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Contribution to the fauna of Coccinellidae (Coleoptera) from eastern Anatolia along with some new records from Turkey

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Summary

The faunistic study on coccinellids, conducted during 1989-90 in the eastern Anatolia and based on the collection of over 3000 specimens, recorded 18 genera and 27 species of subfamily Coccinellinae and one species each of the three genera of the subfamily Epilachninae. Genus ***Cynegetis*** and two species, ***C. impunctata*** (L.) and ***Henosepilachna argus*** (Geoffr.) were recorded for the first time in Turkey. The overwintering behaviour of some species was also studied for the first time in the region and their overwintering sites investigated.

Adonia variegata (Goeze), ***Coccinella septempunctata*** (L.) and ***Propylaea quatuordecimpunctata*** (L.) were of common occurrence and widely-distributed in the study area.

Introduction

Members of the family Coccinellidae (Ladybird beetles) are colourful insects and are present almost in every habitat. Therefore, they are well-known as compared to the other groups of insects.

Ladybird beetles are almost entirely predaceous, except a few plant feeders confined largely to subfamily Epilachninae. The larval and adult stages feed on aphids, mealybugs, whiteflies, scale insects and many other insect species belonging to various orders. The more common species overwinter as adults and some as pupae (Swan, 1964; Borror *et al.*, 1976).

The reproductive capacities of some species are very high. For example, ***Rodolia cardinalis*** Mulsant which feeds on scale insects, especially ***Icerya purchasi*** Maskell

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can reproduce 600-800 eggs and under optimal conditions there may be eight or more generations in a year (Swan, 1964; Clausen, 1958, 1978). On the other hand, their appetite is also more, and they eat almost continuously. To cite two examples ***Coccinella septempunctata*** (L) is reported to eat 267 aphids per day and **Chilocorus similis** (Rossi) eats 772 and 791 aphids during its larval and adult stages respectively (Swan, 1964).

These remarkable features of coccinellids qualify them as one of the most important groups of biological control agents in the fields and in green houses. That is why studies on coccinellids received attention as early as 1874 when effort was made to transport several enemies of aphids from England to New Zealand out of which ***Coccinella undecimpunctata*** (L.) became established (DeBach, 1965). ***R. cardinalis*** was imported from Australia and introduced in California controlled ***Icerya purchasi*** Maskell, and later spread to other parts of the U.S.A. Shortly after the successful establishment of this predator in the U.S.A. attempts were made to introduce it in other countries where ***I. purchasi*** caused economic damage. ***R. cardinalis*** was first imported in Turkey in 1910, later several introductions were made in subsequent years and became established (Kansu, 1982). Another important predator of the same family ***Cryptolaemus montrouzieri*** Mulsant was first introducted into California from Australia in 1891 against ***Planococcus citri*** (Risso). At first the predator did very well, but later lost its impact, because of not being able to survive the winter in most of the regions. In 1917, the predator was reared for the first time on a mass scale and later on released periodically. More than 40 countries including Turkey imported, reared and released ***C. montrouzieri*** (Clausen, 1978). Turkey succeeded in mass producing and releasing this predator in controlling ***P.citri*** in Antalya and Adana.

In various countries many faunal studies have been conducted to determine the species of Coccinellidae. Kolomiets and Kuznetsoy (1982) studied 40 species in southwestern Siberia, Duverger (1983) 43 in İran, Bielawski (1984) 86 in Mongolia, Plaza (1984) 28 in Spain, Pajni and Singh (1982) in India, Klausnitzer (1986) 72 in East Germany and Gordon and Hilburn (1990) 40 in Bermuda.

In Turkey there are some faunal studies in different parts of the country. Günther (1958) determined 28 coccinellid species in southern and central Anatolia and Edirne. Giray (1970) recorded 37 species in western Anatolia. Fürsch und Uygun (1980) and Uygun und Fürsch (1981) studied ***Scymnus*** and ***Hyperaspis*** genera, respectively. Uygun (1981) made a comprehensive study on Turkish Coccinellidae and listed 56 species with identification key.

Some insect faunal studies also find mentione of coccinellids. Tunçyürek (1970) recorded five species of coccinellids as predators of some scale insects on fig and citrus. Soylu and Ürel (1977) determined 27 species as predators of insects present on citrus. Yiğit and Uygun (1982) found 28 species on apple tree in Adana, İçel and Kahramanmaraş. Düzgüneş *et al.* (1982) listed 34 species as predators of aphids in Ankara whereas Zeren (1989) listed 18 species in Çukurova. Twenty one species on soft-seeded fruits in Antalya were recorded by Özkan (1986). In Erzurum four species on alfalfa and six species on potato were reported by Özbek (1986) and Alaoğlu and Özbek (1987) respectively.

Material and Methods

This faunal study conducted during 1980-90, is based on the collection of more than 3000 specimens from diferent parts of Erzurum, Erzincan and Kars provinces. The material was collected from herbaceous plants with a sweep-net. The branches of the trees and bushes were shaken to collect fallen insects.

Results

This study reports 27 species belonging to 18 genera in the subfamily Coccinellinae and one species each of the three genera in the subfamily of Epilachninae. Following is the presentation in alphabetical order.

Subfamily Coccinellinae

***Adalia bipunctata* (L.)**

This species was recorded from Erzurum, Pasinler, Oltu and Posof. It was active from the end of April till the end of August. The population recorded was very low. The species has previously found in Balıkesir, Denizli, İzmir (Giray, 1970); Bursa, Kocaeli, Sakarya (Altay *et al.*, 1972); Afyon, Hakkari, Rize (Uygun, 1981); Ankara (Düzgüneş *et al.*, 1982); Erzurum (Alaoğlu and Özbek, 1987).

***Adalia fasciatopunctata revelierei* Mulsant**

This was found in Erzurum in October 1990. Besides that few specimens were collected from Erzincan and Kars in July and August, respectively. It was recorded earlier in Burdur, Denizli, İzmir, Hakkari, Ankara, Bursa (Giray, 1970; Uygun, 1981; Düzgüneş *et al.*, 1982).

***Adonia variegata* (Goeze)**

This species was very common and highly populated in Erzurum, Erzincan and Kars. Its population was the highest among all the species reported herein and constituted 36 % of the material. It was found on almost all the cultivated and wild plants. Uygun (1981) reported it to be widely-distributed in the country.

***Brumus octosignatus* (Gebler)**

This was found only in Erzurum and Pasinler. The investigations revealed that overwintering adults of this species congregate along with ***Coccinella septempunctata*** (L.) and ***Semiadalia undecimpuntata*** (Schneider) under the stones on Palandöken Mountain at an altitude of 2900 m. The species has previously been found in Adana, Ankara, Edirne, Isparta, Kayseri and Van (Giray, 1970; Uygun, 1981; Özkan, 1986).

***Bulaea lichatschovi* (Hummel)**

In May and June of 1990 a total of 28 specimens were collected on sugar beet, lentil and alfalfa in Erzurum, Aşkale, Pasinler, Iğdır and Oltu. Fürsch (1967) reported that this species feeds on pollens of Chenopodiaceae. Düzgüneş *et al.* (1982) found it on su-

gar beet and some weeds. It was earlier recorded in İzmir and Ankara (Giray, 1970; Uygun, 1981; Düzgüneş *et al.*, 1982).

***Coccinella distinctu* Falderman**

This species was collected in Aşkale, Çat, Narman and Tekman in July on willow and some wild plants infected by aphids. Uygun (1981) found it only in Güzelsu (Van).

***Coccinella septempunctata* (L.)**

It was a very common and highly populated species and constituted 29.4 % of the specimens, ranking second in order of population density. It was found on almost all cultivated and wild plants infested by aphids. Uygun (1981) reported it to be present all over the country. Özbek (1986) and Alaoğlu and Özbek (1987) previously recorded on alfalfa and potato respectively in Erzurum.

***Coccinella undecimpunctata* (L.)**

Only one specimen was found in August 1986 in Pasinler. This was recorded earlier in İzmir, Gaziantep, eastern Mediterranean Region and Bursa (Giray, 1970; Uygun, 1981).

***Coccinula quatuordecimpustulata* (L.)**

This species was found from the beginning of May to October in İspir, Oltu, Tortum, Uzundere and Erzincan on alfalfa, sugar beet, potato, sainfoin and some wild plants. Uygun (1981) indicated that it was present in almost all parts of Turkey.

***Coccinula sinuatomarginata* (Falderman)**

During June and July, it was collected on alfalfa, sainfoin, lentil and some weeds in Erzurum Plain, İspir, Oltu, Narman, Horasan and Pasinler. This species was previously recorded in Hakkari (Uygun, 1981) and Ankara (Düzgüneş *et al.*, 1982).

***Exochomus nigromaculatus* (Goeze)**

This was found only in May in Çağlayan-Erzincan and Iğdır. However, this was earlier reported from Çanakkale, Bursa and İzmir (Giray, 1970; Öncüer, 1977); Adana, Adıyaman and Elazığ (Uygun, 1981) and Ankara (Düzgüneş *et al.*, 1982). From these records it can be said that this species is not able to survive beyond 1200 m. mean sea level.

***Exochomus quadripustulatus* (L)**

Only one specimen was collected in Ayvalı-Oltu at an altitude of about 1000 m. Uygun (1981) collected a lot of material in Southern Anatolia from orchards, vegetable fields and weeds. It was also recorded in İzmir, Balıkesir, Muğla, Ankara, Artvin and Rize (Giray, 1970; Öncüer, 1977; Bozan and Aslıtürk, 1975; Ercan *et al.*, 1975; Düzgüneş *et al.*, 1982). This indicates that the species does not prefer high altitudes and is confined up to 1000 m. mean sea level.

Harmonia quadripunctata (Pontoppidan)

This species was found at the windows of some buildings along with *A. fasiatopunctata revelieri* in October in Erzurum. It was previously recorded in İzmir, Afyon, Isparta, Denizli, Bursa, Adana and Ankara (Giray, 1970; Uygun 1981).

Hippodamia tredecimpunctata (L.)

Six specimens of this species were collected in July and August in Erzincan and Kars only. Uygun (1981) found only two specimens for the first time in Marmara Region. It appears that the population of this species is very low in Turkey.

Hyperaspis quadrimaculata Redtenbacher

It was present from the beginning of April till the end of August in Erzurum, Aşkale, Pasinler, Oltu, Tercan, Kemaliye (Erzincan), Iğdır and Kağızman (Kars). Specimens were mostly found on alfalfa, lentil and some weeds. This species is on record from Balıkesir, İzmir, Denizli, Aydın, Muğla, Adana, Mardin, Gaziantep (Uygun und Fürsch, 1981), Ankara (Düzgüneş *et al.*, 1982) and Antalya (Özkan, 1986).

Platynaspis luteorubra (Goeze)

This species was found in Erzurum, Palandöken Mountain (2600 m), Aşkale, Narman, Oltu and Pasinler. Material was collected mostly on potato, lentil, alfalfa and some weeds. It was previously recorded in western Anatolia (Giray, 1970; Erkin, 1983), Ankara, Adana, Bursa, Van (Uygun 1981; Düzgüneş *et al.*, 1982; Zeren, 1989) and Erzurum (Alaoğlu and Özbek, 1987).

Propylaea quatuordecimpunctata (L.)

This was found during June and August. Material was collected from alfalfa, sainfoin, potato, sugar beet and some weeds. It constituted 6.3 % of the material. It was found to be the third most abundant species after *A. variegata* and *C. septempuctata* in Erzurum as well as Erzincan and Kars. It was previosuly recorded in İzmir and Denizli (Giray, 1970); Erzurum (Alaoğlu and Özbek, 1987). Uygun (1981) indicated that it was present almost every where in Turkey.

Psyllobora vigintiduopunctata (L.)

This species was present in May-September in various localities of Erzurum. Aşkale, Narman, Oltu, Pasinler, Tekman, Uzundere, Iğdır, Tercan and Erzincan. The specimens were collected on alfalfa, bean, lentil, potato, sainfoin, sugar beet and some weeds. It was a common species and constituted 3 % of the material. It was earlier recorded in İzmir (Giray, 1970), Adana, Ankara, Elazığ, Malatya, Bitlis, Mardin, Erzincan and Marmara Region (Uygun, 1981).

Scymnus apetzi Mulsant

The species was active during July-October in Erzurum, Horasan, Pasinler, Oltu, Narman, Şenkaya, Tortum, Uzundere, İspir and Erzincan. Material was collected from al-

falfa, sainfoin, lentil, sugar beet and weeds. It was a common species and the most populated one in the genus *Scymnus*. It was previously recorded in Aydın, İzmir and Muğla (Tunçyürek and Yalçın, 1979); Adana, Bilecik, Hakkari and Van (Kreissl und Uygun, 1980); Marmara Region (Erkan, 1981); Antalya (Yayla, 1983).

Scymnus pallipediformis Günther

The specimens were collected in Horasan, İspir, Oltu and Şenkaya during July and August. It was previously recorded in Adana, Antalya, Bursa, İstanbul, Kırklareli, İzmir, Muğla, Malatya, Mardin, Urfa, Hakkari (Kreissl und Uygun, 1980).

Scymnus quadriguttatus (Fürsch und Kreissl)

Only one specimen was found in May, in Posof (Kars). It was previously recorded in İzmir, Manisa (Giray, 1970); Antalya, Denizli, Bursa, Eskişehir, Kastamonu, Van (Kreissl und Uygun, 1980); Ankara (Düzgüneş *et al.*, 1982).

Scymnus rubromaculatus (Goeze)

It was collected in July and August from alfalfa and some weeds in Oltu, İspir and Üzümlü at an altitude of 1200 m. Kreissl und Uygun (1980) recorded this species in Antalya, İçel, Adana, Hatay, Kahramamaraş, Hakkari, Afyon, Bursa, Kastamonu, Ankara and Kayseri.

Semiadalia undecimnotata Schneider

This was found in June and July in some localities of Erzurum, Oltu, Tortum, Aşkale, Pasinler and Palandöken Mountain. It constituted 3.3 % of the material. Uygun (1981) found this species in İzmir, Hakkari and Van, and Düzgüneş *et al.* (1982) in Ankara.

Stethorus punctillum Weise

This was found in Dumlu (Erzurum). Palandöken Mountain and Erzincan in July and August. This was earlier recorded in western Anatolia (Giray, 1970), Ankara, Adana, Kahramanmaraş (Uygun, 1981) and Antalya (Özkan, 1986).

Synharmonia conglobata (L.)

This was collected in May-July in İspir, Tortum, Oltu, Şenkaya and Iğdır. Its population was very low. Earlier it was recorded in İzmir (Giray, 1970; Öncüer, 1977); Adana (Uygun, 1981); Ankara (Düzgüneş *et al.*, 1982) and Antalya (Özkan 1986).

Synharmonia oncina (Olivieri)

Three specimens were collected in August from Söğütlü (Erzurum), Narman and Pasinler, two from Tercan and Muti (Erzincan) in July. This was previously recorded in Burdur, Denizli and İzmir (Giray, 1970); Isparta and Van (Uygun, 1981); Ankara (Düzgüneş *et al.*, 1982).

Vibidia duodecimguttata (Poda)

Only one specimen was found in Oltu in July, at an altitude of 1200 m. It is on record from İzmir (Giray, 1970), Rize, Ankara, Adana and İçel (Uygun, 1981). It appears that this species also does not prefer high altitude and remains confined up to 1200 m. mean sea level.

Subfamily: Epilachninae

Cynegetis impunctata (L.)

It was collected on lentil in some districts of Erzurum such as Alaybeyli, Çay, Kayapa, Ocak, Paşayurdu and Palandöken in July 1990 (34 specimens). One specimen was found on alfalfa in Devedağı (İspir) in August, 1990. It is for the first time that the genus *Cynegetis* is being reported from Turkey. The present study also adds to our knowledge *C. impunctata* from the country. Earlier this species was recorded from Central Europe (Fürsch, 1967).

Henosepilachna argus (Geoffr.)

Only one specimen was found in Turnalı (Şenkaya). This species is also for the first time recorded from Turkey. Fürsch (1967) gave the distribution area of this as Central Europe.

Subcoccinella vigintiquatuorpunctata (L.)

This was collected in Devedağı (İspir), Oltu and Pasinler in July and August on alfalfa, sainfoin, lentil, potato and weeds. Its population was high in İspir from where 67 specimens were collected on alfalfa in August 1990. Earlier it was recorded in İzmir and Burdur (Giray, 1970), Ankara, Malatya, Bingöl, Tatvan, Denizli, Bursa and Tarsus (Uygun, 1981).

Discussion

Biological control may provide long-term or even permanent results, causes no pollution, and poses no risk to human health. Therefore, it should always be a prefered control measure. In Turkey, it will have special application where the cost of chemical control in subsistence farming is prohibitively expensive and where the inappropriate or excessive use of chemicals has resulted in resistance of several pest species. Considering the immense biological control potentials of coccinellids, the present preliminary faunal investigation, which records 25 predaceous species in eastern Anatolia alone, indicates that the fauna is quite rich as compared to other parts of the world. From geographical distribution point of view, the study reveals the fauna showing varying preferences. *A. variegata*, *C. septempunctata* and *P. quatuordecimpunctata*, the three most common species, accounting for about 72 % of the total population, are of wide occurence, from the sea level to an altitude of 2900 meters. Thus these species offer possibility as bioagents in all the agro-climatic zones of the country. Out of the three species, the overwintering adults of *C. septempunctata* were recorded aggregating in large

numbers in association with other predaceous coccinellids, namely ***B. octosignatus*** and ***S. undecimnotata*** on the mountain at an altitude of 2900 metres.

On the other hand, some species, for example ***E. nigromaculatus***, ***E. quadripustulatus*** and ***V. duodecimguttata*** have shown low altitude occurrence in their distribution while the two species in the study, viz. ***C. distincta*** and ***C. sinuatomarginata*** were recorded only at high altitudes. This has a special significance in their exploitation as bioagents. On the basis of available published literature it appears that ***C. distincta*** is not present in other parts of the country except in eastern Anatolia, recorded in the present study and in Van (Uygun, 1981). Thus at the present moment this species offers possibility of successful utilization in the agro-climatic zone of eastern Anatolia only.

This biological trait as wel as altitudinal preferences can be profitably exploited in their introduction, inoculation, inundation and conservation. The desirable qualities of coccinellids include their great diversity, high degree of specificity and ease of handling. These along with their reproductive potential at optimum temperatures await intensive studies in integrating them successfully in insect-pest management programmes.

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Özet

Doğu Anadolu Bölgesi Coccinellidae (Coleoptera) faunasının tesbiti üzerinde araştırmalar

Bu çalışmada Coccinellinae altfamilyasının 18 cinsine bağlı 27, Epilachninae altfamilyasında ise üç cinse ait üç adet olmak üzere toplam 30 tür tesbit edilmiştir. Bunlardan sırası ile ***Adonia variegata*** (Goeze), ***Coccinella septempunctata*** (L.) ve ***Propylaea quatuordecimpunctata*** (L.) en yaygın ve populasyonun en yüksek olan türlerdir. ***C. septempunctata***, ***Brumus octosignatus*** (Gebler) ve ***Semiadalia undecimnotata*** (Schneider)'nın Palandöken Dağı'nın 2900 m yüksekliğinde toplu halde taş ve kayalar altında ergin olarak kışladıkları gözlenmiştir.

Fitofag türlerden ***Cynegetis impunctata*** (L.) ve ***Henosepilachna argus*** (Geoffr.) ülkemiz faunası için yeni kayıtlardır.

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