Ukrainian Journal of Ecology

Ukrainian Journal of Ecology, 2017, 7(4), 157–168, doi: 10.15421/2017_100

ORIGINAL ARTICLE

Annotated checklist of the dragonflies (Insecta: Odonata) of the Kaliningrad region, north-western Russia.

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Submitted: 21.08.2017. Accepted: 25.11.2017

The first comprehensive surveys on Odonata were made more than 100 years ago, at the beginning of 20th century by La Baume (1908) and especially by Le Roi (1911) and included 50 species. In the following years, no significant publications which particularly address faunistic and taxonomic studies related to the Kaliningrad region were published. Here we present the first modern, most complete checklist of the dragonflies of the Kaliningrad region with notes on the species composition, abundance, and periods of local flight and seasonal migrations. The current checklist is based on data collected by the authors on the Courish Spit (Kaliningrad region, Russia) in 2007-2016. In total, 278 955 specimens belonging to 57 species were recorded. Additional 7 species are included in the list based on the literature data. Thus, the number of species known for the territory of the Kaliningrad region has risen to 64.
Key words: Dragonflies; checklist; Kaliningrad region; Courish Spit; Baltic Sea

Introduction

The dragonfly fauna (Insecta, Odonata) of the Kaliningrad region has received little attention from professional odonatologists. One of the major surveys providing by far the most detailed study on Odonata of this region was published by Le Roi in 1911 and is long out of date. In his publication Le Roi mentioned 50 recorded species for the dragonfly fauna of East Prussia (present day the Kaliningrad region) based on material collected in the 19th century. Since then no comprehensive studies were conducted over the years with the exception of data on 14 dragonflies species collected during nine days of observations in ornithological traps on the Courish Spit, with *Sympecma fusca* and *Anax parthenope* new for the Kaliningrad region (Bertram & Haacks, 1999). The territory of the Kaliningrad region underwent considerable biotopical changes and human habitat disturbance over the past century. These factors, together with climate changes might be expected to affect the species composition of the dragonfly fauna and distribution ranges of dragonflies, as it was shown for some European countries (Ott, 2001, 2010; Hassall et al., 2007; Flenner & Sahlén, 2008; Bernard et al., 2009; Termaat, 2010; De Knijf et al., 2011). Thus, the Kaliningrad region remained one of the most poorly studied areas of Europe. Taking this into account, modern studies are required to provide the most complete to date checklist of the dragonflies and to reveal the characteristics of the dragonfly fauna of the Kaliningrad region, such as number of species, species abundance and periods of local and seasonal migrations.

Unlike the Kaliningrad region, dragonflies of adjacent territories and neighboring countries (Poland, Lithuania and Latvia) have been intensively studied over the recent years. According to the literature and newly collected records (see Table 1): 73 dragonfly species have been recorded in Poland (Bernard et al., 2009); 66 dragonfly species have been recorded in Lithuania (Stanionytė, 1993; Bernard, 2002, 2005; Bernard & Ivinskis, 2004; Bernard et al., 2008; Ivinskis & Rimšaitė, 2010; Gliwa, 2013; Gliwa & Stukonis, 2011; Gliwa et al., 2016; Račkauskaitė & Gliwa, 2015); and 60 dragonfly species have been recorded in Latvia (Kalniņš, 2012).

The dragonfly fauna of the Kaliningrad region is unquestionably understudied with a total of just 52 species listed. Therefore there was a considerable disparity between the number of species that have been recorded in the Kaliningrad region and neighboring countries. Investigations of the dragonfly fauna and migrations of Odonata that we started several years ago resulted in new and interesting records for the Kaliningrad region itself and Baltic countries as a whole (Shapoval & Buczyński, 2012; Buczyński et al., 2014). The present study summarizes personal observations data of Odonata gathered in 2007-2016 on the Courish Spit in the Baltic Sea and literature data, and provides new insights into dragonfly fauna of the Kaliningrad region.

Table. 1. Checklist of the Odonata species recorded in Poland, Lithuania, Latvia and the Kaliningrad region.

Species	Kaliningrad region		Poland	Lithuania	Latvia
	Present study	Le Roi, 1911			
Calopteryx splendens (Harris, 1782)	+	+	+	+	+
Calopteryx virgo (Linnaeus, 1758)	+	+	+	+	+
Lestes sponsa (Hansemann, 1823)	+	+	+	+	+
Lestes dryas Kirby, 1890	+	+	+	+	+
Lestes barbarus (Fabricius, 1798)	+	+	+	+	
Lestes virens (Charpentier, 1825)	+	+	+	+	+
Lestes macrostigma (Eversmann, 1836)			+		
Chalcolestes viridis (Vander Linden, 1825)	+		+	+	
Sympecma fusca (Vander Linden, 1820)	+		+	+	
Sympecma paedisca (Brauer, 1877)	+		+	+	+
Ischnura elegans (Vander Linden, 1820)	+	+	+	+	+
Ischnura pumilio (Charpentier, 1825)	+	+	+	+	+
Enallagma cyathigerum (Charpentier, 1840)		+	+	+	+
Coenagrion pulchellum (Vander Linden, 1825)	+	+	+	+	+
Coenagrion puella (Linnaeus, 1758)	+	+	+	+	+
Coenagrion ornatum (Selys, 1850)			+		
Coenagrion scitulum (Rambur, 1842)			+		
Coenagrion hastulatum (Charpentier, 1825)		+	+	+	+
Coenagrion lunulatum (Charpentier, 1840)		+	+	+	+
Coenagrion johanssoni (Wallengren, 1894)				+	+
Coenagrion armatum (Charpentier, 1840)		+	+	+	+
Erythromma najas (Hansemann, 1823)	+	+	+	+	+
Erythromma viridulum (Charpentier, 1840)			+	+	+
Erythromma lindenii (Selys, 1840)			+		
Pyrrhosoma nymphula (Sulzer, 1776)		+	+	+	+
Nehalennia speciosa (Charpentier, 1840)		+	+	+	+
Platycnemis pennipes (Pallas, 1771)	+	+	+	+	+
Aeshna mixta Latreille, 1805	+	+	+	+	+
Aeshna affinis Vander Linden, 1820	+		+	+	
Aeshna isoceles (Müller, 1767)	+	+	+	+	+
Aeshna grandis (Linnaeus, 1758)	+	+	+	+	+
Aeshna caerulea (Ström, 1783)			+		+
Aeshna cyanea (Müller, 1764)	+	+	+	+	+
Aeshna crenata Hagen, 1856				+	+
Aeshna viridis Eversmann, 1836	+	+	+	+	+
Aeshna juncea (Linnaeus, 1758)	+	+	+	+	+
Aeshna subarctica Walker, 1908	+		+	+	+
Anax imperator Leach, 1815	+	+	+	+	+
Anax parthenope (Selys, 1839)	+		+	+	+
Anax ephippiger (Burmeister, 1839)			+		+
Brachytron pratense (Müller, 1764)	+	+	+	+	+
Gomphus vulgatissimus (Linnaeus, 1758)	+	+	+	+	+
Gomphus flavipes (Charpentier, 1825)	+	+	+	+	+
Ophiogomphus cecilia (Fourcroy, 1785) (=*Ophiogomphus serpentinus* (Charpentier, 1825) in: Le Roi, 1911)	+	+	+	+	+
Onychogomphus forcipatus (Linnaeus, 1758)	+	+	+	+	+
Cordulegaster boltonii (Donovan, 1807) (=*Cordulegaster annulatus* (Latrielle, 1805) in: Le Roi, 1911)		+	+	+	+
Cordulegaster bidentata Selys, 1843			+		
Cordulia aenea (Linnaeus, 1758)	+	+	+	+	+
Somatochlora metallica (Vander Linden, 1825)	+	+	+	+	+
Somatochlora flavomaculata (Vander Linden, 1825)	+	+	+	+	+
Somatochlora arctica (Zetterstedt, 1840)	+		+	+	+
Somatochlora alpestris (Selys, 1840)			+		
Epitheca bimaculata (Charpentier, 1825)	+	+	+	+	+
Libellula quadrimaculata Linnaeus, 1758	+	+	+	+	+

Libellula depressa Linnaeus, 1758	+	+	+	+	+
Libellula fulva Müller, 1764	+	+	+	+	+
Orthetrum cancellatum (Linnaeus, 1758)	+	+	+	+	+
Orthetrum albistylum (Selys, 1848)	+		+	+	
Orthetrum coerulescens (Fabricius, 1798)	+		+	+	
Orthetrum brunneum (Fonscolombe, 1837)	+		+	+	+
Leucorrhinia dubia (Vander Linden, 1825)	+	+	+	+	+
Leucorrhinia rubicunda (Linnaeus, 1758)	+	+	+	+	+
Leucorrhinia pectoralis (Charpentier, 1825)	+	+	+	+	+
Leucorrhinia albifrons (Burmeister, 1839)	+	+	+	+	+
Leucorrhinia caudalis (Charpentier, 1840)	+	+	+	+	+
Sympetrum danae (Sulzer, 1776)	+	+	+	+	+
Sympetrum pedemontanum (Müller in Allioni, 1766)	+	+	+	+	+
Sympetrum sanguineum (Müller, 1764)	+	+	+	+	+
Sympetrum depressiusculum (Selys, 1841)			+	+	
Sympetrum flaveolum (Linnaeus, 1758)	+	+	+	+	+
Sympetrum fonscolombii (Selys, 1840)	+	+	+	+	+
Sympetrum striolatum (Charpentier, 1840)	+		+	+	+
Sympetrum vulgatum (Linnaeus, 1758)	+	+	+	+	+
Sympetrum meridionale (Selys, 1841)	+		+		
Crocothemis erythraea (Brullé, 1832)	+		+	+	
Pantala flavescens (Fabricius,1798)	+				
Total	**57**	**50**	**73**	**66**	**60**

Material and methods

Dragonflies were collected in the period of 2007-2016 on the Courish Spit 12 km S of Rybachy village (Fig. 1), at the field station Fringilla (55°05'N, 20°44'E) belonging to the Biological Station of the Zoological Institute, Russian Academy of Sciences, and in some other localities of the Courish Spit. The Courish Spit is a narrow, extending from the south-west to the north-east peninsula (98 km in length and 0.7 to 3.5 km in width), separating Courish Lagoon from the Baltic Sea. Its main landscape is sand dunes, nowadays mostly covered by planted woodland (*Pinus montana* and *Pinus sylvestris*). Wetlands, meadows and small lakes are very scarce and located mostly in the vicinity of the Rybachy village. The natural forest landscape is represented by scattered in terrain depressions birch woods (*Betula pendula*), aspen (*Populus tremula*) and black alder forests (*Alnus glutinosa*) with abundant herbaceous vegetation consisting mostly of *Urtica dioica* and *Pteridium aquilinum*.

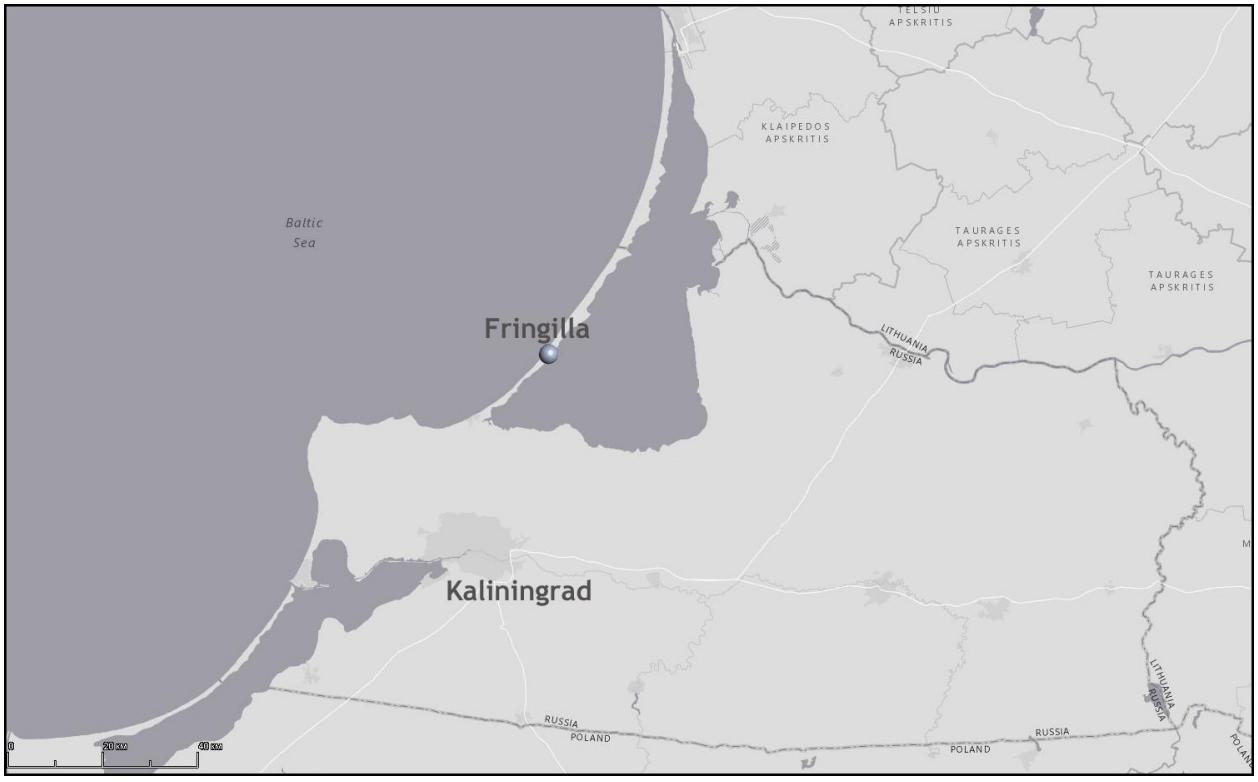

Fig. 1. Map of the Kaliningrad region. The circle indicates location of the study site on the Courish Spit.

On the Courish Spit, Rybachy-type ornithological funnel traps are used for birds migration monitoring. They constitute gradually narrowing cones about 60-70 m long, with a broad entrance (35 m in width and 15 m height) and a small chamber at the end (Fig. 2a). More detailed descriptions of these traps were given by Payevsky (2000) and Shapoval & Buczyński (2012). The traps are located at the boundary between pine forest and sand dunes and allow passive capture of flying birds and also insects: primarily lepidopterans and dragonflies (Shapoval et al., 2005; Shapoval & Shapoval, 2006, 2007; Shapoval & Buczyński, 2012; Buczyński et al., 2014) (Fig. 2b).

Fig. 2. Ornithological Rybachy-type funnel trap (a); dragonflies in the trap (b).

Observations were carried out in the following periods:
2007: 07.07-29.10
2008: 30.03-27.10
2009: 30.03-26.10
2010: 31.03-29.10
2011: 31.03-25.10
2012: 30.03-29.10
2013: 03.04-28.10
2014: 01.04-27.10
2015: 01.04-26.10
2016: 01.04-26.10

Results

Dragonflies were recorded from the first 10-day period of May to the third 10-day period of October. Overall, 278 955 specimens belonging to 57 species were recorded in 10 years of observations (Table 2). The most numerous species were: *Libellula quadrimaculata* (164 904 specimens recorded – 59.15% of the total number of recorded dragonflies), *Sympetrum vulgatum* (53 816 – 19,3%), *Sympetrum sanguineum* (24 919 – 8,9%), *Sympetrum danae* (11 072 – 4%), *Aeshna mixta* (7 211 – 2,6%), *Sympetrum flaveolum* (6 451 – 2,3%), *Somatochlora flavomaculata* (3 090 – 1,1%), *Aeshna juncea* (1 467 – 0,53%) and *Leucorrhinia pectoralis* (1 295- 0,46%). The number of recorded specimens varied considerably in different years from 7 090 in 2015 (only 2,5% of the total number of recorded dragonflies) to 105 786 in 2013 (37,9%). High number of recorded dragonflies in the year 2013 were mainly caused by massive and intensive migration of the following dragonflies species: *Libellula quadrimaculata*, *Sympetrum sanguineum, Sympetrum vulgatum* (75 776, 14 532 and 10 373 specimens collected in Rybachy-type ornithological traps, respectively). These three species with a grand total of 100 681 specimens collected, constitute 95% of the overall number of dragonflies recorded in 2013.
21 species had been recorded annually (not considering the year 2007, when observation started in mid-July), namely *Aeshna cyanea, Aeshna grandis, Aeshna juncea, Aeshna mixta, Aeshna viridis, Anax imperator, Brachytron pratense, Cordulia aenea, Epitheca bimaculata, Somatochlora arctica, Somatochlora flavomaculata, Somatochlora metallica, Leucorrhinia pectoralis, Leucorrhinia rubicunda, Libellula depressa, Libellula quadrimaculata, Orthetrum cancellatum, Sympetrum danae, Sympetrum flaveolum, Sympetrum sanguineum, Sympetrum vulgatum.* On average, 29-33 species were recorded per year with just two exceptions (40 species were registered in 2014 and 41 species were caught in 2011). Notably, the years with the highest numbers of recorded species (2011 and 2014) do not match the years with the highest numbers of recorded specimens (2010, 2012, 2013, 2016).

Discussion

The number of dragonflies species that occur in the Kaliningrad region has certainly been underestimated previously. Until recently, the comprehensive survey published by Le Roi in 1911 remained one of the main sources for dragonflies data of the Kaliningrad region with 50 mentioned Odonata species. At the end of 20th century, Bertram & Haacks (1999) published the results of their 9-day observations at the Biological Station Rybachy on the Courish Spit. They recorded 14 species of Odonata, including two new species for the region (*Sympecma fusca* and *Anax parthenope*). Since then, no reliable data on Odonata were published. Our data, gathered in 2007-2016, revealed presence of 12 new species for the territory of the Kaliningrad region. These species are: *Chalcolestes viridis*, *Sympecma paedisca*, *Aeshna affinis*, *Aeshna subarctica*, *Somatochlora arctica*, *Orthetrum albistylum*, *Orthetrum coerulescens*, *Orthetrum brunneum*, *Sympetrum striolatum*, *Sympetrum meridionale*, *Crocothemis erythraea*, *Pantala flavescens*. Thus, the number of species known for the territory of the Kaliningrad region has risen to 64.
Nine of these species have not been recorded in Latvia: *Orthetrum albistylum*, *Orthetrum coerulescens*, *Sympetrum meridionale*, *Crocothemis erythraea*, *Pantala flavescens*, *Aeshna affinis*, *Sympecma fusca*, *Chalcolestes viridis*, *Lestes barbarus.* Two species are not known from Lithuania: *Sympetrum meridionale* and *Pantala flavescens*. One species, *Pantala flavescens,* has not been recorded in Poland.
Regarding the fauna of the Courish Spit, 59 dragonflies species have been reported so far for this territory: 57 species were recorded by us, and additional two species (*Coenagrion hastulatum*, *Enallagma cyathigerum*) were found in the Lithuanian part of Courish Spit (Stanionytė, 1988).
Courish Spit is well known for its bird migration. Annually during migration, millions of birds that avoid sea crossings, use the Courish Spit as a bridge for their flight. Our data shows, that also insects (primarily lepidopterans and dragonflies) use the Courish Spit as a permanent migratory route. Thus, the ornithological traps (particularly Rybachy-type funnel traps), undoubtedly represent a very effective and useful tool for studies on dragonflies (mainly, members of Anisoptera suborder) allowing to detect both mass dragonfly migrations and species involved in individual migrations or movements. Furthermore, ornithological traps help to record rare migrant or wanderer species, which can hardly be observed in the field. The effectiveness of ornithological nets has been previously documented by some other authors (Baccetti et al., 1990; von Rintelen, 1997; Bertram & Haacks, 1999; Borisov, 2009; Thoma & Althaus, 2015).

On the other hand, some species (mainly, members of Zygoptera suborder) do not undertakes significant movements and prefers to stay near water bodies, thus only accidentally can be trapped in ornithological traps. Together with the fact that wetlands, meadows and small lakes are very scarce in the Courish Spit, this suggests that abundance of some species is most likely underestimated and our current data cannot be directly extrapolated to the whole territory of the Kaliningrad region. Thus, further investigation concerning abundance of these species is required.

Table 2. List of species and numbers of dragonflies recorded in 2007-2016.

Species	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Calopteryx splendens	2	1		1	3			2			9
Calopteryx virgo		5			4	1	2	2		5	19
Lestes barbarus				12							12
Lestes dryas		2		2	10	5		4	2		25
Lestes sponsa		1	2	1				2	2	1	9
Lestes virens	1							1			2
Chalcolestes viridis			1				1	3		1	6
Sympecma paedisca			1		1						2
Sympecma fusca					1						1
Ischnura pumilio										2	2
Ischnura elegans										48	48
Coenagrion puella		9	3		11	30				50	103
Coenagrion pulchellum					1					15	16
Erythromma najas			1							35	36
Platycnemis pennipes					1						1
Aeshna affinis	1			9	2	3	5	3	1	1	25
Aeshna cyanea	9	5	2	18	45	36	14	12	3	1	145
Aeshna grandis	41	83	62	93	112	199	129	81	16	42	858
Aeshna isoceles		11	9	10	56	8	72	27		131	324
Aeshna juncea	101	141	103	192	240	149	205	251	75	10	1467
Aeshna mixta	443	913	902	1045	1702	1223	365	265	242	111	7211
Aeshna subarctica	2				1						3
Aeshna viridis	54	75	54	122	202	118	84	206	25	9	949
Anax imperator	9	2	6	5	10	7	2	8	2	5	56
Anax parthenope	4		1	7	21	4	4	9	4	1	55
Brachytron pratense		10	7	1	21	4	8	15	1	1	68
Gomphus flavipes		1	1					1			3
Gomphus vulgatissimus					2			1		3	6
Onychogomphus forcipatus		1									1
Ophiogomphus cecilia								1			1
Cordulia aenea		5	6	5	7	26	75	18	2	26	170
Epitheca bimaculata		1	4	5	10	5	59	10	1	12	107
Somatochlora arctica		2	11	19	66	1	12	13	4	4	132
Somatochlora flavomaculata	7	159	106	112	1101	101	305	936	213	50	3090
Somatochlora metallica	6	5	6	9	42	8	20	11	3	12	122
Crocothemis erythraea		2									2
Leucorrhinia albifrons				1	1			1			3
Leucorrhinia caudalis					17		4	15		5	41
Leucorrhinia dubia			1	1		1					3
Leucorrhinia pectoralis		12	127	62	64	112	260	80	34	544	1295
Leucorrhinia rubicunda		13	19	3	22	223	378	124	8	32	822
Libellula depressa		47	7	7	59	22	16	43	12	21	234
Libellula fulva					10						10

Libellula quadrimaculata	64	4071	19492	3973	6884	20353	75776	7017	534	26740	164904
Orthetrum albistylum					1	1	9	4		4	19
Orthetrum brunneum	2	1			9			16	2	1	31
Orthetrum cancellatum	3	11	21	13	12	5	14	14	29	25	147
Orthetrum coerulescens					1		2	2			5
Pantala flavescens							1				1
Sympetrum danae	881	1058	1101	745	758	1311	1830	1262	1920	206	11072
Sympetrum flaveolum	147	2142	234	934	137	198	1210	985	309	155	6451
Sympetrum fonscolombii	2			1					6		9
Sympetrum meridionale				2			8	2	2	1	15
Sympetrum pedemontanum	1			8	8	2	4	2	1		26
Sympetrum sanguineum	71	80	332	4653	648	437	14532	1626	1541	999	24919
Sympetrum striolatum	21	7			2		7		9		46
Sympetrum vulgatum	1528	1595	1880	14937	5981	11219	10373	2749	2087	1467	53816
Number of species	23	32	30	33	42	30	33	40	30	37	57
Number of individuals	3400	10471	24502	27008	18286	35812	105786	15824	7090	30776	278 955

Appendix. An Annotated List of Species of the Odonata of the Kaliningrad region

Family Calopterygidae

Calopteryx splendens (Harris, 1782)

During the study period, a total of 9 specimens were recorded, 8 of them collected in Rybachy-type ornithological traps. Flight period: June – August. According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).

Calopteryx virgo (Linnaeus, 1758)

A total of 19 specimens recorded (maximum 5 specimens per year, in 2008 and 2016). Flight period: late May – August. According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).

Family Lestidae

Lestes barbarus (Fabricius, 1798)

Recorded only in 2010 (a total of 12 specimens collected). Flight period: mid-July – August. According to Le Roi (1911), a rare species in East Prussia. Recorded in Poland; recently added as a new species to the Odonata fauna of Lithuania; not found in Latvia.

Lestes dryas (Kirby, 1890)

A total of 25 specimens recorded (maximum 10 specimens per year, 2011). Flight period: July – mid-August. According to Le Roi (1911), a common species in East Prussia, also found in the Courish Spit (Rossitten [Rybachy], Schwarzort [Juodkrantė]). Recorded in Poland, Latvia and Lithuania.

Lestes sponsa (Hansemann, 1823)

A total of 9 specimens recorded. Flight period: late July – early September. According to Le Roi (1911), not a rare species in East Prussia, also found in the Courish Spit (Rossitten [Rybachy], Schwarzort [Juodkrantė]). Recorded in Poland, Latvia and Lithuania.

Lestes virens (Charpentier, 1825)

A total of 2 specimens recorded (05.IX.2007 and 05.IX.2014). According to Le Roi (1911), relatively common in East Prussia (also found in the Courish Spit (Rossitten [Rybachy]). Recorded in Poland, Latvia and Lithuania.

Chalcolestes viridis (Vander Linden, 1825)

A new species for the Kaliningrad region. A total of 6 specimens recorded, 3 of them were collected on 5.IX.2014. Flight period: mid-July – early September. Not found in East Prussia (Le Roi, 1911). Recorded in Poland, and Lithuania. Not found in Latvia.

Sympecma fusca (Vander Linden, 1820)

Single specimen (female) collected on 24.VIII.2011. Not found in East Prussia (Le Roi, 1911). Recorded in Poland, recently recorded in Lithuania (Ivinskis & Rimšaitė, 2010). Not found in Latvia.

Sympecma paedisca (Brauer, 1877)
A new species for the Kaliningrad region. A total of 2 specimens collected (09.IX.2009 and 25.VIII.2011). Not found in East Prussia (Le Roi, 1911). Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).

Family Coenagrionidae
Coenagrion hastulatum (Charpentier, 1825)
Not collected on the Courish Spit by us. According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).
Coenagrion puella (Linnaeus, 1758)
A total of 103 specimens recorded, 16 of them collected in Rybachy-type ornithological traps. Flight period: late May – mid-July. According to Le Roi (1911), a common species in East Prussia, also found in the Courish Spit (Schwarzort [Juodkrantė]). Recorded in Poland, Latvia and Lithuania.
Coenagrion pulchellum (Vander Linden, 1825)
A total of 16 specimens recorded, 2 of them collected in Rybachy-type ornithological traps. According to Le Roi (1911), a common species in East Prussia, also found in the Courish Spit (Schwarzort [Juodkrantė]). Recorded in Poland, Latvia and Lithuania.
Coenagrion lunulatum (Charpentier, 1840)
Not collected on the Courish Spit by us. According to Le Roi (1911), an occasionally common species in East Prussia. Recorded in Poland, Latvia and Lithuania.
Coenagrion armatum (Charpentier, 1840)
Not collected on the Courish Spit by us. According to Le Roi (1911), an occasionally common species in East Prussia. Recorded in Poland, Latvia and Lithuania.
Enallagma cyathigerum (Charpentier, 1840)
Not collected on the Courish Spit by us. According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).
Erythromma najas (Hansenmann, 1823)
A total of 36 specimens collected. According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).
Ischnura pumilio (Charpentier, 1825)
A total of 2 specimens collected in the meadow in the vicinity of Rybachy village in 2016. Recorded in East Prussia in 1901 (Le Roi, 1911). Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).
Ischnura elegans (Vander Linden, 1820)
A total of 48 specimens collected. According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania.
Pyrrhosoma nymphula (Sulzer, 1776)
Not collected on the Courish Spit by us. According to Le Roi (1911), a rare species in East Prussia. Recorded in Poland, Latvia and Lithuania.
Nehalennia speciosa (Charpentier, 1840)
Not collected on the Courish Spit by us. According to Le Roi (1911), a rare species in East Prussia. Recorded in Poland, Latvia and Lithuania.

Family Platycnemidae
Platycnemis pennipes (Pallas, 1771)
Single specimen (male) collected on 11.VII.2011 in a herbaceous glade in pine forest. According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania.

Family Aeshnidae
Aeshna affinis (Vander Linden, 1820)
A new species for the Kaliningrad region. Northward expansion of this species became significant in recent years. A total of 25 specimens recorded. Not found in East Prussia (Le Roi, 1911). Recorded in Poland; recently recorded in Lithuania for the first time (Bernard, 2005). Not found in Latvia.
Aeshna cyanea (Müller, 1764)
A total of 145 specimens recorded. Annually collected in Rybachy-type ornithological traps in small numbers (1-45 specimens per year). Flight period: late May – mid-October. According to Le Roi (1911), a common species in East Prussia, also found in the Courish Spit (Rossitten [Rybachy], Schwarzort [Juodkrantė]). Recorded in Poland, Latvia and Lithuania.
Aeshna grandis (Linnaeus, 1758)
A total of 858 specimens recorded. Annually collected in Rybachy-type ornithological traps in moderate numbers (40-200 specimens per year). Flight period: June – mid-September. According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).
Aeshna isoceles (Müller, 1767)
A total of 324 specimens recorded. Flight period: late May – mid-July. According to Le Roi (1911), a rare, occasional species in East Prussia. Recorded in Poland, Latvia and Lithuania.

Aeshna juncea (Linnaeus, 1758)
A total of 1467 specimens recorded. Annually collected in Rybachy-type ornithological traps in moderate numbers (10-250 specimens per year). Flight period: June – September. According to Le Roi (1911), an uncommon species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).
Aeshna mixta (Latreille, 1805)
One of the most numerous species. A total of 7211 specimens recorded. Regularly collected in Rybachy-type ornithological traps in large numbers (hundreds to thousands specimens annually). According to Le Roi (1911), a relatively rare species in East Prussia. Recorded in Poland, Latvia and Lithuania
Aeshna subarctica (Walker, 1908)
A new species for the Kaliningrad region. A total of 3 specimens recorded. Two specimens (female and male) were collected in 2007 (22.VIII.2007 and 21.IX.2007, respectively); 1 specimen (male) in 2011 (15.VIII.2011). Not found in East Prussia (Le Roi, 1911). Recorded in Poland and Latvia.
Aeshna viridis (Eversmann, 1836)
A total of 949 specimens recorded. Annually collected in Rybachy-type ornithological traps in moderate numbers (9-206 specimens per year). Flight period: late June – mid-September. According to Le Roi (1911), an uncommon species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).
Anax imperator (Leach, 1815)
A total of 56 specimens recorded. Annually collected in Rybachy-type ornithological traps in small numbers (2-10 specimens per year). Flight period: June – August. According to Le Roi (1911), a relatively rare species in East Prussia. Recorded in Poland, Latvia and Lithuania.
Anax parthenope (Selys, 1839)
A total of 55 specimens recorded. Flight period: late May – mid-September. Not found in East Prussia (Le Roi,1911). A northward expansion of this species observed in recent years in Poland. Recorded in Latvia and Lithuania.
Brachytron pratense (Evans, 1845)
A total of 68 specimens recorded. Annually collected in Rybachy-type ornithological traps in small numbers (1-20 specimens per year). Flight period: mid-May – early July. According to Le Roi (1911), a relatively rare species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).

Family Gomphidae
Gomphus flavipes (Charpentier, 1825)
A total of 3 specimens recorded: 26.VII.2008 (female); 07.VIII.2009 (male); 29.VII. 2014 (male). Single records known from East Prussia (Le Roi, 1911). Recorded in Poland, Latvia and Lithuania.
Gomphus vulgatissimus (Linnaeus, 1758)
A total of 6 specimens recorded. Two specimens collected in 2011, one more in 2014, and three more in 2016. According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania.
Onychogomphus forcipatus (Linnaeus, 1758)
A single specimen collected (11.VII.2008, female). According to Le Roi (1911), a rare species in East Prussia. Recorded in Poland, Latvia and Lithuania.
Ophiogomphus cecilia (Fourcroy, 1785)
A single specimen collected (07.VII.2014, female). Single records known in East Prussia (Le Roi, 1911). Recorded in Poland, Latvia and Lithuania.

Famlily Corduliidae
Cordulegaster boltonii (Donovan, 1807)
Not collected on the Courish Spit by us. Mentioned by Le Roi (1911) as a new species for the region (1 female, collected by von Geyr 30.VII.1911). Recorded in Poland, Latvia and Lithuania.
Cordulia aenea (Linnaeus, 1758)
A total of 170 specimens recorded. Number of collected specimens varied significantly from year to year (single specimens in 2008-2011, dozens in 2012-2016, with a maximum number of 75 specimens in 2013). According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania.
Epitheca bimaculata (Charpentier, 1825)
A total of 107 specimens recorded, 105 of them collected in Rybachy-type ornithological traps, one specimen found on the road killed by vehicle. According to Le Roi (1911), uncommon, but sporadically abundant species in East Prussia. Recorded in Poland, Latvia and Lithuania.
Somatochlora arctica (Zetterstedt, 1840)
A new species for the Kaliningrad region. A total of 132 specimens recorded. Annually collected in Rybachy-type ornithological traps in moderate numbers (2-66 specimens per year). Flight period: June – early September. Not found by Le Roi (1911) in East Prussia, but presence in the region suspected. Recorded in Poland, Latvia and Lithuania.
Somatochlora flavomaculata (Vander Linden, 1825)
A total of 3090 specimens recorded. Annually collected in Rybachy-type ornithological traps. Number of collected specimens varied significantly from year to year (50 specimens in 2016, 1101 specimens in 2011). Flight period: late May – mid-September.

According to Le Roi (1911), an uncommon species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).

Somatochlora metallica (Vander Linden, 1825)

A total of 122 specimens recorded. Annually collected in Rybachy-type ornithological traps in moderate numbers (3-42 specimens per year) According to Le Roi (1911), not a rare species in East Prussia. Recorded in Poland, Latvia and Lithuania.

Family Libellulidae

Crocothemis erythraea (Brulle, 1832)

A new species for the Kaliningrad region. A total of 2 specimens recorded, on 05.VII.2008 (male) and 12.VII.2008 (female). Northward expansion of this Mediterranean species is observed in recent years. Not found in East Prussia (Le Roi, 1911). Recently added as a new species to the Odonata fauna of Lithuania (Račkauskaitė, Gliwa, 2015). Not found in Latvia.

Leucorrhinia albifrons (Burmeister, 1839)

A total of 3 specimens recorded: on 30.VI.2010 (male); 31.V.2011 (female); 31.05.2013 (male). According to Le Roi (1911), an uncommon species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).

Leucorrhinia caudalis (Charpentier, 1840)

A total of 41 specimens recorded. Flight period: late May – mid-June. According to Le Roi (1911), a rare, locally distributed species in East Prussia. Recorded in Poland, Latvia and Lithuania.

Leucorrhinia dubia (Vander Linden, 1823)

A total of 3 specimens recorded (01.VI.2009, 11.VI.2010, 21.V.2012, all males). According to Le Roi (1911), an uncommon species in East Prussia. Recorded in Poland, Latvia and Lithuania.

Leucorrhinia pectoralis (Charpentier, 1825)

A total of 1295 specimens recorded. Annually collected in Rybachy-type ornithological traps. Number of collected specimens varied significantly from year to year. Most common this species was in 2016 with 544 specimens recorded, while in 2008 only 12 specimens were collected. Flight period: mid-May – early July. According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).

Leucorrhinia rubicunda (Linnaeus, 1758)

A total of 822 specimens recorded. Annually collected in Rybachy-type ornithological traps in small-moderate numbers (3-378 specimens per year). Flight period: mid-May – mid-July. According to Le Roi (1911), a very common species in East Prussia. Recorded in Poland, Latvia and Lithuania.

Libellula depressa (Linnaeus, 1758)

A total of 234 specimens recorded. Annually collected in Rybachy-type ornithological traps in small to moderate numbers (7-59 specimens per year). According to Le Roi (1911), a common species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).

Libellula fulva (Müller, 1764)

A total of 10 specimens recorded, all in 2011. Flight period: June – mid-July. According to Le Roi (1911), a rare locally distributed species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).

Libellula quadrimaculata (Linnaeus, 1758)

The most common species. During the study period a total of 164 904 specimens were recorded. Significant seasonal migrations (late May – June) on the Courish Spit are typical. Massive migration registered in 2013, with more than 75 000 specimens collected in Rybachy-type ornithological traps. Furthermore, 32 000 of them were collected in one day (on 29.V.2013). Flight period: mid-May – September. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).

Orthetrum albistylum (Selys, 1848)

A new species for the Kaliningrad region. A total of 19 specimens recorded. Flight period: mid-June – early August. Not found in East Prussia (Le Roi, 1911). Recorded in Poland; recently added as a new species to the Odonata fauna of Lithuania (Gliwa, 2013). Not found in Latvia.

Orthetrum brunneum (Fonscolombe, 1837)

A new species for the Kaliningrad region. A total of 31 specimens recorded. Nomadic species, with the tendency to expand northward in recent years. Flight period: late June – mid-August. Not found in East Prussia (Le Roi, 1911). Recorded in Poland; recently added as a new species to the Odonata fauna of Lithuania (Bernard & Ivinskis, 2004) and Latvia (Kalniņš, 2007).

Orthetrum cancellatum (Linnaeus, 1758)

A total of 147 specimens recorded. Annually collected in Rybachy-type ornithological traps in small to moderate numbers (3-29 specimens per year). According to Le Roi (1911), a common species in East Prussia, also found in the Courish Spit (Schwarzort [Juodkrantė]). Recorded in Poland, Latvia and Lithuania.

Orthetrum coerulescens (Fabricius, 1798)

A new species for the Kaliningrad region. A total of 5 specimens recorded: 18.VII.2011 (female); 23.VI.2013 and 02.VIII.2013 (males); 28.VII.2014 (male and female). Not found in East Prussia (Le Roi, 1911). Recorded in Poland and Lithuania. Not found in Latvia.

Sympetrum danae (Sulzer, 1776)

One of the most numerous species, with 11 072 specimens recorded. Flight period: July – mid-October. According to Le Roi (1911), a common species in East Prussia, also found on the Courish Spit (Schwarzort [Juodkrantė], Rossitten [Rybachy]). Recorded in Poland, Latvia and Lithuania.

Sympetrum flaveolum (Linnaeus, 1758)
One of the most numerous species, with 6 451 specimens recorded. Flight period: mid-June – September. According to Le Roi (1911), not a very common species in East Prussia, also found on the Courish Spit (Schwarzort [Juodkrantė], Rossitten [Rybachy]). Recorded in Poland, Latvia and Lithuania.
Sympetrum fonscolombii (Selys, 1840)
A total of 9 specimens recorded (2 specimens in 2007; 1 specimen in 2010; 6 specimens in 2015). Inhabits southern Europe, but casually wanders further north. Periodical northward invasions of this species became more common in recent years. One female was recorded in the southern part of East Prussia in 1877 (Le Roi, 1911). Recorded in Poland, Latvia and Lithuania.
Sympetrum meridionale (Selys, 1841)
A new species for the Kaliningrad region. A total of 15 specimens recorded. In recent years (2013-2016) is regularly collected in Rybachy-type ornithological traps. Flight period: late July – August. Not found in East Prussia (Le Roi, 1911). Not found in Lithuania and Latvia.
Sympetrum pedemontanum (Müller in Allioni, 1766)
A total of 26 specimens recorded. Regularly collected in Rybachy-type ornithological traps (few specimens annually). Flight period: late July – September. According to Le Roi (1911), a rare species, occasionally occurred in East Prussia. Recorded in Poland, Latvia and Lithuania.
Sympetrum striolatum (Charpentier, 1840)
A new species for the Kaliningrad region. A total of 46 specimens recorded. Flight period: mid-July – early September. Not found in East Prussia (Le Roi, 1911). Recorded in Poland, Latvia and Lithuania.
Sympetrum sanguineum (Müller, 1764)
One of the most numerous species, with 24 919 specimens recorded. Massive migration registered in 2013, with more than 14 000 recorded specimens. Flight period: late June – September. According to Le Roi (1911), a relatively common species in East Prussia. Recorded in Poland, Latvia and Lithuania (also found in the Lithuanian part of the Courish Spit).
Sympetrum vulgatum (Linnaeus, 1758)
One of the most numerous species, with 53 816 specimens recorded. Annually collected in Rybachy-type ornithological traps in large numbers (approx. 1500 specimens per year). Massive migration registered in 2010, with ca. 15 000 recorded specimens. Flight period: late June – mid-October. According to Le Roi (1911), a relatively common species in East Prussia also found in the Courish Spit (Schwarzort [Juodkrantė], Rossitten [Rybachy]). Recorded in Poland, Latvia and Lithuania.
Pantala flavescens (Fabricius, 1798)
A new species for the Kaliningrad region. A vagrant in the region. Single specimen collected on 29.V.2013. On the same day a massive dragonfly migration was observed (mainly *Libellula quadrimaculata*), with a total of 32 698 specimens collected in Rybachy-type ornithological traps. Not recorded in Poland, Latvia and Lithuania. This is the northernmost record of this species in Europe.

Acknowledgements

The study was supported by the Russian Foundation for Basic Research (grant no. 17-04-00828 to the Zoological Institute of the Russian Academy of Sciences) and postdoctoral fellowship (N 1.50.1617.2013) was provided to N. Shapoval.

References

Baccetti, N., Perrotti, E. & Utzeri, C. (1990). Dragonflies captured by ornithological “mist nets” (Anisoptera). *Notulae Odonatologicae*, 3(5), 65–68.
Bernard, R. (2002). First record of *Aeshna crenata* Hagen, 1856 in Lithuania with selected aspects of its biology (Odonata: Aeshnidae). *Opuscula zoologica fluminensia*, 202, 1–21.
Bernard, R. (2005). First record of *Aeshna affinis* Vander Linden, 1820 in Lithuania (Anisoptera: Aeshnidae) and corrective notes on the Lithuanian Odonata checklist. *Notulae Odonatologicae*, 6, 53–55.
Bernard, R., Buczyński, P., Tończyk, G. & Wendzonka, J. (2009). *A distribution atlas of dragonflies (Odonata) in Poland*. Poland: Bogucki Wydawnictwo Naukowe.
Bernard, R. & Ivinskis, P. (2004). *Orthetrum brunneum* (Fonscolombe, 1837) a new dragonfly species in Lithuania (Odonata: Libellulidae). *Acta Zoologica Lituanica*, 14 (3), 31–35. http://dx.doi.org/10.1080/13921657.2004.10512588
Bernard, R., Ivinskis, P. & Daraz, B. (2008). *Lestes barbarus* (Fabricius), a forgotten species in the fauna of Lithuania (Zygoptera: Lestidae). *Notulae Odonatologicae*, 1(7), 1–4.
Bertram, G. & Haacks, M. (1999). Beobachtungen von windverdrifteten Libellen auf der Kurischen Nehrung im September 1998. *Libellula*, 18 (1/2), 89–94.
Borisov, S. (2009). Study of dragonfly (Odonata) migrations in the Western Tian Shan Mountains using ornithological traps. *Entomological Review*, 89 (9), 1025–1029. http://dx.doi.org/10.1134/s00138738090024
Buczyński, P., Shapoval, A.P. & Buczyńska, E. (2014). *Pantala flavescens* at the coast of the Baltic Sea (Odonata: Libellulidae). *Odonatologica*, 43(1/2) 2014, 3–11.

Gliwa, B. (2013). First record of *Orthetrum albistylum* (Odonata: Libellulidae) in Lithuania. *New and Rare for Lithuania Insect Species. Records and Descriptions*, 25, 5–6.

Gliwa, B., Petraška, A., Švitra, G., & Uselis, V. (2016). Data on one new and 23 rare to Lithuanian fauna species of dragonflies (Odonata) recorded in 2015-2016. *New and Rare for Lithuania Insect Species. Records and Descriptions*, 28, 5–18.

Gliwa, B. & Stukonis, V. (2011). *Erythromma viridulum* (Odonata: Coenagrionidae) – a new species to Lithuania. *New and Rare for Lithuania Insect Species. Records and Descriptions*, 23, 5–7.

De Knijf, G., Flenker, U., Vanappelghem, C., Manci, C.O., Kalkman, V. & Demolder, H. (2011). The status of two boreo-alpine species, *Somatochlora alpestris* and *S. arctica*, in Romania and their vulnerability to the impact of climate change (Odonata: Corduliidae). *International Journal of Odonatology*, 14 (2), 111–126. http://dx.doi.org/10.1080/13887890.2011.578565

Flenner, I. & Sahlén, G. (2008). Dragonfly community re-organisation in boreal forest lakes: rapid species turnover driven by climate change? *Insect Conservation and Diversity*, 1 (3), 169–179. http://dx.doi.org/10.1111/j.1752-4598.2008.00020.x

Hassall, C., Thompson, D.J., French, G.C. & Harvey, I.F. (2007). Historical changes in the phenology of British Odonata are related to climate. *Global Change Biology*, 13 (5), 933–941. http://dx.doi.org/10.1111/j.1365-2486.2007.01318.x

Ivinskis P. & Rimšaitė, J. (2010). Data on some spreading insects and spiders species in Lithuania. In: Aleksejeva, A., Oļehnovičs, D., Paņina, L. & Zuģiska, I. (Eds.), *Abstracts of the 52*nd *International Scientific Conference of Daugavpils University*. Latvia: Difra, Daugavpils.

Kalniņš, M. (2007). Brown Orthetrum *Orthetrum brunneum* (Fonscolumbe, 1837) (Odonata, Libellulidae) – a new dragonfly species in Latvia. *Acta Biologica Universitatis Daugavpiliensis*, 7 (2), 109–111.

Kalniņš, M. (2012). Dragonflies (Odonata) in Latvia – history of research, bibliography and distribution from 18th century until 2010. *Latvijas Entomologs*, 51, 91–149.

La Baume, W. (1908). Zur Kenntnis der Libellenfauna Westpreussens. *Schriften der Naturforschenden Gesellschaft in Danzig*, 12, 75–83.

Le Roi, O. (1911). Die Odonaten von Ostpreußen. *Schriften der Physikalisch-Ökonomischen Gesellschaft zu Königsberg*, 52, 13–30.

Ott, J. (2001). Expansion of Mediterranean Odonata in Germany and Europe – consequences of climatic changes. In: Walther, G. R., Burga, C.A. & Edwards, P.J. (Eds.), *„Fingerprints" of Climate Change. Adapted Behaviour and Shifting Species Ranges* (pp. 89–111). New York: Kluwer Academic Publishers. http://dx.doi.org/10.1007/978-1-4419-8692-4_6

Ott, J. (2010). Dragonflies and climatic change – recent trends in Germany and Europe. *BioRisk*, 5, 253–286. http://dx.doi.org/10.3897/biorisk.5.857

Payevsky, V.A. (2000). Rybachy-type trap. In: Busse, P. (Eds.), *Bird Station Manual* (pp. 20–24). Gdańsk: Gdańsk University Press.

Račkauskaitė, D. & Gliwa, B. (2015). First record of *Crocothemis erythraea* (Odonata: Libellulidae) in Lithuania. *New and Rare for Lithuania Insect Species. Records and Descriptions*, 27, 5–6.

Shapoval, A.P. & Buczyński, P. (2012). Remarkable Odonata caught in ornithological traps on the Courish Spit, Kaliningrad Oblast, Russia. *Libellula*, 31 (1/2), 97–109. http://dx.doi.org/10.3906/zoo-1401-1

Shapoval, N.A. & Shapoval, A.P. (2006). Geometrid Moth (Lepidoptera, Geometridae) of the Curonian Spit in the Baltic Sea. *Entomological Review*, 86 (4), 389–397. http://dx.doi.org/10.1134/s0013873806040038

Shapoval, N.A. & Shapoval, A.P. (2007). Nocturnal Lepidopterans (Lepidoptera, Macroheterocera) of the Curonian Spit in the Baltic Sea. *Entomological Review*, 87 (7), 859–864. http://dx.doi.org/10.1134/s0013873807070081

Shapoval, N.A., Shapoval, A.P. & Matov, A.Yu. (2005). Noctuid Moths (Lepidoptera, Noctuidae) of the Curonian Spit in the Baltic Sea. *Entomological Review*, 85 (8), 909–917.

Shapoval, N.A. & Shapoval, A.P. (2008). Butterflies (Lepidoptera, Rhopalocera) of the Curonian Spit in the Baltic Sea. *Entomological Review*, 88 (1), 42-45. http://dx.doi.org/10.1134/S0013873808010065

Stanionytė, A. (1988). Dragonflies (Odonata) in the protected territories of the Lithuanian SSR. Acta entomologica Lituanica, 9, 20-26.

Stanionytė, A. (1993). The check-list of dragonflies (Odonata) of Lithuania. In: *New and rare for Lithiuania insect species. Records and descriptions of 1993* (pp. 50–60). Vilnius: Institute of Ecology.

Termaat, T., Kalkman, V.J. & Bouwman, H.J. (2010). Change in the range of dragonflies in the Netherlands and the possible role of temperature change. In: Ott J. (Eds.). *Monitoring Climatic Change With Dragonflies.* BioRisk, 5, pp. 155–173. http://dx.doi.org/10.3897/biorisk.5.847

Thoma, M. & Althaus, S. (2015). Beobachtungen von Libellen (Odonata) auf dem Col de Bretolet (VS). *Entomo Helvetica*, 8, 97–109.

Von Rintelen, T. (1997). Eine Vogelreuse als Libellenfalle: Beobachtungen in der Vogelwarte Pape, Lettland. *Libellula*, 16 (1/2), 61–64.

Citation:

Shapoval, N.A., Shapoval, A.P. (2017). Annotated checklist of the dragonflies (Insecta: Odonata) of the Kaliningrad region, north-western Russia. *Ukrainian Journal of Ecology, 7*(4), 157–168.