

***Pantala flavescens* at the coast of the Baltic Sea (Odonata: Libellulidae)**

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Abstract. A male *Pantala flavescens* was recorded in a bird net trap on the Courish Spit, Kaliningrad Oblast, western Russia (55°05'N, 20°44'E) on 29-v-2013. This is the northernmost record of this species in Europe and in the whole northern hemisphere. The record is discussed against the background of European records of *P. flavescens*.

Key words. Dragonfly, Anisoptera, migration, Courish Spit, Kaliningrad, Russia, Europe

Introduction

Global warming causes distributional expansions of many dragonflies and/or an increase of the range in their migrations (OTT 2001, 2010; DIJKSTRA & LEWINGTON 2006; BERNARD et al. 2009). A species with particularly high potential for migration is *Pantala flavescens* (Fabricius, 1798), which was aptly characterized by DIJKSTRA & LEWINGTON (2006) as »arguably the most successful odonate in the world«. However, in the Palaearctic, this species is clearly less widespread than in the Nearctic; moreover, in Europe the extent of its regular migration range is surprisingly small, covering the south of the continent only (BOUDOT et al. 2009). Therefore data from regions situated north of this area is of significant interest. The aim of this paper is to describe the first record of *P. flavescens* in Central and Eastern Europe and analyse data from the rest of Europe and North Africa.

Material and methods

The material was collected on the Courish Spit (Kaliningrad Oblast, western Russia), at the Biological Station Fringilla (55°05'N, 20°44'E), a field station of the Zoological Institute of the Russian Academy of Sciences, located 12 km south of the village of Rybachy (Fig. 1). The Courish Spit is a 98 km long land strip, separating the Baltic Sea from the Courland Lagoon. It is poor in surface waters, almost entirely forested (70% are pine forests) and sparsely populated: only three small villages are present on the 45 km long Russian part of the spit. Due to the influence of the Baltic Sea, its climate is relatively mild. Mean air temperature in July is 17°C, and in January -3°C. Annual precipitation is 643 mm (DOLNIK & NAPREENKO 2007; ALBRECHT 2008).

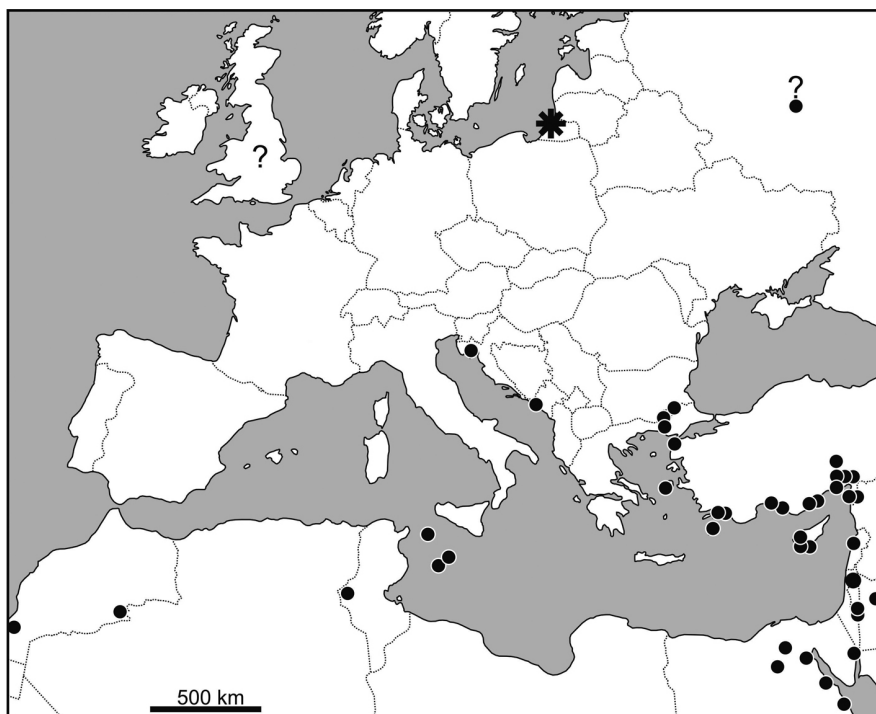


Figure 1. Northernmost authenticated European record of *Pantala flavescens* in the Kaliningrad Oblast, western Russia (*), and the species' distribution in Europe, Anatolia, the Levant and North Africa. Filled circles (●) correspond to UTM squares 50×50 km, in which the species was recorded. ? – doubtful data.

Analysed material was collected in April and May 2013 as part of long-term observations of dragonfly migrations, conducted simultaneously with bird migration monitoring. Two “Rybachy” type traps were used. Each trap consisted of a net cone about 45 m long, with an entrance gate measuring 12×36 m. The cone ends with a netted box serving as a receiving chamber (see SHAPOVAL & BUCZYŃSKI 2012). The traps were located at the boundary between pine forest and the dune belt, 0.4 km from the seashore. They were oriented facing north and south. The maximal air temperature was measured every day as well.

In 2013, traps were first set up on 1st April and the first dragonflies were collected on 9th May. They were removed from traps and preserved in 70 % ethanol.

Results

During the period 01-iv-2013 to 31-v-2013, a total of 50,465 imagines belonging to 10 odonate species were trapped. Those were: *Aeshna isoceles* (O.F. Müller, 1767); *Brachytron pratense* (O.F. Müller, 1764); *Cordulia aenea* (Linnaeus, 1758); *Epitheca bimaculata* (Charpentier, 1825); *Leucorrhinia caudalis* (Charpentier, 1840); *L. pectoralis* (Charpentier, 1825); *L. rubicunda* (Linnaeus, 1758); *Libellula depressa* Linnaeus, 1758; *L. quadrimaculata* Linnaeus, 1758; and *Pantala flavescens* (Fabricius, 1798). Quantitatively, *L. quadrimaculata* was significantly dominant.

One male *P. flavescens* was caught on 29-v-2013 in the trap facing north (leg. A. Shapoval, det. P. Buczyński et A. Shapoval; in coll. ZIN, Zoological Institute of the Russian Academy of Sciences, St. Petersburg). The total length of the specimen was 48 mm, the length of the abdomen was 32 mm. Wings were badly damaged: ragged and cut off beyond the end of the pterostigma (both hindwings), at the beginning of pterostigma (right forewing) and nodus (left forewing).

On the same day, 32,698 imagines were collected altogether. Other recorded species were: *Brachytron pratense* (2 individuals), *Cordulia aenea* (5), *Epitheca bimaculata* (2), *Libellula depressa* (1), *L. quadrimaculata* (32,668, due to a mass migration in the morning), *Leucorrhinia pectoralis* (16) and *L. rubicunda* (3). They were caught mainly in the trap facing north (32,661 ind. or 99.89 %), only a few specimens were collected in the trap

facing south (37 ind. or 0.11 %). Weather was cloudy in the morning, sunny in the afternoon. A south-east wind was moderate in the morning and light in the afternoon. The maximum air temperature was 21°C.

Discussion

Pantala flavescens is a widely distributed circumtropical dragonfly having its main distribution area ranging from 40°S to 40°N (WALKER & CORBET 1975). In Africa, it commonly occurs up to the southern edge of the Sahara, while in the northern part of the continent it is rare. Only in Egypt and adjacent areas of Asia Minor it is more frequent (AYDIN 2006; DIJKSTRA & LEWINGTON 2006; KALKMAN & VAN PELT 2006; BOUDOT et al. 2009; Fig. 1).

Pantala flavescens is a strong flyer and obligatory migrant that travels long distances and breeds *en route* (CORBET 1999; BOUDOT et al. 2013). It is capable of undertaking long-distance migrations across oceans, either diurnal or nocturnal, being able to travel the distance of even 1,000 km within a very short time span, about one week or three days only (FENG et al. 2006; ANDERSON 2009; HOBSON et al. 2013; MAY 2013). Taking this into account, records from Europe are surprisingly scarce. Reliable data is available from five European countries (Turkey, Greece, Montenegro, Croatia, and Italy), referring to 10 sites only (Fig. 1):

- in the European part of Turkey, *P. flavescens* was caught at three sites in Thrace (1997–1999, 4♀, 2♂; HACET & AKTAÇ 2004). Moreover, HACET & AKTAÇ (2006) recorded the species on Gökçeada Island near the Gallipoli Peninsula of Turkish Thrace (22-vii-1998, 1♂);
- in continental Greece, *P. flavescens* was observed in the delta of the River Evros near Alexandropolis (02-viii-2005, 1♂). It was a territorial individual which was watched for a few consecutive days (BLINCOW 2005). Moreover, LAISTER (2005) observed a teneral female on Rhodes Island (29-viii-2001);
- OBER (2008) found one specimen of *P. flavescens* from Herceg-Novi (Montenegro) (vii-1972, 1♂ mature, Caspers leg.) in the collection of the State Museum of Natural History in Stuttgart;
- FINKENZELLER (2010) observed on 31-viii-2010 at least three *P. flavescens* patrolling over the beach near Stara Baška on Krk Island (Croatia);

- CORSO et al. (2012) recorded *P. flavescens* in the years 2010 and 2012 on Lampedusa and Linosa, two Italian islands in the Mediterranean in the Strait of Sicily.

A zoogeographically interesting record of *P. flavescens* in Russia was provided by SKVORTSOV (2010): Lytkatrino in the Moscow Oblast (obs. S.V. Kotachkov). However, the author himself regards this information as unreliable due to the lack of documentary material.

Data from the other three countries – continental Spain, France and the United Kingdom – has been omitted or marked with question marks in recent studies. A comprehensive and critical analysis of this data is given by OBER (2008). Thus we discuss it only briefly below.

Four records are provided from the UK. An observation from 1989 (DAVIES 1991) and unpublished data by James Charles Dale from 1823 mentioned by FRASER (1956) are regarded as highly doubtful (FRASER 1956; MERRITT et al. 1996) and are accordingly not included in the atlas of the dragonflies of Great Britain by MERRITT et al. (1996). Two other records refer to the unintentional introduction of imagines with shipments of bananas (MERRITT et al. 1996) and a warship (CORBET et al. 1960), and so cannot be considered in the context of the occurrence of the species in that country. Except for the UK, the case of unintentional introduction of *P. flavescens* is known from Germany in 1999, pertaining to an imago in a cluster of bananas from Ecuador (KIPPING 2006).

General information about the discovery of a few individuals of *P. flavescens* in Spain and Mediterranean France was given by AGUESSE (1968). This was cited in several following synthetic studies (e.g., DOMMANGET 1987; ASKEW 1988; D'AGUILAR & DOMMANGET 1998; ASKEW 2004). However, these records are generally rejected because AGUESSE's (1968) statement was obviously based on a misinterpretation of information he knew from hearsay only (GRAND & BOUDOT 2006; BOUDOT et al. 2009, 2013).

Pantala flavescens has been recorded from Cyprus (BOUDOT et al. 2009) as well as a few countries and administrative areas in the Caucasus (SKVORTSOV 2010). Data from the Caucasus is particularly interesting. Although geographically, according to the International Geographical Union, this area is part of Asia, it is on the edge of Europe. This suggests *P. flavescens* could occur in south-east Europe.

Considering the data discussed above, the record of *P. flavescens* from the Courish Spit is particularly interesting as it is the northernmost site that the species has been recorded in Europe. It is situated 10° (ca. 1,100 km) north of Krk Island in the Adriatic Sea (44°58'N; FINKENZELLER 2010), which was the previous northernmost European record and shows that migrations of *P. flavescens* can reach much further north than was hitherto stated (BOUDOT et al. 2009; FINKENZELLER 2010; Fig. 1).

This current northern limit of *P. flavescens* in Europe in the Balkans is similar to the boundary in Central Asia where the species does not exceed 45°N (CHAPLINA et al. 2007; BORISOV 2012). Further east its migrations can reach 52–53°N (BELYSHEV 1973; TSUDA 2000; KOSTERIN 2004; DUMONT et al. 2005; KOSTERIN & KORSUN 2006). The most northerly record is from Kamchatka (DUMONT et al. 2005) at Petropavlovsk, a town in the south of the peninsula (53°01'N), where the species was recorded by HAGEN (1856). This information was also cited by CORBET (1999) on the basis of a review paper by BELYSHEV (1968), but the latitude was erroneously recorded as 55°N. In North America, *P. flavescens* has been recorded from the south of Canada. Despite relatively high numbers of new records, especially in Ontario and Quebec, according to DONNELLY (2004) the northern boundary of its distribution (ca 51°30'N) is still the site in Husavick (Manitoba) given by WALKER & CORBET (1975). Against this background, the new record from western Russia is the northernmost for the whole northern hemisphere.

The rarity of occurrence of *P. flavescens* in Europe is explained by the presence of the Sahara, which cuts off North Africa from the continent's interior. The desert is also responsible for dry winds that are particularly unfavourable to migrations of dragonflies. The more frequent occurrence of this species in Egypt and Asia Minor is associated with the Nile Valley, the migration corridor through the desert areas (DUMONT 1977; CORBET 1999; LAISTER 2005). The occurrence of the species in Europe seems to be associated with this more eastern part of the distribution area, apart from the islands in the Strait of Sicily, which are instead associated with the occurrence of *P. flavescens* in Tunisia (Fig. 1). It is highly probable that the Balkans are the migration route to the Courish Spit.

The record of *P. flavescens* on the Courish Spit confirms the assumption that this area is an important migration corridor for dragonflies. Species belonging to many different zoogeographic elements migrate through the spit (BERTRAM & HAACKS 1999; SHAPOVAL & BUCZYŃSKI 2012, unpublished data), including many Mediterranean dragonflies *sensu lato*, i.e. refugial species according to DÉVAI (1976). For many of them the Courish Spit represents the northernmost limit of their range (BERTRAM & HAACKS 1999; SHAPOVAL & BUCZYŃSKI 2012; data in this paper).

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