

Review of the Odonata of Crimea (Ukraine)

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Abstract

A list of 60 Odonata species and their distribution across 109 localities on the Crimean Peninsula is provided. The study is based on a literature review and a field survey between 1999 and 2008. *Erythromma lindenii* and *Epitheca bimaculata* are here recorded for the first time from Crimea. Diagnostic morphological characters of *Calopteryx splendens taurica* and *Orthetrum coerulecens anceps* are briefly described. Descriptions of typical Crimean habitats of dragonflies are also presented. The necessity of the protection of Crimean freshwater habitats is discussed.

Introduction

The investigation of Odonata on the Crimea peninsula has a long history. The first species recorded, *Lestes barbarus*, was mentioned in the review paper by H. Hagen (1856). Later, on 25.02.1895 the flight of *Sympecma fusca* was observed by S. Mokrzhetsky in Simpheropol' (Mokrzhetsky 1899). The first checklists (Brauner 1902, 1903) contain 14 species for the submontane and steppe areas of Crimea and 8 species for the South coast and the Kerch peninsula. Further records are provided by A. Bartenev (1912a, 1912b, 1915), G. Pliginsky (1913) and A. Shorygin (1926). This first stage of Odonata investigation on Crimea, the "faunistic" period, was concluded by Artobolevsky's (1929) fundamental publication. He summarised all previous data and presented the checklist of Crimean Odonata which consisted of 37 species including 6 new ones. He also described the new subspecies *Lestes viridis parvidens* (now: *Chalcolestes parvidens* Art.).

The second stage of Odonata investigation continued with faunistics but placed the main attention to ecological peculiarities and zoogeographical characteristics of Crimean dragonflies. Ya. Tseeb (1947) reported four new species, *Aeshna*



grandis, *Ae. juncea*, *Ae. mixta* and *Sympetrum depressiusculum*, and I. Mal'tsev (1953) recorded 12 species in the forest-belts of the steppe area. A series of hydrobiological papers described the role of dragonfly larvae in freshwater ecosystems (Mel'nikov & Lubyaynov, 1958, Kiseleva et al., 1984, 1985, 1998; Temirova et al., 1980, 1984; Prokopov, 2001, 2003). In a faunistic review of Ukrainian dragonflies (Gorb et al., 2000) 30 species were reported for Crimea from a literature review.

In a third stage of Crimean odonatalogical research the issue of conservation of rare and endangered species occupied a central role. Mal'tsev (1999) proposed a Red list of Crimean Odonata consisting of 23 species. An attempt of the systematisation of biodiversity and zoogeographical data on Crimea Odonata has also been made (Pyshkin et al., 2004). During more systematic inventarisation of Odonata, faunistics, of course, remained an important pillar. New species have been found during the last three years: *Anax ephippiger*, *Sympetrum danae* (Khrokalo & Prokopov, 2005), *Leucorrhinia albifrons* (Matuskina, 2006), *Selysiothemis nigra* (Matuskina, 2007).

The present paper reviews the checklist of Crimean Odonata. We report and comment on all 60 species found in the literature and our original records in 1999-2008.

General characteristics of the Crimean peninsula

A general overview of the Crimean geology and landscapes is given by M. Pistun and Ye. Shipovich (1982). Briefly, the Crimea Peninsula is located in the south of Ukraine, on the northern coast of the Black Sea and on the western coast of the Sea of Azov (Fig. 1). Crimea's total land area is 26,100 km². The peninsula is connected to the mainland by the 5–7 km wide isthmus of Perekop. The Crimean Peninsula is distinguished by its variety of landscapes. Seventy-five percent of Crimea consists of semiarid prairie-like landscape. This is a southward continuation of the Pontic steppes which slope gently to the northwest from the foot of the Crimean Mountains. In the steppe and agricultural regions a number of plantations were created as wind shelters to the arable land. These are referred to as shelter belts in the text. The Crimean mountains are geologically young and consist of three subranges: the main, the internal, represented by separate rocky massifs which heights are 700-1300 meters, and the much less elevated external subrange. The main range is subdivided into several massifs, known as yaylas or mountain plateaus ("yayla" is name after Crimean Tatar for "alpine meadow"). The highest peak is mt. Roman-Kosh (1545 m above sea level). The south coast is flanked by parallel ranges of mountains at a distance of 8–12 km from the sea.



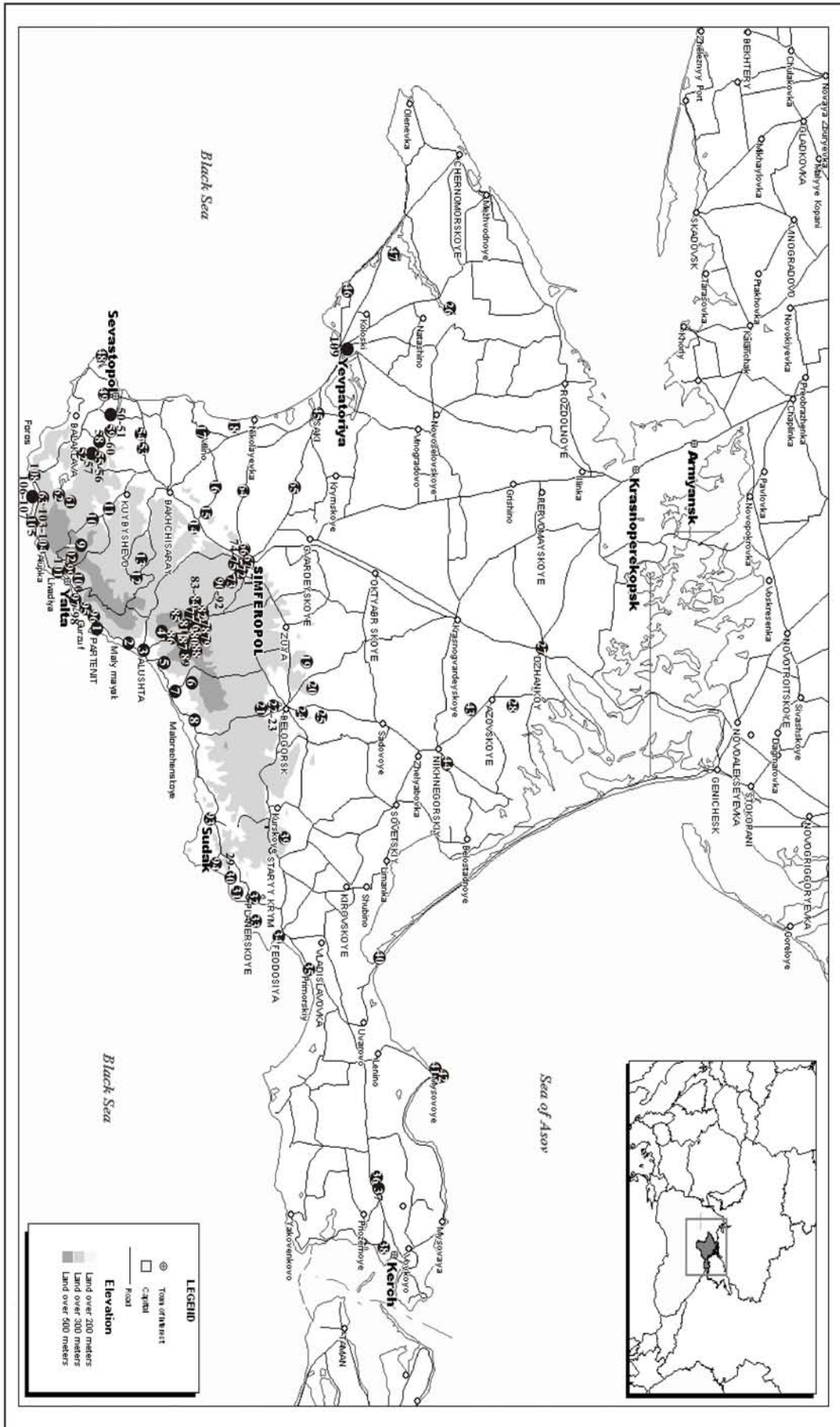


Fig. 1: Map of Crimea with localities of Odonata records (numbers according table 1).



Most of Crimea has a temperate continental climate, except for the south coast where it experiences a humid subtropical climate because of the warm influences from the Black Sea. Summers can be hot (28 °C July average) and winters cool (−0.3 °C January average) in the interior. On the south coast winters are milder (4 °C January average) and temperatures much below freezing are exceptional. Precipitation in the interior is low with only 400 mm a year. On the south coast precipitation is more than double of that.

Montane forests on the northern flank of Crimea Mountains follow a distinct altitudinal pattern. The forest-steppe extends up to 150-300 m above sea level, between 300-350 m oak forests with areas of pine are found whereas between 750-1000 (1300) m there are beech and hornbeam forests. Above 1000 m, up to 1300 m karst plateaus with alpine meadows are found (yaylas). These are often used as a pasture. At the southern flank up to 350-400 m from the sea juniper and oak forests and bushes are found. From 350-400 m to 900-1000 m there is a belt of oak and pine forests while the zone of beech and pine is much narrower than on the north, between 900-1000 m.

The main rivers of the Crimean Mountains include the Al'ma, Chorna and Salhir rivers on the northern slope. The Uchan-Su river on the southern slope forms the Uchan-Su waterfall, the highest one in the Ukraine.

The recent economic development and state of the environment on Crimea is summarised by Gluschenko et al. (2007) and 'Crimea in measures of sustainable development' (2008). Briefly, the largest part of Crimea (above 65 %) is used for agriculture, 63 % of which for cereal and oil-bearing crops, 22.9 % for pastures and the remainder for horticulture and vineyards. Cattle and poultry breeding is found in the steppe, submountane and mountain regions. Heavy industry is represented by big metallurgy plants on the Kerch peninsula, tanneries in the surroundings of Simferopol', and numerous chemical factories. Natural gas reserves are exploited on the Kerch peninsula and the shelves of the Black and Azov seas. Crimea is also a popular recreation place mainly for Ukrainian and Russian citizens. One finds sanatoria and holiday resorts at the south and west coasts as well as in the mountains and the submontane areas.

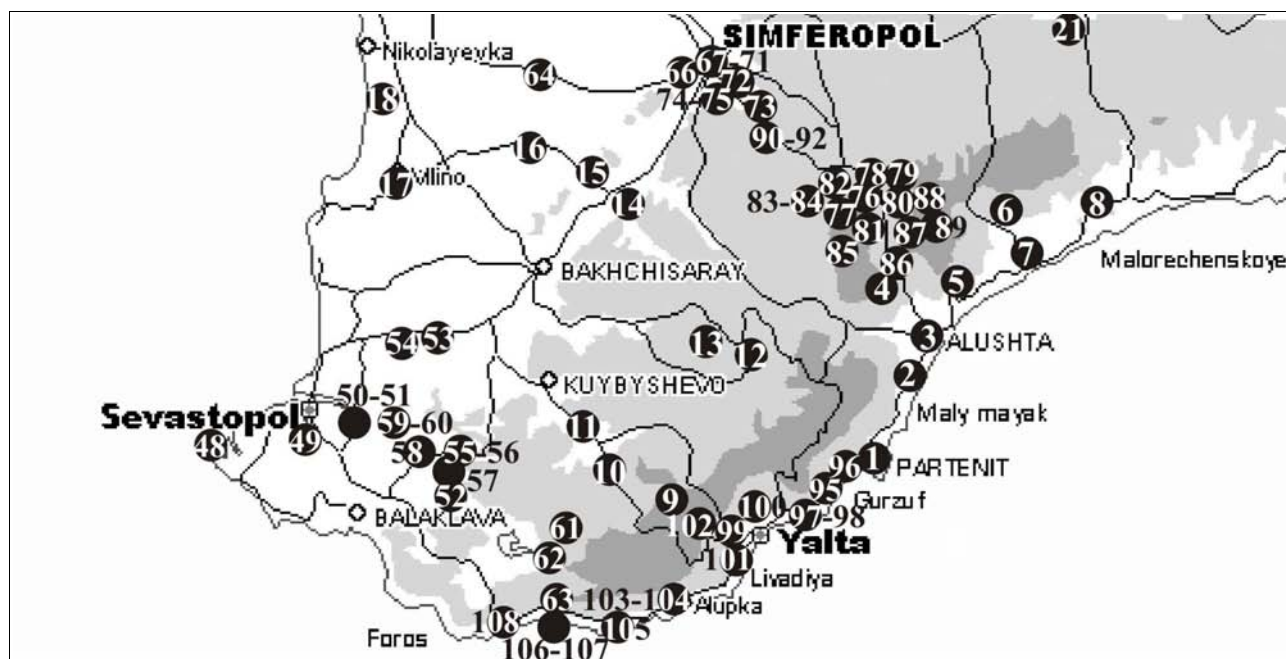
The lack of water resources is one of the largest problems in Crimea. The Severo-Krymskij canal, constructed in 1963, provides drinking water to the greater cities with industrial development. Reservoirs and dams provide water to agriculture and the increasing tourism infrastructure with several billions of over-night stays of tourists. Despite of some reduction of agricultural and industrial activities during last decade, environmental issues are an increasing concern because of the increasing of tourism and recreation. Disposal of industrial sewage into the rivers remains huge problem as well as pollution of various waterbodies by agricultural chemicals. Environmental issues of Crimea are discussed on numer-



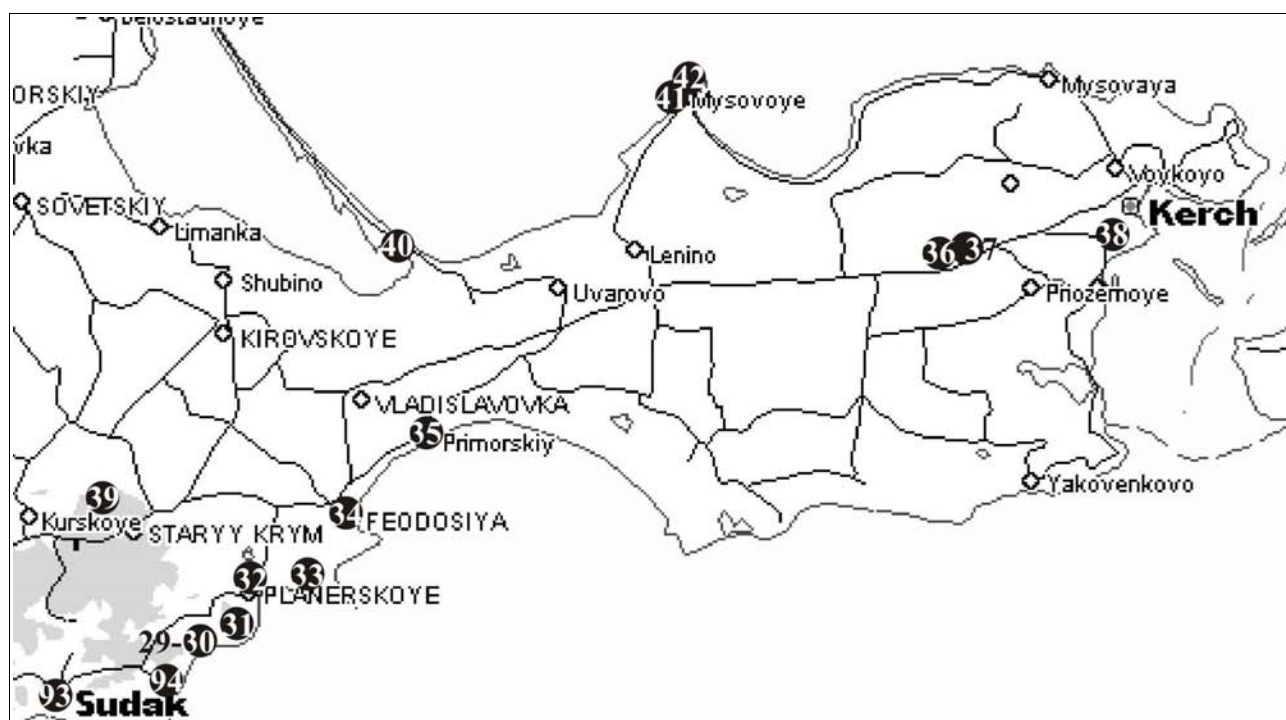
ous conferences, symposia and special government committee meetings in order to balance the state budget, investments and international organization funds.

List of localities

Data from 109 localities were available. These are given in Table 1 and are shown in Fig. 1 and more in detail in figures 1a-c.



1a: Southern part of Crimean Peninsula with localities.



1b: Eastern part of Crimean Peninsula with localities.





1c: North-western part of Crimean Peninsula with localities

Table 1. List of localities of literature and original records of Odonata on Crimea.

Local-ity #	Administrative area (district)	Localities	Coordinates
1.	Alushta	Ayu-Dag mountain, surroundings of Frunsenskoye (Partenit)	44°34'N 34°20'E
2.	Alushta	Kastel mountain	44°38'10"N 34°23'10"E
3.	Alushta	Alushta city	44°41'N 34°24'E
4.	Alushta	village Verchnya Kutusovka	44°43'N 34°23'E
5.	Alushta	South Demerdzhy mountain, pond on Dzhurla river	44°44'N 34°25'E
6.	Alushta	village Generalske	44°48'N 34°29'E
7.	Alushta	River Ulu-Uzen, village Sonyachnogir-ske	44°45'N 34°32'E
8.	Alushta	Kanaka gully, big pond, puddles	44°48'N 34°41'E
9.	Bakhchysaray	Kuybyshevske forestry, Boyka mountain, pond	44°38'N 33°53'E
10.	Bakhchysaray	River Kokkozka, between villages Aromat and Sokoline	44°34'N 33°56'E
11.	Bakhchysaray	river Bel'bek, between villages Aromat and Golubinka	44°35'30"N 33°55'E
12.	Bakhchysaray	River Kacha, Shelkovichne, upstream of Zagorske reservoir	44°43'30"N 33°35'E
13.	Bakhchysaray	River Kacha, downstream of Zagorske reservoir	44°43'30"N 33°33'10"E



Local-ity #	Administrative area (district)	Localities	Coordinates
14.	Bakhchysaray	River Al'ma, village Novopavlivka	44°50'N 33°59'E
15.	Bakhchysaray	Al'ma station (now renamed Poshtove)	44°50'19"N 33°55'48"E
16.	Bakhchysaray	Pond at the river Al'ma, village Plodove	44°52'N 33°51'E
17.	Bakhchysaray	River Al'ma, village Viline	44°50'30"N 33°39' 20"E
18.	Bakhchysaray	Village Beregove, streams and puddles (about 12 m a.s.l) at the seashore, forest belt, river Bulganak	44°54'20"N 33°37'E
19.	Bilogirs'k	river Burulcha, village Tsvitochne	45°06'N 34°21'20"E
20.	Bilogirs'k	Rusanovka, pond	45°08'N 34°29'E
21.	Bilogirs'k	Karasu-Bashy	44°59'N 34°37'E
22.	Bilogirs'k	Tayganskoe reservoir	45°02'06"N 34°35'05"E
23.	Bilogirs'k	Bilogirs'k reservoir, upper part	45°00'N 34°36'40"E
24.	Bilogirs'k	River Biyuk-Karasu downstream of Bilogirs'k	44°59'N 34°36'20"E
25.	Bilogirs'k	Ak-Kaya mountain	45°09'N 34°44'E
26.	Chornomorske	Lake Donuzlav, freshwater part	45°27'30"N 33°14'E
27.	Dzhankoy	Surroundings of Dzhankoy	45°42'N 34°23'E
28.	Dzhankoy	Tarkhan-Sunak (near Sivash)	45°45'36"N 34°24'36"E
29.	Feodosiya	village Kurortne	44°54'30"N 35°11'E
30.	Feodosiya	Village Prymors'ke, around Karadag reserve, Otuzka river	44°54'30"N 35°10'45"E
31.	Feodosiya	Karadag reserve	44°57'N 35°15'E
32.	Feodosiya	Koktebel', stream	44°56'N 35°14'E
33.	Feodosiya	Tykha bukhta	44°58'19"N 35°19'84"E
34.	Feodosiya	Feodosiya city	45°02'N 35°22'E
35.	Feodosiya	Surroundings of town Prymors'ke	45°06'N 35°28'E
36.	Kerch	village Temesh	45°14'20"N 36°03'43"E
37.	Kerch	village Kayaly-Sart	45°14'20"N 36°03'43"E
38.	Kerch	Kerch sity, Arshyntsevsky pit	45°20'N 36°26'E
39.	Kirovske	Agarmisch mountain	45°02'56"N 35°02'36"E
40.	Lenine	Arabats'ka strilka, village Solyane	45°20'N 35°25'E
41.	Lenine	Surroundings of Kazantyp nature reserve, village Mysove	45°27'N 35°49'E
42.	Lenine	Kazantyp nature reserve, lake and stream flow into Azov sea	45°28'N 35°50'E
43.	Nyzhnyogirskiy	Nyzhnyogirskiy forestry	45°28'05"N 34°42'12"E
44.	Nyzhnyogirskiy	River Biyuk-Karasu, mouth	45°28'N 34°47'E
45.	Saky	Surroundings of Saky	45°08'N 33°36'E
46.	Saky	Vitino	45°12'30"N 33°09'14"E
47.	Saky	lake Donuzlav	45°20'N 33°01'E
48.	Sevastopol'	Khersones	44°36' N 33°29'E
49.	Sevastopol'	Sevastopol' city	44°37'30"N 33°33'E
50.	Sevastopol'	Inkerman	44°35'N 33°37'E
51.	Sevastopol'	village Delagarda	44°36'59"N 33°32'03"E
52.	Sevastopol'	Alsu	44°31'18"N 33°42'53"E
53.	Sevastopol'	Village Frontove, river Bel'bek	44°40'30"N 33°44'E
54.	Sevastopol'	Belbek railway station (now renamed	44°41' N 33°42'E



Local-ity #	Administrative area (district)	Localities	Coordinates
		Verkhniosadove village)	
55.	Sevastopol'	Chorgun (now renamed village Chernorechenskoe)	44°32'58"N 33°39'59"E
56.	Sevastopol'	River Chorna, village Chornorichcha	44°32'N 33°41'E
57.	Sevastopol'	River Chorna, Chornorichcha canyon	44°31'N 33°42'E
58.	Sevastopol'	River Chorna, village Shturmove	44°34'30"N 33°37'20"E
59.	Sevastopol'	village Khmel'nitskoye	44°33'N 33°39'E
60.	Sevastopol'	River Chorna, downstream of village Khmelnytske	44°32'40"N 33°37'E
61.	Sevastopol'	Ai-Dimitry, pond	44°30'22"N 33°54'43"E
62.	Sevastopol'	Source of river Chorna	44°29'20"N 38°48'E
63.	Sevastopol'	Pond Shaitan-Merdven	44°24'55"N 33°51'42"E
64.	Simferopol'	village Pozharske, pond on river Bulganak	44°52'30"N 34°20'E
65.	Simferopol'	village Skvortsove	45°04'50"N 33°49'E
66.	Simferopol'	Simferopol', «Dubky» Marshal Zhukov street	44°56'09"N 34°01'10"E
67.	Simferopol'	Simferopol' city	44°57'N 34°07'E
68.	Simferopol'	Simferopol' river Anatra, stream flowing from tannery ponds	44°56'N 34°05'E
69.	Simferopol'	Simferopol', Gagarin Park, river Salhir	44°56'N 34°06'E
70.	Simferopol'	Simferopol', river Salhir near campus of Taurichesky National Vernadsky University	44°56'22"N 34°08'10"E
71.	Simferopol'	Surroundings of Simferopol', Dzhem-safu	44°56'N 34°08'E
72.	Simferopol'	Simferopol' reservoir (large mesotrophic reservoir)	44°55'N 34°09'E
73.	Simferopol'	Mouth of river Salhir into Simferopol' reservoir	44°53'N 34°12'E
74.	Simferopol'	Mouth of river Kurtsy into Simferopol' reservoir	44°53'N 34°08'30"E
75.	Simferopol'	village Petropavlivka	44°53'59"N 34°09'06"E
76.	Simferopol'	village Pereval'ne	44°51'N 34°19'E
77.	Simferopol'	Chatyrgag mountain (NE hills) village Pereval'ne, pond	44°51'N 34°18'E
78.	Simferopol'	river Kizil-Koba	44°52'N 34°20'E
79.	Simferopol'	Chervona cave, river Kyzyl-Koba	44°56'N 33°52'20"E
80.	Simferopol'	river Eni-Sala	44°51'30"N 34°21'E
81.	Simferopol'	river Angara	44°51'N 34°19'E
82.	Simferopol'	river Ayan	44°50'20"N 34°16'15"E
83.	Simferopol'	river Tavel	44°50'N 34°13'20"E
84.	Simferopol'	river Dzhalman	44°51'N 34°10'E
85.	Simferopol'	Chatyrdag mountain	44°45'N 34°18'E
86.	Simferopol'	Angarskiy pereval	44°48'35"N 34°20'23"E
87.	Simferopol'	Taushan-Bazar	44°46'46"N 34°19'50"E
88.	Simferopol'	pond on the Dolgorukov yayla (small cattle ponds, river Subotkan)	44°50'11"N 34°23'13"E



Local-ity #	Administrative area (district)	Localities	Coordinates
89.	Simferopol'	Northern Demerdzhy	44°48'N 34°25'E
90.	Simferopol'	village Pionerske	44°53'N 34°12'E
91.	Simferopol'	village Andrusove, river Salhir	44°54'N 34°11'E
92.	Simferopol'	village Lozove, river Salhir	44°55'N 34°09'E
93.	Sudak	surroundings of Sudak	44°51'N 34°58'E
94.	Sudak	village Prybrezhne, salt marsh	44°51'30"N 35°07'20"E
95.	Yalta	Gurzuf	44°33'N 34°17'E
96.	Yalta	Suuk-Su	44°32'56"N 34°17'55"E
97.	Yalta	"Mountain lake" Yalta mountain and forest reservation, 2 km west of Gurzuf	44°32'30"N 34°15'10"E
98.	Yalta	ponds north of the Mys Mart'yan reservation	44°30'40"N 34°15'E
99.	Yalta	waterfall Uchan-Su	44°29'30"N 34°05'E
100.	Yalta	River Guva, vill.Otradnoye	44°31'20"N 34°10'50"E
101.	Yalta	Ai-Todor mountain	44°25'40"N 34°06'E
102.	Yalta	Ai-Petri mountain, lake	44°27'N 34°5'50"E
103.	Yalta	Alupka	44°25'N 34°03'E
104.	Yalta	Simeiz	44°24'40"N 34°01'E
105.	Yalta	Kekeneiz (now renamed Ponisovka)	44°24'19"N 33°59'22"E
106.	Yalta	village Mukhalatka (near Foros)	44°24'14"N 33°53'16"E
107.	Yalta	village Limeneis (Oliv) (near Foros)	44°24'13"N 33°53'18"E
108.	Yalta	Foros	44°23'N 33°47'E
109.	Yevpatoriya	Surroundings of Yevpatoriya city	45°11'N 33°21'E

Annotated list of species

The localities given in brackets refer to those listed in Table 1.

1. ***Calopteryx virgo*** (Linnaeus, 1758)
Literature: (103): 1 ♂ (Bartenev, 1912a). - (73, 74, 78, 80, 83): larvae (Kiseleva, Ezernytsky, 1985). - (27,73) larvae (Kiseleva, Vershytsky, 1998).- in Crimea: (Mal'tsev, 1999)
 - Original data: none
2. ***Calopteryx splendens*** (Harris, 1782)
Literature: (67): (22.05.1894, 13.07.1894) (Brauner, 1902). - (74, 82, 84): larvae (Kiseleva, Ezernytsky, 1985). - (73): larvae (Kiseleva, Vershytsky, 1998). - (100): (Prokopov, 2001).
 - Original data: (24): (05.06.2008) 1 ♂.

Calopteryx splendens taurica Selys, 1853

According to Bartenev (1912a) the diagnostic feature of adults are the size and shape of the blue band on the wings of the male: the blue colour spreads to 1-10 cells behind node, the band is narrow, its proximal margin



is sharply cut-off. Body size is smaller than *C. s. splendens* (*C. s. splendens* abdomen – 38-42 mm, wings – 27-36 mm; *Calopteryx splendens taurica* abdomen – 36-38 mm, wings – 27-31 mm;). The larvae of *C. s. splendens* and *C. s. taurica* are not distinguishable. The abundance of all larval *Calopteryx* in Crimea refers to *C. s. taurica* if no adults were caught at the same locality.

Literature: Records on Crimea by Selys-Longchamps (1853, 1854, 1887) (cited after Artobolevsky 1915). - (54): (18.05.1897) 2 ♂; (30.05.1897) 2 ♀; - (67): (25.05.1899) 1 ♀; - (71): (19.05.1899) 1 ♂, 1 ♀; - (103): (12.08.1902) 1 ♂ (Bartenev, 1912a). - (50, 52, 54, 55, 67): (11.05.-30.06) (Pliginsky, 1913). - (15): (5.07.1898) 2 ♂; (10.05.1899) 1 ♂; - (49): (17.06.1907) 1 ♀; - (50): (11.05.1908), 1 ♀, 1 ♂; (18.05.1908) 2 ♂, 2 ♀; (08.06.1908) 3 ♂, 1 ♀; - (54): (06.06.1913) - (67): (1898) 2 ♂, 2 ♀; (26.06.1898) 1 ♂, 1 ♀; (07.1898) 1 ♂; (02.07.1898) 1 ♂; (10.05.1899) 1 ♀ Common in montane and submontane Crimea (Artobolevsky, 1929). - in Crimea: (Mal'tsev, 1999). - (57, 60): larvae (Prokopov, 2003). - (30): 26-27.07.2005 (Matuskina, 2006).

- **Original data:** (10): (20.08.2000), larvae 4 ♂, 2 ♀; - (11): (21.08.2000) larvae 2 ♂, 1 ♀; - (12): (25.06.07); - (14): (21.05.2005), larvae 2 ♀; - (17): (21.08.2008) 2 ♂; - (25): (26.07.2007) 1 ♂; - (53): (1.06.1999) larva 1 ♂; (10.04.2005) larva 1 ♀; - (56): larva 1 ♀; - (57): (17.08.2002) 1 ♂; - (17.08.2001) larva 1 ♂; (8.06.2003) 6 ♂, 3 ♀; - (58): (25.11.2003) larvae 2 ♂, 1 ♀, - (60): (25.11.2003) larva 1 ♂; - (64): (06.08.2008) 1 ♂; - (68): (7.08.2002) 11 ♂, 8 ♀, larvae 1 ♂, 1 ♀; (10.06.2005) 6 ♂, 1 ♀; - (69): (9.05.2005) larvae 2 ♀; - (91): (11.10.2001), larvae 2 juv; - (90, 92): (22.09.2002) larvae 1 ♂, 3 ♀, 2 juv; - (99): (12.11.2000), larva 1 ♂.

3. *Sympecma fusca* (Vander Linden, 1823)

Literature: (66): (25. 02. 1895) (Mokrzhetzsky, 1999). - (67): (25.02.1894), (22.04.1894) (Brauner, 1902). - Crimea, 2 ♀ (Shorygin, 1926). - (15): (05.07.1998) 1 ♀; (10.05.1899) 4 ♂ - (67): (25.05.1898) 1 ♀; (Artobolevsky, 1929). - (73, 74) larvae (Kiseleva, Ezernytsky, 1985). - (74, mountain Crimea): larvae (Kiseleva, Vershytsky, 1998)

- **Original data:** (4): (11-20.06.2005) 1 ♂; - (6): (12.07.2006); - (7): (11.03.2007) 2 ♂; - (8): (6.05.2005) 7 ♂, 4 ♀; (8.05.2005) 3 ♂; - (16): 11.08.2008, 1 ♀; - (31): (4.07.2006) 1 ♂, 1 ♀; - (33): (11.09.2005) 1 ♀; - (47): (25.08.2008) 1 ♂; - (51): (20.08.2008) 1 ♂. - (64): (02.10.2006) 1 ♂; - (70): (03.07.2006); - (72): (03.08.2008) 1 ♂. - (77): (19.07.2008) 1 ♂, 1 ♀; - (98): (08-10.07.2008) larvae 2 ♀.

4. *Sympecma paedisca* (Brauer, 1877)

Literature: - in Crimea: (Mal'tsev, 1999). The record of this species in Crimea needs confirmation.



5. ***Lestes virens*** (Charpentier, 1825)
Literature: (3): (10-15.08.1900) 1 ♂ (Bartenev, 1912b). - in Crimea: (Mal'tsev, 1999).
 • Original data: none
6. ***Lestes barbarus*** (Fabricius, 1798)
Literature: (48): (Hagen, 1856). - (2): (19.05.1900) 2 ♂; (26.05.1900) 5 ♂, 6 ♀; (08.07.1900) 1 ♂; - (106): (11.07.1902), 1 ♂; (22.07.1902) 2 ♂; - (3): (02.06.1900) 11 ♂, 4 ♀; (5-10.08.1900) 1 ♀, (10-20.08.1900) 2 ♂; (Bartenev, 1912b). - (28): (24.06.1894) (Brauner, 1902). - (101): (summer 1902) 1 ♀ (Brauner, 1903). - (3): 02.06.1898, 1 ♀; - (15): (05.06.1898) 1 ♀; (05.07.1898) 5 ♂, 5 ♀; (30.07.1899) 1 ♂; (08.06.1914) 2 ♂; (29.06.1914) 2 ♂; - (45): (08.07.1906) 1 ♀; - (49): (11.06.1907) 1 ♂; (17.06.1907) 2 ♂, 2 ♀; (29.06.1907) 1 ♀; (01.07.1907) 1 ♂; (19.07.1907) 1 ♂; (95): (15.08.1917) 1 ♂; (96): (13.08.1917) 1 ♂; - (105): (10.07.1926) 1 ♀; (12.07.1926) 1 ♂; (14.09.1928) 1 ♂; - (109) 1 ♂; (16.07.1902) 1 ♂; (30.06.1914) 5 ♂, 2 ♀; Most abundant of all Lestidae in the steppe area and the south coast (Artobolevsky, 1929). - Widespread between May-August in the shelter belts (Mal'tsev, 1953). - (74, 83): larvae (Kiseleva, Ezerlytsky, 1985). - (74): (Kiseleva, Vershytsky, 1998)
 • Original data: (4): (17.06.2004) 1 ♂; (11-20.06.2005) 1 ♀, larvae 1 ♂, 1 ♀; - (6): (12.07.2006); - (18): (05.08.2004) 4 ♂, 5 ♀; - (41): (12.05.2005) 2 ♀, larvae 6 ♂, 8 ♀. (72): (18.06.2003) 2 ♀; - (88): (19.07.2008) 2 ♂; (7.08.2004) 1 ♀; (10.08.2004) 1 ♀; (21.08.2001) 1 ♂; (19.08.2001) 2 ♂, 2 ♀; (26.08.2001) 1 ♂. (94): (15.06.2005) 2 ♂; - (98):(08.07.2008) 4 ♂, 4 ♀.
7. ***Lestes parvidens*** (Artobolevsky, 1929)
Literature:- (24): larvae (Temirova et al., 1984). - Mountain and steppe areas of Crimea, larvae (Kiseleva, Vershytsky, 1998). - (65): (19.10.2002) 4 ♂ (Martynov, Martynov, 2004). - in Crimea: (Mal'tsev, 1999). - (105): (14.09.1928, 2 ♂ mountain lake (altitude about 400 m) (Artobolevsky, 1929).
 • Original data: (29): (20.08.2008), 2 ♂, 1 ♀; - (62):(16.08.2006) larvae 1 ♂, 1 ♀.
8. ***Lestes macrostigma*** (Eversmann, 1836)
Literature: (28): (16.06.1894) (Brauner, 1902). - (109): (07.06.1906) (Artobolevsky, 1929). - In shelter belts in June and beginning of July (Mal'tsev, 1953). - in Crimea: (Mal'tsev, 1999).
 • Original data: none
9. ***Lestes dryas*** Kirby, 1890
Literature: (3): (02.06.1900) 1 ♂ (Bartenev, 1912b). - (3): (02.06.1898) 1



♀; (109): (30.07.1914) 2 ♂, classified as rare species in Crimea (Artobolevsky, 1929). - (74, 82) larvae (Kiseleva, Ezernytsky, 1985). - in Crimea: (Mal'tsev, 1999).

- Original data: (4):(11-20.06.2005) 3 ♂, 3 ♀, larvae 3 ♂, 1 ♀; (25.06.2008) 12 ♂, 1 ♀, larvae 3 ♂, 9 ♀.

10. ***Lestes sponsa*** (Hansemann, 1823)

Literature: (109): (12.06.1894) (Brauner, 1902). - (67): (30.05.1911) 1 ♀ classified as rare species in Crimea (Artobolevsky, 1929). - Steppe area, in shelter-belts far from water (Mal'tsev, 1953). - (Steppe and South coast, 73) larvae (Kiseleva, Vershytsky, 1998)

- Original data: none

11. ***Platycnemis pennipes*** (Pallas, 1771)

Literature: (54): (19.05.1897) 1 ♀; (14.05.1897) 1 ♀; (18.05.1897) 2 ♀; (30.05.1897) 1 ♂ (Bartenev, 1912b). - (67): (22.05.1894, 13.07.1894) (Brauner, 1902). - (15): (10.05.1899) 1 ♂, 1 ♀ - (49): (17.06.1907) 3 ♀; (23.06.1906) 1 ♀; (50): (11.05.1898) 2 ♂, 7 ♀; (18.05.1908) 2 ♀; (8.06.1908) 2 ♀; (12.07.1908) 1 ♀; - (54): (14.06.1909) 2 ♀; - (67): (30.05.1911) 2 ♂, 1 ♀; (26.06.1898) 1 ♂, 2 ♀; (20-25.07.1898) 1 ♂, 2 ♀; abundant, mostly in submontane regions (Artobolevsky, 1929). - (73, 74, 78, 82, 83, 84): larvae (Kiseleva, Ezernytsky, 1985). - (73), mountain Crimea, larvae (Kiseleva, Vershytsky, 1998). - in Crimea (Mal'tsev, 1999)

- Original data: (7): (19.05.2001) larva 2 ♂; (5): (26.06.2006); - (8): (06.05.2005), larvae 1 ♂; - (12): (25.06.2007) ♂♂, ♀♀; (20.06.2008) 2 ♂; - (13): (25.07.2008) 4 ♂; - (14): (02.03.2007) 3 ♂, 2 ♀; - (18): (14-17.08.2001) 1 ♂; (01.08.2004) 1 ♀; (06.08.2004) 1 ♀; (07.08.2004) 1 ♀; (08.08.2004) 1 ♀; (10.08.2004) 1 ♀; (07-12.08.2008) 3 ♂; (24): (05.06.2008) 4 ♂, 2 ♀; (15.07.2008) 3 ♂, 1 ♀. - (25): (26.07.2007) 1 ♂; - (60): (25.11.2003) larva 1 ♀; - (61): (01.05.2002) larva 2 ♂, 3 ♀; - (64): (06.08.2008) 4 ♂, 2 ♀; - (68): (07.08.2002) 3 ♂, 3 ♀; (10.06.2005) 7 ♂, 9 ♀; (25.07.2007); - (70): (03.07.2006) 1 ♂; - (72): (03.08.2008) 2 ♂, 1 ♂; - (75): (06.07.2008) - 3 ♂, 2 ♀; - (90): (15.06.2002) larva 6 ♂, 7 ♀; - (90, 92): (17.06.2002) larvae 3 ♂; (22.09.2002) larva 1 ♂, 1 ♀; - (95): (03.07.2008) 2 ♂, 3 ♀; - (98): (08-10.07.2008) 3 ♂, 4 ♀.

12. ***Nehalennia speciosa*** (Charpentier, 1840)

Literature: (109): (30.06.1913) 1 ♀ Very rare (Artobolevsky, 1915). - in Crimea: (Mal'tsev, 1999).

- Original data: none

13. ***Ischnura elegans*** (Vander Linden, 1820)

Literature: (2): (19.05.1900) 3 ♂; (26.05.1900) 1 ♂; - (3): (02.06.1900) 1 ♂ (Bartenev, 1912b). - South coast, summer 1902, 1 ♂; - (36, 37, 38):



(15.06.1902) (Brauner, 1903). - (15): (05.07.1898) 1 ♂; - (45): (24.07.1902) 2 ♀; - (49): (02.06.1902) 1 ♀; (18.07.1906) 1 ♀; - (50): 1 ♂; - (109): (30.06.1914) 1 ♂ Not abundant (Artobolevsky, 1929). - In Crimea widespread May-September (Mal'tsev, 1953). - (73, 74): larvae (Kiseleva, Vasyuta, 1984). - (73, 74, 83): larvae (Kiseleva, Ezernytsky, 1985). - (45): larvae, abundant; - mountain and steppe Crimea, everywhere, larvae (Kiseleva, Vershytsky, 1998)

- Original data: (7): (19.05.2001) larva 1 ♀; - (8): (6-8.05.2005) abundant adults, larvae; - (16): (07-12.08.2008) 1 ♂, 3 ♀; - (17): (21.08.2008) 1 ♂; - (18): (14-17.08.2001) 10 ♂, 8 ♀; (23-26.08.2001) 26 ♂, 5 ♀; (23.08.2001) larvae 1 ♂, 1 ♀ juv; (1.08.2004) 11 ♂, 1 ♀; (3.08.2004) 1 ♂, 1 ♀; (04-10.08.2004) abundant;- (20): (26.07.07) 2 ♂, 1 ♀; - (32): (08.09.2002) 2 ♂; - (40): (10.09.2007) 1 ♂; - (41): (12.05.2005), 1 ♂; - (42): (10-11.05.2005) 9 ♂, 13 ♀; (47): (21.07.2007). - (61): (01.05.2002) larvae 4 ♂, 1 ♀; - (64): (06.08.2008) 2 ♂, larvae 4 ♂, 2 ♀; - (68): (25.07.2007) 4 ♂, 7 ♀;- (69): (09.05.2005) 2 ♂; (72): (09.06.2005) 3 ♂, 2 ♀; (03.08.2008) 2 ♂, 1 ♀, larvae 2 ♀; (04.08.2007) 3 ♂, 3 ♀; (76): (13.06.2005) 1 ♀; - (94): (15.06.2005) 1 ♀; - (98): (08-10.07.2008) 4 ♂, 1 ♀; - (102): (23.05.2000), larvae 2 ♂, 4 ♀.

14. *Ischnura pumilio* (Charpentier, 1825)

Literature: (2): (19.05.1900) 5 ♂; (26.05.1900) 1 ♂; - (54): (10.07.1897) 1 ♀; - (104): (09.07.1899) 1 ♀; - (106): (10.07.1902) 2 ♀; (Bartenev, 1912b). - South coast, summer 1902, 2 ♂, 1 ♀ (Brauner, 1903). - (2): (19.05.1900) 2 ♀; - (15): (30.07.1899) 1 ♂, 1 ♀; (34): (1922) 1 ♂, 3 ♀; - (49): (02.06.1902) 1 ♀; (01.07.1907) 1 ♂; - (54): (09.06.1913) 1 ♀; - (86): (07.06.1907) 9 ♂, 2 ♀; - (105): (08-11.06.1926) 1 ♂, 1 ♀; - (106): (09.07.1900) 1 ♂; (13.07.1900) 1 ♂; - (109): (21.06.1914) 1 ♂; (30.06.1914) 2 ♂; (04.07.1914) 3 ♂. Everywhere common and abundant (Artobolevsky, 1929). - (73, 74, 78, 82, 83): larvae (Kiseleva, Ezernytsky, 1985). - Mountain and steppe Crimea, larvae (Kiseleva, Vershytsky, 1998)

- Original data: (6): (12.07.2006) 1 ♂, 1 ♀; - (8): (06-07.05.2005) larvae 1 ♂, 5 ♀; (08.05.2005) 1 ♀; - (12): (21.06.2006) 3 ♂, 1 ♀; (18): (23-26.08.2001) 3 ♂, 4 ♀; (04.08.2004) 2 ♂, 1 ♀; - (19): (18.07.2007) 1 ♂, 1 ♀; (24): (15.07.2008) 1 ♂;- (32): (08.09.2002) 2 ♂; - (41): (12.05.2005) 1 ♂, 2 ♀; - (42): (10-11.05.2005) 7 ♂, 4 ♀; - (63): (19.07.2008) 3 ♂, 1 ♀; - (64): (06.08.2008) 2 ♂;- (79): (14.06.2002) 2 ♂; - (88): (19.07.2008) 2 ♂; - (97): (08-10.07.2008) 1 ♀.

15. *Enallagma cyathigerum* (Charpentier, 1840)

Literature: (36, 37): (15.06.1902) (Brauner, 1903). - (15): (05.07.1898) 2 ♂; (10.05.1899) 1 ♂; - (54): (10.05.1909) 1 ♂; In steppe and submontane Crimea (Artobolevsky, 1929). - (27) (Mal'tsev, 1953). - (73, 74): larvae



(Kiseleva, Ezernytsky, 1985). – (45), mountane and steppe area of Crimea: larvae (Kiseleva, Vershytsky, 1998)

- Original data: (18): (08.08.2004) 1 ♂; - (20): (26.07.2007) 1 ♂.

16. ***Coenagrion pulchellum*** (Vander Linden, 1823)

Literature: (67): (22.05.1899) 1 ♀ (Artobolevsky, 1929). – (73, 78, 82, 83) (Kiseleva, Ezernytsky, 1985). mountane and steppe area of Crimea, larvae (Kiseleva, Vershytsky, 1998)

- Original data: (8): (06-08.05.2005) exuviae 2 ♂, larva 1 ♀; - (9): (04.04.2002) 1 ♂, 1 ♀.

17. ***Coenagrion puella*** (Linnaeus, 1758)

Literature: (2): (19.05.1900) 5 ♂; (26.05.1900) 1 ♂; - (3): (02.06.1900) 4 ♂ (Bartenev, 1912b). - (3): (02.06.1900) 1 ♂; - (15): (08.06.1914) 2 ♂; - (67): (10.05.1899) 9 ♂, 1 ♀; (30.05.1911) 1 ♂, 1 ♀; - (86): (07.06.1907) 2 ♂; common (Artobolevsky, 1929). – (73, 74): (Kiseleva, Vasyuta, 1984).- (73, 74, 78, 82, 83) larvae (Kiseleva, Ezernytsky, 1985). - mountane and steppe area of Crimea, larvae (Kiseleva, Vershytsky, 1998)

- Original data: (3): (11-20.06.2005) 2 ♂;- (25.06.2008) 2 ♂; - (5): (23.09.2001) larvae 1 ♂, 1 ♀. - (8): (06-08.05.2005) 1 ♂, exuvia 1 ♀, larvae 3 ♂, 2 ♀; - (24): (05.06.2008) 1 ♂; - (56): (26-28.05.2007) 1 ♂; - (61): (01.05.2002) larvae 1 ♂, 1 ♀; - (70): (07.07.2002) 1 ♂; - (77): (13.06.2005) 1 ♂, 1 ♂; - (88): (30.04.2001) larvae 5 ♂, 1 ♀; (17.06.2001) larva 1 ♂; (19.07.2008) 2 ♂; - (90): (22.09.2002) 1 ♀ juv; (95): (23.05.2000) larva 1 ♀; - (97): (03.07.2008) 1 ♀; - (98): (08-10.07.2008) 5 ♂, 2.

18. ***Coenagrion ornatum*** (Selys, 1850)

Literature: (73, 74): larvae (Kiseleva, Vasyuta, 1984). – (73, 82, 83): larvae (Kiseleva, Ezernytsky, 1985). - in Crimea: (Mal'tsev, 1999).

- Original data: (24): (05.06.2008) 2 ♂; (15.07.2008) 1 ♂.

19. ***Coenagrion armatum*** (Charpentier, 1840)

Literature: mountane area of Crimea, larvae (Kiseleva, Vershytsky, 1998).

- Original data: none. The occurrence of this species in Crimea needs confirmation.

20. ***Coenagrion lunulatum*** (Charpentier, 1840)

- Literature: (97): larvae (Kiseleva, Vershytsky, 1998)

- Original data: none. The occurrence of this species in Crimea needs confirmation.

21. ***Coenagrion scitulum*** (Rambur, 1842)

Literature: (2): (19.05.1900) 1 ♂; (26.05.1900, 4 ♂); - (3): (02.06.1900) 2 ♂, 1 ♀ (Bartenev, 1912b). – (15): (29.06.1914) 1 ♂; - (54): (09.06.1913) 2 ♀; - (86): (14.06.1909) 1 ♀ common in south coast and submontane part



(Artobolevsky, 1929). – (83) larvae (Kiseleva, Ezernytsky, 1985). - mountane and steppe area of Crimea, larvae (Kiseleva, Vershytsky, 1998)

- Original data: (4): (11.-20.06.2005) 1 ♀; - (9): (04.04.2002) larva 1 ♀.

22. ***Coenagrion mercuriale*** (Charpentier, 1840)

Literature: (72): larvae (Mel'nikov & Lubyaynov, 1958).

- Original data: none. The identification of this species is based on larval characters only and needs confirmation.

23. ***Pyrrhosoma nymphula*** (Sulzer, 1776)

Literature: (72): larvae (Temirova, Zubrik & Sacharov, 1980).

- Original data: none. The identification of this species is based on larval characters only and needs confirmation.

24. ***Erythromma najas*** (Hansemann, 1823)

Literature: (36, 37): (15.06.1902) (Brauner, 1903). - steppe area of Crimea, larvae (Kiseleva, Vershytsky, 1998). - in Crimea: (Mal'tsev, 1999).

- Original data: none

25. ***Erythromma viridulum*** Charpentier, 1840

Literature: (109): (30.06.1914) 1 ♀ (Artobolevsky, 1915)

- Original data: (18): (14-17.08.2001) 1 ♂; (08.08.2004) 1 ♂, 1 ♀; (09.08.2004) 1 ♀; - (20): (26.07.2007) 1 ♂; - (30): (18.07.2005) 1 ♀; - (64): (06.08.2008) 3 ♂; - (98): (08-10.07.2008) 2 ♂, 1 ♀.

26. ***Erythromma lindenii*** (Selys, 1840)

- Original data: (64): (06.08.2008) 2 ♂; - (98): (08-10.07.2008) larva 1 ♂

27. ***Gomphus vulgatissimus*** (Linnaeus, 1758)

Literature: (54): (12-30.05.1897) 1 ♂, 2 ♀ (Bartenev, 1912b); - (67): (05, 09, 22.05.1894) (Brauner, 1902). - (49): (11.06.1905) 1 ♂; (11.05.1908) 1 ♂, 2 ♀; (18.05.1908) 1 ♂, 1 ♀; (25.05.1908) 1 ♀; (08.06.1908) 1 ♀; - (54): (07.05.1909). - (67): (10.05.1899) 3 ♂; Common species recorded in the submontane region (Artobolevsky, 1929). - (73, 74) larvae (Kiseleva, Vasyuta, 1984). - (73, 74, 84) larvae (Kiseleva, Ezernytsky, 1985). - (22, mountane and steppe area of Crimea): larvae (Kiseleva, Vershytsky, 1998). - in Crimea: (Mal'tsev, 1999). - (57,59): larvae (Prokopov, 2003).

- Original data: (8): (06-08.05.2005) exuvia 1 ♂, larva 1 ♂; - (11): (21.08.2000) larva 1 juv; - (56): (04.10.2001) larva 4 ♀; (57): (16.08.2001) exuvia 1 ♂; (04.01.2001) larva 1 juv; (17.08.2001) larva 1 juv; - (90, 92): (22.09.2002) larva 1 juv.



28. ***Onychogomphus forcipatus*** (Linnaeus, 1758)
Literature: (73, 83) larvae (Kiseleva, Ezernytsky, 1985). – (73) (Kiseleva, Vershytsky, 1998). – in Crimea: (Mal'tsev, 1999). – (57): larvae (Prokopov, 2003)
- Original data: (11): (21.08.2000) larvae 2 ♀, 1 juv; – (12): (25.06.2007) larvae 3 ♂; – (13): (25.07.2008) 1 ♂, 1 ♀; – (14): (21.05.2005) larva 1 ♂, exuvia 1 ♀; – (53): (01.06.1999) larvae 2 ♂, 1 ♀, 1 juv; (10.04.2005) larvae 2 ♂, 2 ♀, 1 juv.; – (57): (04.01.2001) larva 1 ♀ juv; – (58): (25.11.2003) larvae 1 ♂, 1 juv; (17.08.2001) larvae 2 ♀, 1 juv; – (90, 92): (17.06.2002) larvae 2 ♂, 1 ♀, 1 juv; (22.09.2002) larvae 1 ♂, 1 ♀, 1 juv; (90): (15.06.2002) larvae 2 ♂, 1 ♀, 1 juv; (08.04.2005) larvae 1 ♂.
29. ***Ophiogomphus cecilia*** (Geoffroy in Fourcroy, 1785)
Literature: (73, 74): larvae (Kiseleva, Vasyuta, 1984).
- Original data: none. The identification of this species is based on larval characters only and needs confirmation.
30. ***Aeshna mixta*** Latreille, 1805
Literature: (South coast) 1 ♂ (Brauner, 1902). – (109): (09.07.1898) 1 ♂ (Artobolevsky, 1929). – (45): (Tseeb, 1947). – (43): (Mal'tsev, 1953). – in Crimea: (Mal'tsev, 1999).
- Original data: (4): (11-20.06.2005) larvae 1 ♂; – (21): (21.08.2006)
31. ***Aeshna affinis*** Vander Linden, 1820
Literature: (49): (09.08.1909) 1 ♀; – (85): (25.07.1928) 1 ♂; – (87): (01.07.-1907) 1 ♂; – (93): 1 ♂; common in south mountainside (Artobolevsky, 1929). – (45): (Tseeb, 1947). – (73, 74) larvae (Kiseleva, Vasyuta, 1984). – (73, 83) (Kiseleva, Ezernytsky, 1985). – mountane area of Crimea, streams, larvae (Kiseleva, Vershytsky, 1998). – in Crimea: (Mal'tsev, 1999).
- Original data: (4): (13.07.2007) 1 ♂, 2 ♀; (25.06.2008) 1 ♂, larvae 4 ♂, 2 ♀; – (72): (03.08.2008) 1 ♂; – (88): (19.07.2008) 2 ♂.
32. ***Aeshna grandis*** (Linnaeus, 1758)
Literature: (45): (Tseeb, 1947). – in Crimea: (Mal'tsev, 1999).
- Original data: none
33. ***Aeshna viridis*** Eversmann, 1836
Literature: (43): (Mal'tsev, 1953). – in Crimea: (Mal'tsev, 1999).
- Original data: none
34. ***Aeshna juncea*** (Linnaeus, 1758)
Literature: In Crimea (Tseeb, 1947). – (73, 74, 81, 83, 84): larvae (Kiseleva, Ezernytsky, 1985). – mountane and steppe area of Crimea and



south coast, larvae (Kiseleva, Vershytsky, 1998)

- Original data: none

35. ***Aeshna cyanea*** (Mueller, 1764)

Literature: (steppe area of Crimea, Northern-Crimean channel) larvae (Kiseleva, Vershytsky, 1998)

- Original data: (4): (11-20.06.2005) larva 1 ♀; - (5): (09.09.2000) larvae 1 ♂, 2 ♀ juv. (49): (30.08.2006).

36. ***Aeshna isoceles*** (Müller, 1767)

Literature: (107): (22.06.1902) 1 ♂ (Bartenev, 1912b). - (49): 17.06.1907, 1 ♂; - (87): (26.06.1907) 1 ♂; - (109): (09.06.1905) 1 ♀ recorded in the south coast and steppe part (Artobolevsky, 1929). - (73, 74) larvae (Kiseleva, Ezernytsky, 1985). - montane area of Crimea, streams, larvae (Kiseleva, Vershytsky, 1998). - (62): (Prokopov, 2003)

- Original data: none

37. ***Anax imperator*** Leach, 1815

Literature: (109): (01.07.1914) (Artobolevsky, 1915). - (67, 49): (June 1894) (Brauner, 1902). - (49): (10.07.1906) 1 ♂ (Artobolevsky, 1929). - (74) larvae (Kiseleva, Ezernytsky, 1985). - Steppe area of Crimea and South coast, larvae (Kiseleva, Vershytsky, 1998)

- Original data: (4): (15.06.2005) 1 ♀; - (20): (26.07.2007) 1 ♂; - (35): (27.07.2005) 1 ♂; - (64): (06.08.2008) 1 ♂; - (77): (17.06.2003) 1 ♂; (13.06.2005) 1 ♂; - (98): (09.07.2008) larva 1 ♂.

38. ***Anax parthenope*** (Selys, 1839)

Literature: (3): (06-10.08.1900) 1 ♀; - (106): (22.07.1902) 1 ♂ (Bartenev, 1912b). - (67): several specimens (Brauner, 1902). - (101): (summer 1902) 2 ♂ (Brauner, 1903); - Crimea: (02.07.1912) 1 ♀; - (49): (04.07.1915) 1 ♂; (20.09.1913) 1 ♀; - (96): (14.08.1917) 1 ♀; (105): (08.08.1926) 1 ♂; - (106): (10.06.1900) 1 ♀; (07.08.1900) 1 ♀; - (109): (08.07.1898) 2 ♂; common everywhere (Artobolevsky, 1929). - (73): larvae (Kiseleva, Ezernytsky, 1985). - Mountain and steppe Crimea, South coast, ponds, lakes larvae (Kiseleva, Vershytsky, 1998)

- Original data: (8): (06-07.05.2005) exuvia 1 ♂, larva 1 ♀ juv; - (16): (10.08.2008) 1 ♂, 1 ♀; - (18): (14-17.08.2001) several dozens of specimens in foraging cohort; (19.08.2001), 2 ♂, 1 ♀, larva 2 ♂, 4 ♀, 1 juv; (23.08.2001) 1 ♂, larva 1 ♀ juv; (26.08.2001) 1 ♀; - (32): (08.09.2002) 1 ♂; - (46): (08.07.2003) 1 ♀; - (47): (25.08.2008) 1 ♂; - (61): (01.05.2002) larva 1 ♂, 3 ♀; - (72): (04.08.2007) larva 4 ♂, 14 ♀, 4 juv; (03.08.2008) abundant; - (89): (02.09.2007), 2 ♀; - (90): (22.09.2002) larvae 3 ♂, 2 ♀.



39. ***Anax ephippiger*** (Burmeister, 1839)
 • Original data: (29): (13.08.2004) 1 ♂. - (30): (21.08.2007) 1 ♀; - (93): (12.08.2002) 1 ♂, 1 ♀.
40. ***Epitheca bimaculata*** (Charpentier, 1825)
 • Original data: (72): (04.08.2007), larvae: 1 ♀
41. ***Cordulia aenea*** Linnaeus, 1758
Literature: (72): larvae (Mel'nikov & Lubyaynov, 1958).
 • Original data: none. The identification of this species is based on larval characters only and needs confirmation.
42. ***Orthetrum brunneum*** (Fonscolombe, 1837)
Literature: (54): (16.07.1897) 1 ♂ (Bartenev, 1912b); - (49): (10.07.1894); - (67): (13.07.1894); (25.10.1894); (Brauner, 1902); - (36, 37): (15.06.1902); - (101): (summer 1902) 1 ♀; - (102): (summer 1902) 1 ♂; (Brauner, 1903). - (Crimea): (03.08.1898) 1 ♀; - (15): (03.08.1898) 4 ♂; - (67): (July 1898) 1 ♂; (10.06.1911) 1 ♀; (05.07.1898) 1 ♂; (20.08.1898) 1 ♀; - (106): (13.07.1900) 1 ♂; - (109): (July 1914) 1 ♀ abundant (Artobolevsky, 1929). - (Crimea, forest shelter belts): (July-October) (Mal'tsev, 1953). - (73, 74, 82): larvae (Kiseleva, Ezernytsky, 1985). - montane and steppe area of Crimea, larvae (Kiseleva, Vershytsky, 1998)
 • Original data: (8): (06-07.05.2005) exuvia 1 ♂, larvae 1 ♂, 1 ♀, 1 ♂ juv.; - (13): (25.07.2008) 1 ♂, 2 ♀; - (16): (07-12.08.2008) 3 ♂; - (17): (21.08.2008) 1 ♂, 1 ♀; - (18): (03.08.2004) 1 ♀; (07.08.2004) 1 ♀; (10.08.2004) 2 ♂, 5 ♀; (19.08.2001), 2 ♂ larvae 2 ♂, 2 ♀, 9 juv; (23-26.08.2001) 3 ♂, 4 ♀, exuvia 2 ♂, 3 ♀, larva 9 juv; - (24): (15.07.2008) 1 ♂, 1 ♀; - (32): (08.09.2002) 3 ♂, 2 ♀; - (41): (12.05.2005) 1 ♀; - (90, 92): (22.09.2002) larva 2 juv; - (64): (06.08.2008) 2 ♂, 2 ♀; - (72): (04.08.2007), 1 ♂.
43. ***Orthetrum cancellatum*** (Linnaeus, 1758)
Literature: (28): (16.06.1894); - (72): (13.07.1893); (Brauner, 1902); - (36, 37): (15.06.1902) (Brauner, 1903). - (67): (1898) 1 ♂ (Artobolevsky, 1929); - (74): larvae (Kiseleva, Ezernytsky, 1985). - (22, montane and steppe area of Crimea): larvae (Kiseleva, Vershytsky, 1998)
 • Original data: (12): (25.06.2007) 1 ♂, 2 ♀; - (16): (07.08.2008) 1 ♂; - (18): (03.08.2004) 1 ♂; - (19, 23.08.2001) exuviae 1 ♂, larva 1 juv; - (20): (26.07.2007) 2 ♂, 2 ♀; - (26): (17.07.2006) 1 ♂, 2 ♀; - (30): (20.07.2005) 1 ♀; - (47): (25.08.2008) 1 ♂, 1 ♀; - (64): (06.08.2008) 1 ♂, 1 ♀; (04.08.2007), 2 ♀; - (70): (03.07.2006); - (72) larvae 1 ♀, 3 juv; - (97): (03.07.2008) 1 ♂; - (98): (08.07.2008) 1 ♂.
44. ***Orthetrum albistylum*** (Selys, 1848)
 • Literature: - Crimea: (Mal'tsev, 1999).



- Original data: (18): (02.08.2004) 1 ♂; (07.08.2004) 1 ♂, 2 ♀; (10.08.2004) 2 ♂, 1 ♀; - (72): (03.08.2008) 1 ♂, 1 ♀.

45. ***Orthetrum coerulecens anceps*** (Schneider, 1845)

Literature: steppe area of Crimea, larvae (Kiseleva, Vershytsky, 1998); - in Crimea: (Mal'tsev, 1999). - (49): 29.06.1998, 3 ♀; - (30): (26.07.2005) 1 ♂, 7 ♀ (Matuskina, 2006).

- Original data: - (12): (20.06.2008) 1 ♀; - (18): (19, 23.08.2001) 4 ♂, exuviae 1 ♂; (04-10.08.2004) 9 ♂, 12 ♀; - (24): (15.07.2008) 3 ♂; - (64): (06.08.2008) 3 ♂; - (68): (07.08.2002) 3 ♂, 2 ♀; (10.06.2005) 1 ♂, 1 ♀; (25.07.2007) 2 ♂; (72): (04.08.2007) 1 ♀; (03.08.2008) 1 ♀; - (98): (10.07.2008) 1 ♂.

Specimens from our collection show a shape of anterior lobe on the copulatory organ of males which are typical of *O. c. anceps* (Mauersberger, 1994).

46. ***Libellula quadrimaculata*** Linnaeus, 1758

Literature: (67): (end of May) (Brauner, 1902). - (39): (27.04.1906) 1 ♀; (49): (17.08.1907) 1 ♀; *rare* (Artobolevsky, 1929). - Steppe area of Crimea, everywhere, saline lakes, larvae (Kiseleva, Vershytsky, 1998)

- Original data: none

47. ***Libellula depressa*** (Linnaeus, 1758)

Literature: (2): (26.05.1900) 1 ♀; - (85): (28.04.1907) 1 ♀; (Bartenev, 1912b); - (67): (5, 22.05.1894); (13.07.1894) (Brauner, 1902); - (15): 08.06.1914, 1 ♂; (54): (14.05.1909) 1 ♀; (31.05.1909) 1 ♂; - (67): (10.05.1899) 4 ♀; - (86): (02.07.1907) 1 ♂, 1 ♀. common in the mountains and submontane areas of Crimea (Artobolevsky, 1929). - (Crimea, forest shelter belts): (May-July) (Mal'tsev, 1953). - (73, 74): larvae (Kiseleva, Vasyuta, 1984). - (73, 74, 78): larvae (Kiseleva, Ezernytsky, 1985). - (22): larvae, abundant; (Northern-Crimean channel, montane and steppe area of Crimea) larvae (Kiseleva, Vershytsky, 1998)

- Original data: (4): (20.06.2005) 1 ♂; - (8): (06-08.05.2005) emergence of adults 3 ♀; exuviae 5 ♂, 6 ♀, larvae 4 ♂, 12 ♀; - (9): (04.04.2002) larvae 1 ♂, 3 ♀; - (13): (21.06.06) 2 ♂, 1 ♀; - (33): (10.09.2007) larvae 2 ♀; (04.05.2008) larvae 2 ♂, 1 ♀; - (88): (20.04.2008) larvae 2 ♂, 2 ♀; - (95): (04.07.2008) 3 ♂.

Libellula depressa taurica Beutler, 1984.

Literature: (1): 15.05.1983, 2 ♂, exuviae 1 ♀ (Beutler, 1984)

- Original data: none

48. ***Libellula fulva*** (Müller, 1764)

Literature: (73): larvae (Kiseleva, Ezernytsky, 1985); - mountains of



Crimea, slow flow rivers, larvae (Kiseleva, Vershytsky, 1998)

- Original data: none

49. ***Crocothemis erythraea*** (Brullé, 1832)

Literature: (50, 67): (30.06.-09.07.) (Pliginsky, 1913). - (49): (09.07.1906) 1 ♂; - (67): (1898) 1 ♂; (Artobolevsky, 1929). - Steppe area of Crimea, larvae (Kiseleva, Vershytsky, 1998)

- Original data: (8): (06-07.05.2005) larva 2 juv; - (16): (08.08.2008) 1 ♂; - (18): (23.08.2001) larva 1 ♀; - (20): (06.07.2007) 2 ♂; - (47): (25.08.2008) 2 ♀; - (64): (06.08.2008) 2 ♂; - (98): (08-10.07.2008) 3 ♂.

50. ***Sympetrum flaveolum*** (Linnaeus, 1758)

Literature: - in Crimea: (Mal'tsev, 1999).

- Original data: (18): (14-17.08.2001) 8 ♂, 8 ♀; (19.08.2001) 4 ♂, 4 ♀; (23-26.08.2001) 3 ♂, 2 ♀; (21.08.2003) 1 ♂; - (20): (26.07.2007) 1 ♀; (98): (08-10.07.2008) 2 ♂, 1 ♀.

51. ***Sympetrum fonscolombii*** (Selys, 1840)

Literature: (3): (01-07.08.1900) (Bartenev, 1912b); - (34): (1922) 1 ♂, 1 ♀; (49): (08.08.1906) 1 ♂, 2 ♀; (105): (18.08.1928) 1 ♀; (20.08.1928) 3 ♂, 1 ♀; - (106): (20.07.1900) 1 ♂, 1 ♀; (31.07.1900) 1 ♀; (01.08.1900) 1 ♂, 1 ♀; - (109): (21.07.1914) common at the south coast and steppe areas of (Artobolevsky, 1929). - in Crimea: (Mal'tsev, 1999). - (49): (16-20.08.2005) 7 ♂, 2 ♀ (Matuskina, 2006).

- Original data: (16): (12.08.2008) 1 ♂, 1 ♀; (07.08.2008) 1 ♀; - (17): (21.08.2008) 1 ♂; - (18): (19.08.2001) exuviae 1 ♂, 1 ♀; - (20): (26.07.2007): 2 ♂; - (32): (08.09.2002) 1 ♂, 2 ♀; - (33): (10.09.2007) 1 ♂, 3 ♀; - (38): 2 males (09.09.2007), 2 ♂; - (40): (10.09.2007), 2 ♂, 3 ♀; - (41): (20-29.07.2007) 3 ♂, 6 ♀; - (47): (21.07.2007) 2 ♂, 1 ♀; - (64): (06.08.2008) 2 ♂, 2 ♀; (25.08.2008) 5 ♂, 8 ♀; - (72): (18.06.2003) 1 ♂; (04.08.2007) 1 ♀.

52. ***Sympetrum pedemontanum*** (Allioni, 1766)

Literature: (67): 1 ♀ (Artobolevsky, 1929). - (74, 83): larvae (Kiseleva, Ezernytsky, 1985). - Steppe Crimea, larvae (Kiseleva, Vershytsky, 1998)

- Original data: (16): 12.08.2008, 1 ♂.

53. ***Sympetrum vulgatum*** (Linnaeus, 1758)

Literature: Crimea 1 ♀ (Bartenev, 1915). - (109): July 1914, 1 ♂ rare (Artobolevsky, 1929). - in Crimea: (Mal'tsev, 1999).

- Original data: (18): 15.08.2001, 1 ♂; - (41): (22.07.2007) 1 ♂; - (47): (21.07.2007) 1 ♀; - (64): 02.10.2006.

54. ***Sympetrum striolatum*** (Charpentier, 1840)

Literature: (106): 22.07.1902 (Bartenev, 1912b). - (67): (26.06.1898) 1



♂. - (109): (08.09.1903) 1 ♂; (06.10.1903) 1 ♀ rare (Artobolevsky, 1929). - In shelter belts (Mal'tsev, 1953). - (73, 74): larvae (Kiseleva, Ezernytsky, 1985). - montane and steppe area of Crimea, Northern-Cri-mean channel, larvae (Kiseleva, Vershytsky, 1998)

- Original data: (6): (12.07.2006); (9): (22.08.2001) 1 ♂; (16): (07-12.08.2008) 1 ♂, 2 ♀; - (18): (25.08.2001) 1 ♂; - (09.08.2004) 1 ♀; (26.08.2001) 14 ♂, 3 ♀ abundant, copulation, oviposition; - (29): (20.07.2006), abundant; - (34): (05.09.2004) 1 ♂, 3 ♀; - (35): (19.07.2005) 2 ♂; - (41): (23.07.2007) 1 ♂; - (48): (20.08.2001) 1 ♀; - (62): (16.08.2006); - (67): (05.06.2005) 1 ♂; - (72): (03.08.2008) 1 ♀; - (98): (08-10.07.2008) 2 ♂.- (108): (19.11.2006).

55. ***Sympetrum sanguineum* (Müller, 1764)**

Literature: (107): (31.08.1928) 1 ♂ (Artobolevsky, 1929). - (74): larvae (Kiseleva, Ezernytsky, 1985). - Montane and steppe area of Crimea, larvae (Kiseleva, Vershytsky, 1998)

- Original data: (4): (11-20.06.2005) 3 ♂, larvae 3 ♂; (13.07.2007) 1 ♂, 2 ♀; (25.06.2008) 1 ♀; - (18): (19.08.2001) exuvia 1 ♂, 1 ♀; - (29): (18.08.2007) 1 ♂; - (72): (03.08.2008) 3 ♂, 1 ♀; - (88): (19.07.2008) 2 ♂; (97): (03.07.2008) 2 ♂; - (98): (08-10.07.2008) 2 ♂.

56. ***Sympetrum meridionale* (Selys, 1841)**

Literature: (2): 08.07.1900, 11♂, 7 ♀; - (54): (16.08.1897) 2 ♂, 1 ♀, (26.08.1897) 4 ♂; - (103): (21.08.1899) 1 ♂, (04.06.1899) 1 ♂; (05.-08.07.1900) 1 ♀; - (106): (11.07.1902), 1 ♀; (14.07.1902) 3 ♂; 2 ♀; (22.07.1902) 3 ♀; (1-5.08.1902) 1 ♀; (Bartenev, 1912b). - (15): (05.07.1898) 1 ♂, 2 ♀; (29.06.1914) 1 ♂; - (45): (12.08.1913) 1 ♀; - (49): (22.07.1907) 1 ♂; (09.08.1909) 1 ♂; (25.09.1907) 1 ♂; (01.10.1907) 1 ♂; (09.08.1909) 1 ♂; - (67): (July 1898) 1 ♂, 2 ♀; (23.06.1898) 1 ♂, 2 ♀; (26.06.1898) 2 ♀; (05.07.1898) 1 ♂; (19.07.1898) 1 ♂, 1 ♀; (09.08.1898) 2 ♂; (20.08.1898) 1 ♂; - (87): (01.07.1907) 1 ♂; - (105): (07.09.1928) 1 ♂, 1 ♀; (11.09.1928) 2 ♀; (14.09.1928) 1 ♂, 1 ♀;- (106): (22.06.1900) 1 ♂ (11.07.1900) 1 ♂, 3 ♀; - (109): (30.06.1914) most abundant than other *Sympetrum* species (Artobolevsky, 1929). - In shelter belts abundant from 10th of June to 25th of October (Mal'tsev, 1953). - (73, 74, 81): larvae (Kiseleva, Ezernytsky, 1985)

- Original data: (4): (20.06.2005) 1 ♂; (13.07.2007) 2 ♂, 3 ♀. - (18): (16.08.2001) 2 ♂; (23-26.08.2001) 6 ♂, 2 ♀; (04.08.2004) 1 ♀; (10.08.2004) 1 ♂; - (20): (26.07.2007) 1 ♀; - (29): (13.08.2004) 1 ♀; - (38): (09.09.2007) 2 ♂, 2 ♀; - (30): (19.07.2005) 1 ♂; - (41): (20-25.07.2007) 1 ♂, 2 ♀; - (47): (25.08.2008) 2 ♂; - (62): (16.08.2006); (18.08.2007) 1 ♂; - (64): (06.08.2008) 1 ♀; - (72): (30.09.2005) abundant; (03.08.2008) abundant; - (97): (03.07.2008) 1 ♂.



57. ***Sympetrum depressiusculum*** (Selys, 1841)
Literature: (45): (Tseeb, 1947). - Steppe area, rice fields, larvae (Kiseleva, Vershytsky, 1998)
• Original data: none
58. ***Sympetrum danae*** (Sulzer, 1776)
• Original data: (18): (24.08.2001) 1 ♂
59. ***Selysiothemis nigra*** (Vander Linden, 1825)
Literature: (30): (15.07.2006) 1 ♀; (22.07.2006) 1 ♂ (Matuskina, 2007).
• Original data: none
60. ***Leucorrhinia albifrons*** (Burmeister, 1839)
Literature: (49): (17.08.2005) 1 ♂ (Matuskina, 2006).
• Original data: none



Fig. 2: River Salgir (Simferopol' district).



Species composition in the investigated biotopes

The six main groups of biotopes that were classified according to peculiarities of relief, climate and hydrology harbour a characteristic fauna of dragonflies (tab. 2).

The first group of nine species is found in the spring and upstream habitats of Crimean rivers and streams of the mountainous part. The water flows fast and is clear. The river bed consists of stones and there is a general lack of submerged and water macrophytes. One typical example is the upper river Salhir (fig. 2).

Table 2: Distribution of Odonata species among the types of biotopes (after original records only)

№	Species (subspecies)	Type of biotope					
		Lotic		Lentic			
		Springs and river upstream	River downstream	Mountain water bodies		Big reservoirs	Ponds, lakes and puddles at the steppe part
Lakes at the yayla	Lakes, ponds and puddles at forest zone						
		1	2	3	4	5	6
1.	<i>Calopteryx splendens splendens</i>		✓				
2.	<i>Calopteryx splendens taurica</i>	✓	✓				
3.	<i>Lestes dryas</i>				✓		
4.	<i>Lestes barbarus</i>			✓	✓	✓	✓
5.	<i>Lestes parvidens</i>				✓		
6.	<i>Sympecma fusca</i>		✓		✓	✓	✓
7.	<i>Platycnemis pennipes</i>	✓	✓		✓	✓	✓
8.	<i>Coenagrion pulchellum</i>				✓		
9.	<i>Coenagrion puella</i>		✓	✓	✓		✓
10.	<i>Coenagrion scitulum</i>				✓		
11.	<i>Coenagrion ornatum</i>		✓				
12.	<i>Erythromma viridulum</i>				✓		✓
13.	<i>Erythromma lindenii</i>				✓		
14.	<i>Ischnura pumilio</i>		✓		✓		✓
15.	<i>Ischnura elegans</i>		✓	✓	✓	✓	✓
16.	<i>Enallagma cyathigerum</i>						✓
17.	<i>Aeshna affinis</i>				✓		✓
18.	<i>Aeshna mixta</i>				✓		
19.	<i>Aeshna cyanea</i>				✓		
20.	<i>Anax imperator</i>				✓		✓
21.	<i>Anax parthenope</i>				✓	✓	✓
22.	<i>Anax ephippiger</i>				✓		✓
23.	<i>Epitheca bimaculata</i>					✓	
24.	<i>Gomphus vulgatissimus</i>	✓	✓		✓		
25.	<i>Onychogomphus forcipatus</i>	✓	✓				
26.	<i>Orthetrum cancellatum</i>		✓		✓	✓	✓
27.	<i>Orthetrum albistylum</i>					✓	✓
28.	<i>Orthetrum brunneum</i>	✓	✓		✓	✓	✓
29.	<i>Orthetrum coerulescens an-</i>	✓	✓		✓	✓	✓



№	Species (subspecies)	Type of biotope					
		Lotic		Lentic			
		Springs and river upstream	River downstream	Mountain water bodies		Big reservoirs	Ponds, lakes and puddles at the steppe part
Lakes at the yayla	Lakes, ponds and puddles at forest zone						
		1	2	3	4	5	6
	<i>ceps</i>						
30.	<i>Libellula depressa</i>	✓	✓	✓	✓		✓
31.	<i>Crocothemis erythraea</i>				✓		✓
32.	<i>Sympetrum flaveolum</i>				✓		✓
33.	<i>Sympetrum danae</i>						✓
34.	<i>Sympetrum vulgatum</i>						✓
35.	<i>Sympetrum striolatum</i>				✓	✓	✓
36.	<i>Sympetrum sanguineum</i>			✓	✓		✓
37.	<i>Sympetrum meridionale</i>	✓			✓	✓	✓
38.	<i>Sympetrum fonscolombii</i>	✓			✓	✓	✓
39.	<i>Sympetrum pedemontanum</i>						✓
	Total	9	14	5	29	13	26

A second group of 14 species is found in the downstream parts of rivers and streams located mainly in submontane areas. The water flow is less rapid and submerged vegetation is well developed. The river bed consists of stone, clay and silt (e.g. river Biyuk Karasu near Bilogirs'k - fig. 3).



Fig. 3: River Biyuk Karasu near Bilogirs'k.





Fig. 4: River Al'ma at the village Viline (Bakhchysaray district).

Another example is the river Al'ma (fig. 4) near the village Viline, which is under permanent anthropogenic impact. The river is regulated, silted, and the water level is low because it was dammed to use it as watering place for cattle. Plants as *Phragmites communis*, *Potamogeton* sp. are abundant, the ground is covered by filamentous algae.



Fig. 5: Lake at the Dolgorukov yayla (Simperepol' district).



A third group occurs in the lakes in the yayla. Lakes on the Gurzuph and Dolgorukov yaylas belong to this group. The latter (fig. 5) were created for watering the cattle. They are small and have a silty floor and well developed macrophyte vegetation such as *Sparganium erectum*, *Phragmites communis*, *Typha angustifolia* L., *Potamogeton* sp. Only five species were recorded in this biotope type.



Fig. 6: Ponds at the north of Mys Mart'yan Reservation.

The fourth group consists of the lentic water bodies in the mountain forest zones. They include lakes, pools, ponds, and areas of dammed rivers. Well developed macrophyte vegetation can be found. One example, are the ponds in the surroundings of Mys Mart'yan Reservation (fig. 6.) where *Potamogeton pectinatus*, *P. natans*, *Phragmites communis*, *Scirpus silvaticus* and *Eleocharis palustris* grow. Usually in August the pond dries up.

Another example is the lake in the surroundings of the village Kutusovka (fig. 7). This is a eutrophic lake with a rich macrophyte vegetation and very low water level in the middle of summer (in some years drying up). In or at all of the water bodies belonging to this group 29 species were recorded. The highest densities of larvae and the highest species diversity were observed in the shallow, thoroughly warmed pools, where most of Odonata predators such as fish were absent.





Fig. 7: Lake at the village Kutuzovka.

The fifth habitat group, the big reservoirs such as the Simferopol' reservoir (fig 8), is the best studied one. It is one of the largest reservoirs in Crimea, created on the river Salhir. In some part of the Simferopol' reservoir mass occurrences of cyanobacteria and algal blooms regularly happened during the last decade. In addition, the water level in these reservoirs changes by several meters two times per day. Such continuous changes of water level negatively impact several biota of the reservoir. At Crimean reservoirs 13 Odonata species were recorded.



Fig. 8: Simferopol' reservoir.



The last group comprises the lakes, ponds and small lentic waterbodies in the steppe zone of Crimea. One example is the lake Donuzlav (fig. 9) which is connected with Black sea and is brackish in its western part. The freshwater part fed by springs is separated from the brackish one by a dam. It is divided into several ponds used for cattle and sheep watering. Submerged and water macrophytes are well developed.



Fig. 9: Lake Donuzlav (freshwater part is main location of dragonflies breeding) Chornomorske district.

An additional example is the pond in the surroundings of the village of Pozharske (fig. 10) created on the river Bulganak. This pond is used as a range for poultry as well as for fishing. Crayfish also occur here. In total 26 species were recorded in this landscape (tab. 2).



Fig. 10: Pond on the river Bulganak at env. of vill. Pozharske (Simpheropol' district).



Conclusions

The Crimea peninsula includes semiarid steppes, mountain forests and meadows as well as subtropical sea coast landscapes. One can, therefore, expect a number of different dragonfly assemblages. However, agriculture and tourism have a strong impact on the environment. There is also a high pressure on water resources and the water quality of the rivers is quite poor. Climate change with increasing air temperatures may additionally exacerbate the situation of waterbodies and their fauna. These general observations on the environmental impact were supported by observations made during field work on the following specific threats for Odonata habitats on the Crimea peninsula:

- Eutrophication and water pollution by fertilizers and pesticides from agriculture (e.g. locality 11, 17, 24, 44, 64, 72, 73, 74)
- Contamination and dangerous waste disposal from industrial activities (e.g. locality 37, 38, 68)
- Recreation activities by tourists (e.g. locality 3, 29, 32, 47, 79, 93, 95, 102, 109).

As a result of these habitat threats the following Odonata species on Crimea are likely to be under particular threat from the following activities:

- Land use intensification because of tourism: *Lestes virens*, *L. macrostigma*, *L. parvidens*, *Aeshna grandis*, *A. viridis*.
- Eutrophication by agriculture: *Erythromma lindenii*, *Coenagrion ornatum*, *Onychogomphus forcipatus*.
- Changing/decreasing water tables: *Sympetrum danae*, *S. depressiusculum*, *S. pedemontanum*.
- Changing climate: all species with a more northern and eurosiberian distribution such as *Calopteryx virgo*, *Nehalennia speciosa*, *Coenagrion lunulatum*, *C. armatum*, *Epitheca bimaculata*.

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References

Artobolevsky G. V., 1915. Dopolnenie k faune strekoz Kryma. (Supplement to Odonata fauna of Crimea). *Entomol. Vestnik* 2(2): 113-114.

Artobolevsky, G. V. 1929. Strekozy Kryma. (Les Odonates de la Crimée. Odonata of Crimea). *Byuleten' obschestva naturalistov i druzey prirody Kryma*. (Proceed-



ings of the Crimean Naturalists' Society) 11: 139-150.

Bartenev, A. N. (1911) 1912a. - Palearcticheskie i vostochnoasiatskie vidy i podvidy roda *Calopteryx* (Odonata, Calopterygidae). (Palearctic and East Asian species and subspecies of the genus *Calopteryx* (Odonata, Calopterygidae)). *Raboty Laboratorii Zoologicheskogo Kabineta Imperatorskogo Varshavskago Universiteta* (Trans. Laboratory of Zoology of the Warsaw Imperial University) 1: 63-257.

Bartenev, A. N. 1912b. K faune strekoz Kryma. (On the Odonata fauna of Crimea). *Ezhegodnik Zool. museya imperatorskoy Akademii Nauk* (Annals of the Zoological Museum of the Imperial Academy of Sciences) 17: 281-288.

Bartenev, A. N. 1915. Insecta Pseudoneuroptera. *Faune de la Russie et des pays limitrophes Du Musée Zoologique de l'Académie Impériale des sciences de Petrograd* 1(1): 1-350.

Beutler, H. 1984. Eine neue Unterart von *Libellula depressa* L., 1758 auf der Halbinsel Krim (UdSSR) (Insecta, Odonata, Libellulidae). *Faunistische Abhandlungen des Staatlichen Museums für Tierkunde, Dresden* 12(6): 55-58.

Brauner, A. 1902. Zametki o strekozakh Khersonskoy gubernii i Kryma. (Notes on Odonata of Kherson district and Crimea). *Zapiski Novorossiyskogo Obschestva Estestvoispytateley* (Trans. Novorossiya Naturalists' Society) 24(2): 75-102.

Brauner, A. 1903. Zametki o strekozakh (Odonata). (Notes on dragonflies (Odonata)). *Revue Russe d'Entomologie* 3(2): 89-91.

Gorb, S. N., R. S. Pavlyuk & Z. D. Spuris, 2000. Babky (Odonata) Ukrainy: faunistychniy oglyag (Odonata of Ukraine: a faunistic overview). *Vestnik zoologii, suppl.* 15: 3-155.

Gluschenko, I. V., S. A. Karpenko, A. I. Lychak & A. V. Sautin, 2007. Systema ekologicheskogo monitoringa Avtonomnoy Respubliki Krym. *Sovremennoe sostoyanie i perspektivy razvitiya* (System of environmental monitoring of Crimea republic. Recent state and perspective of development), *Simferopol'*: 1-188.

Hagen, H. 1856. Die Odonatenfauna des russischen Reichs. *Stettiner Entomol. Zeitung* 17: 363-380.

Khrokalo L. & G. Prokopov, 2005. - Notes on Crimean Odonata (Crimea, Ukraine). *Book of abstracts of 4th WDA International Symposium of Odonatology, Pontevedra (Spain)*: 42.

Kiseleva G. A. & A. N. Vasyuta, 1984. Funktsional'naya rol' i indikatornoe znachenie macrozoobenthosa vodotokov, pitayuschikh Simferopol'skoe vodokhranilische. (Functions and indicator significance of macrozoobenthos of currents feeding Simferopol' reservoir). *Prirodnye komplekсы Kryma, ikh optimizatsiya i okhrana. Sbornik nauchnykh trudov.* (Natural complexes of Crimea and their optimisation and protection. Proc. of scientific works), *Simferopol'*: 141-151.

Kiseleva, G. A. & E. V. Ezernytsky, 1985. Raspredelenie vodnoy entomofauny v verkhov'yakh basseyna reki Salhir pri antropogennom vozdeystvii.



(Distribution of water entomofauna in the uppers of river Salhir basin under anthropogenic impact). *Ecologicheskie i prirodookhrannye aspecty izucheniya gornogo Kryma (Ecological and conservation aspects of mountain Crimea study)*, Simferopol': 110-119.

Kiseleva, G. A. & V. I. Vershytsky, 1998. Odonatofauna v vodnykh ekosystemakh Kryma (Odonata fauna in water ecosystems of Crimea). *Ecosystemy Kryma ikh optimizatsiya i okhrana (Crimean ecosystems and their optimisation and protection)*, Simferopol': 38-41.

Krym v parametrakh ustoichivogo razvitiya (Crimea in measures of sustainable development), 2008. *Simferopol'*: 1-192.

Mal'tsev, I. V. 1953. Vrednye i poleznye nasekomye lesonasazhdeniy stepnogo Kryma (Harmful and useful insects of steppe Crimea plantations). *Trudy Krymskogo filiala Akademii Nauk SSSR (Transactions of the Crimean office Acad. Sci. USSR)* 3(2): 57-64.

Mal'tsev, I. V. 1999. Otryad Odonoptera – Strekozy. Nasekomye Krasnoy knigi Kryma (order Odonata – Dragonflies. Insects of Crimean Red Book). *Voprosy razvitiya Kryma. Nauchno-practicheskyy diskussionno-analitichesky sbornik (Question of Crimea development. Scientific practical discussion and analytical articles)*. Simferopol', *Tauria plus* 15: 124.

Martynov, V.V. & A. V. Martynov 2004. Interesnye nakhodki strekoz (Insecta, Odonata) na teritorii Ukrainy (Interesting records of dragonflies (Insecta, Odonata) from Ukraine). *Vestnik zoologii* 38(5): 38.

Matuskina, N. 2006. New records of rare Odonata in Ukraine (Insecta). *Proc. Zool. Museum of Kyiv National T. Shevchenko Univ.* 4: 154-161.

Matuskina, N. 2007. *Selysiotthemis nigra* (Vander L.) new for the fauna of the Ukraine (Anisoptera: Libellulidae). *Notul. odonatol.* 6(10): 118-119.

Mauersberger, R. 1994. Zur wirklichen Verbreitung von *Orthetrum coerulescens* (Fabricius) und *O. ramburi* (Selys) = *O. anceps* (Schneider) in Europa und die Konsequenzen für deren taxonomischen Rang. *Dtsch. Ent.. Z., N.F.* 41: 235-256.

Mel'nikov G.B. & I.P. Lubyaynov, 1958. Formirovanie zooplanktona i donnoi fauny Symferopl'skogo vodochranilisha v Krimu (Forming of the zooplankton and bottom-dwelling fauna of the in Crimea). *Zool. Journ.* 37(6): 820-831.

Mokrzhetzky, S.A. 1899 Periodicheskie yavleniya v zhyzni zhyvotnykh I rasteniy v zimu 1894-1895 v sravnenii s zimami proshlykh let. (Periodical phenomenon in animal and plant life in winter 1894-1895 in comparison to previous winters). *St. Petersburg*: 1-21.

Pesenko Yu. A. 1982 Printsypy i metody analiza v faunisticheskikh issledovaniyakh (Principles and methods of analysis in faunistic investigations). *Moscow. Nauka*: 1-288.

Pistun M. D. & Ye. J. Shipovich (Ed), 1982. *Geographia Ukrainskoy SSR (Geo-*



graphy of Ukraine republic). *Kyiv, Vyscha Shkola*: 1-303.

Pliginsky, G.V. 1913 Entomologicheskie miniatyury (Entomological miniatures). *Protocol obschestva Ispyt. Pryrody Kharkiv. Univ. (Transactions of the Society for Nature Investigation of the Kharkov University*: 13-15.

Prokopov, G. A. 2001. Ecologo-geographichesky analis reki Guva (Yuzhny bereg Kryma) na osnove prodol'nogo raspredeleniya organizmov macrozoobentosa (Ecological geographic analysis of the river Guva (south coast of Crimea) on the base of the longitudinal distribution of the macrozoobenthos). *Uchenye zapiski Tavricheskogo Natsional'nogo universiteta im. Vernadkogo. Ser. Geographiya (Scientific notes of Tauricheskyy National Vernadsky University. Ser. Geography)* 14(1): 102-107.

Prokopov, G. A. 2003. Presnovodnaya fauna basseyna r. Chernoy (Freshwater fauna of river Chernaya basin). *Voprosy razvitiya Kryma. Nauchno-practicheskyy diskusionno-analiticheskyy sbornik. Problemy inventarisatsii krymskoy bioty (Problems of development of Crimea. Scientific analysis & discussion. Problems of inventory of Crimean biota)* 15: 151-174.

Prokopov, G. A. & L. A. Khrokalo, 2007. Sravnitelnyy analis vidovykh kompleksov strekoz fisiko-geograficheskikh oblastey Kryma (Comparative analysis of Odonata species complexes from Crimean physical-geographical regions). *Reservation of Crimea. Proc. IV int. conf., 2th November 2007, Simferopol'*: 152-164.

Pyshkin V.B., Yevstafyev A.I., Gromenko V.M., Rybka T.S. 2004. Bioraznoobrazie Kryma: Insecta, Odonata (Biodiversity of Crimea). *Kul'tura narodov Prichernomoria (Culture of Crimean nation)* 26(2): 131-135.

Shorygin A. 1926. K poznaniyu poda *Sympycna* Charpentier 1840 (Contribution to the knowledge of the genus *Sympycna* Charpentier 1840). *Revue Russe d'Entomologie* 20: 56-64.

Tseeb Ya. Ya. 1947. Zoogeographichesky ocherk i istoriya krymskoy gidrofauny (Zoogeographical notes and history of Crimean hydrofauna). *Uchenye zapiski Orlovskogo gosudarstvennogo pedinstituta. (Scientific notes of Orlovsky state pedagogical institute)* 2: 67-112.

Temirova S.I., Zubrik I.N. & Sacharov U.A., 1980. K izucheniyu macrozoobentosa litorali Simferopol'skogo vodohranilisha (To investigation of macroinvertebrates of a Simferopol reservoir's littoral fauna). *Okhrana i racional'noe ispolzovanie prirodnnykh resursov (Protection and rational using of natural resources). Simferopol: SGU*: 133-137.

Temirova S. I., Partalokha I. V. & A. L. Turobov, 1984. Zooplankton i macrozoobenthos verkhnego techeniya reki Biyuk-Karasu v svyazi s problemoy okhrany malykh rek (Zooplankton and macrozoobenthos upstream of Biyuk-Karasu river in connection with problem of small rivers protection). *Prirodnye komplekсы Kryma, ikh optimizatsiya i okhrana. (Natural complexes of Crimea, optimisation and protection of them. Proceedings of scientific works), Simferopol'*: 135-141.

