

## From Southern Balkans to Western Russia: Do First Polish Records of *Pantala flavescens* (Fabricius, 1798) (Odonata: Libellulidae) Indicate a Migration Route?

Paweł BUCZYŃSKI<sup>1</sup>

Edyta BUCZYŃSKA<sup>2</sup>

Wacław MICHALCZUK<sup>3</sup>

<sup>1</sup>Department of Zoology, Maria Curie-Skłodowska University, Akademicka 19,  
20-033 Lublin, POLAND

<sup>2</sup>Department of Zoology, Animal Ecology, University of Life Sciences, Akademicka 13,  
20-033 Lublin, POLAND

<sup>3</sup>Zamość Nature Society, Oboźna 19/8, 22-400 Zamość, POLAND

e-mails: <sup>1</sup>pawbucz@gmail.com, <sup>2</sup>edyta.buczynska@gmail.com, <sup>3</sup>wiack@wp.pl

ORCID IDs: <sup>1</sup>0000-0003-4009-1755, <sup>2</sup>0000-0003-1305-2451

### ABSTRACT

*Pantala flavescens*, probably the most widespread dragonfly on Earth, has been recorded for the first time in Poland. Two single specimens (males) were observed in middle-eastern and northern part of the country in Summer 2016. Both observation sites are the valuable completion of knowledge about the distribution of this migratory species, which had been previously found only once in Central-Eastern Europe. New data indicates possible migration routes of this species in this region.

**Key words:** Odonata, *Pantala flavescens*, migration route, Europe, Poland.

## INTRODUCTION

The circumtropical species *Pantala flavescens* is found in all continents except Antarctica (Dijkstra & Lewington, 2006). The species is an obligate migrant. Northeastern African immigrants, as a part of multigenerational migratory circuit, start to migrate in Spring over the distance of even 14-18,000 km to Central Asia. In late Summer and Autumn the adults of the second generation migrate back to the tropics (NE Africa) (Kalkman & Monnerat, 2015). The migratory range in the Palearctic is smaller than in the Nearctic: within the Palearctic it is especially small in Europe which is explained by the presence of the Sahara. The desert conditions generate unfavourable dry winds which make dragonfly passage almost impossible (Corbet, 1999). The core distribution area of *P. flavescens* in Europe covers only the vicinities of the Bosphorus; migratory individuals were recorded relatively regularly only in the south of the Balkans, and, the boundary of the migration area has been defined by the site on Krk Island in Croatia until recently (Finkenzeller, 2010). In 2013, *P. flavescens* was found in the Baltic exclave of Russia - the Kaliningrad Oblast, that is 1,100 km north of Krk Island. This is the northernmost site of this species in the Palearctic (Buczyński, Shapoval, & Buczyńska, 2014). Taking the above into consideration, the specific questions are as follows: (i) do such long-distance migrations of *P. flavescens* happen more often; (ii) where is the possible route of these migrations? In this light, the present records of this species in Central-Eastern Europe seem to be particularly interesting and possibly important parts of the migration puzzle of the species in the western Palearctic (Fig. 1).

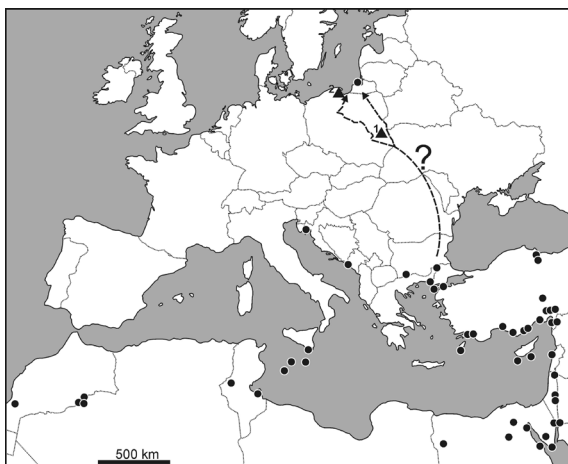


Fig.1. Sites of *Pantala flavescens* (Fabricius, 1798) in Europe and adjacent areas; circles - literature data (De Knijf, 2015; Kalkman & Monnerat, 2015; Galasso, Marletta, & Corso, 2017), triangles - new records (numbers as in the text). Arrows show the possible migration routes.

## MATERIAL AND METHODS

This paper is based on data collected during faunistic studies on dragonflies of eastern and northern Poland, conducted in 2016. Adults were observed with the naked

eye and with the use of binoculars. We determined their number per 100 m-long shore or transect, together with potential reproductive and hunting behaviour. Photographic documentation of both sites and pictures of the specimen from northern Poland (Lębork) are available on the website [https://wazki.pl/wazki\\_pantala\\_flavescens.html](https://wazki.pl/wazki_pantala_flavescens.html) (Buczyński & Michalczuk, 2016).

## RESULTS

*Pantala flavescens* was recorded in two sites in Poland.

(1) Nasutów (51°22'32.6" N, 22°30'59.8" E, UTM: FB09), June 8, 2016. A 20-25-metre-wide dry fallow field, bordering to the west on pine forests and to the east on ploughed field. The nearest surface waters are the River Minina (distance of 1.3 km) and fish ponds (distance of 1.5 km), which are separated from the observation site with a wide belt of clumped forest stand. The weather was sunny, the sky clear. The maximum air temperature in the shade was 24°C, light breeze was blowing from the south-west, however, the fallow field was completely covered from the wind with the forest. In this situation, with full insolation and dry sandy ground, it was very hot: air temperature was certainly higher than 30°C.

One male of *Pantala flavescens* was observed directly and through binocular between 10<sup>30</sup> and 11<sup>00</sup>. It was hunting for insects flying near the forest, mainly Diptera. The male was flying vigorously, from the edge of the fallow field to the first row of trees, at altitudes of 3-6 meters, from time to time lowering its flight to the altitude of 2 meters. The flight was almost continuous: the male briefly disappeared from our sight in treetops only twice, probably crouching with prey on the branches reaching several meters above the ground.

Other dragonfly species observed were as follow: *Ophiogomphus cecilia* (Fourcroy, 1795) (about 10 individuals), *Orthetrum albistylum* (Selys, 1848) (2 ind.) and *O. cancellatum* (Linnaeus, 1758) (about 10 ind.). There were no interactions observed between those and *Pantala flavescens*: in contrast to the species discussed they were hunting at lower altitudes (up to 1-2 m) and perching very often on the ground (sand or mosses) or pine branches lying on the ground or hanging low.

(2) Lębork (54°33'20.2" N, 17°44'47.5" E, UTM: XA74) (26 km from the Baltic shore, 200 km from the site on the Courish Spit and 478 km from the site in Nasutów), August 13, 2016. Clay excavation with two permanent water bodies about 1.5 m deep, supplied from ground water. In 2016, at slightly higher ground level, a few small and shallow (up to ca. 0.3 m) temporary pools appeared, filled with rainwater.

In the morning it was cloudy and windy. During observation, from about 13<sup>00</sup>, cloud cover decreased to approx. 50%, but the wind was still strong. The maximum air temperature in the shade was about 24°C. One male of *Pantala flavescens* was spotted on one of the small temporary pools (size of ca. 10x10 m, depth of ca. 0.2 m). It was flying from shore to shore or along the shore, mostly at an altitude of ca. 1 m above the water, from time to time rising or almost crouching on the water in pursuit

of insects. It looked as if it searched through the pool, which is described as a typical patrol flight of a male (Abbott, 2016). Several times the male flew away from the water and after a while came back. Any perching behaviour was observed.

*Pantala flavescens* was less sensitive to weather conditions than co-occurring species represented by males of *Orthetrum albistylum* and *Libellula depressa* Linnaeus, 1758. Both species perched immediately just after it became cloudy in contrary to *Pantala flavescens* which continued its flight despite the lack of sun and quite strong, chilly wind. About 15<sup>00</sup> the described specimen flew away from the water and was not observed any more.

The observed male was mature: the abdomen was yellow with red coating on top. The eyes were chestnut brown (upper parts) and yellowish (lower parts). This is a less common form of the eye coloration in this species (Dijkstra & Lewington, 2006).

## DISCUSSION

Our data, as a link between the records from the Balkan Peninsula and the Kaliningrad Oblast, may indicate potential routes of the migration of *Pantala flavescens* to Central-Eastern Europe (Fig.1). Taking into consideration the arrangement of mountain ranges (especially the Alps and Carpathians), which are the barrier for the migrations of animals, the most likely seems to be the route from the vicinities of the Bosphorus through Bulgaria and Romania, and next, the western Ukraine, outside the arc of the Carpathians. Further north, up to Central Poland, the migration route may lead either longitudinally along the valley of the River Bug, very favourable for thermophilous dragonfly species, or along the parallel valley of the Vistula. Two regions of Poland: Roztocze and the Sandomierska Basin, can be especially advantageous route for the species. When reaching the Baltic Sea, *P. flavescens* may migrate along the sea coast, as proved by the record from the Coursih Spit (Buczyński, Shapoval, & Buczyńska, 2014).

Our data may indicate that *P. flavescens* migrating from tropical and subtropical areas chooses thermally advantageous, very warm sites during its migration in Europe. Such sites should be taken as starting points in searching for this species. This is confirmed by the fact that at both sites discussed in this paper, we found very thermophilous *Orthetrum albistylum*. The site of the occurrence of this species in Lębork is currently the northernmost in Poland (Bernard, Buczyński, Tończyk, & Wendzonka, 2009) and it is probably the last (towards the north) on which reproductive (territorial) behaviour was observed. Further north, in the Kaliningrad Oblast (Shapoval & Buczyński, 2012) and Lithuania (Gliwa, 2013), only single, probably migrating adults were observed.

The arrangement of mountain barriers for the specimens migrating from Balkans can be the reason why there is still no data on *P. flavescens* from western Europe. However, outside the islands in the Mediterranean Sea, it has not been recorded here, even at the southern edges of the continent (De Knijf, 2015; Kalkman & Monnerat, 2015; Galasso et al, 2017). The key role for a wider range of migration on the east

*From Southern Balkans to Western Russia: Do First Polish Records*

seems to be the valley of the Nile, which is the migration route of dragonflies through desert areas (Dumont, 1977). Bigger number of sites in north-eastern Africa is a better source of migrant individuals. Recently, dragonflies have been fostered by more and more warmer and drier climate as well as tropical air currents from Africa, beneficial for migrations towards the north (EEA, 2012). This might explain why *P. flavescens* has recently moved outside the Balkans. In general, these are weather phenomena like winds, on which the distribution of *P. flavescens* is related to a large extent (Troast, Suhling, Jinguji, Sahlén, & Ware, 2016). Taking into consideration the growing importance of the current and expected temperature rise conditioned by the inflow of warm air masses to Central-Eastern Europe including Poland (MERP, 2013), the next records of the species in this area are highly probable. Nevertheless, the route to western Europe can be bounded by the Alps. This is symptomatic that Krk Island, situated on the shortest route in this direction (along the Adriatic) and the northernmost site of the occurrence of *P. flavescens* on this sea (Finkenzeller, 2010), is actually located in the foothills of the Alps. The best solution for the resolving the problem of the real migration routes of the species would be genetic studies, however, in the current situation, the main obstacle is the lack of the specimens for such analysis. Assuming that the year temperatures are getting higher and higher, we can expect the occurrence of the new specimens which allow to clarify another unanswered questions in the present: (i) does the species migrate back from Europe to Africa; (ii) does the species reproduce in Europe; (iii) do such long distance migrations of *P. flavescens* happen more frequently?

## ACKNOWLEDGEMENTS

We would like to thank to anonymous Reviewer for the help in improving our manuscript.

## REFERENCES

- Abbott, J.C. (2016). *Odonata Central: An online resource for the distribution and identification of Odonata*. Retrieved from <http://www.odonatacentral.org>
- Bernard, R., Buczyński, P., Tończyk, G., & Wendzonka, J. (2009). *A distribution atlas of dragonflies (Odonata) in Poland*. Bogucki Wydawnictwo Naukowe, Poznań
- Buczyński, P., Milchalczuk, W. (2016, March 19). *Nomadka żółtawa Pantala flavescens*. Retrieved from [https://wazki.pl/wazki\\_pantala\\_flavescens.html](https://wazki.pl/wazki_pantala_flavescens.html).
- Buczyński, P., Shapoval, A.P., & Buczyńska, E. (2014). *Pantala flavescens* at the coast of the Baltic Sea (Odonata: Libellulidae). *Odonatologica*, 43(1), 3-11
- Corbet, P.S. (1999). *Dragonflies. Behaviour and ecology of Odonata*. Harley, Colchester
- De Knijf, G. (2015). *Pantala flavescens* - a new species for the fauna of Bulgaria (Odonata: Libellulidae). *Notulae Odonatologicae*, 8(6), 191-196
- Dijkstra, K.-D.B. (Ed.) & Lewington, R. (2006). *Field guide to the dragonflies and damselflies of Britain and Europe*. British Wildlife Publishing, Gillingham
- Dumont, H.J. (1977). A review of the dragonfly fauna of Turkey and adjacent Mediterranean islands (Insecta Odonata). *Bulletin et Annales de la Societe Royale Belge d'Entomologie*, 113, 119-172

- EEA [European Environment Agency] (2012). *EEA Report No. 12/2012. Climate change, impacts and vulnerability in Europe 2012*. EEA, Copenhagen
- Finkenzeller, M. (2010). First record of *Pantala flavescens* for Croatia (Odonata: Libellulidae). *Libellula*, 29(3/4), 205-208
- Galasso, P., Marletta, A., & Corso, A. (2017). Odonata of the South-eastern swamp lakes 'Pantano Cuba' and 'Pantano Longarini' (Sicily). *Bulletin of the Entomological Society of Malta*, 9, 100
- 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
- Kalkman, V.J. & Monnerat, C. (2015). *Pantala flavescens* (Fabricius, 1798). In J.-P. Boudot, V.J. Kalkman (Eds.). *Atlas of the European dragonflies and damselflies* (pp. 289-291). KNNV Publishing, Zeist
- MERP [Ministry of the Environment Republic of Poland] (2013). *Polish national strategy for adaptation to climate change (NAS 2020) with the perspective by 2030*. Ministry of the Environment, Warsaw
- 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
- Troast, D., Suhling, F., Jinguji, H., Sahlén, G., & Ware, J. (2016). A Global population genetic study of *Pantala flavescens*. *PLoS ONE*, 11(3), e0148949

Received: July 21, 2017

Accepted: April 05, 2018