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Araştırma Makalesi / Research Article

Notes on the Seasonal and Ecological Dynamics Of Some Hemerobiidae Family Latreille, 1803 (Neuroptera: Hemerobiidae) Species In Osmaniye Province, East Mediterranenan Anatolia

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Keywords
Neuroptera, *Hemerobiidae*, *Hemerobius*, *Micromus*, seasonal dynamics, Osmaniye

Abstract

In this study, in 2011 and 2013, the 53 localities in the province of Osmaniye, at different heights (43m and 676m) adult (Hemerobiidae) the seasonal activity were investigated. As a result of research Hemerobidae belonging to the subfamily *Hemerobius*, *Megalomus*, *Micromuse*, *Sympherobius*, *Wesmaelius*, 1733 samples belonging to the genus consists of 13 species were recorded Hemerobiide. Total number of samples based on the situation and proportional, respectively, the first five types are: *Micromuse angulatus*, *Wesmaelius* (*Wesmaelius*) *concinnus*, *Hemerobius gilvus*, *Sympherobius elegans*, and is in the form *Sympherobius pygmaeus*. As the basis of species recorded seasonal activities evaluated and compared with published results from the Palearctic Region.

Osmaniye İli Hemerobiidae Latreille, 1803 (Neuroptera: Hemerobiidae) Familyası Bazı Türlerin Mevsimsel ve Ekolojik Dinamikleri Üzerine Notlar

Anahtar kelimeler
Neuroptera; Hemerobiidae; Hemerobius; Micromus; Mevsimsel Dinamik; Osmaniye

Özet

Bu çalışmada, 2011 ve 2013 yılları arasında Osmaniye İli'nin 53 lokalitesinden farklı yükseltilerde (43m ve 676m) ergin Hemerobiidae türlerinin mevsimsel aktivitesi incelenmiştir. Çalışma neticesinde *Hemerobius*, *Megalomus*, *Micromuse*, *Sympherobius* ve *Wesmaelius* altfamilyalarına mensup 13 tür ve 1733 örnek toplanmıştır. Durum ve orana bağlı toplam örnek sayısı *Micromuse angulatus*, *Wesmaelius* (*Wesmaelius*) *concinnus*, *Hemerobius gilvus*, *Sympherobius elegans* ve *Sympherobius pygmaeus* şeklinde beş tiptedir. Kaydedilen tüm türlerin mevsimsel aktiviteleri değerlendirilmiş, Palearktik Bölgede yapılmış diğer çalışmalarla karşılaştırılmıştır.

1. Giriş

The family Hemerobiidae Latreille, 1803, brown lacewings, is a cosmopolitan group of predaceous insects containing approximately 550 species distributed among 27 extant genera and placed in 10 living subfamilies (Mc Ewen *et al.* 2001). The larvae of many hemerobiid species, especially of the genera *Hemerobius*, *Micromus*, *Megalomus*, commonly prey upon economically important pest insects in agricultural, horticultural, and forest environments. However, despite their significance as predators in these situations and their potential usefulness for ecological and biodiversity studies, the ecological stages of Hemerobiidae in the East

Mediterranean part of Turkey (Osmaniye) have received almost never attention. Hemerobiids posses the following preimaginal stages: egg/prelarva, three instars, and a pupa. They lay sessile (not stalked) eggs that are deposited singly or in small groups. Most known hemerobiid larvae relatively active, plant-frequenting predators of soft-bodied insects or their eggs (Oswald, 2004; Oliveira *et al.* 2013).

There are numerous examples of patterns representing the seasonal dynamics of developmental stages of various species of Hemerobiids, especially in the agricultural areas of Europe. Also there are significant changes in environmental factors, such as day-light, climate, vegatation type, weather condition etc. Most species of hemerobiids are predaceous in both imaginal and preimaginal stages, and many are of considerable value as biological control agents (Lara *et al.* 2008; 2010).

Hemerobius is one of two hemerobiid genera that is commonly found in agricultural situations, especially in temperature regions; it is also frequently encountered in forests. Some species are active under relatively low temperatures and thus have potential as biological control agents when other natural enemies are inactive. Several Micromus species commonly occur in agricultural situations where they feed on economically important pests Hemerobiids are always predacious, adults as well as larvae, feeding on slow-moving soft-bodied arthropods.The gut content of all species that have been analysed included aphid remains They consequently depend on the same prey, often with a relatively straight food choice, especially on conifers (Lara and Freitas 2003).

There is some information regarding parallel sampling of lacewing predators and aphid seasonality. The most characteristic peak of abundance of hemerobiid species was between mid August and mid September. The results provide the first data on seasonal dynamics of these hemerobiids in Turkey. Therefore, we emphasized Hemerobiidae species in the comparison for several reasons.

Our article focuses on to evaluate the Hemerobiidae Latreille, 1803 fauna at twenty five locations at different altitudes in Osmaniye province, east-mediterranean Anatolia. This article presents ecological and seasonal distribution informations gathered during 2011 and 2013 years about Osmaniye Province in Turkey.

2. Material and Method

Study area

Fieldwork was carried out from August 2011 to July 2013 at the 59 locations situated in different altitudes (43-1018 m.), Osmaniye province, East-Mediterranean Turkey. This city is located at 120 m above sea level and its region has an undulating topography. The climate is characterized from Jenuary to December (Fig. 2). Average heighest air temperature is in the summer 40.9ºC. The monthly average temperature ranges from 24ºC to 28ºC and the annual rainfall is about 54.236 mm.

Sampling and sample processing

These insects were collected by both sweeping and light trapping. Species were sorted according to morphological characters, including male genitalia when necessary. The unidentified taxa were classified as morpho-species. The specimens are deposited in the first author's collection.

The material referred to in this study is deposited in the Kahramanmaraş Entomological Museum (KEMT), Department of Biology, KSU University (Kahramanmaraş, Turkey) and first author's private collections. Taxonomy and classification follows [Aspöck *et al.* 1980a; 1980b; Şengonca, 1980; Şengonca, 1981; Aspöck *et al*. 2001; Canbulat, 2003).

The coordinates of the localities are 36°55'-37°42''N and 35°54'-36°42'', respectively (Figure 2).

Dataes

Dataes (Temperature, Wind Speed, Precipitation, Rainy Days) were obtained from the Meteorology General Management of Turkey.

Osmaniye	January	February	March	April	May	June	July	August	September	October	November	December
	Realized in Long Period Average Values (2011 - 2013)											
Monthly Average Temperature (°C)	9,6 8,2 9,6	10,3 8,3 12,2	12.6 - -	16.1 - 18.0	20.2 21.0 22.9	24.3 - 25.1	27.8 - 27.5	28.4 28.7 28.0	26.1 - 24.8	19.2 21.4 18.5	11.4 - 17.0	9.2 - 10.8
Monthly highest Temperature (°C)	18.3 16.6 19.4	23.6 18.4 23.8	27.0 - 30.4	30.2 - 35.4	31.7 33.9 35.3	36.9 - 36.4	35.7 40.9 36.9	37.1 37.1 37.1	37.6 - 38.6	35.3 35.3 31.8	23.7 - 29.1	21,0 23.2 20.7
Monthly Average Wind Speed (m_sec)	1.9 2.6 2.0	2.1 2.3 2.4	2.0 - -	2.5 - 2.1	2.2 - 2.0	2.4 - 2.5	2.3 - 2.7	- - 2.4	2.0 - 2.1	1.7 - 1.5	1.6 - 1.7	- 1.8 -
Monthly Number of Rainy Days	9 18 13	10 12 12	11 10 9	17 7 13	11 11 7	7 - 1	- 1 2	1 3 1	4 - 7	5 12 3	10 5 3	7 16 6
Monthly Total Precipitation Amount (kg/m^2)	53.6 154.6 71.2	98.2 132.2 84.8	107.0 1.6 62.8	113.2 10.6 98.0	54.4 26.6 78.4	183.4 - 24.6	- 7.6 -	1.0 - 6.6	15.4 - 37.8	32.2 77.0 27.4	45.8 90.6 34.6	72.0 191.6 8.8

Figure 1. Avarage temperature and average rainfall amount in Osmaniye province, estern-mediterranean Anatolia Average Rainfall Amount (kg /m²)

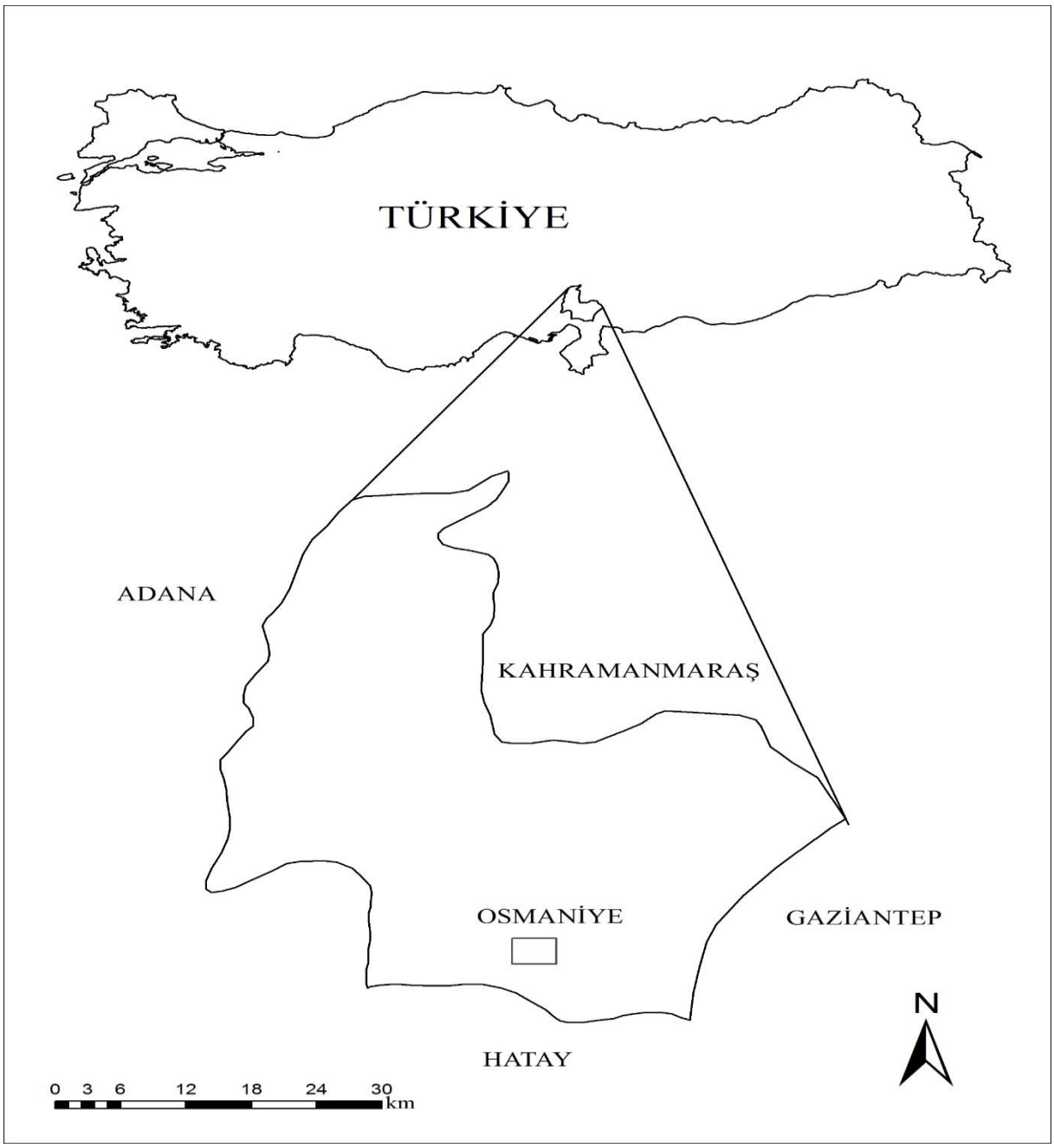


Figure 2. Map of the study area (Osmaniye Province, Turkey).

Results

A total of 628 specimens belonging to 13 species of noctuids were collected during from 2011 to 2013. Seasonal and habitat preferences and host plant specialization are shown in Table 1.

Table 1. Number of collected species in the survey area

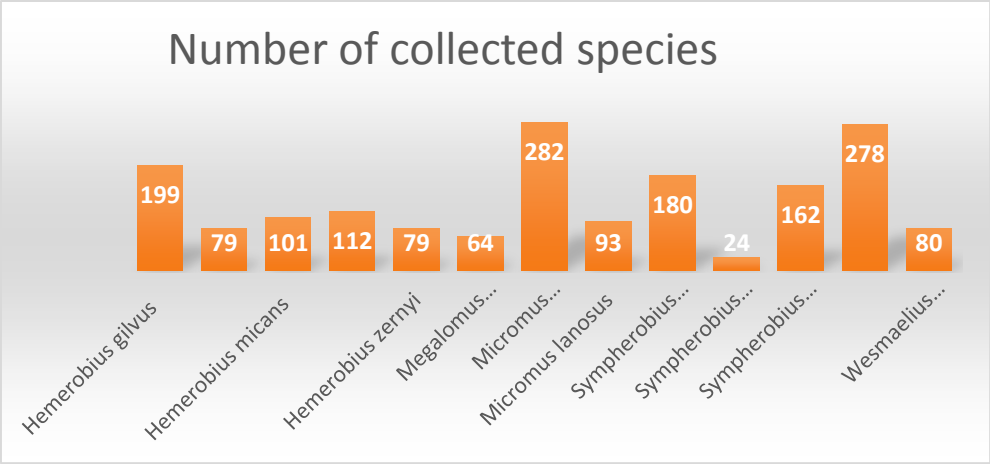


Table 2. Seasonal and habitat preferences of Hemerobiidae of the Osmaniye Province

Locality Group No	Species	Habitat Type	Total Collected number
2,7,29,36	*Hemerobius gilvus*	pasture, wooded, swamp, heathland	199
33,34	*Hemerobius handschini*	pasture, wooded, swamp, heathland	79
18,37,30	*Hemerobius micans*	pasture, wooded, heathland	101
5,27,31,43,516	*Hemerobius nitidulus*	swamp, heathland	112
59,12	*Hemerobius zernyi*	pasture, wooded	79
39,16,44	*Megalomus tortricoides*	pasture, wooded, swamp, heathland	64
8,35,14,15,46,47	*Micromus angulatus*	pasture, wooded, swamp, heathland	282
1,32,55,22,24	*Micromus lanosus*	pasture, wooded, swamp	93
50,51,52,53	*Sympherobius elegans*	pasture, swamp	180
3,10,20,21	*Sympherobius (Niremberge) fuscescens*	wooded, heathland	24
4,6,7,9	*Sympherobius pygmaeus*	pasture, wooded, swamp, heathland	162
49,54,57,58,38,40 , 41,42,28,17	*Wesmaelius (Wesmaelius) concinnus*	pasture, wooded, swamp, heathland	278
23,45,48,25,26,11 ,13	*Wesmaelius (Kimminsia) ravus*	swamp, heathland	80

Wesmaelius (*Wesmaelius*) *concinnus* species has been seen in Toprakkale Düziçi, Sumbas, Kadirli and Merkez, *Hemerobius handschini* only in Kadirli, *Sympherobius elegans* only in the Toprakkale, *Sympherobius pygmaeus* only in the center, *Hemerobius handschini* only in the Kadirli.

Table 3. Vertical distribution of Hemerobiidae species and number of collected samples

Locality No	Coordinate(s)	Altitude (m)	Collected samples	Weather Condition
	Centrium			
1	37º05'39.83''K; 36º20'58.18''D	519	12	Mostly Cloudy
2	37º06'44.80''K; 36º20'34.65''D	214	59	Sunny
3	37º01'46.81''K; 36º15'24.64''D	456	14	Mostly Cloudy
4	37º05'52.91''K; 36º20'13.19''D	255	90	Windy
5	37º13'08.50''K; 36º11'08.70''D	182	25	Mostly Cloudy
6	37º12'17.09''K; 36º10'46.91''D	232	17	Partly Cloudy
7	37º12'37.53''K; 36º10'42.69''D	254	11	Rainy
8	37º12'51.44''K; 36º11'34.12''D	161	39	Sunny
9	37º12'25.41''K; 36º10'54.56''D	236	44	Windy
10	37º05'18.40''K; 36º22'46.89''D	1003	3	Mostly Cloudy
11	37º07'46.78''K; 36º17'10.86''D	554	7	Partly Cloudy
12	37º02'03.14''K; 36º06'16.58''D	84	39	Rainy
13	37º04'08.50''K; 36º18'11.88''D	600	4	Sunny
14	37º03'15.34''K; 36º12'55.33''D	133	51	Windy
15	37º06'02.98''K; 36º08'45.92''D	89	22	Mostly Cloudy
16	37º03'30.89''K; 36º15'26.79''D	357	10	Partly Cloudy
17	37º07'15.74''K; 36º12'06.29''D	134	26	Rainy
18	37º03'30.89''K; 36º15'26.79''D	357	40	Sunny
	Bahçe (Borough)			
19	37º10'34.97''K; 36º34'12.70''D	676	11	Mostly Cloudy
20	37º10'21.45''K; 36º35'56.00''D	801	5	Mostly Cloudy
21	37º12'01.89''K; 36º37'13.87''D	856	2	Mostly Cloudy
22	37º12'34.73''K; 36º35'50.77''D	1018	6	Mostly Cloudy
23	37º11'39.38''K; 36º40'41.63''D	777	2	Windy
24	37º10'32.47''K; 36º38'35.44''D	767	8	Mostly Cloudy

Continuation of Table 3

25	37º11’01.92’’K; 36º35’00.58’’D	651	3	Partly Cloudy
26	37º09’43.83’’K; 36º32’58.96’’D	632	3	Rainy
27	37º10’25.70’’K; 36º32’48.45’’D	588	5	Sunny
28	37º12’01.67’’K; 36º35’51.75’’D	802	2	Windy
	Kadirli (Borough)			
29	37º20’26.28’’K; 36º12’11.77’’D	202	109	Partly Cloudy
30	37º24’06.91’’K; 36º10’08.74’’D	366	34	Rainy
31	37º27’57.70’’K; 36º08’21.54’’D	265	18	Sunny
32	37º25’18.81’’K; 36º03’31.28’’D	137	37	Mostly Cloudy
33	37º19’33.18’’K; 36º07’52.01’’D	173	44	Mostly Cloudy
34	37º20’21.11’’K; 36º06’33.35’’D	153	35	Partly Cloudy
35	37º21’14.18’’K; 36º08’52.30’’D	186	20	Rainy
36	37º25’09.39’’K; 36º05’20.30’’D	199	20	Sunny
	Düziçi (Borough)			
37	37º16’50.19’’K; 36º22’44.66’’D	332	27	Mostly Cloudy
38	37º18’46.84’’K; 36º25’15.31’’D	566	46	Cloudy
39	37º14’36.62’’K; 36º19’31.30’’D	409	38	Rainy
40	37º17’41.96’’K; 36º17’30.56’’D	318	40	Sunny
	Sumbas (Borough)			
41	37º28’53.30’’K; 36º01’13.31’’D	189	13	Mostly Cloudy
42	37º30’23.34’’K; 35º58’15.24’’D	428	30	Partly Cloudy
43	37º30’19.41’’K; 36º02’49.60’’D	229	29	Rainy
44	37º32’40.25’’K; 36º02’24.10’’D	506	16	Sunny
45	37º29’57.85’’K; 36º02’55.09’’D	209	44	Windy
46	37º32’34.82’’K; 36º02’02.90’’D	411	41	Mostly Cloudy
47	37º29’18.48’’K; 36º04’10.43’’D	255	83	Partly Cloudy
	Toprakkale (Borough)			
48	37º05’38.40’’K; 36º06’36.62’’D	43	17	Sunny
49	37º03’40.37’’K; 36º08’50.38’’D	76	30	Windy
50	37º03’48.71’’K; 36º10’44.09’’D	81	25	Rainy
51	37º04’50.56’’K; 36º07’44.74’’D	51	20	Partly Cloudy

52	37º05'43.48''K; 36º08'53.05''D	59	80	Rainy
53	37º03'46.62''K; 36º10'04.87''D	76	55	Sunny

Continuation of Table 3

54	37º02'17.46''K; 36º09'38.26''D	79	39	Sunny
55	37º06'43.37''K; 36º06'45.85''D	44	30	Mostly Cloudy
56	37º01'55.25''K; 36º10'20.58''D	121	35	Sunny
57	37º04'40.62''K; 36º09'07.00''D	64	37	Sunny
58	37º03'09.48''K; 36º09'36.76''D	73	41	Sunny
59	37º05'23.94''K; 36º08'17.20''D	54	40	Windy

The monthly distribution

Considering the vertical distribution, while *Micromuse lanosus* in raises living minimum 44, maximum 1018 m., *Hemerobius zernyi* 54-84, 51-81 m., *Sympherobius elegans* were determined respectively. *Megalomus tortricoides* and *Sympherobius Niremberge) fuscescens* were only seen in the months of June-July and April May in nature respectively. The maximum number of samples that were found in April, on the other hand minumum number of samples were found to be June.

Habitat Selection

Hemerobius gilvus, Hemerobius handschini, Megalomus tortricoides, Micromus angulatus Sympherobius pygmaeus, Wesmaelius (Wesmaelius) concinnus species lives in four habitat types (pasture, wooded, swamp, Heathland).

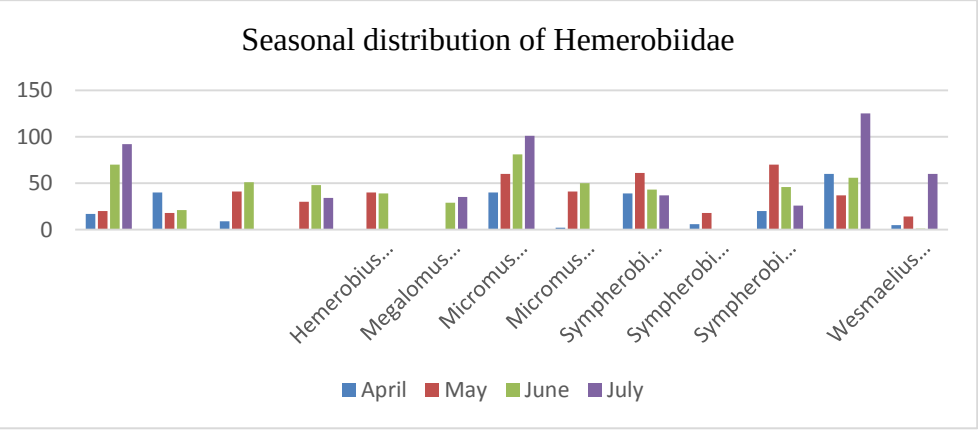
Altitude

Sympherobius elegans and *S. Pygmaeus* were observed at 51-81m., 232-255m. respectively. All other species were not to be seen a stable altitude value. *Micromuse lanosus* has been founded to be the most tolerance species.

Weather Condition

In the survey area, *Sympherobius (Niremberge) fuscescens* and *Micromus lanosus* were collected in just mostly cloudy weather conditionals. *Wesmaelius (Wesmaelius) concinnus* has been observed in all the weather condition types.

Table 4. Seasonal distribution of Hemerobiidae species



Number of collected species

Micromuse angulatus, has been founded the maximum number of samples the species, followed by the *Wesmaelius* (*Wesmaelius*) *concinnus* and *Hemerobius gilvus*. *Sympherobius* (*Niremberge*) *fuscescens* has been founded the least with 24 samples.

Discussion

This study has shown that in the Osmaniye Province, Turkey, seasonal variability Kadirli and Sumbas are the northwest of Osmaniye. On the other hand Düziçi and Bahçe are the northeast of Osmaniye. Toprakkale is the west of Osmaniye. These borough are covered by pasture, wooded, swamp and heathland habitat types. During the survey these localities were each sampled once a week or more throughout the year.

Micromus angulatus was the most abundant in samples in the survey area. Kim et al. (2010) showed that *Micromus* genus is one of most diverse hemerobiid brown lacewing in the world.

Micromus lanosus completes its development on trees, shrubs, and it lives in warm biotopes. However, the species does not live in dry habitats. It can be found from the sea level to over 1000 m of altitude (Arı and Kıyak 2003). But we found it from 44 to 1018 m. during the survey. It can be explained by the presence of host plants that specificed species in the low-elevation.

Hemerobius gilvus, *Hemerobius handschini*, *Megalomus tortricoides*, *Micromus angulatus* *Sympherobius pygmaeus*, *Wesmaelius* (*Wesmaelius*) *concinnus* lived in all the habitat types (pasture, wooded, swamp, heathland).

Micromus and *Hemerobius* are the most common and agriculturally important genera of hemerobiids in North America and other Europan countries (Krakauer and Tauber 1996).

Hemerobius genera has a potential importance in the forest areas as a biocontrol agents. (Mc Ewen *et al.* 2001).

Adults are commonly attracted to lights. Adults and larvae can be found by beating or sweeping plants, especially oaks and pines and plants with high aphid infestations such as wooded and heathland habitats as we found.

Such differences in the seasonal dynamics is labile and they could be modified by species-species interactions (including competition) as well as by weather or other ecological factors.

In our country Hemerobiidae local studies conducted on species is extremely rare. therefore habitats of hemerobit It is difficult to identify accurately. hemerobit in our study are observed in all four habitats, within these four habitats hemerobit indicate the presence of the host plant.

Micromus, *megalomus* and *hemerobius* species belonging to the genus has been observed in nature from April until July. In the nature of these three terms, starting from April to September, there are studies indicating that observed.

The number of samples to be collected unstable terrain that arise from the periodic output of their time.

Hemerobius humulinus, *Micromus variegatus*, M. *angulatus*, *Wesmaelius subnebulosus* and *Sympherohius pygmaeus* were the most dominant and common species in apple orchards (Szentkiralyi, 1992). Osmaniye Province, It incorporates many of the surface shape is one of the rare places. Land south, north and eastward rises steadily. Osmaniye province in the western part of the plain of Adana plain extends eastward. The very central lowland terrain, Toprakkale Düziçi Kadirli and are located in counties.

Osmaniye climatic characteristics and geographical location Hemerobit the developmental stages unusual qualities, considering our study emerged, the number of samples, habitat selection, monthly distribution and seasonal phenology of parameters such as the outcome is not surprising shows.

In this study, Hemerobiidae species in a very clear, which effects the ecology of ecological parameters was found. We Paleoarctic familar with the phenology and habitat with other studies conducted in the region shows significant similarity.

Hemerobiidae habitat preference in comparison with the other Neuroptera families showing wide range habitat tolerans Mc Ewen *et al.*(2001) that also observed in this survey.

The results of this experimental study of vertical distribution show that, there is no direct correlation between with the number of samples and altitude. (Table 3).

Klimaszewski *et al.* (2009) reported *Micromus variegatus* (Fabricius) (Neuroptera, Hemerobiidae), as new to eastern Canada. He also claimed that *Micromus variegatus* is a Palaearctic species occurring in the British Isles, Western Europe and Turkey (Anatolia).

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