

Dragonflies (Odonata) of the Nature Reserve Torozlín and water area Komjatice-Štrkáreň gravel-pit in the southwestern part of the Slovak Republic

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Over the period of the years 2014 and 2015 in the locality of nature reserve Torozlín and water area Štrkáreň gravel-pit being located at the village Komjatice, lying in the southwestern part of the Podunajská pahorkatina upland was evaluated the species of dragonflies. 179 individuals of dragonflies were collected during the monitoring period, of which 13 species were determined as belonging to eight families. On the locality of the Torozlín Nature Reserve, the dominant species were *Ischnura elegans* (37.50%), *Platycnemis pennipes* (28.85%), *Sympetrum vulgatum* (10.58%), *Sympetrum sanguineum* (5.76%) and *Platycnemis pennipes* (54.67%) *Ischnura elegans* (37.33%) and *Libellula depressa* (5.34%). Based on the fact that the Torozlín site has a marshy character, the species composition was more varied. Protection and vulnerability were assessed by the Red List of IUCN, the European Red List of dragonflies and the Red List of dragonflies of the Slovak Republic. Evaluation of protection was carried out under the Decree of the Ministry of Environment of the Slovak Republic No. 492/2006 Collection of Laws. For individual species found also their dominance was calculated.

Keywords: dragonflies, locality, nature reserve, dominance, Slovakia

1 Introduction

The diversity of aquatic habitats creates convenient habitat conditions for dragonflies and other aquatic insects (Janský and David, 2010). Dragonflies (Odonata) are an ancient group of insects with incomplete metamorphosis, occurring in wet meadows, bogs, margins of water reservoirs, river banks, ponds, marshes and wetlands (Waldhauser and Černý, 2014). By nymphs development cycle they are linked to the aquatic environment (Dolný et al., 2007). Larvae accumulate contaminants in water in its outer skeleton (exoskeleton) and the tissue. Dragonflies have the ability to respond to pollutants in the environment by reducing population density (David, 2006). It can say that there is no water surface, where they occur. Optimal conditions for each type found in various habitats. What is important is mainly water clarity and an appropriate degree of development of the vegetation and the low number of predators of other groups of animals, especially fish (Waldhauser and Black, 2014). The aim of the research was to find the species composition of dragonflies in selected localities.

2 Material and methods

2.1 Research area

The village of Komjatice is located in western Slovakia, on the territory of the Nitra region in the northwestern part of the district of Nové Zámky, in the south-western part of the Podunajská pahorkatina upland. They lie on 48° 9' 13.49" N 9° 47.87" E at an altitude of 125–150 m height above sea level. The area of interest is located on flat lands which created the old arms of the river Nitra and the flat loess terraces. In their surroundings are fertile flat alluvial soils and chernozem soils. The village territory is a component part the Podunajská nížina lowland which is consisted of the units, the Podunajská rovina plain and the Podunajská pahorkatina upland – part of the Nitra pane. Hydrogeography the village Komjatice belong to a wider catchment area of Nitra. The Small Nitra river with a total length of 31.1 km is flowing through the village of Komjatice. It flows into from the north, bypassing nearly the entire urban area of the village (from the northeast and southeast) and flows out of it in the south. In the east of the village is located a gravel pit called Štrkáreň with an area of 45.0 hectares. It concerns a perspective tourist recreational destination suitable for bathing and

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water sports. In the southeastern part of the village there is a new smaller gravel-pit called Nová Štrkáreň. Both lakes formed as excavator areas gravel mining, which still benefits from them and are also fishing locations. In the land area of the village located a few oxbows of the river Nitra, as a rule, being dried-up or filled by ground water only in years of heavy rainfalls. The most important of them is the water surface Kňazova jama – Torozlín, which is now a protected nature reserve with rare flora (62 species) and fauna (including the occurrence *Emys orbicularis*).

According to the geomorphological division of Slovakia addressed territory belongs in the Podunajská pahorkatina uplands, subsector the Nitrianska pahorkatina uplands, subsection of the Nitrianska niva plain. According to the phytogeographical division of Slovakia, the whole area being monitored belongs to the Pannonian flora of the circuit of Eupanian xerotherm flora of the Podunajská nížina plain. According to the typological division of the relief, the addressed area belongs to a fluvial plane with a fluvial relief with hydromorphic soils and hygrophilous vegetation.

Climatic conditions are affected primarily by latitude, altitude and orographic conditions. On the basis of climatic regions (Lapin et al., 2002), the territory of the village Komjatice is included in the climate region with warm, dry, with mild winters. In the framework of Podunajskej nížiny lowland, the warmest month is July with an average temperature of 20.8 °C and the coldest is January with an average temperature of minus 3.9 °C. The average annual temperature is 11 °C. The average rainfall is 606.34 mm. The prevailing wind flow is of southeast and northwest direction (Programme of economic and social development of the village Komjatice for the period of the years 2015–2023).

2.2 Sampling sites

Dragonflies were caught in the years 2014 and 2015 during the period from May to August in two locations:

1. Nature Reserve Torozlín – declared in 1982, covers an area of 5.4 hectares and it is characterized by valuable wetland flora and fauna, of which a unique occurrence is a European pond turtle (*Emys orbicularis*).
2. Štrkáreň – water area in the eastern part of the village was founded dredging, and gravel and sand extraction. Its area is 45 ha, with a maximum depth of 18 m. The lake is fishing hunting ground and a tourist destination.

2.3 Sampling and identification

The adult dragonflies were caught by an entomological net above the water and in the vegetation under ideal meteorological conditions (clear to cloudy weather, warm,

complete windlessness or only a slight breeze). The material was preserved by 96% alcohol. The determination of dragonflies was carried according to the keys of Askew (1988), Hanel and Zelený (2000), Dijkstra and Lewington (2006), Heidemann and Seidenbusch (1993) and Kohl (1998). Classification and nomenclature of dragonflies, according to Wasscher and Bos (2000). Dominance was calculated according to Losos (1984, 1992):

$$D = n_i / N \times 100$$

where:

- n_i – number of specimens of a species i
 N – total number of individuals

Assessment of vulnerability and protection, according to IUCN (2014), European Red List of dragonflies (Kalkman et al., 2010) and the Red List of dragonflies of the Slovak Republic (David, 2001). Protection of species was evaluated by Decree of the Ministry of Environment no. 492/2006 Coll., amending and supplementing the implementing Decree of Ministry of the Environment of the Slovak Republic no. 24/2003 Coll., National Council of the Slovak Republic Act no. 543/2002 on Nature and Landscape Protection.

3 Results and discussion

In the locations monitored over the years 2014 and 2015 it was collected 179 individuals of dragonflies (108 ♂, 71 ♀), of which 13 species were determined and included into eight families (Tab. 1). For the territory of the Slovak Republic is known the occurrence of 69 species of dragonflies. On the basis stated by us the number of species found represents 18.84% of the species richness of our odonatofauna (David, 2005, 2013). In 2014, the capture of dragonflies was carried out on 8 May, 15 June, 5 July and 29 August (66 individuals included into five species) and in 2015 in the dates 8 May, 13 June, 4 July, 5 July and 15 August (113 individuals pertaining to twelve species).

Of all the species being determined over the period of the years 2014 and 2015 in the locations monitored there is one species (*Anax imperator*) specifies in the list of species of national importance.

The dragonfly species identified were assigned to categories according to lists of endangered species, national and European legislation. In the characteristics of the identified species of dragonflies, behind the name of the species is given the number of locality, date of capture, abundance of males and females and ecosozological evaluation of species according to the Red List IUCN (2014), the European Red List of dragonflies (EURL) (Kalkman et al., 2010), National Red List (NRL) and the Red List of dragonflies of the Slovak Republic

Table 1 Frequency of dragonflies in the localities Nature Reserve Torozlín and Štrkáreň between 2014 and 2015

| Species/Locality | 1 | D (%) | 2 | D (%) | Σ |
|--|-----|-------|----|-------|-----|
| <i>Calopteryx splendens</i> (Harris, 1782) | 1 | 0.96 | | | 1 |
| <i>Ischnura elegans</i> (Vander, Linden, 1820) | 39 | 37.50 | 28 | 37.33 | 67 |
| <i>Coenagrion puella</i> (Linnaeus, 1758) | 5 | 4.81 | | | 5 |
| <i>Platycnemis pennipes</i> (Pallas, 1771) | 30 | 28.85 | 41 | 54.67 | 71 |
| <i>Aeshna affinis</i> (Vander, Linden, 1820) | 4 | 3.85 | | | 4 |
| <i>Anax imperator</i> (Leach, 1815) | 4 | 3.85 | | | 4 |
| <i>Gomphus flavipes</i> (Charpentier, 1825) | | | 2 | 2.66 | 2 |
| <i>Somatochlora metallica</i> (Vander, Linden, 1825) | 1 | 0.96 | | | 1 |
| <i>Libellula depressa</i> (Linnaeus, 1758) | | | 4 | 5.34 | 4 |
| <i>Sympetrum sanguineum</i> (Müller, 1764) | 6 | 5.76 | | | 6 |
| <i>Sympetrum striolatum</i> (Charpentier, 1840) | 2 | 1.92 | | | 2 |
| <i>Sympetrum vulgatum</i> (Linnaeus, 1758) | 11 | 10.58 | | | 11 |
| <i>Orthetrum cancellatum</i> (Linnaeus, 1758) | 1 | 0.96 | | | 1 |
| Total | 104 | 100 | 75 | 100 | 179 |

1 – Nature Reserve Torozlín, 2 – Štrkáreň

(RL SR) (David, 2001), according to which there are the following categories of threat: CR – critically endangered, EN – strongly endangered, VU – vulnerable, LR – lower risk, NT – near threatened, LC – less affected, DD – data deficient, NE – not evaluated, LR – less endangered.

Suborder: Zygoptera

Family: Calopterygidae

Calopteryx splendens (Harris, 1782)

Locality 1: 4 July 2015 – 1♂; ecosozological evaluation: EURL – LC; NRL – VU

Family: Coenagrionidae

Ischnura elegans (Vander, Linden, 1820)

Locality 1: 8 May 2014 – 4♂, 2♀, 15 June 2014 – 6♂, 3♀, Habitat 2: 5 July 2014 – 6♂, 4♀, 29 August 2014 – 4♂, 2♀, Habitat 1: 4 July 2015 – 12♂, 9♀; **Locality 2:** 13 June 2015 – 6♂, 3♀, 5 July 2015 – 3♂. Number of individuals: 67 of which 41♂ and 26♀. It concerns an abundant species and is one of dragonflies occurring mostly throughout the territory of Slovakia, from lowlands to mountain areas. Ecosozological evaluation: IUCN – LC; EURL – LC; NRL – LC.

Coenagrion puella (Linnaeus, 1758)

Locality 1: 4 July 2015 – 3♂, 2♀. Number of individuals: 5. One of the most common dragonflies, expanded widely throughout the territory. Without the current threat. Ecosozological evaluation: IUCN – LC; EURL – LC; NRL – LC.

Family: Platycnemididae

Platycnemis pennipes (Pallas, 1771)

Locality 1: 8 May 2014 – 7♂, 2♀, **Locality 2:** 15 June 2014 – 10♂, 5♀, **Locality 1:** 5 July 2015 – 9♂, 12♀, **Locality**

2: 13 June 2015 – 15♂, 11♀. Number of individuals: 71 of which 41♂, 30♀. It concerns an abundant species occurring in the area of lowlands and basins. Its potential threat is due to water pollution (eutrophication) and biotope liquidation. Without a current endanger. Ecosozological evaluation: IUCN – LC, EURL – LC; NRL – LC.

Suborder: Anisoptera

Family: Aeshnidae

Aeshna affinis (Vander, Linden, 1820)

Locality 1: 4 July 2015 – 3♂, 1♀. Number of individuals: 4. Species is widespread, especially in the warmer areas. Threat can be water pollution and destruction of habitat. Ecosozological evaluation: IUCN – LC; EURL – LC; NRL – NE; RL SR – LR: nt.

Anax imperator (Leach, 1815)

Locality 1: 4 July 2015 – 2♂, 2♀. Number of individuals: 4. Abundant species occurring in the whole territory of the Slovak Republic. Possible threat is water pollution and destruction of habitat. Ecosozological evaluation: IUCN – LC; EURL – LC; NRL – LC. It has been included in the Ministry of Environment Decree no. 492/2006 Coll. on Nature Protection as a species of the national significance in Annexes 4B and 6B.

Family: Gomphidae

Gomphus flavipes (Charpentier, 1825)

Locality 2: 13 June 2015 – 1♂, 1♀. Number of individuals: 2. Rarely occurring mainly in southern Slovakia. Endangered due to water pollution, stream regulations, cutting down of bank vegetation and biotope liquidation. In the Red List assessed category VU – vulnerable. It has been included in the Decree on Nature Protection as

a species of the European importance in Annexes 4B and 6A. Listed in Annexes 2 of the Bern convention and Directive 4 of the EC biotopes.

Family: Corduliidae

Somatochlora metallica (Vander, Linden 1825)

Locality 1: 5 July 2014 – 1♂. Number of individuals: 1. Endangered due to biotope liquidation and water pollution. Ecosozological evaluation: IUCN – LC; EURL – LC; NRL – LC; RL SR – LR: Ic; 492/2006 – 4B, 6B.

Family: Libellulidae

Libellula depressa (Linnaeus, 1758)

Locality 2: 4 July 2015 – 2♂, 2♀. Number of individuals: 4. Abundant species, common in the whole territory. Without being endangered. Ecosozological evaluation: EURL – LC; NRL – LC.

Sympetrum sanguineum (Müller, 1764)

Locality 1: 29 August 2014 – 3♂; **Locality 1:** 5 July 2015 – 2♂, 1♀. Number of individuals: 6 of which 5♂ and 1♀. This is a very abundant species that occurs in the whole territory of the Slovak Republic. Without being endangered. Ecosozological evaluation: IUCN – LC; EURL – LC; NRL – LC.

Sympetrum striolatum (Charpentier, 1840)

Locality 1: 5 July 2015 – 1♂, 1♀. Number of individuals: 2. A very abundant species. It occurs throughout Slovakia. Without being endangered. Ecosozological evaluation: IUCN – LC; EURL – LC; NRL – LC.

Sympetrum vulgatum (Linnaeus, 1758)

Locality 1: 29 August 2014 – 4♂, 3♀, **Locality 1:** 5 July 2015 – 2♂, 2♀. Number of individuals: 11 of which 6♂

and 5♀. A very abundant species. It occurs throughout Slovakia. Without being endangered. Ecosozological evaluation: EURL – LC; NRL – LC.

Suborder: Anisoptera

Family: Libellulidae

Orthetrum cancellatum (Linnaeus, 1758)

Locality 1: 13 June 2015 – 1♂, without being currently endangered; ecosozological evaluation: IUCN – LC; EURL – LC; NRL – LC.

From among the dragonfly species detected in the examined territory according to the origin (fauna centre) Pontocaspic and Holomediterranean species are dominating. Pontomediterranean and Westsiberian are represented two species, Mediterranean, Ethiopian-Mediterranean and Siberian are represented by one species.

Based on the assessment of dominance of the species occurred it can be stated that in the habitat no. 1 (Torozlín), eudominant representation was shown by *Ischnura elegans*, *Platycnemis pennipes* and *Sympetrum vulgatum*. The dominant species is *Sympetrum sanguineum*. Subdominant species are *Coenagrion puella*, *Aeshna affinis* and *Anax imperator*. The recedent species is *Sympetrum striolatum* and subrecedent species are *Calopteryx splendens*, *Somatochlora metallica* and *Orthetrum cancellatum*.

In the habitat no. 2 (Štrkáreň) a eudominant species is *Ischnura elegans* and *Platycnemis pennipes*. Dominant representation has *Libellula depressa* and subdominant representation has *Gomphus flavipes* (Table 2).

Table 2 The dominance of determined dragonfly species at selected sites between 2014 and 2015

| Species | 1 | 2 |
|---|---|---|
| <i>Calopteryx splendens</i> (Harris, 1782) | | |
| <i>Ischnura elegans</i> (Vander, Linden, 1820) | | |
| <i>Coenagrion puella</i> (Linnaeus, 1758) | | |
| <i>Platycnemis pennipes</i> (Pallas, 1771) | | |
| <i>Aeshna affinis</i> (Vander, Linden, 1820) | | |
| <i>Anax imperator</i> (Leach, 1815) | | |
| <i>Gomphus flavipes</i> (Charpentier, 1825) | | |
| <i>Somatochlora metallica</i> (Vander, Linden 1825) | | |
| <i>Libellula depressa</i> (Linnaeus, 1758) | | |
| <i>Sympetrum sanguineum</i> (Müller, 1764) | | |
| <i>Sympetrum striolatum</i> (Charpentier, 1840) | | |
| <i>Sympetrum vulgatum</i> (Linnaeus, 1758) | | |
| <i>Orthetrum cancellatum</i> (Linnaeus, 1758) | | |

eudominant (D ≥ 10%); dominant (5% ≤ D < 10%); subdominant (2% ≤ D < 5%); recedent (1% ≤ D < 2%); subrecedent (0% < D < 1%); 1 – Nature Reserve Torozlín, 2 – Štrkáreň

The monitored sites do not belong among the biotopes of running waters, from the reason mentioned no species were, as a rule, recorded here, which prefer flowing waters. The only identified rheophilous species (preferably flowing water) were *Calopteryx splendens*, *Platycnemis pennipes* and *Gomphus flavipes*. A more numerous representation was found in the eurytope species of dragonflies (they occur in different habitats – *Ischnura elegans*, *Libellula depressa*, *Somatochlora metallica* and *Orthetrum cancellatum*), because according to David (2006) their larvae live in slow or occasionally flowing waters. Other recorded species are typical species of stagnant water, which, according to David, Ábelová (2015) are settled by different types of aquatic habitats of standing waters, as the garden and park small lakes, dead river branches and the like.

It can be said that the difference between the monitored localities is mainly in different habitats. The nature reserve has a marshy nature with the occurrence of aquatic vegetation and the water surface is a typical habitat of standing water without aquatic vegetation.

4 Conclusions

In the period of the years 2014 and 2015 in the area of Nature Reserve Torozlín and the water area Štrkáreň, which are located in the southwestern part of the Slovak Republic we evaluated the species composition of dragonflies. During the monitoring period in the area of interest have been gathered 179 individuals, of which 13 species was determined and included in eight families, which represents 18.84% of the species richness of odonatofauna of the Slovak Republic. Of all the species that have been during the years of 2014 and 2015 in the monitored habitats determined is one species (*Anax imperator*) mentioned in the List of species of national importance. In both habitats monitored a eudominant is species *Ischnura elegans* and *Platycnemis pennipes*. It can be stated that the species of dragonflies found prefer, as a rule, habitats of stagnant waters. The number of dragonflies found indicates the significant biotope, ecological and conservation diversity of this small area. Ecological value is given by the possibility of their reproduction, habitat stability and dragon migration capabilities.

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