

## Contributions to the Knowledge of the Eulophinae (Hymenoptera: Eulophidae) from Sivas, Turkey, with Some New Records

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### ABSTRACT

This study was carried out to determine Eulophinae (Hymenoptera: Chalcidoidea: Eulophidae) fauna of Sivas province and specimens were collected by using sweeping net from pasture. In this study 15 species were found in 9 genera belonging to Eulophinae. These are: *Cirrospilus elegantissimus* Westwood, 1832, *Diglyphus crassinervis* Erdős, 1958, *D. isaea* (Walker, 1838), *D. pachyneurus* Graham 1963, *Elachertus inunctus* Nees, 1834, *Euplectrus flavipes* (Fonscolombe, 1832), *Hemiptarsenus unguicellus* (Zetterstedt, 1838), *H. zilahisebessi* Erdős, 1951, *Necremnus leucarthros* (Nees, 1834), *N. tidius* (Walker, 1839), *Platyplectrus chlorocephalus* (Nees, 1834), *P. pannonica* (Erdős, 1966), *Prigalio pectinicornis* (Linnaeus, 1758), *Sympiesis acalle* (Walker, 1848), *S. sericeicornis* (Nees, 1834). Among these *C. elegantissimus*, *E. inunctus*, *P. chlorocephalus* and *P. pannonica* are reported for the first time in the Turkish fauna.

*Key words:* Eulophidae, Eulophinae, Chalcidoidea, Fauna, Sivas.

### INTRODUCTION

The Eulophidae is a very large family, containing over 4000 species placed in 294 genera worldwide. Principal classification of Eulophidae are placed by Asheamed (1904), Bouček (1988), Bouček and Askew (1968), Burks (1979), Graham (1987), Riek (1970) and Peck *et al.* (1964). According to the most recent authors, the Eulophidae is subdivided into four subfamilies: Entedoninae, Eulophinae, Entiinae (=Euderinae) and Tetrastichinae (Burks *et al.*, 2011; Gauthier *et al.*, 2000; Gibson, 1993; Schauf *et al.*, 1997; Ubaidillah, 2006).

Subfamily Eulophinae is the largest and most widespread one in the family. Species represented in all zoogeographical regions but especially numerous in temperate zones. Most of Eulophinae are mostly solitary or gregarious external parasitoids of Diptera, Lepidoptera, Coleoptera, Hymenoptera (usually of larvae but rarely of the pupae of members of these orders) and Hemiptera. Leafminers and free-living caterpillars are the most common hosts. A few species are phytophagous, some species hyperparasitoids (Bouček and Askew, 1968; Gibson, 1993).

Although some studies have been conducted by various works on the species of Eulophinae in Turkey. The Turkish fauna of this subfamily has been worked by a few authors (Doğanlar, 1985; Gençer, 2004; Yefremova *et al.*, 2010).

## MATERIAL AND METHODS

In 2010 the material for this study were collected by the Mustafa Erdoğan from different localities in Sivas by sweeping from pasture and deposited in the Entomology Museum, Sivas, Turkey.

The European species of *Cirrospilus*, *Necremnus* and *Sympiesis* belonging to Eulophinae are keyed Bouček (1959, 1988) and species of the genus *Diglyphus* for the world list, a review for European species and Chinese are keyed by Gordh and Hendrickson; (1979), Yefremova and Shrol (1996) and Zhu *et al.*, (2000a) respectively. The species of *Elachertus*, *Euplectrus* and *Hemiptarsenus* were identified using key by Zhu and Huang (2001, 2003a, 2003b) and Zhu *et al.*, (2000b). The species for USSR and China of *Platyplectrus* were keyed by Tryapitsyn (1978) and Zhu and Huang (2000, 2004) respectively were used in identification. Tryapitsyn (1978)'s key for the identification of species of *Pnigalio* was used for identifying relevant species. The distribution records of species were taken from Doğanlar, (1985), Gençer, (2004); Noyes, (2002, 2011).

## RESULTS

In this study, 15 species from 9 genera belonging to the subfamily Eulophinae of the family Eulophidae were recorded from Sivas in Turkey. Four of them were recorded for the first time from Turkey. These species are presented alphabetically with their distributions as follow.

### ***Cirrospilus* Westwood, 1832**

#### ***Cirrospilus elegantissimus* Westwood, 1832**

Material examined: Suşehri, Kurutaş, 737 m, 40°13" N / 38°03" E, 27.IV.2010, ♀.

Distribution: Bulgaria, Czech Republic, France, Germany, Hungary, Ireland, Macedonia, Moldova, Netherlands, China, Romania, Russia, Sweden, Switzerland, Turkmenistan, United Kingdom, Yugoslavia (pre 1991).

New record for the Turkish fauna

### ***Diglyphus* Walker, 1844**

#### ***Diglyphus crassinervis* Erdős, 1958**

Material examined: Ulaş, Çavdar, 1605 m, 39°29" N / 37°29" E, 7.VI.2010, 3♀.

Distribution: Bulgaria, Canary Islands, Czech Republic, Egypt, France, Germany, Hungary, Iran, Iraq, Italy, Jordan, Moldova, Morocco, China, Portugal, Slovakia, Spain, Sweden, Turkey, United Kingdom, Yemen.

*Contributions to the Knowledge of the Eulophinae from Sivas, Turkey****Diglyphus isaea* (Walker, 1838)**

Material examined: Altınyayla, Kaleköy, 1447 m, 39°16" N / 36°35" E, 3.V.2010, ♀; Divriği, Kayaburun, 1137 m, 39°17" N / 38°02" E, 14.V.2010, Ödek, 1717 m, 39°15" N / 37°56" E, 14.V.2010, 2♀♀; Gölova, Okçuören, 1635 m, 40°01" N / 38°30" E, 6.V.2010, ♀; Gürün, Mağara, 1669 m, 39°03" N / 37°14" E, 9.V.2010, ♀; Koyulhisar, Yolüstü, 1417 m, 40°10" N / 37°54" E, 20.V.2010, ♀; Sivas, Paşabahçe, 1550 m, 39°20" N / 37°06" E, 29.IV.2010, 7♀♀, Sorguncuk, 1381 m, 39°30" N / 36°50" E, 25.VI.2010, ♀; Suşehri, Kurutaş, 737 m, 40°13" N / 38°03" E, 27.V.2010, 83♀♀ 20♂♂; Ulaş, Acıyurt, 1725 m, 39°16" N / 36°58" E, 3.VI.2010, 1♀, Başçayır, 1614 m, 39°22" N / 37°12" E, 2.VI.2010, ♀, Çavdar, 1605 m, 39°29" N / 37°29" E, 7.VI.2010, 3♀♀, Gürpınar, 1524 m, 39°21" N / 37°10" E, 11.VI.2010, ♀, Kayapınar, 1504 m, 39°24" N / 37°09" E, 12.V.2010, 8♀♀, Paşaçiftliği, 1734 m, 39°21" N / 37°11" E, 11.V.2010, 17♀♀, 5♂♂, Sertmahmut, 1566 m, 39°26" N / 37°17" E, 7.VI.2010, ♀, Şenyurt, 1615 m, 39°27" N / 37°18" E, 9.VIII.2010, 2♀♀, Tecer, 1408 m, 39°24" N / 37°05" E, 20.IV.2010, 5♀♀; Yıldızeli, Karacaören, 1376 m, 39°52" N / 36°45" E, 9.VI.2010, 2♀♀, Kıldır, 1374 m, 36°47" N / 39°55" E, 22.V.2010, 5♀♀; Zara, Yeşilköy, 1772 m, 40°09" N / 37°49" E, 7.VII.2010, ♀.

Distribution: Australia, Azerbaijan, Belgium, Bulgaria, Canada, Canary Islands, Channel Islands, Croatia, Czech Republic, Denmark, Eritrea, Ethiopia, Finland, France, Germany, Greece, Greenland, Hungary, Iceland, India, Iran, Iraq, Israel, Italy, Japan, Jordan, Korea, Lithuania, Macedonia, Madeira, Moldova, Mongolia, Montenegro, Netherlands, New Zealand, North Africa, Pakistan, China, Poland, Portugal, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Syria, Turkey, Ukraine, United Arab Emirates, United Kingdom, United States of America, USSR, Yemen.

***Diglyphus pachyneurus* Graham 1963**

Material examined: Altınyayla, Kaleköy, 1447 m, 39°16" N / 36°35" E, 13.V.2010, ♀; Divriği, Kayaburun, 1137 m, 39°17" N / 38°02" E, 14.V.2010, ♀, Ödek, 1717 m, 39°15" N / 37°56" E, 14.V.2010, ♀; Doğanşar, Kozlu, 1233 m, 40°13" N / 37°33" E, 27.V.2010, ♀; Kangal, Arpalı, 1572 m, 39°10" N / 37°25" E, 10.VII.2010, ♀; Şarkışla, Kömürkaya, 1277 m, 39°17" N / 36°16" E, 25.VI.2010, ♀.

Distribution: Croatia, Germany, Italy, Moldova, Montenegro, Netherlands, China, Russia, Sweden, Turkey, United Kingdom, Yemen.

***Elachertus Spinola, 1811******Elachertus inunctus* Nees, 1834**

Material examined: Ulaş, Başçayır, 1614 m, 39°22" N / 37°12" E, 23.VII.2010, ♀, Eskikarahisar, 1491 m, 39°24" N / 37°11" E, 19.VIII.2010, ♀, Paşaçiftliği, 1734 m, 39°21" N / 37°11" E, 11.V.2010, ♀.

Distribution: Austria, Bosnia and Herzegovina, Bulgaria, Czech Republic, Germany, Hungary, Italy, Japan, Korea, Lithuania, Moldova, Netherlands, Norway, China, Poland, Russia, Slovakia, Slovenia, Sweden, Switzerland, Taiwan, Turkmenistan, Ukraine, United Kingdom, USSR, Yugoslavia (pre 1991).

New record for the Turkish fauna

***Euplectrus Westwood, 1832******Euplectrus flavipes* (Fonscolombe, 1832)**

Material examined: Suşehri, Yeşilyayla, 946 m, 40°08" N / 38°09" E, 19.VII.2010, ♀.

Distribution: Bulgaria, Canary Islands, Croatia, Cyprus, Dominican Republic, France, Hungary, Italy, Mexico, Moldova, China, Portugal, Slovakia, Slovenia, Spain, Sweden, Syria, Taiwan, Turkey, Turkmenistan, Yugoslavia (Federal Republic).

***Hemiptarsenus Westwood, 1833******Hemiptarsenus unguicellus (Zetterstedt, 1838)***

Material examined: Doğanşar, Eskiköy, 1386 m, 40°10" N / 37°34" E, 27.V.2010, ♀; Gölova, Canköy, 1722 m, 40°01" N / 38°30" E, 6.VII.2010, ♀; Hafik, Düzyayla, 1288 m, 39°52" N / 37°23" E, 8.VII.2010, ♀; Sivas, Paşabahçe, 1550 m, 39°20" N / 37°06" E, 29.IV.2010 ♀.

Distribution: Afghanistan, Azerbaijan, Bulgaria, Canada, Canary Islands, China, Croatia, Czech Republic, Faeroe Islands, France, Hungary, India, Italy, Japan, Korea, Macedonia, Madeira, Moldova, Mongolia, Morocco, Montenegro, Netherlands, North Africa, Norway, Poland, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Taiwan, United Kingdom, United States of America, USRR.

***Hemiptarsenus zilahisebessi Erdös, 1951***

Material examined: Gölova, Canköy, 1722 m, 40°01" N / 38°30" E, 6.VII.2010, ♀, Dikköy 1200 m, 40°04" N / 38°33" E, 28.V.2010, ♀; Ulaş, Başçayır, 1614 m, 39°22" N / 37°12" E, 2.VI.2010, ♀, Sertmahmut, 1566 m, 39°26" N / 37°17" E, 7.VI.2010, ♀, Tecer, 1408 m, 39°24" N / 37°05" E, 11.VI.2010, ♀.

Distribution: Bulgaria, China, Czechoslovakia, Egypt, France, Hungary, Jordan, Korea, Moldova, Poland, Russia, Serbia, Slovakia, Spain, Turkey.

***Necremnus Thomson, 1878******Necremnus leucarthros (Nees, 1834)***

Material examined: Divriği, Höbek, 1766 m, 39°18" N / 37°50" E, 8.VI.2010 ♀; Gürün, Karaören, 1671 m, 39°00" N / 37°15" E, 9.VI.2010, ♀; Ulaş, Acıyurt, 1725 m, 39°16" N / 36°58" E, 3.VI.2010, ♀, Başçayır, 1614 m, 39°22" N / 37°12" E, 2.VI.2010, 19 ♀♀, 6 ♂♂; Gürpınar, 1524 m, 39°21" N / 37°10" E, 11.VI.2010, ♀; Yıldızeli, Kıldır, 1374 m, 36°47" N / 39°55" E, 22.V.2010, ♀; Zara, Tödürge, 1312 m, 37°37" N / 39°52" E, 23.V.2010, ♀, 1303 m, 39°52" N / 37°36" E, 8.VII.2010, ♀.

Distribution: Algeria, Armenia, Bulgaria, Czech Republic, Denmark, France, Germany, Greece, Hungary, India, Italy, Macedonia, Moldova, Montenegro, Netherlands, Poland, Russia, Slovakia, Sweden, Switzerland, Transcaucasus, Turkey, England, United States of America, USRR, Yugoslavia (pre 1991).

***Necremnus tidius (Walker, 1839)***

Material examined: Divriği, Kayaburun, 1137 m, 39°17" N / 38°02" E, 14.V.2010, ♀, Ödek, 1714 m, 39°15" N / 37°56" E, 14.V.2010, 2 ♀♀; Kangal, Çukurçayır, 1624 m, 39°10" N / 37°27" E, 10.VI.2010, ♀; Sivas, Paşabahçe, 1550 m, 39°20" N / 37° 06" E, 29.IV.2010, ♀; Ulaş, Acıyurt, 1725 m, 39°16" N / 36°58" E, 23.VI.2010, ♀, Başçayır, 1614 m, 39°22" N / 37°12" E, 2.VI.2010, 4 ♀♀, 4 ♂♂, Kayapınarı, 1504 m, 39°24" N / 37°09" E, 12.V.2010, ♀, Tecer, 1626 m, 39°24" N / 37°09" E, 20.IV.2010, ♀; Yıldızeli, Karakaya, 1242 m, 39°49" N / 36°17" E, 5.VII.2010, ♀.

Distribution: Bulgaria, Canada, Canary Islands, Croatia, Czech Republic, France, Germany, Iran, Israel, Netherlands, Poland, Russia, Slovakia, Spain, Sweden, Turkey, United Kingdom.

***Platylepterus Ferrière, 1941******Platylepterus chlorocephalus (Nees, 1834)***

Material examined: Ulaş, Başçayır, 1614 m, 39°22" N / 37°12" E, 2.VI.2010, ♀.

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Distribution: Bulgaria, Czechoslovakia, Germany, Hungary, Poland, Slovenia.

New record for the Turkish fauna.

***Platyplectrus pannonica* (Erdős, 1966)**

Material examined: Kangal, Arpalı, 1572 m, 39°10" N / 37°25" E, 10.VI.2010♀; Ulaş, Başçayır, 1614 m, 39°22" N / 37°12" E, 2.VII.2010, ♀.

Distribution: China, Croatia, France, Germany, Hungary, Italy, Netherlands, Spain, Yugoslavia (pre 1991)

New record for the Turkish fauna

***Pnigalio* Schrank, 1802**

***Pnigalio pectinicornis* (Linnaeus, 1758)**

Material examined: Altınyayla, Kaleköy, 1447 m, 39°16" N / 36°35" E, 13.V.2010, ♀; Doğanşar, Kozlu, 1233 m, 40°13" N / 37°33" E, 27.V.2010, ♀; Ulaş, Tecer, 1553 m, 39°24" N / 37°08" E, 10.IV.2010, ♀; Zara, Keçeyurdu, 1716 m, 40°01" N / 37°43" E, 7.VII.2010, ♀.

Distribution: Australia, Austria, Bosnia and Herzegovina, Bulgaria, Canary Islands, China, Croatia, Czech Republic, France, Germany, Greece, Hungary, Iran, Italy, Macedonia, Moldova, Montenegro, Netherlands, New Zealand, Norway, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, USSR, Yugoslavia (pre 1991)

***Sympiesis* Förster, 1856**

***Sympiesis acalle* (Walker, 1848)**

Material examined : Zara, Keçeyurdu, 1716 m, 40°01" N / 37°43" E, 7.VII.2010, ♀.

Distribution: Azerbaijan, Bosnia and Herzegovina, Bulgaria, Canada, Canary Islands, Croatia, Czech Republic, Germany, Hungary, Italy, Japan, Kirgizia, Korea, Moldova, Montenegro, Netherlands, Romania, Russia, Serbia, Slovakia, Spain, Sweden, Switzerland, Tadjikistan, Transcaucasus, Turkey, Turkmenistan, Ukraine, England, United States of America, Yemen.

***Sympiesis sericeicornis* (Nees, 1834)**

Material examined : Ulaş, Kayapınar, 1504 m, 39°24" N / 37°09" E, 12.V.2010, ♀.

Distribution: Armenia, Austria, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Canada, Canary Islands, Caucasus, China, Croatia, Czech Republic, France, Germany, Hungary, Iran, Israel, Italy, Japan, Kazakhstan, Macedonia, Moldova, Montenegro, Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tadjikistan, Taiwan, Transcaucasus, Turkey, Ukraine, United Kingdom, United States of America, USSR, Yugoslavia (pre 1991).

**DISCUSSION**

Two of the new records are parasitoids of some economically important species. *Cirrospilus elegantissimus* is a parasitoid of horse chestnuts leafminer moth, *Cameraria ohridella* Deschka and Dimic, 1986, and has rapidly expanded its range in

European countries over the past 25 years (Gilbert *et al.*, 2005). Horse chestnuts are commonly planted as ornamental trees in many provinces of Turkey and consequently *C. ohridella* has been recorded in Turkey in recent years (Cebeci *et al.*, 2011). The other parasitoid, *Elachertus inunctus* is a parasitoid of *Phyllonorycter blancardella* (F.) which is a potential pest on apple trees (Kovancı *et al.*, 2002). In addition, these two species have a wide range of host species belong to Coleoptera, Hymenoptera and Lepidoptera. In particular, a large number of Gracillariidae (Lepidoptera) species have been reported as their host. Lastly, *Platyplectrus chlorocephalus* is a parasitoid of *Rhagades pruni* (Denis and Schiffermüller) (Zygenidae: Lepidoptera) and *P. pannonica* is parasitoid on *Cifuna locuples* Wallker (Lymantriidae: Lepidoptera) (Noyes, 2011).

Some species of eulophids are important in biological control programmes in the world. Thus, it is important to know fauna of eulophids of any region. The number of Turkish eulophids fauna is increased with this study. The new four records are important for showing the biodiversity of Turkey.

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