

NEW RECORDS OF *CULICOIDES* SPECIES (DIPTERA; CERATOPOGONIDAE)  
FROM GOLAN HEIGHTS, ISRAEL AND SINAI PENINSULA

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**ABSTRACT**

In recent surveys of *Culicoides* species carried out in Golan Heights, Israel and Sinai, 8 new records and 1 new species were identified. Nineteen species of *Culicoides* were recorded in the Golan Heights, 2 of them are included in the present study. Seven species, one of them new to science, were added to the existing list of species in Israel. Sixteen species were recorded for the first time in Sinai and the total number in this area is now seventeen. Altogether 48 species of *Culicoides* were recorded up to the present date from Golan Heights, Israel and Sinai.

**INTRODUCTION**

Increasing evidence of the potential importance of *Culicoides*, as animal disease vectors, prompted a survey of those areas of Israel, Sinai and Golan Heights which were previously poorly surveyed. This study is the first survey of *Culicoides* in Sinai. Macfie (1942) collected few specimens of *Culicoides* from Bir el Abd (exact location unknown). Taxonomic studies of the genus *Culicoides* in Palestine were conducted by Austen (1921), Vimmer (1932) and Macfie (1933). All these studies were based on the random collection of insects. Bodenheimer (1937) recorded 33 species of *Culicoides* from Palestine. Of Bodenheimer's list, nine of the species that were described by Vimmer (1932) were lately revised by Kremer *et al.* (1981). Three additional species were added to the list of *Culicoides* by Callot *et al.* (1969) — *C. imicola* Kieffer, *C. kingi-schultzei* group and *C. cataneii* Clastrier. One of Austen's (1921) species — *C. vitreipennis* — was redescribed by Boorman *et al.*, (1974). In a further extensive study in Israel and Golan Heights Braverman *et al.* (1976) recorded 39 species in the localities sampled. The present qualitative study was undertaken mainly to survey the *Culicoides* of Sinai and areas in Israel and Golan Heights which previously were not or poorly sampled. This study will be accompanied by a later publication of the quantitative data.

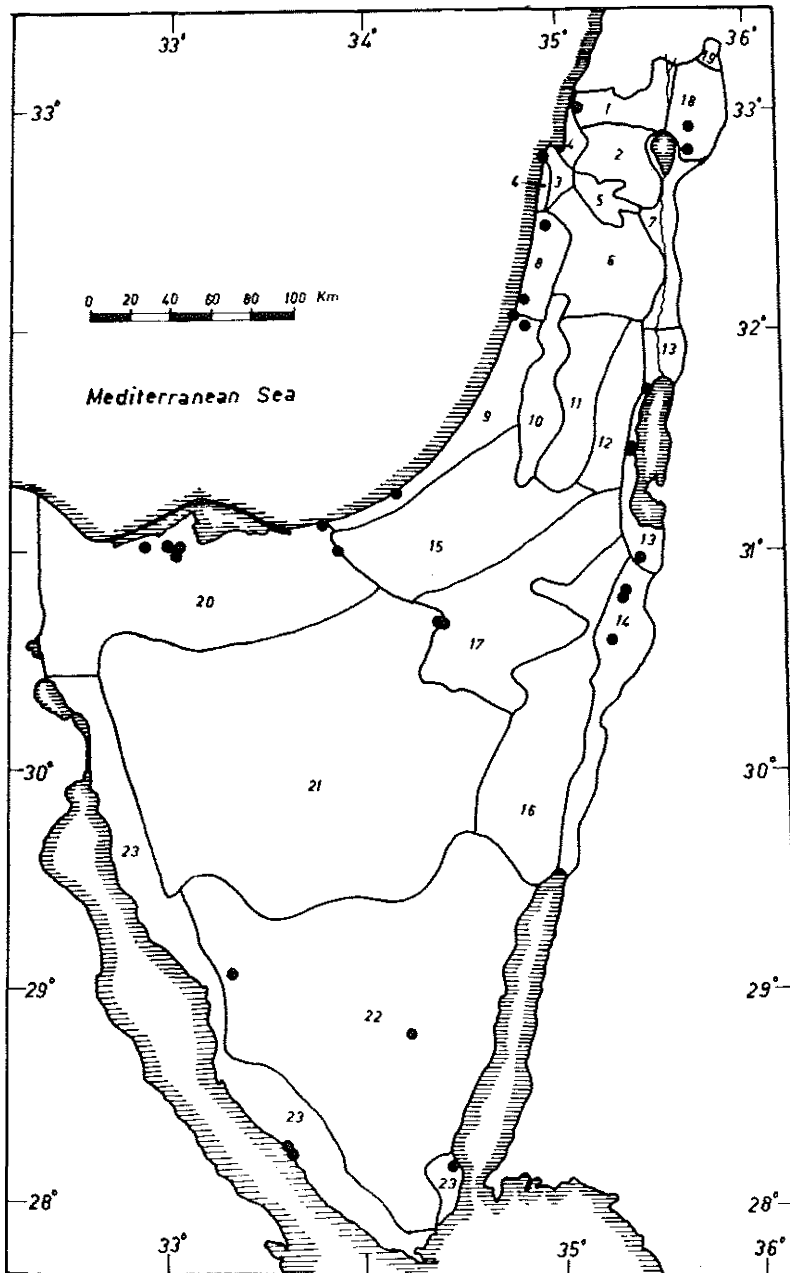
## MATERIAL AND METHODS

Trapping localities are shown in Map 1. The following suction light traps were used: DuToit's (DuToit, 1944) modification of the New Jersey suction light trap, AC powered in which we replaced the original incandescent light source with a black light bulb (HPW 125W E/70/2, Philips, Belgium); a modification of DuToit's trap which operates on a 12V wet battery equipped with a 4W black light tube (F4T5) which was taken from a Katlan Camping Flying Insect Exterminator, Model 301-134 (Amcor Inc., Israel); the Communicable Disease Center (C.D.C.) trap (Sudia and Chamberlain, 1962) with 0.9W incandescent bulb powered by a 6V dry battery; a modification of the C.D.C. trap powered by a 12V wet battery and equipped with a 21W incandescent bulb according to the design of Dyce *et al.*, 1972 and a trap with a 6W black light fluorescent tube (GEF 6T5/B2) powered by a 12V wet battery, manufactured by Ellisco Inc. (Philadelphia, PA 19146) to which a fan was added. In most of the light trapping operations conducted in northern Sinai (areas no. 20 & 21) solid carbon dioxide blocks of 3Kg were hung near each suction light trap as a bait to attract more biting midges. In several operations a caged hamster was also hung as a bait. Few samples of mud containing preimaginal stages were also taken and reared to adults in the laboratory. The samplings were carried out from 13th October 1978 to 11th December 1979. Up to 21 suction light traps of the various types were used in one night operation. The majority of suction light trappings were conducted in northern Sinai (area no. 20) at date palm plantations around sea shore swamps (Sabkhas). A few light trappings were conducted near Beduin dwellings, army camps and animal enclosures. In southern Sinai (areas nos. 22, 23) the majority of light trappings were conducted in oases at date palm plantations and orchards and a few light trappings were conducted near Beduin dwellings and animal enclosures. In Israel and Golan Heights insects were collected mainly by suction light trappings near animal houses.

## CHARACTERISTICS OF THE SURVEYED AREAS

The trapping and collection of insects were made in localities situated in various zoogeographical areas in Israel, Golan Heights and Sinai and therefore a description of these various zones is given below.

**Zoogeography of Israel.** In demarcation of the zoogeographical zones the partition of Theodor & Costa (1967) was adopted. According to these authors Israel is divided zoogeographically into a Northern Mediterranean Zone (Map 1 nos. 1-12 & 15-19) which penetrates southwards in the hills and southern eremic zone (Map 1 nos. 7-9 & 13-17) which penetrates northwards in the Jordan Valley and along the coastal dune belt. Ethiopian elements are present in tropical enclaves in the Dead Sea area, the Jordan Valley and other parts of the country (Map 1 nos. 7; 13; 14; 16). North African eremic elements are common in the southern desert (Negev). Some central and West Asiatic elements are also scattered throughout the country. No oriental elements have been recorded from Israel. As a general remark it is worth to remember that the zoogeography is different for each species. Herbivorous insects have different zoogeography



Map 1. Trapping localities in southern Golan Heights, Israel and Sinai peninsula. KEY. 1. Upper Galilee. 2. Lower Galilee. 3. Carmel Ridge. 4. Northern Coastal Plain. 5. Valley of Yizre'el. 6. Samaria. 7. Jordan Valley and Southern Golan. 8. Central Coastal Plain. 9. Southern Coastal Plain. 10. Foothills of Judea. 11. Judean Hills. 12. Judean Desert. 13. Dead Sea Area. 14. Arava Valley. 15. Northern Negev. 16. Southern Negev. 17. Central Negev. 18. Golan Heights. 19. Mount Hermon. 20. Northern Sinai. 21. Central Sinai Foothills. 22. Sinai Mountains. 23. Southwestern Sinai.

than aquatic ones. The aquatic fauna has more Ethiopian elements than any other group of insects. Qadesh Barnea (Map 1 no. 17) is a meeting point. In this stream one can find Mediterranean, eremic and Ethiopian elements (Margalit, J. pers. commun.; Furth, D.G. pers. commun.).

**Zoogeography of Sinai** (Furth, D.G. pers. commun.). Geographical area (Map 1) no. 20 – mainly eremic; no. 21 – mainly eremic with Mediterranean elements; no. 22 – mainly eremic with Ethiopian and Mediterranean elements; no. 23 – mainly eremic with Ethiopian elements. The following is a description of the various geographical areas and their climatic profiles.

**Southern Golan Heights** (Map 1 no. 18). A thick cover of fertile basalt soil. Hills up to 500 m. Average temperature of the coldest month – January: 6.8°C. Average temperature of the warmest month – August: 33°C. Annual rainfall 455 mm. (Orni & Efrat, 1973). Climate: Mediterranean, semi humid (Köppen & Geiger, 1953).

**Israel. Northern Coastal Plain** (Map 1 no. 4). Alluvial and colluvial soils (Ravikovitch, 1970). Average temperature of January: 12°C., of August: 28°C. Annual rainfall 600-700 mm. (Rosenan, 1970). Climate defined as Mediterranean (Köppen & Geiger, 1953).

**Central Coastal Plain** (Map 1 no. 8). Brown – red sandy soils; coastal sand dunes; brown – red degrading sandy soils; alluvial soils, brown alluvial soils (Versitols) (Ravikovitch, 1970). Average temperature of January: 14°C., of August: 28°C. Annual rainfall 600-700 mm. (Rosenan, 1970). Mediterranean climate (Köppen & Geiger, 1953).

**Southern Coastal Plain** (Map 1 no. 9). Brown – red sandy soils; coastal sand dunes; brown – red degrading sandy soils; alluvial soils; brown alluvial soils (Ravikovitch, 1970). Average temperature of January: 14°C., of August: 28°C. Annual rainfall in the southern section 200 mm. and up to 600 mm. in the northern section (Rosenan, 1970). Mediterranean climate from Tel-Aviv to Gaza and steppe climate from Gaza to El-Arish (Köppen & Geiger, 1953).

**Dead Sea Area** (Map 1 no. 13). Desert alluvial soil, coarse desert alluvium desert sandy land (Ravikovitch, 1970). Average temperature of January: 25°C., of August: 34°C. Annual rainfall: 50 mm. (Rosenan, 1970). Desert climate (Köppen & Geiger, 1953).

**Central Negev** (Map 1 no. 17). Desert stony land; loess raw soils (Ravikovitch, 1970). Average temperature of January: 10°C., of August: 26°C. (Waisel *et al.*, 1978). Annual rainfall: 55 mm., 8 days per year (Israel Meteorological Service). Desert climate (Köppen & Geiger, 1953).

**Arava Valley** (Map 1 no. 14). Coarse desert alluvium; hamada soils of plains; desert stony land; desert alluvial soils (Ravikovitch, 1970). Average temperature of January: 14°C., of August: 34°C. Annual rainfall 50 mm. (Rosenan, 1970). Desert climate (Köppen & Geiger, 1953).

**Sinai. Northern Sinai** (Map 1 no. 20). Recent alluvian sands, gravel etc. (Orni & Efrat, 1973). Average temperature of January: 13.7°C., of August: 26.4°C. (Orni & Efrat, 1973). Annual rainfall (in El-Arish) 97 mm., 8 days per year (Israel Meteorological Service). Desert climate (Köppen & Geiger, 1953).

Southern Sinai (Map 1 no. 23). Recent alluvium sands, gravels etc. (Orni & Efrat, 1973). Average temperature of January: 18,2°C., of August: 32,4°C. (Kapra & Barkai, 1979). Annual rainfall: 9 mm., 7 days per year (in E-Tur) (Israel Meteorological Service). Desert climate (Köppen & Geiger, 1953).

Sinai Mountains (Map 1 no. 22). Precambrian – plutonic and intrusive rocks. Average temperature of January: 8°C., of August: 24°C. (Orni & Efrat, 1973). The only annual rainfall records are: in 1935 – 19,9 mm.; in 1936 – 19,9 mm., in 1937 – 124,5 mm. (Israel Meteorological Service). Desert climate (Köppen & Geiger, 1953)

## RESULTS AND DISCUSSION

In Golan Heights besides *gejgelensis* and near *jumineri* which are new records of this study (Table 1 no. 18) the following additional 17 species were recorded in a previous study (Braverman *et al.*, 1976): *brunnicans* Edwards; *circumscriptus*; *cubitalis* Edwards; *fascipennis* gp; *kingi* gp; *longipennis*; *montanus* Scharkirzyanova; *odiatus* Austen; *picturatus* Kremer & Dedit; *pseudopallidus* Khalaf; *pulicaris*; *punctatus* Meigen; *saevanicus* Dzshafarov (sensu Callot & Kremer); *shaklawensis* Khalaf; *univittatus*; *vidourlensis* Callot, Kremer, Molet & Bach and *vitreipennis*.

Of this list *brunnicans* and *picturatus* were found only in the Golan Heights. The one individual *brunnicans* was found in Eli-Al (Braverman *et al.*, 1976). Of the 18 species recorded in this study within the boundaries of Israel (Table 1 nos. 4, 8, 9, 13, 14) the following 6 are new records to this country: *faghihi*; *firuzae*; *mesghalii*; *mosulensis*; *sejfadinei* and *subravus*. *Culicoides* sp. A is a new species to be described later. Except for *mesghalii* it can be assumed according the distribution that the rest of the species are typical for arid areas. Indeed the original description of some of these species like *C. faghihi* (Navai, 1971) were from arid areas. Within the political boundaries of Sinai (Table 1 nos. 17, 20, 22, 23) 17 species were collected and except *langeroni* the rest 16 species are new records and of them *Culicoides* sp near *marcleti* is a new record in Israel and the areas governed by Israel. The following four species were found only in El-Quseima, Qadesh Barnea (Table 1 no. 17) and not in other areas of Sinai (Table 1 nos. 20, 22, 23): *fascipennis* gp; *indistinctus*; *pulicaris* and *Culicoides* sp. A. *C. circumscriptus*; *newsteadi* and *puncticollis* were recorded previously from El-Quseima (Braverman *et al.*, 1976; unpublished data). Therefore a total of 20 species are now recorded within the political boundaries of Sinai and, altogether, 48 species are now known from Israel, Golan Heights and Sinai.

## ACKNOWLEDGEMENTS

We would like to thank Mrs Y. Maoz, S. Shahin, R. Versano of the Ministry of Agriculture Gaza district and M. Magal and M. Oron of the civil administration of Shlomo District (Southern Sinai) for assisting in the survey.

TABLE 1. *CULICOIDES* SPP. COLLECTED IN GOLAN HEIGHTS,  
ISRAEL AND SINAI (1978-1979) \*\*, \*\*\*, \*\*\*

Zone No.	Geographical area Locality (Latitude & Longitude)	<i>Culicoides</i> spp trapped
	<i>Golan Heights</i>	
18	Eli-AI (32°48'N 35°45'E) Yahoudiye (32°56'N 35°41'E)	* <i>gejelensis</i> Dzhafarov (sensu Callot, Kremer) <i>fascipennis</i> group near * <i>jumineri</i> Callot & Kremer <i>longipennis</i> Khalaf
	<i>Israel</i>	
4	Kabri (33°01'N 35°08'E) Kefar Gallim (32°46'N 34°57'E)	** <i>mesghalii</i> Navai <i>obsoletus</i> Meigen <i>cataneii</i> Clastrier <i>gejelensis</i> <i>obsoletus</i> <i>gejelensis</i>
8	Hakfar haYarok (32°16'N 34°49'E)  Tel-Aviv, Research Zoo (32°03'N 34°49'E)	<i>gejelensis</i> <i>maritimus</i> Kieffer (var <i>submaritimus</i> Dzhafarov) <i>indistinctus</i> Khalaf <i>univittatus</i> Vimmer <i>gejelensis</i> <i>odibilis</i> Austen
	Talmé El'azar (32°26'N 34°57'E)	<i>circumscriptus</i> Kieffer <i>cataneii</i> <i>gejelensis</i>
9	Bet Dagan (32°00'N 34°49'E)	<i>circumscriptus</i> Kieffer <i>cataneii</i> <i>gejelensis</i>
	<sup>1</sup> Yamit (31°17'N 34°10'E)	** <i>mosulensis</i> Khalaf
13	Arugot Stream (31°26'N 35°22'E) David stream (31°28'N 35°22'E) Ein Fashkha (31°43'N 35°27'E)  Ne'ot haKikar (30°56'N 35°23'E)	** <i>firuzae</i> Dzhafarov near <i>jumineri</i> near <i>jumineri</i> ** <i>faghihi</i> Navai ** <i>seffadinei</i> Dzhafarov <i>faghihi</i> **undescribed sp. A
17	<sup>1</sup> El-Quseima (30°40'N 34°22'E)	<i>maritimus</i> (var <i>submaritimus</i> ) <i>coluzzii</i> Callot & Kremer <i>kingi</i> group <i>fascipennis</i> group <i>indistinctus</i> <i>pulicaris</i> Linnaeus <i>fascipennis</i> group <i>coluzzii</i> <i>seffadinei</i> <i>azerbajdzancus</i> Dzhafarov <i>langeroni</i> Kieffer <i>kingi</i> group near <i>jumineri</i> <i>firuzae</i> undescribed sp. A
	<sup>1</sup> Qadesh Barnea (30°39'N 34°26'E)	<i>indistinctus</i> <i>pulicaris</i> Linnaeus <i>fascipennis</i> group <i>coluzzii</i> <i>seffadinei</i> <i>azerbajdzancus</i> Dzhafarov <i>langeroni</i> Kieffer <i>kingi</i> group near <i>jumineri</i> <i>firuzae</i> undescribed sp. A

\* Species recorded for the first time from the Golan Heights

\*\* Species recorded for the first time from Israel

\*\*\* Species recorded for the first time from Sinai

<sup>1</sup> Within the political boundaries of Sinai

TABLE 1. CONTINUED

14	En Yahav (30°37'N 35°11'E)	<i>firuzae</i> <i>faghihi</i> <i>pulicaris</i> <i>mosulensis</i> <i>seffadinei</i>
	Hazeva (30°47'N 35°15'E)	<i>pulicaris</i> <i>mosulensis</i>
	Idan (30°53'N 35°15'E)	<i>Lailae</i> Khalaf <i>pulicaris</i> ** <i>subravus</i> Cornet & Chateau <i>firuzae</i>
	<i>Sinai</i>	
20	Bir el Abd (31°00'N 35°22'E)	*** <i>maritimus</i> (var <i>submaritimus</i> ) *** <i>kingi</i> group *** <i>coluzzii</i> *** <i>cataneii</i> ***near <i>jumneri</i> <i>maritimus</i> (var <i>submaritimus</i> ) <i>maritimus</i> (var <i>submaritimus</i> ) near <i>numneri</i> near *** <i>marcleti</i> Callot, Kremer & Basset
	Bir Lahfan (31°00'N 33°53'E)	
	El-Arish (31°01'N 33°48'E)	
	Ga'ai (30°59'N 33°03'E)	
	Khirba (31°01'N 32°53'E)	
	Salmana (31°03'N 33°06'E)	<i>maritimus</i> (var <i>submaritimus</i> )
23	E-Tur (28°16'N 33°38'E)	*** <i>calloti</i> Kremer, Delecoille, Bailly-Choumara & Chaker *** <i>mosulensis</i> *** <i>azerbajdzhanicus</i> <i>langeroni</i>
	Hammam Saïdna Mussa (28°16'N 33°36'E)	<i>calloti</i> <i>langeroni</i> near <i>marcleti</i>
	Marsa Abu Zabad (28°10'N 34°27'E)	<i>azerbajdzhanicus</i> *** <i>mesghalii</i> near <i>marcleti</i>
	Wadi Dissa (E-Tur) (28°16'N 33°38'E)	<i>calloti</i> near <i>marcleti</i>
22	Wadi Ba'aba'a (29°04'N 33°21'E)	<i>mosulensis</i> <i>azerbajdzhanicus</i> *** <i>firuzae</i> *** <i>seffadinei</i>
	Wadi Sa'al (28°46'N 34°15'E)	

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