



RESEARCH ARTICLE

Seasonal distribution of immature stages of *Culicoides*
(Diptera: Ceratopogonidae) species

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Özet

Uslu U, Dik B. *Culicoides* türlerinin (Diptera: Ceratopogonidae) olgunlaşmamış dönemlerinin mevsimsel dağılımları. **Eurasian J Vet Sci, 2011, 27, 2, 127-130**

Amaç: Araştırmada *Culicoides* türlerinin larva ve pupa dönemlerinin mevsimsel dağılımlarının belirlenmesi amaçlanmıştır.

Gereç ve Yöntem: Ocak-Aralık 2004 tarihlerinde, *Culicoides* türlerinin larva ve pupalarını elde etmek için Konya'nın üç farklı bölgesinden düzenli olarak her ay 9420 cm³ hacminde çamur örnekleri alındı. Alınan çamur örnekleri laboratuvarında doymuş şekerli su yüzdürme tekniği kullanılarak incelendi, larva ve pupalar elde edildi. Toplanan larva ve pupalar 30 cm uzunluğunda ve 1 cm çapında tüplere alındı. Ergin döneme geçebilmelerini sağlamak için tüplerin ağız kısmında yaklaşık bir cm boşluk kalacak şekilde, içlerine 5 mm eninde beyaz bir filtre kağıdı konuldu ve üzerleri pamukla kapatıldı. Ergin döneme ulaşan *Culicoides* örnekleri özel şarjlı elektrik süpürgesi ile yakalanarak içinde %70 etil alkol bulunan cam tüplere alındı.

Bulgular: Araştırmada tespit edilen 258 larvadan 193 adet ergin *Culicoides* üretilirken, 192 pupadan 146 adet ergin *Culicoides* üretildi. En yüksek sayıda larva ve pupaya Ağustos (59 larva ve 35 pupa) ve Temmuz (41 larva ve 32 pupa) aylarında rastlandı. Nisan ayında 4 larva ve 9 pupa, Mayıs'ta 22 larva ve 16 pupa, Haziran'da 24 larva ve 29 pupa, Eylül'de 29 larva ve 17 pupa, Ekim'de 14 larva ve 8 pupa elde edildi.

Öneri: *Culicoides* larva ve pupalarına en çok Ağustos ve Temmuz aylarında, en az Nisan ayında rastlanmıştır. Kış aylarında ise larva ve pupa tespit edilememiştir.

Abstract

Uslu U, Dik B. Seasonal distribution of immature stages of *Culicoides* (Diptera: Ceratopogonidae) species. **Eurasian J Vet Sci, 2011, 27, 2, 127-130**

Aim: The aim of this study was to determine the seasonal distribution of larvae and pupae of *Culicoides* species.

Materials and Methods: Mud samples (9420 cm³) were collected at regular intervals from three regions of Konya province at January - December 2004. Larvae and pupae were obtained with saturated sugar flotation technique. The larvae and pupae of *Culicoides* species were transferred into 30 cm length and 1 cm diameter tubes. To become adult, 5 mm width white filter paper was placed into the tubes, 1 cm space at the top of the tubes, and closed with cotton. *Culicoides* samples were collected gently using a special rechargeable small vacuum cleaner and after were preserved in 70% ethyl alcohol.

Results: Adults 193 and 146 *Culicoides* were obtained from 258 larvae and 192 pupae, respectively. The highest number of larvae and pupae was determined in August (59 larvae and 35 pupae) and July (41 larvae and 32 pupae). Four larvae and nine pupae, 22 larvae and 16 pupae, 24 larvae and 29 pupae, 29 larvae and 17 pupae and 14 larvae and 8 pupae were determined in April, May, June, September and October, respectively.

Conclusions: The highest number of larvae and pupae of *Culicoides* was determined in August and July, and the lowest number of larvae and pupae were collected in April. Larvae and pupae were not seen during winter.

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Keywords: *Culicoides*, immature stage, seasonal distribution.

► Introduction

The Ceratopogonidae have been named as biting midges, punkies, no-see-ums, no-nos, moose-flies, jens or biting gnats, according to geographical location (Blackwell 2001). *Culicoides* transmits important viral diseases such as bluetongue, African horse sickness, epizootic hemorrhagic disease and ephemeral fever, protozoan diseases such as *Haemoproteus meleagridis* and *Leucocytozoon caulleryi*, nematode diseases such as *Onchocerca cervicalis* (Braverman and Galun 1973a, Dik 1988, Dik 1989, Bishop et al 1996, Blackwell 2001, Wall and Shearer 2001, Mullen and Durden 2002, Uslu 2003, Uslu and Dik 2006, Dik et al 2010).

Yonguc et al (1982) reported that bluetongue disease was seen in sheep in the western region of Turkey. Girgin et al (1986) explained also that ephemeral fever was seen in the South East, Middle and South Anatolian Regions, each of which caused great number of animal death. Although *Culicoides* species are known to cause great economic losses, yet there is not enough study for immature stages.

Culicoides can breed in various habitats such as swamps, mud along streams, mud near ponds and mud rich organic matter (Blackwell 2001, Uslu 2003, Uslu and Dik 2006, Uslu and Dik 2007, Uslu and Dik 2010). *Culicoides* can be seen throughout the entire year in countries with mild climate, whereas in countries with hard climate, it can be seen during only spring and summer seasons (Braverman and Galun 1973b). In the Konya region, known with its hard climate, *Culicoides* species are detected from the beginning of April up to the end of October (Uslu and Dik 2005). Muradov (1965) stated that *C. puncticollis* (Becker) pupae were seen mostly in August in Turkmenistan. Konurbayev (1965) also recorded that *Culicoides* larvae and pupae were seen in the second half of July in Kyrgyzstan. Unfortunately, there is only a little literature dealing with *Culicoides* larvae and pupae seasonal variation both in Turkey and in the other country.

This study was carried out in order to determine the seasonal distribution of larvae and pupae and served as a starting point for studies on the ecology of the immature stages of the flies and thus contribute to the development of control strategies of them.

► Materials and Methods

Mud samples were collected from three sites located at the north-west region of Konya, where the presence of larvae and pupae were previously detected between 2004 January and December 2004.

Site I: Located at Meydanlı village, Kadınhanı district, at an altitude of 1126 m, with 10 m length and 50 cm width, near water sources, where fowl, ducks and geese drink water thus containing mud rich organic matter.

Site II: Located at Sarayönü District at an altitude of 1050 m, with 20 m length and 150 cm width, mild organic matter moisture soil, where cattle drink water.

Site III: Located at Kestel village, a rushy, organic matter-poor soil area around the dam. Mud samples were collected at noon, from ten different places for each site, using steel-made sampling tool. Samples were collected from a 30 cm depth. Each sample was 9420 cm³ volumes. Each sample was investigated for the larvae and pupae using flotation technique with saturated sugar solution in the laboratory. The larvae and pupae of *Culicoides* species were passed into the water and collected by a pipette and transferred into 30 cm length and 1 cm diameter tubes, filled up to 2/3 with partially diluted and filtered mud collected from their natural habitats.

In order to enable *Culicoides* larvae and pupae to become adult and for easy collection of these adults, a white filter paper of 5 mm width was placed into the tubes, leaving 1 cm space at the top of the tubes, which were then closed with cotton. The tubes were daily controlled and *Culicoides* samples that had reached the top of the tubes were collected gently using a special rechargeable small vacuum cleaner.

The adult *Culicoides* species collected from the tubes were preserved in 70% alcohol. They were cleared in alcohol-phenol for a few days. Afterward they were mounted on slides by using Faure-Forte medium and the species identified. Meteorological data (mean monthly temperature, rainfall and humidity) were recorded in the study area (Fig. 1).

The data were analyzed with Chi-Square test. Results were considered to be significant at $p < 0.05$.

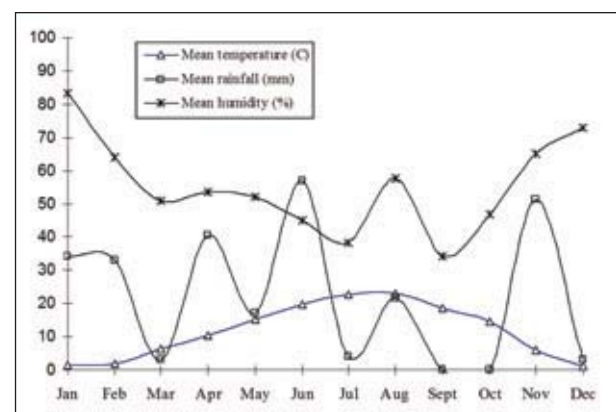


Figure 1. Climatic data of Konya district (Turkey).

► Results

A total of 339 species of which 6 species belongs to *Culicoides* were reared from 193 larvae and 146 pupae from suspected breeding sites from January to December 2004. In our study we obtained 193 adult *Culicoides* from 258 larvae and 146 adult from 192 pupae. The highest number of larvae and pupae of *Culicoides* have been seen in August (59 larvae and 35

pupae) and in July (41 larvae and 32 pupae). Four larvae and nine pupae in April, 22 larvae and 16 pupae in May, 24 larvae and 29 pupae in June, 29 larvae and 17 pupae in September and 14 larvae and 8 pupae in October were collected, respectively (Fig. 2).

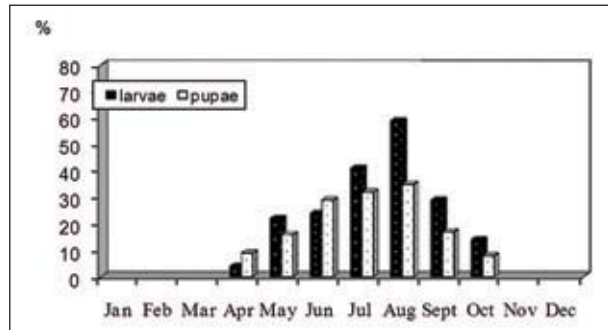


Figure 2. Seasonal distribution of *Culicoides* species found in Konya province.

Table 1. Distribution of larvae and pupae *Culicoides* species in three different habitats.

Locality	Species	L	P	Total
Site I	<i>C. nubeculosus</i>	62	29	91
	<i>C. puncticollis</i>	7	12	19
	<i>C. riethi</i>	2	2	4
	<i>C. circumscriptus</i>	9	9	18
	Total			132 ^a
Site II	<i>C. nubeculosus</i>	19	6	25
	<i>C. puncticollis</i>	34	35	69
	<i>C. riethi</i>	9	4	13
	<i>C. circumscriptus</i>	26	13	39
	Total			146 ^a
Site III	<i>C. nubeculosus</i>	2	5	7
	<i>C. riethi</i>	-	2	2
	<i>C. circumscriptus</i>	9	1	10
	<i>C. gejjelensis</i>	-	3	3
	<i>C. festivipennis</i>	14	25	39
	Total			61 ^b
Total		193	146	339

^{a, b}: Different letters amongst sites are statistically significant (Chi-Square test, p<0.05).

The total numbers of larvae (L) and Pupae (P) were found as *C. nubeculosus* (Meigen) 83 (L) and 40 (P), *C. puncticollis* (Becker) 41 (L) and 47 (P), *C. circumscriptus* Kieffer 44 (L) and 23 (P), *C. festivipennis* Kieffer 14 (L) and 25 (P), *C. riethi* Kieffer 11 (L) and 8 (P), *C. gejjelensis* Dzhafarov 2 (P), respectively.

In the soil samples of the 3 sites, it was observed that *C. circumscriptus* Kieffer, *C. nubeculosus* (Meigen) and *C. riethi* Kieffer and were observed in each three sites as cosmopolitan species (Table 1).

► Discussion

Blind use of insecticides against the mosquitoes in Konya province greatly harms both useful organisms and environmental health. Additionally, these applications cause large economical losses. With correct

larvacide selection; it will be possible to decrease the *Culicoides* population. Kline et al (1985) stated that organophosphate compounds were used in the control of *Culicoides furens* (Poey) and *C. mississippiensis* Hoffman larvae in United States of America. The earliest recorded appearance of *Culicoides* larvae and pupae was on 15 April 2004 and the latest 22 October 2004. Uslu and Dik (2005) have reported that adult *Culicoides* are seen in the Konya province between April and October. In this study, larvae and pupae of *Culicoides* were also collected between April and October. This result has supported the findings of Uslu and Dik (2005). According to the light of these findings, control studies of immature stages of *Culicoides* should be carried out especially from April to October.

It has been reported that *C. puncticollis* (Becker) pupae are mostly seen in August in Turkmenistan (Muradov 1965). *Culicoides* larvae and pupae are seen in the second half of July in Kyrgyzstan (Konurbayev 1965). In the current study, in laboratory, *Culicoides* larvae and pupae were also mostly seen in July and August. The rate of larvae began to rise sharply at the beginning of August. These findings are supported the results that of Muradov and Konurbayev. These results are in agreement with that of Muradov (1965) and Konurbayev (1965). *Culicoides* larvae increased regularly from April to August and these larvae were in the highest in August, afterward decreased steadily until October. *Culicoides* pupae also increased from April to August after decreased regularly until October. The highest number of *Culicoides* larvae (59) and pupae (35) were obtained in August (Table 1). The total number of larvae and pupae were found as 51 (15.04%) in spring, 220 (64.90%) in summer and 68 (20.06%) in autumn, respectively. No *Culicoides* larvae and pupae were seen during winter because of the lowest level of temperature (Fig. 2).

► Conclusions

It would be suggested that taking into consideration of the characteristic of breeding site and determination of the seasonal distribution of *Culicoides* larvae and pupae in this study would assist taking effective measurements in the control of *Culicoides*. This study was carried out in order to determine the seasonal distribution of larvae and pupae of *Culicoides* and served as a starting point for studies on the ecology of the immature stages of the flies and thus contribute to the development of control strategies of them.

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