

A close-up photograph of two damselflies perched on a vibrant green leaf. The damselfly in the foreground is positioned lower and to the right, while the second one is higher and to the left. Both insects have dark, translucent wings and slender bodies. The background is a soft-focus field of similar green leaves, creating a sense of a natural, outdoor environment.

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Update to Odonata of the Black Sea coast of the western Caucasus, Russia

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Abstract

Results are presented of a brief odonatological examination of the Abrau and Taman' Peninsulas at the northwesternmost Caucasian Black Sea coast in Krasnodarskiy Kray, Russia, on July 20-26, 2017. Twenty three species have been observed at the former peninsula and five at the latter. The Odonata records at the Abrau Peninsula are summarised, to include 34 species.

Key words: Russia, the West Caucasus, the Black Sea coast, Krasnodarskiy Kray, Odonata, fauna, the Abrau Peninsula, the Taman' Peninsula

Introduction

In mid-summer 2015-2016 I made two visits to the Black Sea coast of the western Caucasus, aimed to collect wild peas in nature. Although I failed to fulfil that aim, the trips were rewarded with a good deal of faunal data on Odonata, mostly from the Kabardinka village environs, including a new species recorded in Russian Federation. Since I did not plan to continue this research, I published those data (Kosterin & Solovyev 2017). Having however provided with precise data on wild pea localities in that area, I unexpectedly undertook one more trip on July 20-26, 2017, now successful with respect to wild peas found at the Abrau and Taman' Peninsulas. Expectedly, Odonata were also put on record and although no important faunal update was made, these observations worth publishing in brief, as only very limited data on Odonata of the two mentioned peninsulas can be found in literature. We arrived to the area immediately after a two-day long and very strong storm (bora) but during our visit the weather was good and hot and did not impair observing Odonata.

The summarising work by the western Caucasus, Bartenev (1930) involved one locality at Abrau Peninsula, which he denoted as "the Abrau, a small liman at the very sea shore" (page 5). The local word 'liman' used at the Black and Azov Seas means a brackish or freshwater river estuary isolated from the sea by a spit. Presently there are Abrau village situated apart from the sea and Dyurso village at the sea, which are often considered under a united name Abrau-Dyurso. Since there is a tiny brackish

estuary of the Dyurso River at Dyurso village, there is little doubt that it was the latter which Bartenev implied. For this locality he reported ten species.

On my previous trips to the western Caucasus (Kosterin & Solovyev 2017) I examined five localities at the north-western (Sukko and Bol'shoi Utrish, locs. 1-2) and south-eastern (Lake Krugloe, Yuzhnaya Ozereevka village, and Lake Abrau, locs 4-6) Abrau Peninsula and reported for them in sum seventeenth species, of which only three were those reported by Bartenev (1930) for Dyurso village (his "Abrau"), as discussed below. So, 24 species of Odonata were hitherto known for Abrau Peninsula. This paper updates the tally with ten more species.

As far as I know, no odonatological data have been published for the Taman' Peninsula. Since the localities themselves appear more important in this context than species found, I provide below locality-wise observations and their discussion.

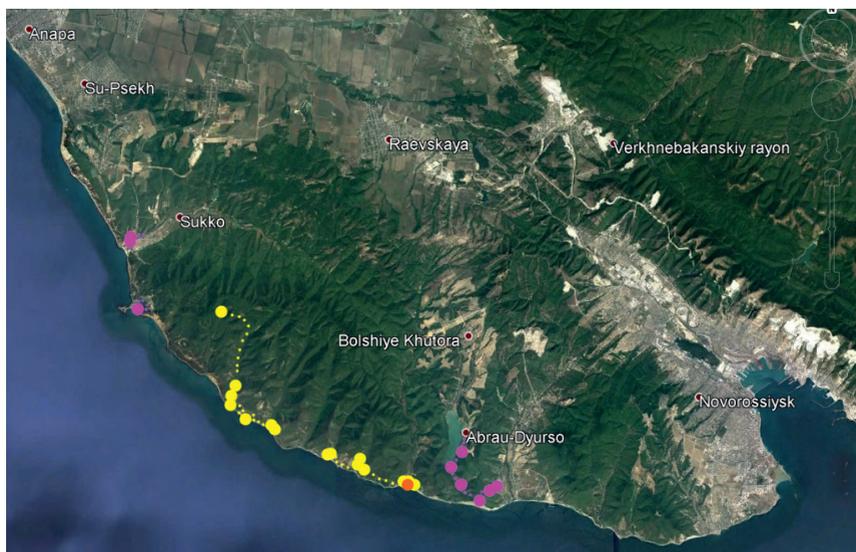


Figure 1. Localities of the Abrau Peninsula examined by the author in 2017 (yellow; this paper), 2014-2016 (pink; Kosterin & Solovyev 2017), and a locality examined by Bartenev (1930) in 1928 and the author in 2017 (orange). Small dots indicate walking routes. The mapping base is adopted from Google Earth.

Results

Abrau Peninsula

The mountainous Abrau Peninsula moderately extends into the Black Sea between the well-known cities of Anapa in the north-west and Novorossiysk in the south-east (Fig. 1). It is formed by the Navagir Mountain Range (up to 459 m a.s.l.) along the coast and the Kuznya Range (up to 483 m a.s.l.) along the Sukko River, both about 5 km long. The peninsula mostly has steep banks with high cliffs (Figs 2-3), divided by



Figure 2. The Black Sea Coast in the vicinity of Dyurso village (seen in the left photo).

Figure 3. The Black Sea Coast in the vicinity of Malyy Utrish village (seen in the lower photo).

small valleys, dry or with small rivulets, locally called 'shchel' ('crevice'). There are two flat capes protruding to the sea named Bol'shoy Utrish and Maly Utrish (Fig. 3). The region is seismically active and these capes resulted from catastrophic landslides in the past. The peninsula interior is occupied by the Utrish Nature Reserve. It is entirely covered with beech and /or oak forests. The drier coastal slopes are covered with hardly permeable low hornbeam (*Carpinus betulus* L.) / dawnny oak (*Quercus pubescens* Willd.) forests, sparser oak/pistachio (*Pistacea mutica* Fisch. ex C.A. Mey.) /smoketree (*Cotynus coggygria*

Scop) / juniper (*Juniperus excelsa* L., *J. foetidissima* Willd. and *J. oxycedrus* L.) / Christ's thorn (*Paliurus spina-christi* Mill.) stands, pure juniper forests, or more open grassy 'savannah'. There are two small groves of *Pinus pityusa* Stev. at the coast. The flat Malyy Utrich environs is mostly overgrown with oak forest with participation of ash, with grass or, mostly, butcher's broom (*Ruscus aculeatus* L.) in the ground layer. These plant communities are typical for the Mediterranean biota of the Black Sea coast of the Caucasus. For the flora of this area see Demina et al. (2015) and Seregin & Suslova (2016).

Of lotic habitats there is Lake Sukhoy Liman approximately at the centre of the peninsula and a smaller lake not far from Malyy Utrish village. This tiny village is reachable only by sea or two very bad ground roads, along the coast from Dyurso village or across the peninsula from Sukko Town, hence its surroundings are most pristine than the rest of the Black Sea coast in this area and almost devoid of resorts (Fig. 3), although the coastal forest is overloaded by thousands of 'wild' (not organised) tourist tents.

Dyurso River lowermost reaches

Within Dyurso village (Fig. 2), the Dyurso River (44.679-692° N, 37.561-567° E) is margined with tall poplars and flows, at a considerable speed but without turbulence, over a somewhat muddy bed with some stones, with abundant rush (*Juncus* sp.), some cattail (*Typha latifolia* L. s.l.), loosestrife (*Lythrum* sp.), and patches of reed (*Phragmites australis* (Cav.) Trin ex Stev.) and large-leaved *Petasites hybridus* (L.) Gaertn., Mey et Scherb. at banks and in the water. Brief examination on 21-22.07.2017 revealed numerous *Calopteryx splendens* (Harris, 1780) of both sexes which abounded reed, cattail and other tall grasses and herbs along the water course, and few *Ischnura elegans* (Vander Linden, 1820). Some individuals of *Aeshna affinis* Vander Linden, 1820 occasionally flew near the river during their evening trophic flight on 21.07.2017, and of *Aeshna mixta* (Linnaeus, 1758) in the morning 22.07.2017 but they exhibited no special attention to water.

There is a small (150 x 20 m) but deep pond-like expanded estuary before the shingle beach bar (44.679-680° N, 37.561-562° E), with fresh water judging by presence of frogs; examined on 21.07.2017. Its banks are occupied by reed and tress but that facing the shingle beach bar is barren. (This estuary [a "small liman"] was examined by A.N. Bartenev (1930) for two days in June 1928) There were few *C. splendens* (Fig. 4), enormous amount of *I. elegans*, and somewhat less but still very abundant *Platycnemis pennipes* (Pallas, 1771), both immature whitish and mature blue individuals (Fig. 5).

I. elegans was very frequent and *Sympetma fusca* (Vander Linden, 1820) frequent in shrubby edges and openings on the slopes bordering the valley (examined on 21-22 and 24.07.2017). Surprisingly, a copula of *Ischnura pumilio* (Charpentier, 1825) (Fig. 6a) was collected on 22.07.2017 among quite many *I. elegans* atop of the coastal bluff (44.677° N, 37.565° E, 45 m a.s.l.) 300 m E of the river. Few *I. elegans*, *Sympetrum meridionale* (Selys, 1841) and a female of *Orthetrum coerulescens anceps* (Schneider, 1845) (Fig. 7a) were registered in a herbaceous wasting land in place of an abandoned vineyard (44.683° N, 37.561° E) on 25.07.2017. Quite many *A. mixta* commenced trophic flight all over the valley from dawn to dusk, while numerous *A. affinis* joined them in



Figure 4. Two males of *Calopteryx splendens* at the Dyurso River estuary in Dyurso vil-
lage, 21.07.2017.



Figure 5. Immature (left) and mature (right) males of *Platycnemis pennipes* at the
Dyurso River estuary in Dyurso village, 21.07.2017.

dusk, since 8 p.m. to darkness; there was an impression that the latter species preferred to fly lower above the ground.

Less common species, obviously on dispersal, were found at the beach: at ca 7:30 a.m. 22.07.2017 an individual of *Selysiothemis nigra* (Vander Linden, 1825) was observed

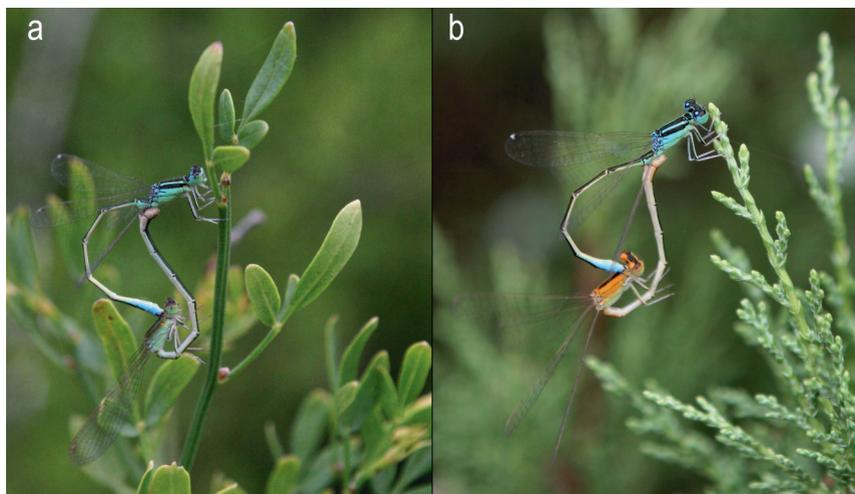


Figure 6. Copulae of *Ischnura pumilio*, at the top of a coastal cliff 300 m E of Dyurso village, 21.07.10`7 (a) and at a coastal slope with open pistachio/oak/hornbeam/juniper stand km E of Maly Utrish village, 22.07.2017 (b).

on scanty herbs behind the shingle bar (44.679° N, 37.560° E) and an individual of *Pantala flavescens* (Fabricius, 1798) patrolled over a nearby street, while at ca 10 a.m. 23.07.2017 several immature *Anax ephippiger* (Burmeister, 1839) flew along a low shingle bluff on a beach end near a coastal slope (44.678° N, 37.559° E).

Small congregations of *A. ephippiger* were also encountered at the valley boards: about a dozen individuals (1 collected) at a road going through hornbeam thickets along the western slope of the left valley board (44.679-680° N, 37.564-565° E, 48-54 m a.s.l.) at 7:32-7:40 a.m. 22.07.2017. At 5:53 p.m. on 20.07.2017; three individuals were startled from bases of several close tall grass stems at a roadside under a steep SE coastal slope (44.681° N, 37.557° E, 76 m a.s.l.), and again three individuals from exactly the same place at 9 a.m. next day (but none there at 6 p.m.).

In total 13 odonate species.

Coastal slopes and Maly Utrish Cape

The coastal slopes were examined between Dyurso Village and Mokraya Shchel' valley (44.680-694° N, 37.510-557° E) (Fig. 2) on 21.07.2017 and from 2 km NW to 1.5 km ESE of Maly Utrish village (44.703-723° N, 37.441-475° E) (Fig. 3) on 22-24.01.2017. The natural conditions are described above in the 'Area' section. All Odonata observed were on dispersal from breeding habitats.

S. fusca frequently occurred throughout the area, mostly under open tree canopy and at bushes. A male of *Lestes barbarus* (Fabricius, 1798) (Fig. 8c) was collected on a sunlit road going through dense oak/hornbeam forest on the Sukhaya Shchel' Valley right slope (44.688° N, 37.535° E). *I. elegans* was scarce, more frequent at slopes



Figure 7. Females of *Orthetrum coerulescens anceps* on 25.07.2017 in the Dyurso River valley at Dyurso village (a) and eastern environs of Taman' Town (b-c).

facing Mokraya Shchel' and Lobanova Shchel' valleys, occurring mostly in open areas at shrubbery and grove margins. Three males of *I. pumilio* (Fig. 6b) were collected among them on a SW slope (44.704° N, 37.475° E) facing both the sea and Lobanova Shchel' Valley.

Few to many individuals of *A. mixta* were permanently observed on trophic flight throughout the day or rest on low trees and all over the area; they were especially numerous at Mokraya Shchel' and Lobanova Shchel' Valleys. Among them few *A. affinis* occurred, being active even at midday at Mokraya Shchel' Valley on 21.07.2017 (again they flew above the road on average lower, 0.5-1 m, than *A. mixta*). In the mornings of 23-24.07.2017. *A. affinis* were observed to form temporary trophic swarms over the roads. At 7:46 on 23.07.2017 ca 1.3 km NW of Malyy Utrish valley, a female of *Anax imperator* was found on herbs under one of such swarms eating an individual of *A. affinis* (Fig. 9).

Also 1-3 individuals of *A. ephippiger* were frequently observed flying above the road from Dyurso village to Mokraya Shchel' Valley on 21.07.2017. On the same day they appeared (at ca 11-12 a.m.) very numerous and obviously congregated at quite a large area of a dry SSW slope with open juniper/oak/hornbeam stand (44.685-688° N, 37.532-534° E, 60-130 m a.s.l.) 2.4 km WNW of Dyurso village. There was obvious turnover between those flying in loose swarms and those resting at bases of grass and



Figure 8. *Lestes barbarus*: a – a female in the Shirokaya Shchel' valley in the vicinity of a nameless lake, 23.07.2017; b – a tandem at Lake Sukhoy Liman, 23.07.2017; c – a male on a road through oak forest ~2 km WNW of Dyurso village, 21.07.2017.

bush stems and were startled by dozens while walking. A less abundant congregation of this species was observed on the same day at a road going through SE slope of the Mokraya Shchel' valley (44.691-693° N, 37.510-513° E). Another very numerous congregation was observed at ca 7:42-50 a.m. on 23.07.2017 at roadside hornbeam thickets 1 km NW of Maly Utrish village (44.717-718° N, 37.449° E). Interestingly, not a single individual was observed there next morning. Neither this species was observed on 22-24.07.2017 elsewhere in the vicinity of Maly Utrish village. All individuals of *A. ephippiger* observed were immature (Fig. 10), still with dull-pinkish rather than blue colour of abdominal segment 2.

An individual of *Lindenia tetraphylla* (Vander Linden, 1825) was startled from a forest road 0,9 km NW of Maly Utrish at ca 7:30 a.m. (44.716° N, 37.451° E), and then was clearly observed flying over further section of the same road (44.719° N, 37.449° E) at ca 8:30 on 23.07/2017.

Immature, still yellow, individuals of *S. meridionale* were common throughout the area (2 collected); most of them were heavily infested by water mites while other dragonflies were free of those (the same was observed in 2015-2016 at Kabardinka village, see Kosterin & Solovyev 2017). *Sympetrum fonscolombii* (Selys, 1840) (1 col-



Figure 9. A female of *Anax imperator* devouring *Aeshna affinis* 1.3 km NW of Maly Utrish village on 23.07.2017.

lected) were fewer in number but still common, mostly at more open areas at the main road or at cliffs above the sea (Fig. 11). They were also all immature, still yellowish-orange rather than red. I was trying to catch and collect any *Sympetrum* looking differently from these two species. This yielded 2 of *Sympetrum vulgatum* (Linnaeus, 1758) at the above mentioned dry SSW slope (44.685-688° N, 37.532-534° E) 2.4 km WNW of Dyurso village on 21.07.2017: 1 of the latter species and 2 of *Sympetrum striolatum* (Charpentier, 1840) 1-1.5 km NW-NNW of Maly Utrish village on 23.07.2017 and another of the same species at Maly Utrishy village on 22.07.2017. Both males of *S. vulgatum* attracted attention by resting only on barren detritus (Fig. 12) while other species invariably perched on grasses or bush branches.

S. nigra occurred on open places over the area as solitary females (Fig. 13) or immature (still greyish) males (1, 1 collected) perching on high prominent sticks or stems. They were quite frequent on the above mentioned dry slope 2.4 km WNW of Dyurso village (44.685-688° N, 37.532-534° E). A female of *Orthetrum brunneum* (Fonscolombe, 1837) was also collected there. They all, as well as *Sympetrum* spp., could have emerged from two small ponds (44.685-686° N, 37.524-526° E), surrounded by thick



Figure 10. Immature male (above) and female (below) of *Anax ephippiger* 1.3 km NW of Malyy Utrish village on 23.07.2017.

reed (Fig. 14), at the sea bank below (0.5 km SW), but these were in the restricted territory of the resort of the Moscow State Technical University and could not be examined.

On 21.07.2017, individuals of *Pantala flavescens* were from time to time observed flying above the main road along the coast, often together with *A. ephippiger*. At 7:45 p.m. on 20.07.2017, two females were observed to land for rest on hornbeam branches in its open stand 1.5 km W of Dyurso village (44.682° N, 37.542° E).

In total 16 species.

Of three deep valleys examined, that of Mokraya Shchel' had a small running stream while those of Sukhaya Shchel' and Lobanova Shchel' had dry shingle beds of temporary streams. No lotic species were found.



Figure 11. A male of *Sympetrum fonscolombii* at a sea facing cliff WNW of Dyrurso village, 21.07.2017.



Figure 12. A male of *Sympetrum vulgatum* on a SWS slope 2.4 km WNW of Dyrurso village, 21.07.2017.



Figure 13. A female of *Selysiothemis nigra* on a SWS slope 2.4 km WNW of Dyrurso village, 21.07.2017.

Lake at Shirokaya Shchel' valley

There is a small (140 x 70 m) nameless (?) lake (44.723-725° N, 37.452-453° E, 40 m a.s.l.) in the Shirokaya Shshel' valley, clad with thick oak forest with participation of hornbeam and junipers (Fig. 15), 1.5 km NW of Maly Utrish village, well seen from a nearby road. Its northern bank is very shallow and muddy (with astonishingly numerous



Figure 14. Two ponds at the sea shore 3 km W of Dyurso village, with the access restricted, possible habitats of *Lestes barbarus*, *Sympetma fusca*, *Ischnura elegans*, *I. pumilio*, *Aeshna affinis*, *A. mixta*, *Selysiothemis nigra* and *Sympetrum* spp. 21.07.2017.



Figure 15. A nameless (?) lake in the Shirokaya Shchel' valley, 1.5 km NW of Malyy Utrish village, 23.07.2017.



Lispe flies of four species kindly identified by Nikita Vikhrev: *L. tentaculata* (De Geer, 1776), *L. longicollis* Meigen, 1826, *L. melaleuca* Loew, 1847 and *L. nana* Masquart, 1835), with sparse dead bushes of Christ's thorn and a tiny cold stream emerging under nearby bushes, obviously from ground waters, and entering the lake. The southern bank is steep and the water looks deep. The water is very clear but devoid from macrophytes, only with some small floating mats of filamentous algae. Examined at 1:00-1:40 p.m. on 23.07.2017.

Odonates were abundant there. There were tandems of *Erythromma viridulum* Charpentier, 1840 (2, 1 collected) ovipositing, by 4-5 and very closely to each other, on scarce algae mats (Fig. 16), common *I. elegans* and an admixture of *I. pumilio*, few tandems of *L. barbarus*, several *A. imperator* females ovipositing at muddy banks, a number of males and copulae of *Orthetrum cancellatum* (Linnaeus, 1758) (Fig. 17a) and at least one male of *O. albistylum* (Selys, 1848). At the nearby road a mature female of *O. cancellatum* (Fig. 17b) and several *L. barbarus* (Fig. 8a) were met, as well as everywhere common *A. mixta* and *S. meridionale*. In total 9 species.

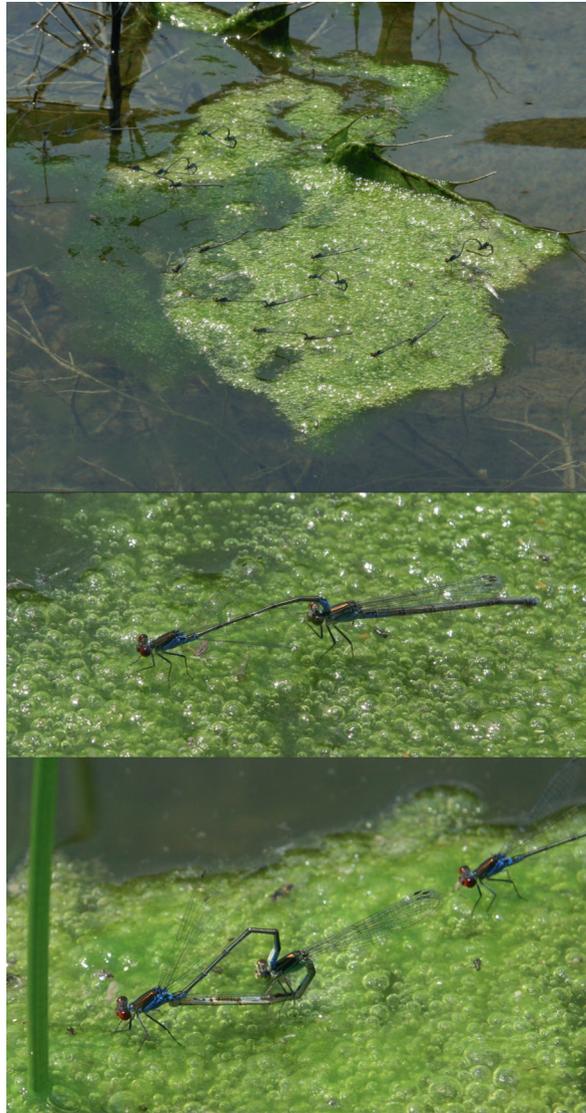
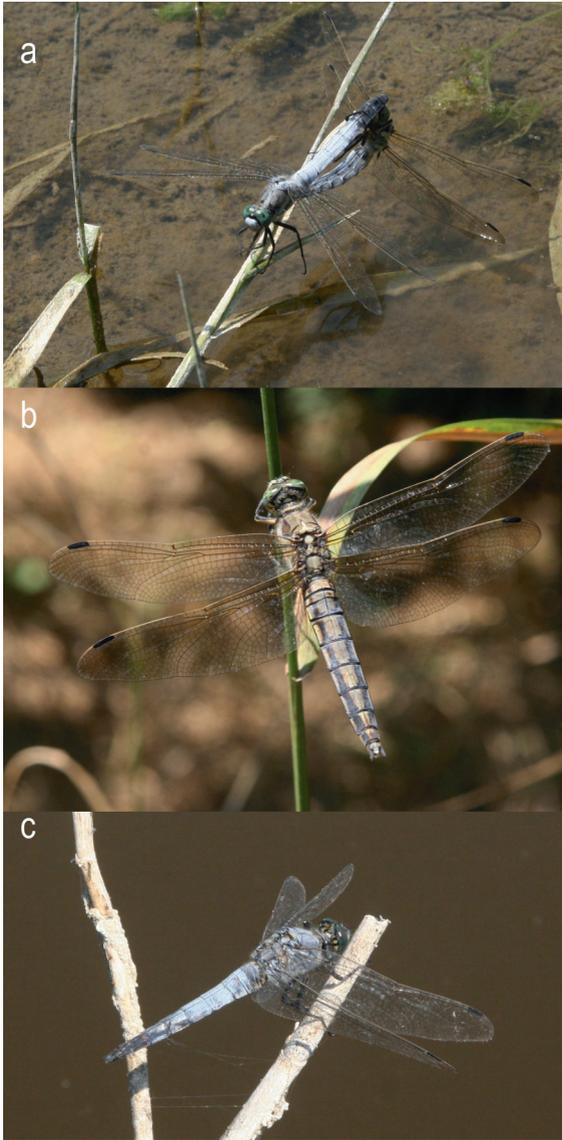


Figure 16. Copulae and ovipositing tandems of *Erythromma viridulum* at a nameless (?) lake 1.5 km NW of Malyy Utrish village, 23.07.2017.



Lake Sukhoy Liman

Lake Sukhoy Liman (44.754-756° N, 37.454-458° E, 293 m a.s.l.) (Fig. 18) is the only considerable sized (260 x 250 m) and well known lake at the Peninsula, harbouring a number of aquatic and semiaquatic plant species not found elsewhere in the area (Seregin & Suslova 2016). Examined at 10:15-11:40 on 23.07.2017. It is situated in a broad and shallow intermontane depression with some meadows and surrounding hills covered with thick beech (*Fagus orientalis* Lipsky) and oak forests with participation of *Pinus kochiana* Klotzsch ex C. Koch. The water is very shallow and warm, said to become brackish to the end of the summer (Seregin & Suslova 2016), banks muddy (also with abundant *Lispe* sp., but not as numerous as above), surrounded by a stripe of

Figure 17. *Orthetrum cancelatum* at a nameless (?) lake 1.5 km NW of Malyy Utrish village, 23.07.2017 (a-b) and at the Dymkova Balka valley 4.25 km W of Taman' Town, 26.07.2017 (c): a – a copula; b – a female; c – a male.

almost pure carpet of young plants of an invasive ruderal species *Xanthium californicum* Greene, at the NE side near the road accompanied with the second stripe of a pure carpet of young plants of another such species from the same family, *Ambrosia artemisifolia* L. There is sparse emergent vegetation all over the water table, represented mostly by *Scirpus* (*Schoenoplectus*) *lacustris* L. and to a lesser extent by some emergent

plant with broader leaves but without inflorescences. There were also cattail thickets (*Typha* sp.), mostly at N bank.

Damselflies were numerous at the emergent vegetation, mostly *I. elegans* with an admixture of *I. pumilio* (3 collected), many *L. barbarus* including tandems (Fig. 8b) (more in cattail) (3 collected). At the *Xanthium* stripe I noticed a fast flying blue damselfly which appeared to be a mature male of *P. pennipes* (collected), not at all

expected at a stagnant eutrophic lake of some salinity. A male of *A. imperator* ranged at the deeper southern bank, with more open water, while many males of *A. affinis* commenced reproductive flight among emergent vegetation, especially cattail (their typical breeding habitat), very unlike their trophic flight: slow, persistent, with numerous conflicts with each other. At emergent vegetation there were *Sympetrum sanguineum* (Müller, 1764) (2 collected), not abundant, mostly teneral, some orange, one mature (Fig. 19), and few males *S. fonscolombii*. At roads going through surrounding forests immature *S. sanguineum* were also quite frequent (this species was not observed beyond the Sukhoy Liman depression).

In total only 8 species at so conspicuous a lake.



Figure 18. Lake Sukhoy Liman, 23.04.2017.



Figure 19. A male of *Sympetrum sanguineum* at Lake Sukhoy Liman, 23.04.2017.

Discussion

Bartenev (1930) reported for the Dyurso village env. [for the interpretation of his 'Abrau' see above] the following 10 species (Table 1): *Calopteryx virgo feminalis*, Kosterin 2017 (as "*Calopteryx virgo festiva* var. *feminalis* Bart.", for details see Kosterin 2017), *I. elegans*, *Coenagrion pulchellum* (Vander Linden, 1825) (as "*Agrion pulchellum* Lind."), *Erythromma lindenii* (Selys, 1840) (as "*Agrion lindenii* Selys"), *Aeshna isocetes* (Müller,

Table 1. Odonata species recorded at Abrau Peninsula (subspecies not indicated),

Species	Bartenev (1930); data of 11- 12.06.1928	Kosterin & Solovyev (2017); data of 4- 5.08.2015, 9.07.2016	this paper; data of 20- 24.07.2017
<i>Calopteryx splendens</i> (Harris, 1780)	-	-	+
<i>Calopteryx virgo</i> (Linnaeus, 1758)	+	-	-
<i>Lestes barbarus</i> (Fabricius, 1798)	-	-	+
<i>Sympecma fusa</i> (Vander Linden, 1820)	-	+	+
<i>Coenagrion pulchellum</i> (Vander Linden, 1825)	+	-	-
<i>Coenagrion scitulum</i> (Rambur, 1842)	-	+	-
<i>Erythromma lindenii</i> (Selys, 1840)	+	-	-
<i>Erythromma viridulum</i> Charpentier, 1840	-	+	+
<i>Ischnura elegans</i> (Vander Linden, 1820)	+	+	+
<i>Ischnura pumilio</i> (Charpentier, 1825)	-	+	+
<i>Platycnemis pennipes</i> (Pallas, 1771)	-	-	+
<i>Aeshna affinis</i> Vander Linden	-	+	+
<i>Aeshna mixta</i> (Linnaeus, 1758)	-	+	+
<i>Aeshna isaceles</i> (Müller, 1767),	+	-	-
<i>Anax ephippiger</i> (Burmeister, 1839)	-	-	+
<i>Anax imperator</i> Leach, 1815	+	+	+
<i>Anax parthenope</i> Selys, 1839	+	+	-
<i>Lindenia tetraphylla</i> (Vander Linden, 1825)	-	-	+
<i>Onychogomphus forcipatus</i> (Linnaeus, 1758)	-	+	-
<i>Cordulia aenea</i> (Linnaeus, 1758)	+	-	-
<i>Crocothemis erythraea</i> (Brullé, 1832)	-	+	-
<i>Libellula depressa</i> (Linnaeus, 1758)	+	-	-
<i>Libellula fulva</i> Müller, 1764	+	-	-
<i>Orthetrum albistylum</i> (Selys, 1848)	-	+	+
<i>Orthetrum cancellatum</i> (Linnaeus, 1758)	-	-	+
<i>Orthetrum coerulescens</i> (Fabricius, 1798)	-	+	+
<i>Orthetrum brunneum</i> (Fonscolombe, 1837)	-	-	-
<i>Pantala flavescens</i> (Fabricius, 1798)	-	-	+
<i>Selysiothemis nigra</i> (Vander Linden, 1825)	-	+	+
<i>Sympetrum fonscolombii</i> (Selys, 1840)	-	+	+
<i>Sympetrum meridionale</i> (Selys, 1841)	-	+	+
<i>Sympetrum sanguineum</i> (Müller, 1764)	-	+	+
<i>Sympetrum striolatum</i> (Charpentier, 1840)	-	-	+
<i>Sympetrum vulgatum</i> (Linnaeus, 1758)	-	-	+
Total: 34; subtotal:	10	17	23

1767), *Anax imperator*, *A. parthenope*, *Cordulia aenea* (Linnaeus, 1758), *Libellula depressa* (Linnaeus, 1758), *L. fulva* Müller, 1764. All they were collected by himself on 11-12.06.1928

but *A. parthenope* was collected on 30.05.1902 by A. Brauner. The record of *E. lindenii* until present remains the only in the Russian part of the Caucasus (Skvortsov 2010).

On 4-5.08.2015 and 10.07.2016, I observed and collected at five localities at both ends of the Abrau Peninsula 17 species (Kosterin & Solovyev 2017) (Table 1), of which only three, *I. elegans*, *A. imperator* and *A. parthenope* were from the Bartenev's list while 14 were formally new to the Peninsula, namely *Sympecma fusca*, *Coenagrion scitulum* (Rambur, 1842), *Erythromma viridulum* Charpentier, 1840, *Ischnura pumilio*, *Aeshna affinis*, *A. mixta*, *Onychogomphus forcipatus forcipatus* (Linnaeus, 1758), *Crocothemis erythraea* (Brullé, 1832), *Orthetrum albistylum* (Selys, 1848), *Orthetrum coerulescens anceps*, *Selysiotthemis nigra*, *Sympetrum fonscolombii*, *S. meridionale*, *S. sanguineum*. Such a great difference could be explained by seasonality, as Bartenev worked there in early summer while I in mid/late summer.

Hereby I report 23 species found on the Peninsula on 20-25.07.2017 (for six days, that is a longer examination than the two mentioned above), as follows (new for the Peninsula boldfaced): *C. splendens*, *L. barbarus*, *S. fusca*, *E. viridulum*, *I. elegans*, *I. pumilio*, *P. pennipes*, *A. affinis*, *A. mixta*, *A. ephippiger*, *A. imperator*, *L. tetraphylla*, *A. albistylum*, *O. brunneum*, *O. coerulescens*, *O. cancellatum*, *P. flavescens*, *S. nigra*, *S. fonscolombii*, *S. meridionale*, *S. sanguineum*, *S. striolatum*, *S. vulgatum*. Nearly half of them, 12 (not boldfaced) were reported earlier: 2 by Bartenev (1930) and all by us (Kosterin & Solovyev 2017), while 11 (boldfaced) are formally new for the Peninsula. So, the known (for the hundred years of too few and brief examinations) fauna of Abrau Peninsula reached 34 species (Table 1), that is not bad for a mountainous region with scanty water bodies. Nevertheless, early summer deserves more attention in this area, especially with 89 years passed since the previous brief examination by Bartenev. First of all, the unexpected occurrences of the western species *E. lindenii* and the northern species *C. aenea* are to be confirmed, at least in the present time.

An irregular invasion of *A. ephippiger*, as common for this species, has been witnessed on this trip, which will be discussed in detail elsewhere (Kosterin & Borisov in press), together with a synopsis of records of this species in Russian Federation. Note that another migrant species, *P. flavescens*, was observed along with it, although in much lesser quantities.

Interestingly, Bartenev (1930) reported for Dyurso River only *C. virgo* while I observed only *C. splendens* (but very numerous). At the same time, in 2015-2016 I found both (the former much more abundant) 40 km ESE at the Doob River in Kabardinka village (Kosterin & Solovyev 2017). It is remarkable that males of *C. splendens* at Dyurso River had the wingspot size as common in Europe (Fig. 4), while those from Kabardinka had the wingspot expanded almost to wing tips, leaving only very narrow transparent rims at apices (Kosterin & Solovyev 2017: fig. 9).

Taman' Peninsula

The Taman' Peninsula protrudes from the Caucasian Black Sea coast to the west, enclosing the shallow (only to 5 m deep) Taman' Bay of the Kerch Strait. It had a rich and multi-ethnic history started in VI century B.C. with foundation of the Greek towns Hermonassa and Phanagoria. In X-XI century there existed the southernmost of the

Russian principalities with the capitol Tmutarakan' at the site of the former Hermonassa, presently Taman' Town. (Curiously, the word 'tmutarakan'' was inherited by the contemporary Russian language with the meaning 'most remote, desolate and desperate place'). The Peninsula has a very gently hilly relief and is covered by steppe (Fig. 20), at the time of our visit on 25-26.07.2017, already dried out. There are several vast brackish 'limans' formed by the large Kuban' River at the southern coast facing the Black Sea. These should be interesting dragonfly habitats but unfortunately remained unstudied. I had an opportunity to examine only two localities at the northern coast.



Figure 20. The northern coast of Taman' Peninsula in the western vicinity of Taman' Town, 26.04.2017.

The coast itself was explored from Taman' Town to 2.6 km NE of it (45.218-225° N, 36.720-750° E, 293 m a.s.l.) on 25.07.2017, to find only one species, *O. coerulescens anceps*, many females at different stages of age-related darkening (Fig. 7b-c) and one male of which were found at the dried out thickets of legume herbs (*Vicia* sp., *Lathyrus tuberosus* L.) at a low stony wall along the coastal cliffs.

On 26.07.2017 I examined a small (130 x 52 m) natural lake (45.216-218° N, 36.661-662° E) in the Dymkova Balka valley (Fig. 21) 4.25 km W of Taman', situated just 100 m SW and 16 m above the sea. It had impermeable banks of sticky saturated-black mud, indicative for brackish water, overgrown by narrow but continuous thickets of reed. (Locals said that some 20 years ago it had clear firm banks.) The water surface along the banks was patrolled by a male of *Anax parthenope* Selys, 1839 and the banks by one or two males of *O. cancellatum* which also perched on broken reed (Fig. 17c). The reed thickets were full of *I. elegans*, including copulae. Nearby at scarce bushes of hawthorn (*Crataegus* sp.) near a small grove of Asiatic elm (*Ulmus pumila* L.) and cherry plum (*Prunus cerasifera* Ehrh.), two males of *S. striolatum* (Fig. 22) were found to perch on prominent branches without leaves (one photographed).

Only five species registered.

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Figure 21. A small lake in the Dymkova Balka valley 4.25 km W of Taman' Town, 26.04.2017.



Figure 22. A male of *Sympetrum sanguineum* in the Dymkova Balka valley, 23.04.2017.

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There are a number of reasons for the increase in the number of people employed in the public sector. One reason is that the public sector has become a major employer in the UK. Another reason is that the public sector has become a major employer in the health care sector. A third reason is that the public sector has become a major employer in the education sector.

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