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Contributions to *Culicoides* Latreille, 1809 (Diptera: Ceratopogonidae) Fauna of Sinop Province

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Abstract

In recent years, Sinop Province has become an important touristic center of Black Sea Region in Turkey. Akliman is also one of the most visited touristic areas of Sinop. It is notable that aquatic and semi-aquatic habitats in Akliman and surrounding areas are suitable reproduction areas for *Culicoides* (Diptera: Ceratopogonidae). Biting female *Culicoides* midges irritate people and animals because they feed by blood sucking. Thus, the study aimed to determine the species of the genus in Akliman District of Sinop Province, which is little investigated. The present study was conducted in 2014 and 2015. The study area was divided into three stations. Specimens were collected using CDC miniature light trap and black fluorescent lamp light trap at these stations, which were kept inside bottles with 70% ethyl alcohol. *Culicoides* specimens were identified using steromicroscope and light microscope. A total of 15 species of the *Culicoides* genus were identified in the study area. *Culicoides alazanicus, C. cataneii, C. gejgelensis, C. griseidorsum, C. kibunensis, C. longipennis, C. obsoletus, C. picturatus* and *C. subfasciipennis* species are new records for Sinop. Male individuals belonging to *C. alazanicus* and *C. griseidorsum* in Turkey have been identified for the first time in this study.

Keywords: Sinop, Akliman, Diptera, Ceratopogonidae, *Culicoides*

1. INTRODUCTION

Midges of *Culicoides* Latreille, 1809 are small midges sized 1-3 mm [1]. *Culicoides* is the largest genus in the Ceratopogonidae family with around 1400 species [2]. They spend their larva and pupa stages in aquatic and semi-aquatic habitats. Particularly mud near water sources that is rich in organic matter is mostly preferred by these insects [3]. Adults are seen in Turkey between April and October [4, 5, 6]. They reach the highest population particularly in July and August [6]. Since the female *Culicoides* biting midges feed on blood, they are important in terms of health and veterinary medicine. Infestation is an important cause of irritation in many parts of the world [7]. Santiago-Alarcon et al. [8] found out that 13 of 20 *Culicoides* species detected in a study in a suburban forest in Germany fed on the blood of humans. Similarly, Santiago-Alarcon et al. [9] reported from a study in the urban forest that *Culicoides* fed on birds, farm animals and mostly humans. Hadj-Henni et al. [10] suggested that humans, as well as horses, donkeys, cattle, cats and chickens are also sources of blood. Bites are painful in sensitive people and cause various allergic reactions to occur [4, 7, 11]. Additionally, they lead viruses, bacteria, protozoa and helminths to be transmitted to humans [7, 12, 13]. Particularly in farm animals, there are many diseases that arise from the role of *Culicoides* as a vector [4, 12, 14]. Although they are not a vector of dangerous disease in humans [15], Oropouche virus and nematodes causing mansonellosis are known to be transmitted to humans via *Culicoides* [12, 13].

Although there are many studies on *Culicoides* in Turkey, the number of faunistic studies in Black Sea Region is fewer compared to other regions, which remained under-researched. The first faunistic study in the Black Sea Region was carried out by Dik et al. [16]. A total of 13 species were reported from Amasya, Giresun, Ordu, Sinop and Samsun Provinces. Turgut

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and Kılıç [17] detected a total of 36 species with two new records in Central Black Sea Region. Dik et al. [18] reported 35 species from Western Black Sea Region with two new records. As a result of these studies, the number of *Culicoides* species found in Turkey has been reached to 61 [18].

In recent years, Sinop Province has become one of the most important touristic centers of Black Sea Region. Akliman is one of the most famous tourist areas of Sinop. The district, which is also home to Hamsilos Nature Park, hosts many tourists in summer. Furthermore, Akliman and its surrounding areas present suitable areas for reproduction for *Culicoides* spp. because they contain both aquatic and semi-aquatic habitats. The present study aims to investigate the species of this genus which irritate people in Akliman District which has become an important touristic site of Sinop.

2. MATERIAL AND METHOD

This study was carried out in Akliman District of Sinop Province from May to November 2014 and from June to November 2015. Midges were collected from the study site every 10-15 days. The midges were caught using UV led and 6 V halogen bulb CDC miniature light traps as well as 18 W, 12 V black fluorescent lamp traps [17, 19]

Akliman is 12 km away from Sinop city center and on the coastline. This district, which is on the sea level, was investigated by separating into three stations, which are reported below (Figure 1).

Figure 1. Akliman District and sampling stations (figure from Goggle maps)

Station I (42°01'41.0"N 35°03'11.0"E): This is a paddy production area which is surrounded by agricultural areas. Additionally, Karasu Stream reaches the sea at this point. However, the flow rate of the stream at this point is slow, its connection with the sea is lost from time to time, and it is a dark green, turbid and stagnant water body.

Station II (42°02'28.3"N 35°02'26.7"E): Station II representing the area surrounding Sırakaraağaçlar Stream. Sırakaraağaçlar Stream is 3.2 km long and has two divisions. Its average depth is 1.5 m. While the part of the stream which flows into the sea is sandy, other parts are muddy and look like a swamp. At the end of spring and in summer, its connection with the sea is completely lost [20, 21]. Around this station, there are residential areas of Abalı Village as well as tourist accommodation facilities. Due to these residential areas and agricultural activities, waste water enters the Stream [21]. In summer, tourists stay at the accommodation facilities in this area.

Station III (42°03'14.7"N 35°02'20.4"E): Station III covers Hamsilos Nature Park. It is a location which is surrounded by a large forest with pine trees and low level of settlement. It contains reed fields formed by puddles. The area surrounding this station is one of the areas where tourists often visit in summer.

Light traps were placed into the station before sunset. CDC miniature trap caught specimens were collected using CDC miniature light trap until the morning while the trap with the black fluorescent lamp was kept in the field for 2-3 hours to collect specimens. Collected midges were kept inside 70% ethyl alcohol. Specimens of *Culicoides* genus were determined and identified using a stereomicroscope. Preparations of *Culicoides* specimens which could not be identified by using a stereomicroscope were made [22]. Preparations were investigated under the light microscope and identified.

Taxonomic measurements and terminology were in line with the study of Szadziewski [23]. Measurements are presented below:

Palpal ratio (PR): Calculated by dividing the length of third palpal segment by the length of its widest side.

Male Antenna Ratio (AR): Calculated by dividing the total length of four distal antenna segments by the total length of nine proximal segments.

Costal Ratio (CR): Calculated by dividing costal length by wing length. Costal length and wing length were measured from basal arculus.

Tarsal Ratio (TR): Calculated by dividing first tarsomere length (basitarsus) by second tarsomere length. While tarsomere length is calculated, its part in the joint is not included in the measurement.

3. RESULTS

In this study, 15 *Culicoides* species were identified in Akliman District of Sinop Province. 9 of these species are new records for Sinop Province.

Species review

Tribe: Culicoidini Kieffer, 1911

Genus: *Culicoides* Latreille, 1809

***Culicoides alazanicus* Dzhafarov, 1961**

Material examined: Station I: 21.VI.2014, ♂, 30.VII.2015, 5 ♀♀, 29.IX.2015, 4 ♀♀; Station II: 13.IX.2014, ♀, 25.IX.2014, ♀, 22.IX.2014, ♀, ♂, 02.VI.2015, ♀, 14.VII.2015, ♀, 3 ♂♂, 26.IX.2015, 3 ♀♀, ♂, 16.IX.2015, ♀, Station III: 22.VII.2015, ♀, 30.VII.2015, 2 ♀♀ (Table 1).

Male Description: Eyes bare. Flagellomeres 1-10 with long setae and flagellomeres 2-10 fused. Flagellomeres 1, 11, 12 and 13 with sensilla coeloconica. Flagellum length 705-737 μm (n=4). AR 0.88-0.94 (n=4). Third palpal segment length 43.3-52.1 μm (n=5), sensory pit distinct. PR 0.31-0.35 (n=5) (Figure 2 c). Thorax dark brown. Legs light brown. Hind tibial comb with four spines. TR (I) 2-2.41, TR (II) 2.47-2.73, TR (III) 1.83-1.87 (n=6). Wing length 828-1034 μm (n=6). CR 0.52-0.54 (n=6) (Figure 2 a, b). Sternite IX with a deep and wide caudomedian excavation. Basal membrane of Sternite IX without spicules (Figure 2 d, e). Dorsal and ventral apodemes of gonocoxite thin and long. Dorsal apodeme of gonocoxite sclerotized (Figure 2 f). Apex of gonostylus like a beak. Tergite IX with long and outward apicolateral processes. Aedeagus arc wide, high and sclerotized. Basal arms of paramers sclerotized and curved with acute angle (Figure 2 d, e). Paramers inflated on the middle part, ends with tapering (Figure 2 g).

Distribution in Turkey: Bartın, Zonguldak [18]. New record for Sinop.

General distribution: Albania, Azerbaijan, Belgium, Bosnia and Herzegovina, Britain I., Corsica, Croatia, Czech Republic, Danish mainland, French mainland, Germany, Near East, Portuguese mainland, Slovakia, Spanish mainland [24, 25].

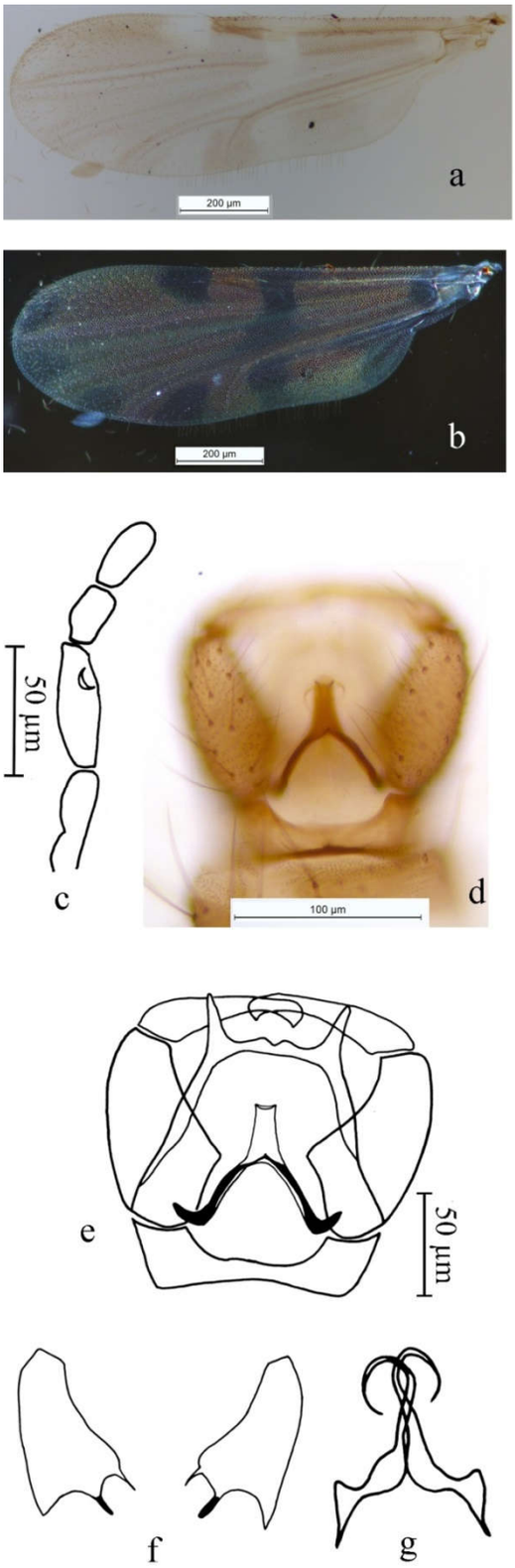

Figure 2. Male *Culicoides alazanicus* Dzhafarov, 1961. a) wing (bright field image), b) wing (dark field image), c) maxillary palp, d) and e) genitalia, f) dorsal and ventral apodemes of gonocoxite, g) paramers

***Culicoides cataneii* Clastrier, 1957**

Material examined: Station II: 14.VII.2015, 2 ♀♀ (Table 1).

Distribution in Turkey: Adana [26], Ankara [4], Aydın [5, 27], Bursa [28], Çanakkale, Edirne, Tekirdağ [29], Elazığ [30], Hatay [31], Konya [3, 14], Kütahya [27], Samsun [17]. New record for Sinop.

General distribution: Albania, Algeria, Britain I., Channel Is., Corsica, Croatia, Cyprus, French mainland, Germany, Iran, Iraq, Israel, Italian mainland, Morocco, Portuguese mainland, Sardinia, Sicily, Spanish mainland, Switzerland, Turkmenistan, Ukraine, Vóreion Aiyáion (North Aegean Is.) [24, 25].

***Culicoides circumscriptus* Kieffer, 1918**

Material examined: Station I: 27.VIII.2014, ♂, 30.VII.2015, ♀, 20.VIII.2015, 3 ♀♀, 28.VIII.2015, ♀, 29.IX.2015, 5 ♀♀, 4 ♂♂, 23.XI.2015, 5 ♀♀; Station II: 17.X.2014, ♀, Station III: 09.VI.2014, ♀ (Table 1).

Distribution in Turkey: Adana [26, 32], Amasya, Ordu, Samsun [16, 17], Ankara [4, 33], Antalya [26, 33, 34], Aydın [5, 27], Bartın, Bolu, Kastamonu, Zonguldak [18], Bursa [28], Çanakkale [29, 34], Çorum, Tokat [17], Edirne, İstanbul, Kırklareli, Tekirdağ [29], Denizli [27, 33], Elazığ [30], Giresun, Sinop [16], Hatay [19, 31, 32], İzmir [27, 32, 34], Konya [3, 14, 33, 35], Kütahya [27], Mersin [26], Muğla [27, 34], Niğde [36].

General distribution: Afro-tropical region, Albania, Azores Is., Belarus, Belgium, Bosnia and Herzegovina, Britain I., Bulgaria, Central European Russia, Corsica, Croatia, Cyprus, Czech Republic, Danish mainland, East Palaearctic, Estonia, French mainland, Germany, Ireland, Italian mainland, Lithuania, Near East, North Africa, North European Russia, Northern Ireland, Northwest European Russia, Norwegian mainland, Oriental region, Poland, Portuguese mainland, Romania, Sardinia, Sicily, Slovakia, Spanish mainland, Switzerland, Vóreion Aiyáion (North Aegean Is.) [24, 25].

***Culicoides duddingstoni* Kettle and Lawson, 1955**

Material examined: Station I: 21.VI.2014, ♀, 22.VI.2015, ♀, 30.VII.2015, ♀, 28.VIII.2015, 2 ♀♀, 29.IX.2015, 3 ♀♀; Station II: 14.VII.2015, ♀, 26.VIII.2015, ♀, 20.X.2015, ♀; Station III: 22.VI.2015, 3 ♀♀, 30.VII.2015, 11 ♀♀ (Table 1).

Distribution in Turkey: Denizli, Kütahya [27], Konya [14], Samsun [17], Sinop [16].

General distribution: Britain I., Corsica, Czech Republic, Danish mainland, East Palaearctic, Estonia, Faroe Is., French mainland, Germany, Ireland, Near

East, Northern Ireland, Poland, Romania, Sardinia, Slovakia, Spanish mainland, Transcaucasus, Ukraine, Uzbekistan [24, 25].

***Culicoides festivipennis* Kieffer, 1914**

Material examined: Station I: 21.VI.2014, 3 ♀♀, ♂, 03.VII.2015, ♂, 30.VII.2015, 35 ♀♀, 2 ♂♂, 20.VIII.2015, 2 ♀♀, 29.IX.2015, 9 ♀♀; Station II: 13.VIII.2014, ♀, 25.VIII.2014, ♀, 02.X.2014, ♀, 17.X.2014, ♀, 02.VI.2015, 5 ♀♀, 14.VII.2015, 6 ♀♀, 13 ♂♂, 26.VIII.2015, 5 ♀♀, 4 ♂♂, 16.IX.2015, ♀, 05.XI.2015, ♀; Station III: 22.VII.2015, 3 ♀♀, 30.VII.2015, ♀ (Table 1).

Distribution in Turkey: Ankara [4], Antalya [33], Aydın [5], Bartın, Bolu, Düzce, Kastamonu, Zonguldak [18], Bursa [28], Çorum, Ordu, Samsun, Tokat [17], Diyarbakır [32], Edirne, Kırklareli [29], Elazığ [30], Hatay [31, 32], İzmir [27, 32], Konya [3, 14], Kütahya [27], Muğla [34], Niğde [36], Sinop [16].

General distribution: Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Britain I., Central European Russia, Channel Is., Corsica, Croatia, Czech Republic, Danish mainland, East Palaearctic, Estonia, French mainland, Germany, Hungary, Ireland, Italian mainland, Lithuania, Luxembourg, Near East, North Africa, North European Russia, Northwest European Russia, Norwegian mainland, Poland, Portuguese mainland, Sardinia, Slovakia, Spanish mainland, Switzerland, The Netherlands [24, 25].

***Culicoides gejgelensis* Dzhafarov, 1964**

Material examined: Station II: 13.VIII.2014, ♀, 25.VIII.2014, ♂, 14.VII.2015, 3 ♂♂, 16.IX.2015, ♀, 05.XI.2015, ♂, Station III: 30.VII.2015, ♀ (Table 1).

Distribution in Turkey: Amasya, Samsun [16, 17], Ankara [4], Antalya [26, 33], Aydın [5, 27], Bartın, Bolu, Düzce, Kastamonu, Zonguldak [18], Bursa [28], Çorum, Ordu, Tokat [17], Denizli [27], Edirne [29], Elazığ [30], Hatay [31], İzmir [27], Konya [3, 14], Kütahya [27], Mersin [26], Muğla [34], Niğde [36]. New record for Sinop.

General distribution: Albania, Algeria, Bosnia and Herzegovina, Corsica, Croatia, East Palaearctic, French mainland, Israel, Italian mainland, Near East, North Africa, Portuguese mainland, Sardinia, Sicily, Spanish mainland, Tajikistan, Transcaucasus, Turkmenistan, Ukraine, Uzbekistan, Vóreion Aiyáion (North Aegean Is.) [24, 25].

***Culicoides griseidorsum* Kieffer, 1918**

Material examined: Station I: 30.VII.2015, 4 ♀♀, 29.IX.2015, ♀; Station II: 28.V.2014, ♀, 14.VII.2015, ♂ (Table 1).

Male Description (n=1): Eyes bare. Flagellomeres 1-10 with long setae and flagellomeres 2-10 fused. Flagellomeres 1, 11 and 12 with sensilla coeloconica. Flagellum length 788 µm. AR 0.9. Third palpal segment with shallow sensory pit. Third palpal segment length 60 µm. PR 0.28. (Figure 3 c). Thorax dark brown. Scutellum and legs light brown, halters pale. Hind tibial comb with four spines. TR (I) 2.04, TR (II) 2.34, TR (III) 1.95. Wing length 1200 µm. CR 0.53 (Figure 3 a, b). Sternite IX with a shallow and wide caudomedian excavation. Basal membrane of Sternite IX with small spicules (Figure 3 d, e). Dorsal apodeme of gonocoxite long and sclerotized. Ventral apodeme of gonocoxite short (Figure 3 f). Apex of gonostylus like a beak. Tergite IX with long and outward apicolateral processes. Aedeagus arc wide and high. Aedeagus apex looks like a triangle. Basal arms of paramers sclerotized and curved with acute angle (Figure 3 d, e). Paramers inflated on the middle part, ends with tapering (Figure 3 g).

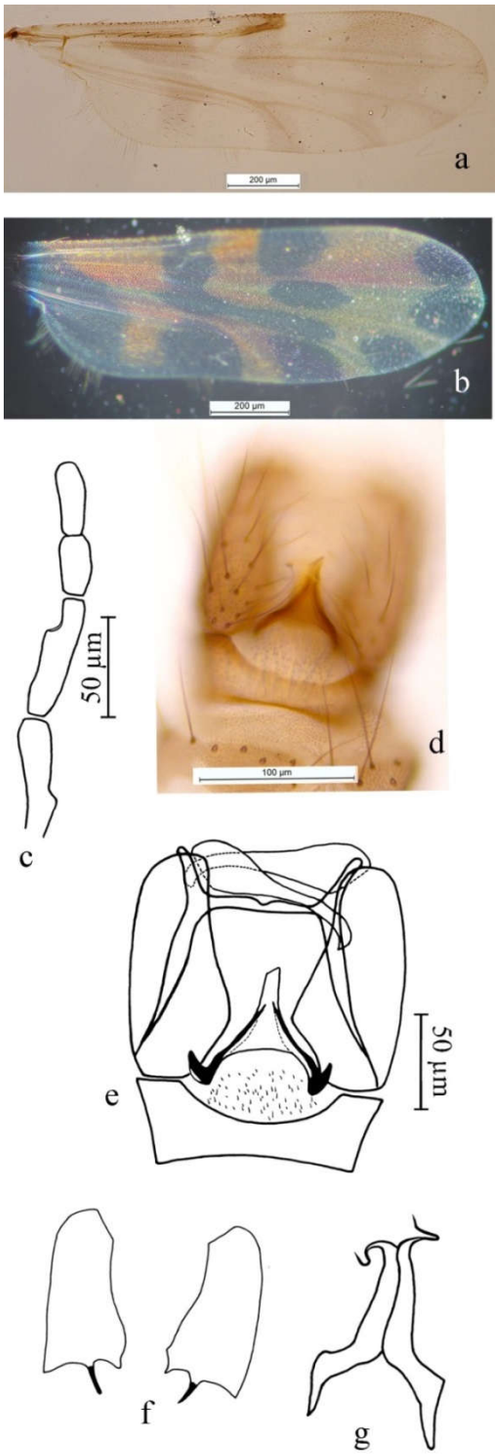

Figure 3. Male *Culicoides griseidorsum* Kieffer, 1918. a) wing (bright field image), b) wing (dark field image), c) maxillary palp, d) and e) genitalia, f) dorsal and ventral apodemes of gonocoxite, g) paramers

Distribution in Turkey: Samsun [17]. New record for Sinop.

General distribution: Britain I., Corsica, French mainland, Italian mainland, Poland, Spanish mainland, Near East, North Africa [24, 25].

***Culicoides kibunensis* Tokunaga, 1937**

Material examined: Station II: 14.VII.2015, ♀, 05.XI.2015, ♀ (Table 1).

Distribution in Turkey: Ankara [4], Bolu, Kastamonu, Zonguldak [18], Bursa [28], Denizli [27], Elazığ [30], Konya [3, 14], Ordu, Samsun, Tokat [17]. New record for Sinop.

General distribution: Albania, Andorra, Belarus, Belgium, Bosnia and Herzegovina, Britain I., Central European Russia, Channel Is., Corsica, Croatia, Czech Republic, Danish mainland, East Palaearctic, Estonia, French mainland, Germany, Hungary, Iran, Ireland, Israel, Italian mainland, Japan, Korea, Lithuania, Luxembourg, Near East, North Africa, North America, North China, North European Russia, Northern Ireland, Norwegian mainland, Poland, Portuguese mainland, Romania, Sardinia, Sicily, Slovakia, Slovenia, Spanish mainland, Switzerland, The Netherlands [24, 25].

***Culicoides longipennis* Khalaf, 1957**

Material examined: Station II: 11.IX.2014, ♂, 14.VII.2015, ♀, 26.VIII.2015, ♀ (Table 1).

Distribution in Turkey: Adana [26, 32], Amasya, Çorum, Ordu, Tokat [17], Ankara [4], Antalya [26, 33, 34], Aydın [5, 27, 33], Bartın, Bolu, Kastamonu, Zonguldak [18], Bursa [28], Denizli [27, 33], Edirne, İstanbul, Kırklareli [29], Elazığ [30], Hatay [19], İzmir [27, 32, 34], Konya [3, 14, 33], Kütahya [27], Mersin [26], Muğla [34], Niğde [36], Samsun [16, 17]. New record for Sinop.

General distribution: Algeria, Bosnia and Herzegovina, Corsica, Croatia, Cyprus, Dodekánisos (Dodecanese Is.), East Palaearctic, French mainland, Iran, Iraq, Israel, Italian mainland, Kazakhistan, Morocco, Near East, Portuguese mainland, Sardinia, Spanish mainland, Tajikistan, Transcaucasus, Turkmenistan, Ukraine, Uzbekistan, Vóreion Aiyáion (North Aegean Is.) [24, 25].

***Culicoides maritimus* Kieffer, 1924**

Material examined: Station II: 14.VII.2015, ♂, 16.IX.2015, ♀; Station III: 22.VII.2015, ♀ (Table 1).

Distribution in Turkey: Amasya, Tokat [17], Ankara, Antalya and Aydın [33], Bartın, Bolu, Zonguldak [18], Bursa [28], Denizli [27], Elazığ [30], Hatay and İzmir [32], Konya [3, 14, 33, 35], Niğde [36], Samsun [16, 17], Sinop [16].

General distribution: Albania, Algeria, Belgium, Britain I., Central European Russia, Corsica, Cyprus, Czech Republic, Danish mainland, East Palaearctic, French mainland, Germany, Hungary, Iran, Israel, Italian mainland, Kazakhistan, Morocco, Near East, Poland, Portuguese mainland, Romania, Sardinia, Sicily, Slovakia, Spanish mainland, The Netherlands, Transcaucasus, Tunisia, Turkmenistan, Ukraine, Uzbekistan, Vóreion Aiyáion (North Aegean Is.) [24, 25].

***Culicoides newsteadi* Austen, 1921**

Material examined: Station I: 22.VI.2015, ♀, 30.VII.2015, 20 ♀♀, ♂, 30.VII.2015, 2 ♀♀, ♂, 20.VIII.2015, 9 ♀♀, 2 ♂♂, 29.IX.2015, 3 ♀♀; Station II: 02.X.2014, ♀, 17.X.2014, 2 ♂♂, 14.VII.2015, 9 ♀♀, ♂, 26.VIII.2015, 19 ♀♀, 2 ♂♂, 16.IX.2015, 2 ♀♀, 05.XI.2015, ♂, 24.XI.2015, 3 ♀♀; Station III: 22.VII.2015, 2 ♀♀, 30.VII.2015, 48 ♀♀ (Table 1).

Distribution in Turkey: Ankara [4, 33], Antalya [26, 33], Amasya, Samsun [17], Aydın [5, 27, 33], Bartın, Bolu, Zonguldak [18], Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ [29], Denizli [33], Elazığ [30], Konya [14, 33, 35], Sinop [16].

General distribution: Albania, Algeria, Austria, Azores Is., Balearic Is., Belgium, Britain I., Corsica, Cyprus, Danish mainland, Dodekánisos (Dodecanese Is.), East Palaearctic, Egypt, French mainland, Germany, Greek mainland, Hungary, Iran, Iraq, Ireland, Israel, Italian mainland, Latvia, Madeira Is., Morocco, Near East, Northern Ireland, Norwegian mainland, Portuguese mainland, Sardinia, Sicily, Slovakia, Spanish mainland, Switzerland, Tajikistan, The Netherlands, Transcaucasus, Turkmenistan, Ukraine, Vóreion Aiyáion (North Aegean Is.) [24, 25].

***Culicoides obsoletus* (Meigen, 1818)**

Material examined: Station II: 14.VII.2015, ♂ (Table 1).

Distribution in Turkey: Adana [26], Amasya, Samsun [16, 17], Ankara [4], Antalya [26, 33], Aydın [5, 27, 33], Bartın, Bolu, Düzce, Karabük, Kastamonu, Zonguldak [18], Bursa [28], Çanakkale [34], Çorum, Ordu, Tokat [17], Denizli [33], Edirne, İstanbul, Kırklareli, Tekirdağ [29], Elazığ [30], Giresun [16], Hatay [19], İzmir [32], Konya [14, 35], Kütahya [27], Mersin [26], Muğla [27]. New record for Sinop.

General distribution: Albania, Algeria, Andorra, Austria, Azores Is., Balearic Is., Belarus, Belgium, Bosnia and Herzegovina, Britain I., Canary Is., Central European Russia, Channel Is., Corsica, Croatia, Cyprus, Czech Republic, Danish mainland, East European Russia, East Palaearctic, Estonia, French mainland, Germany, Hungary, Ireland, Italian mainland, Lithuania, Madeira Is., Morocco, Near East, North America, North European Russia, Northern Ireland, Northwest European Russia, Norwegian mainland, Poland, Portuguese mainland, Sardinia, Sicily, Slovakia, Spanish mainland, Switzerland, The Netherlands, Vóreion Aiyáion (North Aegean Is.) [24, 25].

***Culicoides picturatus* Kremer and Deduit, 1961**

Material examined: Station II: 14.VI.2015, ♀, ♂ (Table 1).

Distribution in Turkey: Amasya [16], Elazığ [30], Bartın, Bolu, Düzce, Kastamonu, Zonguldak [18], Hatay [31], Konya [14], Niğde [36], Tokat [17]. New record for Sinop.

General distribution: Britain I., Channel Is., Corsica, Danish mainland, French mainland, Israel, Italian mainland, Morocco, Near East, Portuguese mainland, Romania, Sardinia, Sicily, Spanish mainland [24, 25].

***Culicoides punctatus* (Meigen, 1804)**

Material examined: Station I: 30.VII.2015, 2 ♀♀, 20.VIII.2015, 2 ♀♀, 29.IX.2015, ♀; Station II: 26.VIII.2015, 4 ♀♀; Station III: 30.VII.2015, 2 ♀♀ (Table 1).

Distribution in Turkey: Amasya, Çorum, Ordu, Tokat [17], Ankara [4, 33], Antalya [26, 33], Aydın [33, 37], Bartın, Bolu, Düzce, Kastamonu, Zonguldak [18], Bursa [28], Çanakkale, Edirne, İstanbul, Kırklareli, Tekirdağ [29], Elazığ [30], İzmir [27], Konya [14, 33, 35], Kütahya [27], Niğde [36], Samsun [16, 17], Sinop [16].

General distribution: Afro-tropical region, Albania, Belarus, Belgium, Britain I., Central European Russia, Channel Is., Corsica, Cyprus, Czech Republic, Danish mainland, Dodekánisos (Dodecanese Is.), East Palaearctic, Estonia, Finland, French mainland, Germany, Hungary, Ireland, Italian mainland, Latvia, Lithuania, Luxembourg, Near East, North Africa, North European Russia, Northern Ireland, Northwest European Russia, Norwegian mainland, Poland, Portuguese mainland, Sardinia, Sicily, Slovakia, Spanish mainland, Switzerland, The Netherlands [24, 25].

***Culicoides subfasciipennis* Kieffer, 1919**

Material examined: Station I: 21.VI.2014, 2 ♀♀, ♂, 30.VII.2015, 3 ♀♀, 28.VIII.2015, 3 ♀♀; Station II: 14.VII.2015, 3 ♂♂; Station III: 30.VII.2015, ♀ (Table 1).

Distribution in Turkey: Antalya [33], Aydın, Denizli and Kütahya [27], Bartın, Bolu, Kastamonu,

Zonguldak [18], Çorum, Ordu, Samsun, Tokat [17], Elazığ [30], Konya [3, 14]. New record for Sinop.

General distribution: Algeria, Austria, Belarus, Belgium, Britain I., Central European Russia, Corsica, Czech Republic, Danish mainland, East European Russia, East Palaearctic, Estonia, French mainland, Germany, Hungary, Iran, Italian mainland, Lithuania, Mongolia, Morocco, Near East, North China, North European Russia, Poland, Portuguese mainland, Sardinia, Sicily, Slovakia, Spanish mainland, Switzerland, The Netherlands [24, 25].

Table 1. Male and female numbers of species according to stations

	Station I		Station II		Station III	
	♀	♂	♀	♂	♀	♂
C. alazanicus	9	1	9	5	3	-
C. cataneii	-	-	2	-	-	-
C. circumscriptus	15	5	1	-	1	-
C. duddingstoni	8	-	3	-	14	-
C. festivipennis	49	4	22	17	4	-
C. gejgelensis	-	-	2	5	1	-
C. griseidorsum	5	-	1	1	-	-
C. kibunensis	-	-	2	-	-	-
C. longipennis	-	-	2	1	-	-
C. maritimus	-	-	1	1	1	-
C. newsteadi	35	4	34	6	50	-
C. obsoletus	-	-	-	1	-	-
C. picturatus	-	-	1	1	-	-
C. punctatus	5	-	4	-	2	-
C. subfasciipennis	8	1	-	3	1	-

4. DISCUSSION

In this study, a total of 15 species of the *Culicoides* genus was determined in Akliman District of Sinop Province.

Dik et al. [16], reported *C. circumscriptus, C. duddingstoni, C. festivipennis, C. maritimus, C. newsteadi* and *C. punctatus* from Sinop as a result of their study in Black Sea Region. In line with Dik et al.'s findings, all of the identified species were obtained in this study. In addition to these species, distribution of *C. alazanicus, C. cataneii, C. gejgelensis, C. griseidorsum, C. kibunensis, C. longipennis, C. obsoletus, C. picturatus* and *C. subfasciipennis* species in Sinop was determined. With the recently registered species in Sinop, the number of species of the *Culicoides* fauna in Sinop reaches 15. Males of *C. alazanicus* and *C. griseidorsum* were firstly identified with this study in Turkey.

Dik et al. [16] reported two females *Culicoides* whose species they could not identify and they suggested that the specimens had characteristics of Pictipennis group. As a result of this study, no specimens of the specified characteristics could be determined.

C. alazanicus species was reported from Bartın and Zonguldak [18]. Detection of this species in Sinop shows its distribution along West Black Sea coastline. However, in spite of the sufficient number of field studies [18], the fact that the species has not been detected in Kastamonu is an interesting point. Further studies on the presence of the species in Kastamonu emerges.

C. griseidorsum species was detected in Turkey for the second time in Sinop after its first detection in Samsun [17]. Its male was detected for the first time in Turkey.

C.cataneii was detected in Turkey for the second time in Sinop following its first detection in Samsun Province of the Black Sea Region [17].

With the detection of *C. gejgelensis, C. longipennis, C. obsoletus* and *C. punctatus* species in Sinop, it was understood that these species were the most common species in Central and Western Black Sea Region. *C. obsoletus* was detected in all provinces of Central and Western Black Sea Region. *C. gejgelensis* and *C. punctatus* were reported from Karabük, while *C. longipennis* was reported from Central and Western Black Sea Region provinces other than Düzce and Karabük [17, 18]. With the detection of *C. picturatus* in Sinop, its distribution in Western Black Sea Region except Karabük can be noticed. When the data are assessed, these species are estimated to be distributed in Karabük and surrounding areas, and this can be verified as a result of the new studies.

When study areas are assessed on station basis, the highest number of species was caught in the Station II. In the Station II, all of the 15 reported species were detected. In the Station I, 8 species (*C. alazanicus, C. circumscriptus, C. duddingstoni, C. festivipennis, C. griseidorsum, C. newsteadi, C. punctatus* and *C. subfasciipennis*) were determined while in the Station III, 9 species (*C. alazanicus, C. circumscriptus, C. duddingstoni, C. festivipennis, C. gejgelensis, C. maritimus, C. newsteadi, C. punctatus* and *C.*

subfasciipennis) were identified. The fact that Station II is located close to residential areas, as well as the relatively higher human presence of this area and the presence of cattle barns are factors attracting *Culicoides* to the area. *C. cataneii, C. kibunensis, C. longipennis, C. obsoletus* and *C. picturatus* were only detected in the Station II. The fact that Station II all of the 15 species reported from the field studies in July 2015 were detected in the station. Particularly, the field study dated 14.VII.2015 is striking. 13 of 15 species were identified in this field study. Given that *Culicoides* reach its highest population density in July and August [6] is the most important reason for us to obtain this result.

Culicoides adults are generally reported to be seen in Turkey between April and October [6]. *Culicoides* is reported to be seen in Bursa between May and September [28], in Elazığ [30] and Konya [14] between April and October. Eren et al. [4] reported in their study in Ankara that they could not collect *Culicoides* specimens in April and after mid-October. Specimens were collected from Hatay [31] between April and October, from Niğde [36] between June and October and from Thrace Region [29] between August and October. In their study on the growth of larvae and pupae, which was carried out in Konya between April and November, Uslu and Dik [6] obtained adult midges between May and October. However, they could not obtain adult midges in November. In their study on reproduction areas of *Culicoides*, which was carried out in Konya during the whole year, Uslu and Dik [6] only could collect specimens were collected from between May and October. The findings from previous studies showed that adult *Culicoides* could only be seen in Turkey until the end of October. However, the collection of *Culicoides* specimens were collected from in November from Akliman District is going to change this notion. In Sinop, *C. festivipennis, C. gejgelensis* and *C. kibunensis* were collected at the beginning of November, while *C. circumscriptus* and *C. newsteadi* were collected until the end of November. Therefore, it is prominent that these midges can survive until the end of November in provinces like Sinop where winter conditions are observed later than other areas.

Three nematodes (*Mansonella ozzardi, M. perstans, M. streptocerca*) causing mansonellosis and Oropouche virus are transmitted to humans by biting midges [12]. *Culicoides* species transmiting filarial nematodes and Oropouche virus don't have distribution in Turkey. These species are also not found in Sinop. Thus the most important harmful effect for people in this region is their attacks and discomfort caused by their biting.

Santiago-Alarcon et al. [8] reported *C. festivipennis, C. kibunensis* and *C. obsoletus* among the species fed by human blood. These three species are also found in Akliman. Therefore it is highly probable that these species attack the people and suck blood in Akliman District. Since Akliman has highly suitable aquatic and semi-aquatic breeding habitats for *Culicoides*, it seems quite difficult to control the breeding sites of the biting midges. For this reason the solution in the fight against *Culicoides* may be the use of mosquito control methods in Akliman.

As a result, findings from Akliman District contribute to the *Culicoides* fauna of Black Sea Region and sheds light on new studies. Due to having different types of habitats, it is considered that the number of species collected in Sinop is expected to increase with the province-wide new faunistic studies.

REFERENCES

[1] G. J. Venter, K. Labuschagne, S. N. Boikanyo, L. Morey, "The effect of high frequency sound on *Culicoides* numbers collected with suction light traps", *Journal of the South African Veterinary Association*, vol. 83, no. 1, pp. 35-40, 2012.

[2] A. Borkent (2016). *World species of biting midges (Diptera: Ceratopogonidae)*. [Online]. Avaible: http://wwx.inhs.illinois.edu/files/1114/2384/5200/CeratopogonidaeCatalog.pdf

[3] U. Uslu, B. Dik, "Description of breeding sites of *Culicoides* species (Diptera: Ceratopogonidae) in Turkey", *Parasite*, vol. 14, no. 2, pp. 173-177, 2007.

[4] H. Eren, Ş. Yağcı, Ş. Dinçer, "Determination of *Culicoides* (Diptera: Ceratopogonidae) species in Ankara", *Ankara Üniversitesi Veteriner Fakültesi Dergisi*, vol. 42, pp. 179-182, 1995.

[5] Ş. Yağcı, H. Eren, Ş. Dinçer, "Some of the species of Nematocera (Diptera) determined in Aydın area", *Türkiye Parazitoloji Dergisi*, vol. 23, no. 2, pp. 210-215, 1999.

[6] U. Uslu, B. Dik, "Seasonal distribution of species *Culicoides* (Diptera: Ceratopogonidae) in Konya Province", *Veteriner Bilimleri Dergisi*, vol. 20, no.4, pp. 5-10, 2004.

[7] Y. Braverman, R. Galun, "The medical and veterinary importance of the genus *Culicoides* (Diptera: Ceratopogonidae)", *Refuah Veterinarith*, vol. 30, no. 2, pp. 62-68, 1973.

[8] D. Santiago-Alarcon, P. Havelka, H. M. Schaefer, G. Segelbacher, "Bloodmeal analysis reveals avian *Plasmodium* infections and broad host preferences of *Culicoides* (Diptera: Ceratopogonidae) vectors", *PLoS One,* vol 7, no.2: e31098, 2012.

[9] D. Santiago-Alarcon, P. Havelka, E. Pineda, G. Segelbacher, H. M. Schaefer, "Urban forests as hubs for novel zoonosis: blood meal analysis, seasonal variation in *Culicoides* (Diptera: Ceratopogonidae) vectors, and avian haemosporidians", *Parasitology*, vol. 140, no. 14, 1799-1810, 2013.

[10] L. Hadj-Henni, T. De Meulemeester, J. Depaquit, P. Noël, A. Germain, R. Helder, D. Augot, "Comparison of vertebrate cytochrome b and prepronociceptin for blood meal analyses in *Culicoides*", *Frontiers in Veterinary Science*, vol. 2, article 15, 2015.

[11] D., Pekmezci, A. A. Sancak, O. Pınar, D. Çakıroğlu, S. Arslan, "Allergen determination in thoroughbred stallions via detecting serum specific IgE", *Kafkas Üniversitesi Veteriner Fakultesi Dergisi*, vol. 19, no. 6, 1045-1048, 2013.

[12] G. R. Mullen, "Biting Midges (Ceratopogonidae)," in Medical and Veterinary Entomology, G. R. Mullen, L. Durden, Eds. USA, CA, San Diego: Academic Press, 2002, pp. 163-183.

[13] S. Carpenter, M. H. Groschup, C. Garros, M. L. Felippe-Bauer, B. V. Purse, "*Culicoides* biting midges, arboviruses and public health in Europe", *Antiviral research*, vol. 100, no. 1, pp. 102-113, 2013.

[14] B. Dik, T. Dinçer, "Studies on *Culicoides* (Diptera: Ceratopogonidae) species around Konya", *Doğa Türk Veterinerlik ve Hayvancılık Dergisi*, vol. 16, no. 2, pp. 199-215, 1992.

[15] Y. H. Lin, M. T. Yu, T. W. Kuo, K. I. Lam, J. T. Yang, "Does *Culicoides* spp. (Diptera: Ceratopogonidae) not suck human blood in Riparian Habitat of a National Park", *Advances in Entomology*, vol. 5, pp. 93-98, 2017.

[16] B. Dik, M. Kurt, İ. Aydın, "A study on *Culicoides* (Diptera: Ceratopogonidae) species in Black Sea Region in Turkey", *Bornova Veteriner Kontrol Araştırma Enstitüsü Dergisi*, vol. 30, no. 44, pp. 23-26, 2008.

[17] F. Turgut, A. Y. Kılıç, "The Ceratopogonidae (Insecta: Diptera) fauna of the Central Black Sea Region in Turkey", *Turkish Journal of Zoology*, vol. 39, no. 6, pp. 1071-1089, 2015.

[18] B. Dik, Ö. Kuçlu and R. Öztürk, "*Culicoides* Latreille, 1809 (Diptera: Ceratopogonidae) species in the Western Black Sea Region of Turkey, new records for the Turkish fauna", *Turkish Journal of Veterinary and Animal Sciences*, vol. 41, no. 2, pp. 228-237, 2017.

[19] N. Tilki, B. Dik, "The effects of different light-sources on the capture of *Culicoides* species (Diptera: Ceratopogonidae)", *Türkiye Parazitoloji Dergisi*, vol. 27, no.2, pp. 144-147, 2003.

[20] Z. Karslı, O. Aral, "Population age, sex structure and growth of *Aphanius danfordii* (Boulenger, 1890) to Sırakaraağaçlar Stream, Turkey", *Journal of Animal and Veterinary Advances*, vol. 9, no. 10, pp. 1427-1431, 2010.

[21] L. Bat, M. Akbulut, M. Çulha, M. Sezgin, "The macrobenthic fauna of Sırakaraağaçlar Stream flowing into the Black Sea at Akliman, Sinop". *Journal of Black Sea/ Mediterranean Environment*, vol. 6, no. 1, 71-86, 2000.

[22] W. Wirth, "The subgenus *Atrichopogon* (*Lophomyidium*) with a revision of the Nearctic species (Diptera: Ceratopogonidae)", *Insecta Mundi*, vol. 8, no. 1-2, pp. 17-36, 1994.

[23] R. Szadziewski, "Biting midges (Diptera, Ceratopogonidae) from Baltic amber", *Polskie Pismo Entomologiczne*, vol. 57, pp. 3-283, 1988.

[24] H. Remm, "Family Ceratopogonidae," in *Catalogue of Palaearctic Diptera*, *volume 3, Ceratopogonidae-Mycetophilidae,* A. Soos and L. Papp, Eds. Hungary, Budapest: Akademiai Ciado, 1988, pp.11-110.

[25] R. Szadziewski, A. Borkent, P. Dominiak. (2017). *Fauna Europaea: Ceratopogonidae. In: P. Beuk & T. Pape, Fauna Europeae: Diptera Nematocera*. Fauna Europaea Version 2.6.2 [Online]. Avaible: URL http://www.faunaeur.org

[26] B. Dik, "Determination of *Culicoides* Latreille, 1908 (Diptera: Ceratopogonidae) species in Adana, İçel and Antalya arounds", *Türk Vetetiner Hekimliği Dergisi*, vol. 5, pp. 48-55, 1993.

[27] B. Dik, "Determination of *Culicoides* species (Diptera: Ceratopogonidae) from Aegean Region", *Türkiye Parazitoloji Dergisi*, vol. 20, no. 1, pp. 131-137, 1996.

[28] H., Eren, A. İnci, "Species of *Culicoides* (Diptera: Ceratopogonidae) determined in an area of Bursa (Gemlik)", *Türkiye Parazitoloji Dergisi*, vol. 26, no. 2, 199-200, 2002.

[29] A. Deniz, T. Öncel, M. J. Patakakis, "Species composition of *Culicoides* Latreille, 1809 (Diptera: Ceratopogonidae) in Thrace Region of Turkey", *Kafkas Üniversitesi Veteriner Fakültesi Dergisi*, vol. 16, no. 6, pp. 1057-1060, 2010.

[30] H. Yılmaz, N. Dumanlı, "Investigations on *Culicoides* (Diptera: Ceratopogonidae) species in Elazığ Province", *Fırat Üniversitesi Sağlık Bilimleri Dergisi*, vol. 11, no. 1, pp. 135-143, 1997.

[31] B. Dik, M. Yaman, U. Uslu, "*Culicoides* species (Latreille, 1809) (Diptera: Ceratopogonidae) in Hatay Province", *Kafkas Universitesi Veteriner Fakültesi Dergisi*, vol. 16, no. Suppl. B, pp. 255-258, 2010.

[32] S. Navai, "Biting-midges of the genus *Culicoides* (Diptera: Ceratopogonidae) from South-west Asia". Ph.D., College Park, University of Maryland, MD, USA, 1977

[33] M. Jennings, J. Boorman, H. Ergün, "*Culicoides* from Western Turkey in relation to bluetongue disease of sheep and cattle", *Revue d'élevage et de médecine vétérinaire des pays tropicaux*, vol. 36, no. 1, pp. 67-70, 1983.

[34] B. Dik, S. Yavru, U. Uslu, O. Yapıcı, E. Esin, "Determination of *Culicoides* species (Diptera: Ceratopogonidae) as suspect vectors of epizootic haemorrhagic disease and bluetongue viruses in southern and western Anatolia by RT-PCR", *Revue de Médecine Vétérinaire*, vol. 163, no.11, pp. 505-510, 2012.

[35] B. Dik, R. Ergül, "Nocturnal flight activities of *Culicoides* (Diptera: Ceratopogonidae) species in Konya", *Türkiye Parazitoloji Dergisi, vol.* 30, no. 3, pp. 213-216, 2006.

[36] B. Dik, M. Karatepe, B. Karatepe, Ş. Yağcı, "*Culicoides* Latr, 1809 (Diptera: Ceratopogonidae) species in the Niğde Province", *Türkiye Parazitoloji Dergisi*, vol. 30, no. 2, pp. 121-124, 2006.

[37] M. Leclercq, "Contribution à l'etude des diptères suceurs de sang de Turquie". *Bulletin des Recherches Agronomiques de Gembloux*, vol. 1, pp. 455-457, 1966.