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Ichneumonidae (Hymenoptera) Fauna of Natural Protection Areas in East Mediteranean Region of Turkey, Part I

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ABSTRACT

Ichneumonidae species diversity of three Natural Protection Areas (Halep Çamlığı, Kengerlidüz, Habib-i Neccar) chosen from East Mediterranean Region of Turkey were investigated comparatively. The surveys were conducted between March-September 2007-2008 once a month intervals. In the study, 54 species were determined, of which 17 species were recorded for the first time in Turkish Ichneumonidae fauna. Zoogeographical notes were given for each species. Also, the hotspot distributions were added.

Key words: Ichneumonidae, zoogeographical notes, hotspots, nature protection areas, fauna.

INTRODUCTION

Ichneumonidae is the largest family of the Hymenoptera and one of the largest families within Insecta containing 60,000 species (Townes, 1969a). Ichneumonidae is represented with about 8711 species in the Palearctic region (Yu & Horstmann, 1997). From the standpoint of taxanomy, Ichneumonidae is one of the most difficult groups of insects to study. Because this family is rather poorly known, it is difficult to identify the endangered, relict or endemic species. One may indicate rare species in some groups (Kaźmierczak, 2004).

Ichneumonids are egg parasitoids of immature holometabolous insects such as Coleoptera, Diptera, Hymenoptera, Lepidoptera, Rhaphidioptera, Trichoptera and also other arthropods such as Chelicerata, adult Araneae, and Pseudoscorpionida. However, symphytan and lepidopteran are the most common hosts (Townes, 1969a).

Turkey has great variability in topographic and climatic features because of its significant geographical location joining two continents (Çıplak, 2004). It is also one of the most remarkable regions of the world in terms of the biodiversity hotspots such that three of them have major extensions into Turkey: Caucasus, Irano- Anatolian, and Mediterranean Basin (Myers *et al*., 2000) (Fig. 1).

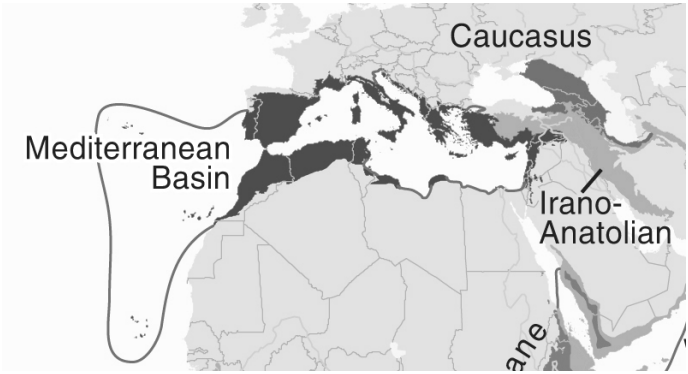

Fig. 1. Biodiversity hotspots of Turkey (Myers *et al*., 2000)

The aims of this study are; to determine the species existing in the selected Natural Protection Areas of East Mediterranean; to point out which hotspots the species located in and to evaluate the diversity index.

MATERIAL AND METHODS

Study site

Yumurtalık Halep Çamlığı Natural Protection Area (Adana) which is situated in Eastern Mediterranean, Turkey (37˚47'N 38˚39'E), covers an area from sea level to 3 m. elevation a. s. l. Yumurtalık Lagoons have various habitat characters with abundant vegetation, existence of the animals and constitutes an open laboratory for scientific research (Fig. 2). Yumurtalık has been declared as a Natural Protection Area of Eastern Mediterranean in Turkey since 1994. *Astragalus subuliferus* and *Bupleurum polyactis* are two endemic plant species for Yumurtalık Lagoons. Also *Pinus halepensis*, which covers about 54 Ha. in Yumurtalık, is a unique natural sample. Vegetation: *Myrtus communis*, *Erica manipuliflora*, *Salicornia europaea, Juncus maritimus, Plantago maritima, Plantago lanceolata, Trifolium campestre, Juncus acutus, Pistacia lentiscus* and lots of lemur plants.

Tekkoz Kengerlidüz Natural Protection Area (Hatay province, Dörtyol District) is located in Eastern Mediterranean Region (36˚ 57'N 36˚ 23'E) within the borders of the Küllü and Kızlarçayı villages (Fig. 2). Field size is 172 Ha. and covers an area from 930 to 1900 m. elevation a.s.l. This area is in the forest zone, and has different features for ecosystem. Vegetation: *Fagus orientalis*, *Quercus cerris* and *Abies cilicica* are in Kengerlidüz; *Carpinus orientali*, *Ostrya spi, Fraxinus ornus, Pinus nigra* and *Acer plata noides* are in Tekkoz (Http2).

Habibi Neccar Natural Protection Area (Hatay) is located within the border of Center district of Antakya (36˚ 25'N 36˚ 22'E), in the Eastern Mediterranean Region. Field size is 118 Ha. (Fig. 2). Vegetation: *Quercus ilex, Quercus coccifera, Pinus brutia, Arbutus andrachne, Astragalus* sp.*, Verbascum* sp.*, Alhagi mannifera, Urtica pilulifera, Olea europeae, Malva nicaeensis* (Http1).

Fig. 2. Map of selected areas of East Mediterranean.

Sampling method and collection

The Ichneumonidae samples were collected from March to September in 2007 and 2008 once a month intervals.

The Ichneumonidae were sampled using Malaise traps, yellow pan traps and by sweep netting. Ichneumonidae samples were taken in the average fifteen-day period from malaise trap and yellow pan trap. The samples, which were collected by sweep netting, were and put into %70 ethanol solution in the plastic pots. The samples were brought to laboratory with these pots. Softening process of samples was done with isopropyl alcohol. Isopropyl alcohol helps to soften the samples which were hardened because of the ethanol. The preparation process was done under the stereo microscope. The samples are preserved in the collection of the Department of Biology, Faculty of Arts and Sciences at Süleyman Demirel University, Isparta, Turkey.

The literature used for the identification of specimens were Townes (1969a-c, 1971), Kasparyan (1973, 1981, 1990), Fitton *et al*., (1988), Gupta (1990) and Kolarov (1997a, b).

The Shannon-Wiener diversity index (H'), Simpson's index (1/D) and Berger-Parker index of dominance (1/d) were used as the alpha-diversity indices. The Jaccard (Cj) and Bray- Curtis (CN, quantitative version of Sørensen index) indices were used to determine the degree of similarity in species composition of different areas (Magurran, 2004). Data were analyzed by using the program BioDiversity Pro (Version 2)

RESULTS

A list of the species is given below along with the collection dates, locations, general and Turkey distrubitions, specimen numbers of each sex. New recorded species are marked by an asteriks in the list.

SUBFAMILY ANOMALONINAE

Anomalon cruentatum (Geoffroy, 1785)

Material examined: Hatay, Habib-i Neccar, 9-12.IV.2007, 3♂♂; 9-12.VI.2007, 3♂♂ 6♀♀; Adana, Halep Çamlığı, 23.IV.2008, 1♀; 6-9.VI.2007, 6♂♂, 5♀♀; 7.VI.2007, 1♂; 1-12.VII.2008, 1♀; 13.IV.2008, 2♂♂; Hatay, Kengerlidüz, 1150m, 26.IV.2008, 1♂, 2♀♀;12-15.VI.2007, 2♀♀; 21.VI.2007, 3♀♀; 4.VII.2007, 1♀; 21.VII.2007, 3♀♀; 7.VIII.2007, 1♀; 18.VI.2008, 2♂♂, 1♀; 919m, 21.VI.2008, 1♂; 27.05.-10.VI.2008, 3♂♂, 4♀♀; 22-23.VII.2008, 2♂♂, 1♀; 17.VII.2008, 5♀♀.

Distribution in Turkey: Adana, Gaziantep, İçel, Antalya, Adıyaman, Kırklareli, Edirne, Tekirdağ, İstanbul (Kolarov *et al*., 1994), Afyon-Bayat-Köroğlu, Muğla-Yaraş (Kolarov *et al*., 2002); Isparta-Merkez, Kirazlıdere, Gönen (Gürbüz, 2004); Antalya, Bayburt, Bingöl, Diyarbakır, Erzincan, Erzurum, Hatay, Kahramanmaraş, Iğdır, Kars (Çoruh *et al*., 2004); Adıyaman-Merkez, Batman-Hasankeyf, Diyarbakır-Çermik, Merkez, Elazığ-Yemişlik, Malatya-Yeşilyurt, Doğanyurt, Mardin-Savur (Akkaya, 2005), Tekirdağ-Işıklar, Tekirdağ-Şarköy-Güzelköy (Beyarslan *et al*., 2006), Isparta-Kirazlıdere (Gürbüz *et al*., 2009)

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot, Caucasus Hotspot.

General distribution: Palearctic, Oriental (Yu *et al*., 2006).

**Aphanistes ruficornis* (Gravenhorst, 1829)

Material examined: Adana, Halep Çamlığı, 13-16.IV.2007, 2♀♀; Hatay, Habib-i Neccar, 16.IV.2007, 1♂.

Hotspot distribution: Mediterranean Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

**Erigorgus fibulator* (Gravenhorst, 1829)

Material examined: Adana, Halep Çamlığı, 13-17.IV.07, 1♀.

Hotspot distribution: Mediterranean Hotspot, Caucasus Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

SUBFAMILY BANCHINAE

Banchopsis crassicornis Rudow, 1886

Material examined: Hatay, Samandağ, 670m, 14.IV.07, 1♀.

Distribution in Turkey: Ankara, İstanbul (Kolarov, 1989b), Erzurum. Pasinler (Pekel *et al*., 2000), Batman (Akkaya, 2005).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

**Exetastes gracilicornis* Gravenhorst, 1829

Material examined: Osmaniye, Fenk, 1120 m, 19-26.VI.2008, 6♀♀; 26.VI-3.VII.2008, 7♀♀.

Hotspot distribution: Mediterranean Hotspot, Caucasus Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

***Lissonota* (Lissonota) *bivittata* Gravenhorst, 1829**

Material examined: Hatay, Habib-i Neccar, 9-12.VI.2007, 1♀.

Distribution in Turkey: Ankara (Özdemir, 1996), Elazığ (Akkaya, 2005); Tekirdağ (Beyarslan *et al*., 2006).

Hotspot distribution: Mediterranean Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

***Lissonota* (Lissonota) *carbonaria* Holmgren, 1860**

Material examined: Adana, Halep Çamlığı, 2. IV. 2008, 4♂♂ 1♀.

Distribution in Turkey: Kırşehir (Özdemir, 1996).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot, Caucasus Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

***Lissonota lineata* (Gravenhorst, 1829)**

Material examined: Hatay, Kengerliduz, 1650 m, 10-18.VI.2008, 2♂♂; Osmanyie, Fenk, 1120 m, 26.VI.-3.VII.2008, 6♂♂; 8-15.VII.2008, 3♂♂; 3-8.VII.2008, 4♂♂; 15-22.VII.2008, 3♂♂;19-26.VI.2008, 3♂♂.

Distribution in Turkey: Turkey (Kolarov, 1995), Diyarbakır (Akkaya, 2005).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot, Caucasus Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

****Lissonota* (Lissonota) *folii* Thomson, 1877**

Material examined: Osmaniye, Fenk, 1120 m, 3-8.VII.2008, 1♂♂.

Hotspot distribution: Mediterranean Hotspot.

General distribution: Palaearctic, Europe, Nearctic (Yu *et al*., 2006).

***Lissonota* (Lissonota) *fundator* (Thunberg, 1822)**

Material examined: Hatay, Tokgöz, 12.XI.2006, 1♀.

Distribution in Turkey: Isparta-Gökçay, Kasnakmeşesi, Sav, Burdur-Dirmil (Kolarov & Gürbüz, 2006), Isparta-Ayazmana-Sütçüler (Gürbüz *et al*., 2009).

Hotspot distribution: Mediterranean Hotspot, Caucasus Hotspot.

General distribution: Palaearctic, Europe, Nearctic (Yu *et al*., 2006).

***Lissonota* (Loxonota) *cruentator* (Panzer,1809)**

Material examined: Osmaniye, Fenk, 1120 m, 8-15.VII.2008, 2♂♂; 15-22.VII.2008, 1♂.

Distribution in Turkey: Edirne (Sevidy, 1959), Erzincan, Erzurum, Kars (Pekel *et al*., 2000).

Hotspot distribution: Mediterranean Hotspot, Caucasus Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

***Lissonota* (Lissonota) *linearis* Gravenhorst, 1829**

Material examined: Hatay, Dörtyol, 1625 m, 21.VII.2007, 1♂.

Hotspot distribution: Mediterranean Hotspot.

General distribution: Western Palaearctic, Europe (Yu *et al*., 2006).

***Lissonota ? pimplator* (Zetterstedt, 1838)**

Material examined: Hatay, Samandağ, 670m, 14.IV.07, 1♀.

Distribution in Turkey: Gökçeada ve Bozcaada (Kolarov *et al*., 1997).

Hotspot distribution: Mediterranean Hotspot, Caucasus Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

***Lissonota* (Lissonota) *versicolor* Homgren, 1860**

Material examined: Adana, Halep Çamlığı, 16-19.III.2007, 1♀.

Hotspot distribution: Mediterranean Hotspot.

General distribution: Western Palaearctic, Europe (Yu *et al*., 2006).

SUBFAMILY BRACHYCYRTINAE

***Brachycyrtus ornatus* Kriechbaumer, 1880**

Material examined: Osmaniye, Fenk, 1120 m, 3-8.VII.2008, 1♀.

Distribution in Turkey: Çanakkale (Kolarov *et al*., 1997), Karabük-Eskipazar-Ortakoy (Kolarov & Yurtcan, 2008).

Hotspot distribution: Mediterranean Hotspot.

General distribution: Palearctic, Europe, Nearctic, Neotropical (Yu *et al*., 2006).

SUBFAMILY CTENOPELMATINAE

***Barytarbes laeviusculus* (Thomson, 1883)**

Material examined: Osmaniye, Mitisin, 1705 m, 18.VI.2008, 3♂♂; 20.VI.2008, 1♂ 1♀.

Hotspot distribution: Mediterranean Hotspot.

General distribution: Czechoslovakia, France, Germany, Hungary, İtaly, Portugal, Russia, Sweden, A.B.D. (Yu *et al*., 2006).

***Bremiella pulchella* (Kriechbaumer, 1890)**

Material examined: Hatay, Habib-i Neccar, 200 m, 15.IV.2007, 2♂♂.

Distribution in Turkey: Erzurum (Kolarov & Özbek, 1998).

Hotspot distribution: Mediterranean Hotspot, Caucasus Hotspot.

General distribution: Western Palaearctic, Europe (Yu *et al*., 2006).

***Lamachus eques* (Hartig, 1838)**

Material examined: Adana, Toprakkale, 60 m, 15.IV.2008, 2♂♂ 2♀.

Distribution in Turkey: Turkey (Aubert, 2000).

Hotspot distribution: Mediterranean Hotspot.

General distribution: Western Palaearctic, Europe (Yu *et al*., 2006).

****Lathrolestes ungularis* (Thomson, 1883)**

Material examined: Hatay, Kengerlidüz, 1650 m, 10-18.VI.2008, 1♂.

General distribution: Germany, Norway, Portugal, Netherlands, Sweden, A.B.D. (Yu *et al*., 2006).

***Perilissus amperis* (Heinrich, 1949)**

Material examined: Hatay, Samandağ, 14.IV.2007, 1♂.

Distribution in Turkey: Turkey (Aubert, 2000).

Hotspot distribution: Mediterranean Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

***Perilissus dissimilitor* Aubert, 1987**

Material examined: Hatay, Habib-i Neccar, 200 m, 16.IV.2007, 1♀.

Distribution in Turkey: Turkey (Aubert, 2000).

Hotspot distribution: Mediterranean Hotspot.

General distribution: Western Palaearctic, Europe (Yu *et al*., 2006).

***Perilissus lutescens* Holmgren, 1857**

Material examined: Hatay, Habib-i Neccar, 200 m, 1♀.

Distribution in Turkey: İstanbul (Kolarov, 1989b).

Hotspot distribution: Mediterranean Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

***Perilissus spilonotus* (Stephens, 1835)**

Material examined: Osmaniye, Mitisin, 18.VI.2008, 1♀.

Distribution in Turkey: Edirne (Kolarov, 1995).

Hotspot distribution: Mediterranean Hotspot.

General distribution: Western Palaearctic, Europe (Yu *et al*., 2006).

***Phobetes leptocerus* (Gravenhorst, 1820)**

Material examined: Adana, Halep Çamlığı, 13.IV.2007, 1♂; 16.IV.2007, 3♂♂; Hatay, Habib-i Neccar, 200 m, 15.IV.2007, 5♂♂; 18.IV.2008, 3♂♂; Adana, Pozantı, 1114 m, 17.VI.2008, 1♂; Osmaniye, Hacbel, 1365 m, 22.VI.2008, 1♂.

Distribution in Turkey: Turkey (Aubert, 2000).

Hotspot distribution: Mediterranean Hotspot.

General distribution: Western Palaearctic, Europe (Yu *et al*., 2006).

***Pion fortipes* (Gravenhorst, 1829)**

Material examined: Osmaniye, Mitisin, 1705 m, 18.VI.2008, 1♂.

Distribution in Turkey: İstanbul (Kolarov, 1995); Erzurum (Özbek *et al*., 2000).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot, Caucasus Hotspot.

General distribution: Palaearctic, Europe (Yu *et al*., 2006).

***Rhinotorus* sp. Förster, 1869**

Material examined: Hatay, Habib-i Neccar, 200 m, 15.IV.2007, 1♂; 18.IV.2007, 1♀.

General distribution: Austria, Belgium, Czechoslovakia, France, Germany, Hungary, İtaly, Finland, Latvia Lithuania Netherlands Norway, Portugal, Romania, Russia, Sweden, A.B.D. (Yu *et al*., 2006).

***Rhorus* sp. Förster, 1869**

Material examined: Osmaniye, Mitisin, 1705 m, 20.VI.2008, 1♂.

General distribution: Palaearctic, Europe, Nearctic, Neotropical, Oriental (Yu *et al*., 2006).

***Rhorus longicornis* (Holmgren, 1858)**

Material examined: Osmaniye, Fenk, 1705 m, 21.VI.2008, 1♂; Osmaniye, Mitisin, 1705 m, 18.VI.2008, 1♀.

Distribution in Turkey: Turkey (Aubert, 2000).

Hotspot distribution: Mediterranean Hotspot, Caucasus Hotspot.

General distribution: Western Palaearctic, Europe (Yu *et al*., 2006).

***Scolobates auriculatus* (Fabricius, 1804)**

Material examined: İskenderun, Güzelyayla, 1119 m, 22.VI.2008, 1♂.

Distribution in Turkey: Turkey (Aubert, 2000), Erzurum-Oltu (Çoruh *et al*., 2002).

Hotspot distribution: Mediterranean Hotspot, Caucasus Hotspot.

General distribution: Western Palaearctic, Europe, Nearctic, Oriental (Yu *et al*., 2006).

***Synodites* sp. Förster, 1869**

Material examined: Hatay, Habib-i Neccar, 477 m, 16.IV.2007, 1♂.

General distribution: Palaearctic, Europe, Nearctic (Yu *et al*., 2006).

SUBFAMILY DIPLAZONTINAE

***Diplazon* sp. Nees, 1819**

Material examined: Hatay, Habib-i Neccar, 16-19.III.2007, 2♂♂.

General distribution: Austria, Palearctic, Europe, Nearctic, Neotropical, Oriental, Ethiopia (Yu *et al*., 2006).

***Diplazon laetatorius* (Fabricius, 1781)**

Material examined: Adana, Halep Çamlığı, 16-19.III.2007, 1♀; 13-17.IV.2007, 22♀♀; 25.IV.2007, 5♀♀; 7-9.V. 2007, 16♀♀; 21.V.2007, 7♀♀; 6-9.VI.2007, 2♀♀; 3.VII.2007,1♀; 3-14.VII.2007, 1♀; Hatay, Samandağ, 14.IV.2007, 1♀; 15.IV.2007, 4♀; Hatay,Habib-i Neccar, 13.XI.2006, 550m, 1♀; 15.IV.04,

200m, 2♀♀; Adana, Pozantı, 1114m,17.VI.2008, 1♀, Osmaniye, Mitisin, 20.VI.2008, 1♀; Osmaniye, Hacbel, 22.VI.2008, 1♀; Hatay, Kengerliduz, 1650 m, 6-17.V.2008, 1♀; 26.IV.6-V.2008, 1♀.

Distribution in Turkey: Ankara (Tuatay *et al*., 1972), İstanbul (Kolarov, 1989a), Ankara (Öncüer, 1991), Edirne, Tekirdağ, Kırklareli (Yurtcan *et al*., 1999), Isparta, Şarkikaraağaç, Merkez, Sav, Gönen (Gürbüz, 2004), Isparta-Ayazmana (Gürbüz *et al*., 2009).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot, Caucasus Hotspot.

General distribution: Cosmopolitan (Yu *et al*., 2006).

***Syrphophilus bizonarius* (Gravenhorst, 1829)**

Material examined: Adana, Halep Çamlığı, 13-17.IV.07, 11♀♀; Hatay, Tokgöz, 12.XI.2006, 1♀; Hatay, Samandağ, 10.V.2007, 1♀.

Distribution in Turkey: Isparta-Gökdere, Sav, Uluborlu (Gürbüz, 2005).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot, Caucasus Hotspot.

General distribution: Holarctic, Oriental (Yu *et al*., 2006).

***Syrphoctonus* sp. Förster, 1869**

Material examined: Adana, Halep Çamlığı, 16-19.III.2007 4♂♂; Hatay, Tokgöz, 12.XI.2006, 1♂; Hatay, Habib-i Neccar, 16-19.III.2007 1♂.

General distribution: Austria, Palearctic, Europe, Neacktic, Neotropical, Oriental, Ethiopia (Yu *et al*., 2006).

***Syrphoctonus nigritarsus* (Gravenhorst, 1829)**

Material examined: Osmanyie, Mitisin, 1705 m, 18.VI.2008, 1♀.

Distribution in Turkey: Ankara, Çankırı, Eskişehir (Özdemir, 2001).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot.

General distribution: Palearctic, Europe, Nearcric, Neotropical (Yu *et al*., 2006).

SUBFAMILY OPHIONINAE

***Enicospilus inflexus* (Ratzeburg, 1844)**

Material examined: Adana, Halep Çamlığı, 16.IV.07, 1♂.

Distribution in Turkey: Erzurum-Horasan (Kolarov *et al*., 2000).

Hotspot distribution: Mediterranean Hotspot.

General distribution: Palearctic, Europe (Yu *et al*., 2006).

***Enicospilus ramidulus* (Linnaeus, 1758)**

Material examined: Adana, Halep Çamlığı, 13-17.IV.07, 1♀; Hatay, Habib-i Neccar, 16.IV.07, 2 ♀♀.

Distribution in Turkey: Konya (Kolarov, 1989a); Nevşehir (Kolarov, 1994); Ankara-Şereflikoçhisar;Erzurum-Üniversite kampusü, Palandöken, Aşkale, Ilıca, Pasinler,Çalıyazı, İspir, Pazaryolu, Narman, Oltu, Çamlıbel, Süngübayır; Erzincan-Bahçekültürleri; Rize-Anzer (Kolarov *et al*., 2000); Malatya (Akkaya, 2005)

Isparta (Kolarov & Gürbüz, 2006); Tekirdağ (Beyarslan *et al*., 2006); Bolu, Sinop, Karabük, Kastamonu (Okyar & Yurtcan, 2007).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot, Caucasus Hotspot.

General distribution: Palearctic, Ethiopia, Europe, Oriental (Yu *et al*., 2006).

***Ophion mocsaryi* Brauns, 1889**

Material examined: Adana, Halep Çamlığı, 25.IV.2007, 1♀.

Distribution in Turkey: Bayburt, Erzurum (Kolarov et al., 2000); Isparta-Güneykent (Kolarov & Gürbüz, 2006).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot, Caucasus Hotspot.

General distribution: Europe, Georgia, Turkey, Israel (Yu *et al*., 2006).

***Ophion pteridis* Kriechbaumer, 1879**

Material examined: Adana, Toprakkale, 60 m, 15.IV.2008, 3♂♂.

Distribution in Turkey: Erzurum (Kolarov *et al*., 2000).

Hotspot distribution: Mediterranean Hotspot.

General distribution: Palearctic, Europe (Yu *et al*., 2006).

SUBFAMILY ORTHOCENTRINAE

***Orthocentrus* sp. Gravenhorst, 1829**

Material examined: Adana, Halep Çamlığı, 16-19.III.2007, 1♀.

General distribution: Australia, Palearctic, Europe, Nearctic, Neotropical, Oriental, Ethiopia (Yu *et al*., 2006).

****Orthocentrus frontator* (Zetterstedt, 1838)**

Material examined: Hatay, Kengerlidüz, 21.VI.2007, 1♀.

Hotspot distribution: Mediterranean Hotspot.

General distribution: Holarctic (Yu *et al*., 2006).

***Orthocentrus radialis* Thomson, 1897**

Material examined: Hatay, Kengerlidüz, 28.VIII.2007, 1♀.

Distribution in Turkey: İstanbul (Kolarov, 1989a).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot.

General distribution: Europe, Turkey (Yu *et al*., 2006).

SUBFAMILY TERSILOCHINAE

****Allophroides boops* (Gravenhorst, 1829)**

Material examined: Karaman, Sertavul Geçidi, 477 m, 18-19.IV.2008, 1♀.

Hotspot distribution: Mediterranean Hotspot.

General distribution: Austria, Belgium, Czechoslovakia, Finland, France, Hungary, Germany, Italy, Polond, Romania, Russia, A.B.D. (Yu *et al*., 2006).

***Diaparsis aperta* (Thomson, 1889)**

Material examined: Hatay, Kengerlidüz, 1625 m, 21.VII.2007, 1♀; Osmaniye, Fenk, 1120 m, 3-8. VII.2008, 1♀; Osmaniye, Hacbel, 1365 m, 22.VI.2008, 1♀.

Distribution in Turkey: Turkey (Horstmann, 1971).

Hotspot distribution: Mediterranean Hotspot, Caucasus Hotspot.

General distribution: Palearctic, Europe (Yu *et al*., 2006).

****Diaparsis nitida* Horstmann, 1981**

Material examined: Hatay, Habib-i Neccar, 477 m, 15.IV.2007, 2♀♀.

General distribution: Palearctic, Europe (Yu *et al*., 2006).

***Gelanes* sp. Horstmann, 1981**

Material examined: Adana, Halep Çamlığı, 0 m, 16-19.III.2007, 1♂.

General distribution: Western Palearctic, Europe (Yu *et al*., 2006).

****Gelanes fusculus* (Holmgren, 1860)**

Material examined: Hatay, Habib-i Neccar, 477 m, 16-19.III.2007, 2♀♀.

General distribution: Austria, Russia, Bulgaria, Finland, Germany, Hungary, Norway, Kazakhistan, Polond, Ukrainia, Sweden (Yu *et al*., 2006).

****Gelanes simillimus* Horstmann, 1981**

Material examined: Hatay, Habib-i Neccar, 477 m, 16-19.III.2007, 1♀; 15.IV.2007, 1♀.

General distribution: Bulgaria, Finland, Litvania, Polond, Russia, Ukrainia, A.B.D. (Yu *et al*., 2006).

****Phradis brevis* (Brischke, 1880)**

Material examined: Hatay, Habib-i Neccar, 477 m, 16-19.III.2007, 2♀♀.

Hotspot distribution: Mediterranean Hotspot.

General distribution: Austria, Bulgaria, Czechoslovakia, Estonia, Finland, France, Germany, Hungary, Italy, Portugal, Polond, United Kingdom, Yugoslavia (Yu *et al*., 2006).

***Probles* sp. Förster, 1869**

Material examined: Hatay, Samandağ, 450m, 14.IV.07, 1♂; Hatay, Dörtyol, 1416m, 16.0IV.08, 1♂.

****Tersilochus ? jocator* Holmgren, 1859**

Material examined: Hatay, Dörtyol, 1538 m, 16-17.IV.2008, 1♀.

Hotspot distribution: Mediterranean Hotspot.

General distribution: Austria, Belgium, Bulgaria, Czechoslovakia, Danimark, Estonia, Finland, France, Germany, Russia, Italy, Norway, Polond, Romania, Hungary, Netherlands, Sweden, Ukrainia, Switzerland, A.B.D. (Yu *et al*., 2006).

**** Tersilochus nitens* Horstmann and Kolarov, 1988**

Material examined: Hatay, Habib-i Neccar, 106 m, 18.IV.2008, 1♀; Hatay, Samandağ,15.IV.2007, 2♂♂ 2♀♀; Osmaniye, Mitisin, 1705 m, 18.VI.2008, 1♀.

General distribution: Bulgaria (Yu *et al*., 2006).

****Tersilochus triangularis* (Gravenhorst, 1807)**

Material examined: Hatay, Samandağ, 470 m, 14.IV.2007, 1♀.

Hotspot distribution: Mediterranean Hotspot.

General distribution: Austria, Bulgaria, Czechoslovakia, Finland, France, Germany, Russia, Netherlands, Portugal, Hungary, Moldovia, Ukrainia, A.B.D. (Yu *et al*., 2006).

SUBFAMILY XORIDINAE

***Xorides gracilicornis* (Gravenhorst, 1829)**

Material examined: Osmaniye, Fenk, 1120 m, 26.VI.-7.VIII.2008, 1♀.

Distribution in Turkey: Türkiye (Aubert, 1969); Isparta (Kolarov & Gürbüz, 2006).

Hotspot distribution: Mediterranean Hotspot, Irano Anatolian Hotspot, Caucasus Hotspot.

General distribution: Palearctic, Europe (Yu *et al*., 2006).

DISCUSSION

In this study, 54 species belonging to 32 genera were collected. 17 of them are new records for Turkey: one species from Anomaloninae, three from Banchinae, two from Ctenopalmetinae, one from Orthocentrinae and eight from Tersilochinae.

Diplazontinae is the most dominant subfamily in Halep Çamlığı, Yumurtalık Nature Reserve; Banchinae is the common subfamily in Kengerlidüz Nature Reserve, Ctenopelmatinae is dominant subfamily in Habib-i Neccar Nature Reserve (Fig. 3). Different subfamilies are dominant in each of the three regions.

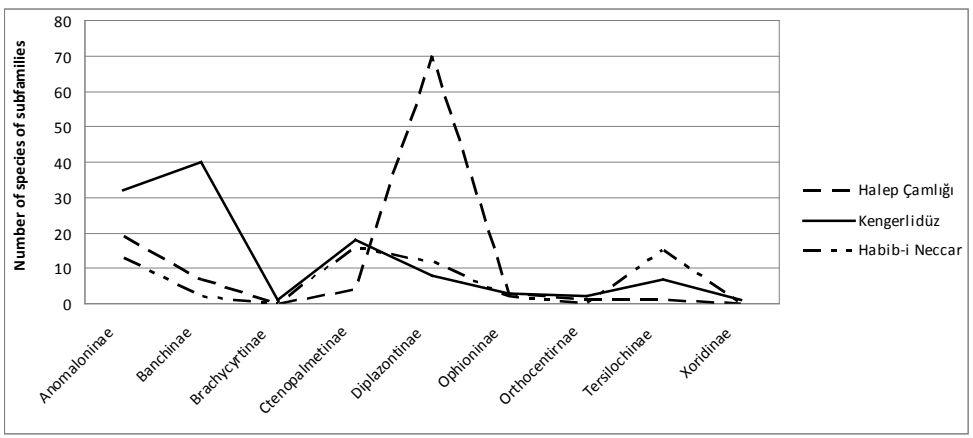

Fig. 3. The number of the species of the subfamilies in three study areas.

The comparison of the three natural reserves by using the data obtained during the whole study period showed that, the overall faunistic similarity of Habib-i Neccar and Halep Çamlığı was 33,93 according to Bray-Curtis index, (Fig. 4).

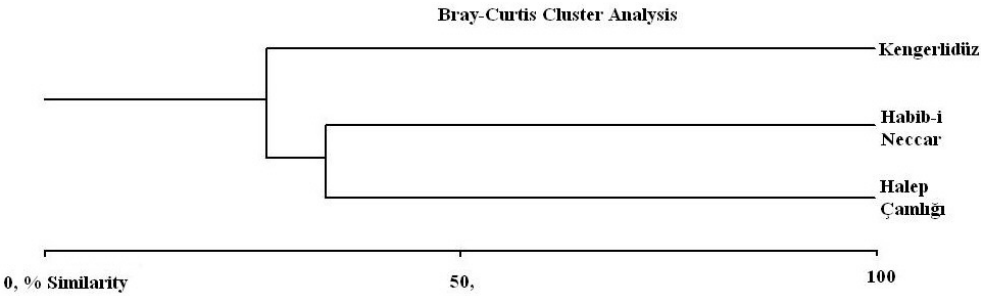

Fig. 4. Similarity between Ichneumonidae communities inhabiting natural reserves based on quantitative data (Bray-Curtis index).

According to Shannon, Simpsons and Berger-Parker diversity index, Habib-i Neccar has a higher diversity value than the others (Table 1).

Table 1. The results of the diversity index.

	Halep Çamlığı	Kengerlidüz	Habib-i Neccar
Shannon H'	0,732	1,109	1,183
Simpsons Diversity (1/D)	3,244	7,571	12,643
Berger-Parker (1/d)	1,909	3,5	5

Turkey has three hotspots. These are Caucasus, Irano-Anatolian and Mediterranean Basin (Myers *et al.*, 2000). The results of our study shows that nine species are found in all three hotspot, 20 only in the Mediterreanean hotspot, nine in Mediterranean-Caucasus hotspots, three in Mediterranean-Irano-Anatolian hotspots. Five ichneumonids were not found in three hotspots.

Icneumonids are prone to reach these hotspots. For example, *Banchopsis crassicornis, Syrphoctonus nigritarsus* and *Orthocentrus radialis* were found initially in Mediterranean, and later these species were found in Irano-Anatolian hotspots. As a result, we can say that if those insects were found in two regions, may be, they could arive at Caucasus hotspot.

Lissonota lineata, Pion fortipes and *Syrphophilus bizonarius* were spread in three hotspots. According to Yu *et al.*, 2006, these insects were found first in Mediterranean hotspot, later found in Irano Anatolian hotspot and lastly in Caucasus hotspot. Consequently, we can say that these insects may have followed these routes.

Lathrolestes ungularis, Diaparsis nitida, Gelanes fusculus, Gelanes simillimus and *Tersilochus nitens,* which are in Palearctic region, were not found in three hotspots. These insects have reached to Mediterranean hotspot.

Ichneumonidae species gathered three groups along two axes in CCA graphic. In the graphic, second group of species were affected by height and downfall, third group of species were affected by temperature and first group of species were not affected

by these environmental variables. In CCA graphic, long arrows indicate the affect of environmental variable. Temperature is the most importatnt environmental variable for distribution of Ichneumonidae species according to CCA. In addition, species were affected from the vicinity of the arrows. Example: *Gelanes* sp. was affected positively from temperature where *Xorides gracilicornis* was affected positively from rainfal (Fig. 5).

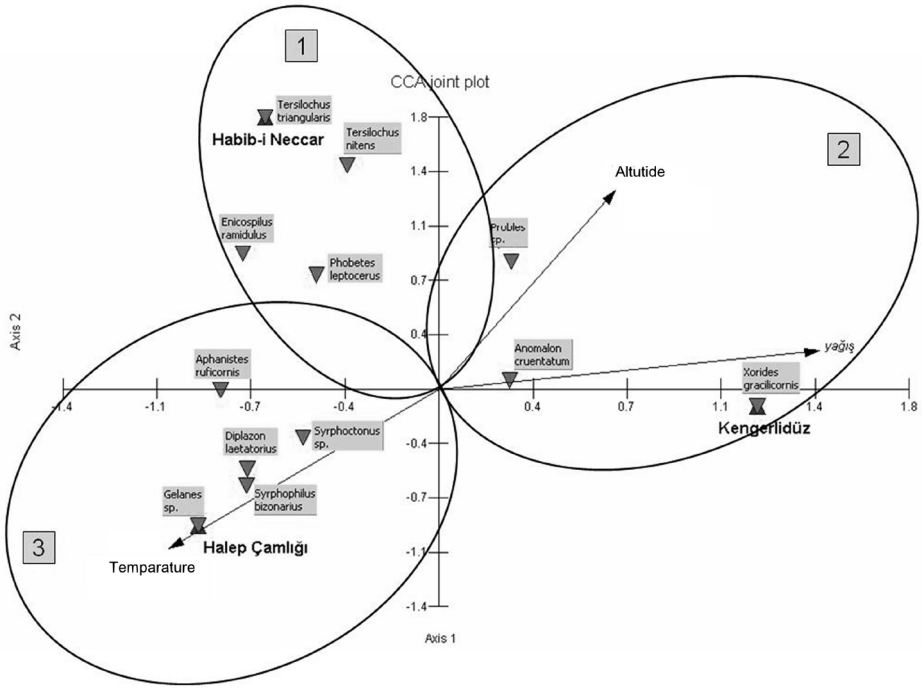

Fig. 5. The results of the environmental variables on Ichneumonidae species according to CCA.

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. Palearctic chorotypes: *Anomalon cruentatum, Aphanistes ruficornis, Exetastes gracilicornis, Lissonota* (*Loxonota*) *cruentator, Ophion pteridis, Xorides gracilicornis, Diaparsis nitida, Gelanes simillimus, G. fusculus.* 2. Holarctic chorotypes: *Lissonota* (Lissonota) *folii, Lissonota* (Lissonota) *fundator, Brachycyrtus ornatus, Scolobates auriculatus, Orthocentrus frontator.* 3. Holarctic-oriental chorotype: *Syrphophilus bizonarius.* 4. Holarctic-neotropical chorotype: *Syrphoctonus nigritarsus.* 5. European chorotypes*: Lissonota* (Lissonota) *linearis, Lissonota* (Lissonota) *versicolor, Barytarbes laeviusculus, Bremiella pulchella, Lamachus eques, Lathrolestes ungularis, Perilissus dissimilitor, P. spilonotus, Phobetes leptocerus, Rhorus longicornis, Enicospilus*

inflexus, *Ophion mocsary, Orthocentrus radialis, Allophroides boops, Diaparsis aperta*, *Phradis brevis*, *Tersilochus ? jocator, Tersilochus triangularis*, *Lissonota ? pimplator, Tersilochus nitens.* 6. Asiatic European Chorotype: *Erigorgus fibulator.* 7. Mediterranean Chorotype*: Banchopsis crassicornis.* 8. Centralasiatic European Chorotypes*: Lissonota* (Lissonota) *bivittata, Lissonota lineate.* 9. Sibero European Chorotypes: *Lissonota* (Lissonota) *carbonaria, Perilissus amperis*, *Perilissus lutescens, Pion fortipes.* 10. Palearctic-Ethiopian-Oriental chorotype: *Enicospilus ramidulus.* 11. Cosmopolitan: *Diplazon laetatorius.*

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