnanç; Hadımağa, 10.V.1987, 60 m, pasture, 1 ♀, leg. F. İnanç; Havsa, Abalar, 01.VIII.1992, 45 m, pasture, 1 ♀, leg. F. İnanç; Lalapaşa, 06.VI.1987, 172 m, pasture, 1 ♂, leg. F. İnanç; Lalapaşa, Hacıdanışment, 05.VI.1988, 156 m, orchard, 1 ♀, leg. F. İnanç; Trakya Üniversitesi Balkan Yerleşkesi (light trap), 04.X.2001, 60 m, pasture, 1 ♀; 25.V.2001, 1 ♀, leg. M. Yurtcan; Elaziğ, Baskil, Hacımustafa, 04.VI.2007, 1436 m, orchard, pasture, 1 ♀, leg. M. Yurtcan; Cip Barajı, , 04.VI.2007, 1006 m pasture, 3 ♀♀, leg. E. Çoban, A. Beyarslan; Erzurum, Atatürk Üniversitesi Kampüsü, 18.VIII.1999, 1939 m, pasture, 1 ♀, leg. Ç. Güçlü; Gaziantep, 06.V.1985, 832 m, pasture, 1 ♀; Oğuzeli, 13.VII.1985, 639 m, orchard, 1 ♀, leg. A. Beyarslan; Hatay, Habib-i Neccar, 13.XI.2006, 550 m, pasture, 2 ♀♀, leg. M. F. Gürbüz; Tokgöz, 12.XI.2006, 1550 m, pasture, 1 ♂, leg. M. F. Gürbüz; İçel, Namrun, 25.V.1979, 1301 m, orchard, 1 ♀, leg. A. Beyarslan; Kahramanmaraş, 24.VII.1980, 668 m, orchard, 1 ♀, leg. A. Beyarslan; Göksun, 25.VII.1998, 1327 m, orchard, 2 ♀♀, leg. A. Beyarslan; Gölpinar, 09.V.1985, 1349 m, pasture, 1 ♀, leg. A. Beyarslan; Karabük, Eskipazar, Ortaköy, , 28.VIII.2002, 870 m pasture, 1 ♀, leg. A. Beyarslan; Karaman, Çakırbağ, 27.VI.2009, 1025 m, orchard (Cherry), 1 ♀, leg. M. Yurtcan; Kastamonu, Çatören, , 30.VIII.2002, 950 m orchard, 2 ♀♀, leg. M. Aydoğdu; Daday, 29.VIII.2002, 700 m, clover field, 1 ♀, leg. A. Beyarslan; Daday, Ballıdağ, 01.VII.2001, 1750 m, mixed forest, 1 ♀, 1 ♂, leg. M. Yurtcan; Daday, İnceğiz, Çiftlik, 29.VIII.2002, 860 m, pine forest, 1 ♀, leg. F. İnanç; Daday, Sarpun, 29.VIII.2002, 1340 m, pine forest, 1 ♀, leg. Ö. Çetin; Kanlıgöl Milli Parkı, 28.VIII.2002, 1140 m, pine forest, 1 ♀, leg. M. Aydoğdu; Tosya, İkinci, 01.VIII.2002, 1000 m, orchard, 1 ♀, leg. Ö. Çetin; Kayseri, Bağpınar, 14.IX.2006, 1097 m, clover field, 4 ♀♀, 1 ♂, leg. M. Aydoğdu, E. Çoban; Talas, Başakpınar, 06.VI.2007, 1421 m, crop field, 1 ♂, leg. A. Beyarslan; Erciyes, 25.VI.2009, 2056 m, pasture, 2 ♀♀, leg. Ö. Çetin; Yahyalı, Mustafabeyli, 15.IX.2006, 1113 m, orchard, 2 ♀, 2 ♂♂, leg. T. Koldaş, M. Aydoğdu; Yemliha, 15.IX.2006, 992 m, pasture, 1 ♂, leg. A. Beyarslan; Kırklareli, İnece, Paşayeri, 02.VIII.2000, 150 m, clover field, 1 ♀, 1 ♂, leg. F. İnanç; Vize, Kömürköy, 08.V.1988, 180 m, mixed forest, 1 ♂, leg. M. Aydoğdu; Kırşehir, Hirfanlı barajı, 28.IV.2001, 1023 m, pasture, 1 ♀, 1 ♂, leg. A. Beyarslan; Kaman, Darıözü, 16.IX.2006, 902 m, pasture, 1 ♀, leg. M. Aydoğdu; Malatya, Akçadağ, Sarıhacı, 05.VI.2007, 1367 m, orchard, 1 ♀, 1 ♂, leg. A. Beyarslan; Nevşehir, Avanos, Saruhan, 06.VI.2007, 958 m, poplar grove, 1 ♀, leg. A. Beyarslan; Çaliş, 05.VI.2008, 1286 m, pasture, 1 ♀, leg. A. Beyarslan; Gülşehir-Gümüşkent, 07.VI.2007, 1286 m, crop field, pasture, 1 ♀, leg. M. Aydoğdu; Mazi, 24.IV.2001, 1557 m, pasture, 1 ♀, 1 ♂, leg. A. Beyarslan; Niğde-Bor, Çukurkuyu, 19.VII.2007, 1078 m, vegetable garden, pasture, 2 ♀, 1 ♂, leg. E. Çoban; Ulukışla, 25.V.1984, 1385 m, pasture, 2 ♀♀, leg. A. Beyarslan; Niğde, Üniversite Kampüsü, 26.VI.2009, 1562 m, crop field, 1 ♀, leg. A. Beyarslan; Çiftlik, 18.VII.2007, 1562 m, crop field, 2 ♀♀, 1 ♂, leg. A. Beyarslan; Sivas, Gürün, İncesu, 13.VII.2007, 1685 m, pasture, 1 ♀, 2 ♂♂, leg. Ö. Çetin; Şanlıurfa, Suruç, 08.V.1985, 494 m, pasture, 1 ♀, leg. A. Beyarslan; Yozgat, Akdağmadeni, Gökdere, 30.V.2007, 1194 m, crop field, 1 ♂, leg. M. Aydoğdu.

Distribution in Turkey: Tekirdağ (Beyarslan *et al.*, 2006).

General distribution: Ethiopian, Neotropical, Oceanic, Oriental, Palaearctic (Afghanistan, Albania, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Canary Islands, China, Cyprus Czech Republic, former Czechoslovakia, Finland, France, Germany, Greece, Hungary, Iran, Ireland, Italy, Korea, Latvia, Libya, Lithuania, Macedonia, Moldavia, Mongolia, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden,

Switzerland, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, United Kingdom, former Yugoslavia).

Chorotype: Palaearctic.

Macrocentrus flavus* Vollenhoven, 1878

Material examined: Zonguldak, Yayla, 27.V.2007, 695 m, pasture, 1 ♀, leg. M. Aydoğdu.

General distribution: Palaearctic (Armenia, Austria, Azerbaijan, Bulgaria, former Czechoslovakia, France, Germany, Greece, Hungary, Iran, Italy, Kazakhstan, Moldova, Netherlands, Poland, Russia, Slovakia, Tajikistan, Ukraine).

Chorotype: Asiatic-European.

Macrocentrus equalis* Lyle, 1914

Material examined: Bolu, Aladağ, Çepni Yaylası, 27.VIII.2002, 1470 m, mixed forest, 1 ♀, leg. M. Aydoğdu; Bursa, Orhaneli, Gönükbelen, 13.VII.1993, 700 m, orchard, 1 ♂, leg. F. İnanç; Edirne, Havsa, Abalar, 01.VIII.1992, 45 m, pasture, 1 ♂, leg. M. Yurtcan; Kastamonu, Çatören, 30.VIII.2002, 950 m, orchard, 1 ♀, leg. F. İnanç; Daday, 29.VIII.2002, 700 m, clover field, 1 ♀, leg. M. Aydoğdu.

General distribution: Palaearctic (Bulgaria, Finland, Germany, Hungary, Japan, Korea Lithuania, Mongolia, Netherlands, United Kingdom).

Chorotype: Asiatic-European.

Macrocentrus infirmus* (Nees, 1834)

Material examined: Kastamonu, Ballıdağ, 29.VIII.2002, 1600-1740 m, mixed forest, 1 ♂, leg. Ö. Çetin; Çatören, 30.VIII.2002, 950 m, orchard, 1 ♀, leg. F. İnanç; Ilgaz mountain, 30.VIII.2004, 1850-2100 m, mixed forest, 2 ♀♀, leg. A. Beyarslan, Ö. Çetin; Sivas, Gürün, İncesu, 23.VI.2009, 1685 m, pasture, 2 ♀♀, leg. M. Yurtcan.

General distribution: Palaearctic (Austria, Belgium, Bulgaria, China, Croatia, former Czechoslovakia, Finland, France, Germany, Hungary, Ireland, Italy, Kazakhstan, Korea, Lithuania, Moldova, Mongolia, Netherlands, Norway, Poland, Romania, Russia, Sweden, Switzerland, United Kingdom, former Yugoslavia).

Chorotype: Asiatic-European.

Macrocentrus kurnakovi* Tobias, 1976

Material examined: Trabzon, Maçka, Gülin mountain, 06.08.2005, 1572 m, fir forest, pasture, 1 ♀, leg. M. Yurtcan.

General distribution: Palaearctic (Azerbaijan, former Czechoslovakia, Georgia, Germany, Hungary, Italy, Japan, Korea, Netherlands, Poland).

Chorotype: Asiatic-European.

***Macrocentrus marginator* (Nees, 1811)**

Distribution in Turkey: Turkey (Yu *et al.*, 2006).

General Distribution: Nearctic, Oriental, Palaearctic (Austria, Azerbaijan, Belarus, Belgium, Bulgaria, China, Croatia, Czech Republic, former Czechoslovakia, Denmark, Finland, France, Georgia, Germany, Hungary, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Moldova, Mongolia, Netherlands, Norway, Poland, Romania, Russia, Slovakia, Slovenia, Sweden, Switzerland, Turkey, former Yugoslavia).

Chorotype: Holarctic.

Macrocentrus pallipes* (Nees, 1811)

Material examined: Adana, Feke, 02.X.1990, 543 m, pasture, 1 ♂, leg. A. Beyarslan; Artvin, Yusufeli, Demirdöven, 02.VII.2005, 1463 m, mixed forest, 1 ♂, leg. A. Beyarslan; Yusufeli, Olgunlar, 02.VII.2005, 2730 m, pasture, 1 ♂, leg. A. Beyarslan; Bartın, Çamlık, 30.VI.2001, 60 m, orchard, pasture, 1 ♀, leg. M. Yurtcan; Edirne, Keşan, Korudağı, 19.V.1986, 354 m, pine forest, 1 ♀, leg. A. Beyarslan; Elazığ, Baskil, Hacimustafa, 08.VIII.1990, 1436 m, orchard, pasture, 1 ♂, leg. A. Beyarslan; Hatay, Hassa, 23.VI.1980, 68 m, pasture, 1 ♂, leg. A. Beyarslan; Niğde, Üniversite Kampüsü, 26.VI.2009, 1205 m, pasture, 1 ♀, leg. M. Yurtcan; Çiftlik, 18.VII.2007, 1562 m, crop field, 1 ♂, leg. A. Beyarslan.

General distribution: Palaearctic (Austria, Bulgaria, China, Croatia, former Czechoslovakia, Finland, France, Germany, Hungary, Japan, Korea, Lithuania, Moldova, Netherlands, Poland, Russia, Slovakia, Switzerland, United Kingdom).

Chorotype: Asiatic-European.

***Macrocentrus sylvestrellae* van Achterberg, 2001**

Distribution in Turkey: Turkey (Achterberg, 2001).

General Distribution: Palaearctic (France, Italy, Turkey).

Chorotype: Turano-European.

***Macrocentrus tessulatanae* Hedwig, 1959**

Distribution in Turkey: Turkey (Achterberg, 1993).

General Distribution: Palaearctic (Turkey).

Chorotype: Turano-European.

***Macrocentrus thoracicus* (Nees, 1811)**

Distribution in Turkey: Turkey (Achterberg, 1993).

General Distribution: Oriental, Palaearctic (Albania, Armenia, Austria, Azerbaijan, Belgium, Bulgaria, China, former Czechoslovakia, Croatia, Finland, France, Georgia, Germany, Greece, Hungary, Italy, Japan, Kazakhstan, Korea, Lithuania, Moldova, Netherlands, Poland, Russia, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, former Yugoslavia).

Chorotype: Asiatic European.

DISCUSSION

In this study, 8 species belonging to *Macrocentrus* genus were collected of which 7 are new records for Turkey: *Macrocentrus blandus* Eady and Clark, *M. buolianae* Eady and Clark, *M. flavus* Vollenhoven, *M. equalis* Lyle, *M. infirmus* (Nees), *M. kurnakovi* Tobias, *M. pallipes* (Nees). Among the species determined, *M. collaris* appeared to be the most dominant species (% 60) in Turkey (Table 1), as in worldwide. This species were collected by using a light trap so that members of *Macrocentrus*, at least *M. collaris*, have a nocturnal flight activity.

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Table 1. Dominance and presence of *Macrocentrus* species (COMM Program).

Species	Sum	Dom(%)	Presence
<i>M. blandus</i>	3.0	6.0	7.9
<i>M. buolianae</i>	3.0	6.0	7.9
<i>M. collaris</i>	30.0	60.0	78.9
<i>M. flavus</i>	1.0	2.0	2.6
<i>M. equalis</i>	4.0	8.0	10.5
<i>M. infirmus</i>	2.0	4.0	5.3
<i>M. kurnakovi</i>	1.0	2.0	2.6
<i>M. pallipes</i>	6.0	12.0	15.8

The Single-Linkage (Bray-Curtis-Index) analysis revealed that the overall similarity of *M. blandus* and *M. infirmus* with respect to their presence in sampling provinces was the highest (Fig. 2).

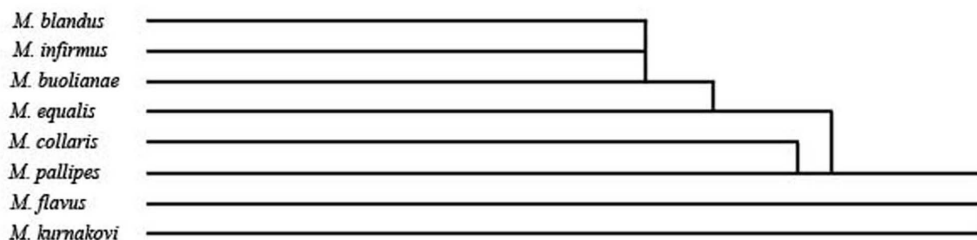


Fig. 2. The dendrogram showing the similarity of *Macrocentrus* species among provinces (Single-Linkage, Bray-Curtis-Index, CI= 0.8989).

The comparison of the main geographic regions of Turkey in terms of species diversity by using the data obtained so far showed that the overall faunistic similarity was highest between Eastern and Southeastern Anatolia regions and lowest between Aegean and Black Sea regions as revealed by Bray-Curtis Index (Fig. 3).

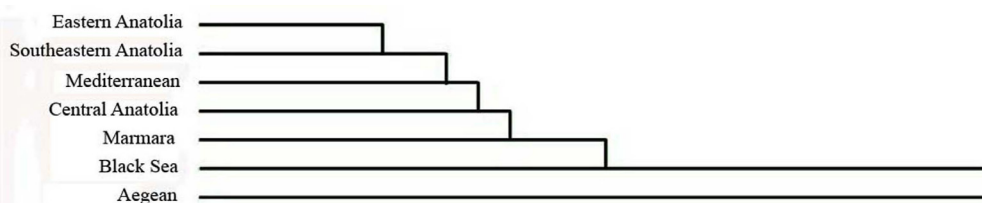


Fig. 3. The dendrogram showing the similarity geographical regions of Turkey in terms of *Macrocentrus* species living here (Single-Linkage, Bray-Curtis-Index, CI= 0.9530).

Zoogeographical characterization

The zoogeographical characterization of the species follows the chorotype classification of the Near East fauna, proposed by Taglianti *et al.* (1999). By the investigation of recent geographical distributions of the species mentioned above, they can be divided into the following groups:

1. Multiregional species (1 species): *M. collaris*.
2. Species with ranges in two zoogeographical regions, usually Holarctic and Oriental (2 species): *M. cingulum*, *M. marginator*.
3. Asiatic-European range: *M. blandus*, *M. buolianae*, *M. flavus*, *M. equalis*, *M. infirmus*, *M. kurnakovi*, *M. pallipes*, *M. thoracicus*.
4. Turano-European range: *M. sylvestrellae*, *M. tessulatanae*.

REFERENCES

- Achterberg, C. van, 1990, Illustrated key to the subfamilies of the Holarctic Braconidae (Hymenoptera: Ichneumonidae). *Zoologische Meddelingen*, 64: 1-20.
- Achterberg, C. van, 1993, Revision of the subfamily Macrocentrinae Förster (Hymenoptera, Braconidae) from the Palaearctic region. *Zoologische Verhandelingen*, Netherlands, Leiden, 286: 110 pp.
- Achterberg, C. van, 2001, *Macrocentrus sylvestrellae* spec. nov. (Hymenoptera: Braconidae: Macrocentrinae), a parasitoid of *Dioryctria sylvestrella* (Ratzeburg) (Lepidoptera: Pyralidae). *Zoologische Meddelingen*, 75: 79-88.
- Beyarslan, A., Yurtcan, M., Erdoğan, Ç. Ö., Aydoğdu, M., 2006, A Study on Braconidae and Ichneumonidae from Ganos Mountains (Thrace Region, Turkey) (Hymenoptera, Braconidae, Ichneumonidae). *Linzer biologische Beiträge*, 38(1): 409-422.
- Piepenburg, D., Piatkowski, U., 1992, A program for computer-aided analyses of ecological field data. *CABIOS*, 8(6): 587-590.
- Taglianti, A. V., Audisio, P. A., Biondi, M., Bologna, M. A., Carpaneto, G. M., De Biase, A., Fattorini, S., Piattella, E., Sindaco, R., Venchi, A., Zapparoli, M., 1999, A proposal for a chorotype classification of the Near East fauna, in the framework of the Western Palaearctic Region. *Biogeographia*, 20:31-59.
- Tobias, V. I., 1986, [Order Hymenoptera. Family Braconidae]. In: Medvedev G. S. (ed.), 'Opredelitel Nasekomykh Evropeiskoi Tsasti SSSR 3, Peredpiontdatokrylye 4. Opr. Faune SSSR.' 145: 1-501. [Keys to the insects of the European part of USSR. Hymenoptera]. [English translation. Lebanon, U. S. A.].
- Ural, İ., Işık M., Kurt, A., 1973, Doğu Karadeniz Bölgesi Fındık bahçelerinde tesbit edilen böcekler üzerinde bazı incelemeler. *Bitki Koruma Bülteni*, 13(2): 55-66.
- Yu D. S., van Achterberg C. and Horstmann K. 2006, World Ichneumonidea 2004. Taxonomy, Biology, Morphology and Distribution (Braconidae). *Taxapad 2005 (Scientific Names for Information Management) Interactive Catalogue* on DVD/CDROM. Vancouver.

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