Odonata observations in the Danube Delta, Romania, from July 2016

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Introduction

The Odonata fauna of Romania remains one of the least known of Europe (De Knijf et al. 2011, Rakosy et al. 2012, Boudot & Kalkman 2015). Manci (2012) mentions 70 species and the recently published European Atlas 71 species (Boudot & Kalkman 2015) for Romania. There is still plenty to explore about Romania's odonate fauna, as is indicated by recent discoveries of new species such as *Somatochlora arctica* (De Knijf 2007), *Aeshna subarctica* (Flenker 2011)

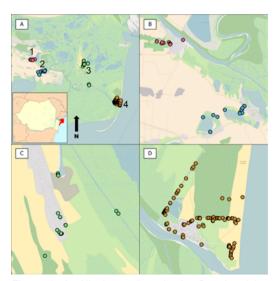


Figure 1. A. All observations in the Danube delta, located in the far east of Romania, Eastern Europe. B: observations in region 1 - Mahmudia (red) and region 2 - Murighiol (blue). C: observations in region 3 - Caraorman. D: observations in region 4 - Sfantu Gheorghe.

A: Alle waarnemingen uit de Donau delta, gelegen in het uiterste oosten van Roemenië. B: waarnemingen in regio 1 – Mahmudia (rood) en regio 2 - Murighiol (blauw). C: waarnemingen in regio 3 – Caraorman. D: waarnemingen in regio 4 - Sfantu Gheorghe.

and *Epitheca bimaculata* (Manci 2012), the rediscovery of Nehalennia speciosa (Manci 2012) and new populations of Cordulegaster heros outside its known range (Manci 2012, Murányi et al. 2015). Romania hosts a large diversity of pristine natural habitats (Rakosy et al. 2012). One of its major natural treasures is the Danube Delta, Europe's second-largest delta and one of its most important wetlands (Bulankova et al. 2013). Its climate is continental, with cold winters and hot summers, but - unlike most of the country - it receives some sub-Mediterranean influences as well, leading to drier conditions (Rakosy et al. 2012). The Danube delta is one of the richest dragonfly habitats of Romania, supporting a large diversity of water bodies and corresponding species (Gorb & Ermolenko 1995, Rakosy et al. 2012). Fifty species are currently known from the Romanian Danube Delta (Manci 2012, Boudot & Kalkman 2015), including strictly protected species like Gomphus flavipes (Bulankova et al. 2013). Furthermore, very large numbers of common species such as Aeshna mixta and Sympetrum meridionale have been recorded (Dyatlova & Kalkman 2008a). During the first half of July 2016, a group of the Dutch youth nature organisation JNM - Jongeren in de Natuur visited the Danube Delta on a nature camp to Romania. In this article, we present the findings of dragonfly inventories perfored at several locations within the Delta during that trip.

Materials & Methods

Study area

Surveys were conducted in four regions (figure 1, figure 2). The majority of the observations are from the surroundings of Sfantu Gheorghe village



Figure 2. A: habitat near Mahmudia (region 1). B: eastern canal near Sfantu Gheorghe (region 4). C: habitat near Caraorman (region 3). D: habitat near Murighiol (region 2). E: salt marshes near Sfantu Gheorghe (region 4).

A: Omgeving van Mahmudia (Regio 1). B: kanaal ten oosten van Sfantu Gheorghe (Regio 4). C: omgeving van Caraorman (Regio 3). D: omgeving van Murighiol (Regio 2). E: zoutmoerassen bij Sfantu Gheorghe (Regio 4) (Photos: A - Rick Buesink, B, C, E - Reinier de Vries, D - Peter Links)

(figure 2B, 2E), all within the square (45°05'18"N, 29°05'34"E) by (45°05'06"N, 29°03'57"E). Sfantu Gheorghe is situated on the coastal strip in the south of the delta, and supports a large variety in habitats. Next to the sea lies a narrow zone of sandy beach and sparsely vegetated dunes, dunes with grass cover and scrubs, and (largely dried) salt marshes dominated by Bolboschoenus vegetation. Adjacent lies a zone with meadows and woods towards the north, intersected by canals with varied water vegetation. Meadows were dominated by sedges, while in the woods willow and poplar trees were dominant. In between the woods and meadows lies and old eastward-running canal with a large habitat and species diversity, hereafter referred to as the eastern canal. On the inland side of Sfantu Gheorghe, extensive and largely inaccessible reed beds start. These are bordered by a relatively large canal running in northern direction, hereafter referred to as

the western canal. At last, the waterfront of the village provides some small riverine woodland.

Other data was obtained on visits of a few hours in the surroundings of Caraorman, Mahmudia and Murighiol villages. The Caraorman region (figure 2C), within the square (45°03'28"N, 29°23'23"E) by (45°04'54"N, 29°25'12"E), supports an old dune ridge covered by dry grassy vegetation with shallow marshes in depressions, which held a high Odonata diversity. An old riverine forest stands at the fringes. The ridge is surrounded by extensive reed beds with several lakes and canals. Mahmudia (45° 05'N, 29°04'E) (figure 2A) and Murighiol (45° 01'N, 29° 07'E) (figure 2D) are situated at the inland edge of the delta. Records from Mahmudia are mainly from the Bestepe hills, supporting dry grass and scrub vegetation, while records from Murighiol are from open steppe habitat with shallow lakes. All areas were explored on foot. Detailed site information as well as permission to access certain restricted areas and to catch and release insects was given by the Rewilding Europe program for the Danube delta (https://www.rewildingeurope.com/areas/danube-delta/).

Data collection

Dragonflies were observed with binoculars and if necessary caught with an aerial insect net for identification in hand, occasionally with the use of a hand lens and photographed. Identification was based on Dijkstra & Lewington (2006). In general, most species could be readily identified in hand or with binoculars. A few records were verified afterwards based on pictures. The distinction between Chalcolestes parvidens and C. viridis, however, proved difficult. Both species show a clear genetic difference, but field characters as well as the upper appendages are very similar (Gyulavári et al. 2011). Since dimensional differences are very subtle and show regional variations (Utzeri et al. 1995, Marinov 2000), the identification of Chalcolestes specimens on this trip was based on the anal appendage, with the use of hand lenses and detailed pictures. Females of C. parvidens have 6-8 teeth on the lateral valve, compared to 10-14 teeth for C. viridis (Matushkina 2006). Identification of males was based on the limited amount of black on the upper appendage tips and the finely upturned shape of the lower appendage tips in C. parvidens. Based on these characters (figure 3), all specimens were identified as C.

parvidens. It is however important to remark that some females seemed to have 9 carinal teeth, as can be seen in figure 3, which makes it hard to exclude a mixed origin. Additionally, all specimens had an evenly brown pterostigma.

The numbers of individuals of rare and less common species were recorded accurately, numbers of common species were partly estimated. In these cases the total number of records is indicated as more than 100. Observers had prior experience with most species from recording work in the Netherlands or from previous trips to eastern Europe. Records were submitted online using ObsMapp on mobile phones, or otherwise recorded on paper and submitted afterwards. A complete overview of all records from this survey is available at www. observation.org. For this article this overview was downloaded as a CSV file displaying the name, date, coordinates and number of individuals. The observations were then assigned to four different regions (figure 1), based on their coordinates. Double observations (same individuals observed by different observers) were excluded manually, based on their coordinates and time. Some remarkable observations were checked with the observer and if available with photographs. Species' distributions were analysed per region. All records per region are shown in table 1.

Results

A total of 25 species were recorded during this trip. Twenty three species were found



Figure 3. Detailed pictures of the female (left) and male (right) cerci of Chalcolestes parvidens.

Detailfoto van het vrouwelijk (links) en mannelijk (rechts) achterlijfaanhangsels van Chalcolestes parvidens Sfantu Gheorghe, 13 juli 2016 (Foto: Jan van Leeuwen).

Tabel 1. Recorded species per region (July 2016). normal font: exact numbers; bold: estimated numbers; no number: not recorded in the region.

Waargenomen soorten per regio (juli 2016). Gewoon lettertype: exacte aantallen; vet: geschatte aantallen; geen cijfer: niet waargenomen in deze regio

Species	Region 1: Mahmudia	Region 2: Murighiol	Region 3: Caraorman	Region 4: S. Gheorghe
Calopteryx splendens			60	6
Lestes barbarus	1	3	11	37
Lestes macrostigma		2		50+
Lestes sponsa			1	7
Chalcolestes parvidens				7
Sympecma fusca				1
Ischnura elegans		13	50+	100+
Enallagma cyathigerum		2		
Coenagrion puella		2		3
Erythromma viridulum	3	2	1	40+
Platycnemis pennipes				2
Aeshna affinis			5	3
Aeshna isoceles			2	2
Aeshna mixta	1	2		
Anax imperator		1	1	7
Anax parthenope	1		3	17
Anax ephippiger			2	7
Crocothemis erythraea	2	9	30	100+
Orthetrum albistylum			5	100+
Orthetrum brunneum				3
Orthetrum cancellatum			1	31
Selysiothemis nigra	2	5		4
Sympetrum fonscolombii		6	1	57
Sympetrum meridionale	100+	2		25
Sympetrum sanguineum		1	2	59

around Sfantu Gheorghe. On shorter visits to Caraorman, Murighiol and Mahmudia 15, 13 and 7 species were found respectively. All records per region are presented in table 1. The records include one species which was not yet known for the Romanian Danube delta, *Anax ephippiger*, as well as notable records of *Lestes macrostigma*, *Chalcolestes parvidens* and *Selysiothemis nigra*.

Regions account

Sfantu Gheorghe: The most common and widespread species were *Ischnura elegans* and *Crocothemis erythraea*, with over 100 records from all habitats including the coastal salt marshes. This habitat supported large numbers of *Lestes macrostigma*, as well as *Sympetrum fonscolombii* and smaller numbers of *Lestes barbarus*, *Anax parthenope*, *A. ephippiger*, *Orthetrum albistylum*, *O. cancellatum* and *Selysiothemis nigra*. Anax ephippiger and S. nigra were only found in dry marshes adjacent to the eastern canal. Few species were found at the Danube riverfront, namely Calopteryx splendens, Platycnemis pennipes and Orthetrum brunneum, while Lestes sponsa and Sympetrum meridionale were found in the village itself. The highest dragonfly numbers and diversity were found in freshwater habitats along the western and particularly the eastern canals. Orthetrum albistylum was particularly common here. Lestes barbarus, Erythromma viridulum, Anax parthenope, Orthetrum cancellatum, Sympetrum meridionale and S. sanguineum were also common along both canals, while smaller numbers were recorded of Coenagrion puella, Anax imperator and Aeshna isoceles. Lestes macrostigma was also present in small aggregations along both canals. Individuals of Platycnemis pennipes, Orthetrum brunneum and Sympetrum fonscolombii were found at the western canal, while Lestes sponsa, Sympecma fusca, Aeshna affinis and Anax ephippiger, were only found at the eastern canal. Chalcolestes parvidens was found in pockets of willow trees along the eastern canal.

Caraorman: A large concentration of *Calopteryx* splendens, numbering around 60 imagos, was found in riverine forest on the way (44°58'44"N 29°25'34"E). Individuals of Aeshna affinis and Anax parthenope were recorded in the reed beds west of the village. Ischnura elegans, Crocothemis erythraea and individuals of Erythromma viridulum and Sympetrum fonscolombii were recorded in the harbour of the village. The richest dragonfly habitat was formed by the shallow marshes south of the village. Lestes barbarus, Ischnura elegans, Aeshna affinis, A. isoceles, Anax parthenope, two fresh images of A. ephippiger, Crocothemis erythraea, Orthetrum albistylum, O. cancellatum and Sympetrum sanguineum were found here. Lestes sponsa and Aeshna isoceles were found in the riverine forest.

Mahmudia: Most records are from the Bestepe hills next to the village. Large aggregations of *Sympetrum meridionale* were present here, resulting in well over 100 records. Furthermore individuals of *Lestes barbarus*, *Aeshna mixta*, *Anax parthenope*, *Crocothemis erythraea* and *Selysiothemis nigra* were recorded here. *Erythromma viridulum* and *Selysiothemis nigra* were found in the Mahmudia harbour.

Murighiol: 13 species were recorded near Murighiol. Lestes barbarus, Erythromma viridulum, Anax imperator and Sympetrum fonscolombii were found at the eastern freshwater lake. Lestes barbarus, two imagos of Lestes macrostigma, Ischnura elegans, Enallagma cyathigerum, Coenagrion puella, Erythromma viridulum and Sympetrum fonscolombii were found at the western, more saline lake. The steppe east of the eastern lake supported Ischnura elegans, Coenagrion puella, Aeshna



Figure 4. Selysiothemis nigra, Mahmudia, Romania, 10 July 2016. Windvaantje (Selysiothemis nigra), Mahmudia, Roemenië, 10 juli 2016 (Photo: Jan van Leeuwen).



Figure 5. Anax epphiphiger, Sfantu Gheorghe, Romania, July 2016. Zadellibel (Anax epphiphiger), Sfantu Gheorghe, Roemenië, juli 2016 (Photo: Jan van Leeuwen).

mixta, Crocothemis erythraea, Sympetrum meridionale, S. sanguineum and Selysiothemis nigra.

Discussion

Noteworthy observations

Eleven of the 23 species recorded in Sfantu Gheorahe. namely Calopteryx splendens, Lestes sponsa, L. macrostigma, Chalcolestes Sympecma Coenagrion parvidens, fusca. puella, Aeshna affinis, Α. isoceles. Anax ephippiger, Orthetrum brunneum Selysiothemis nigra, had not been previously reported from the southern part of the Danube delta (Manci 2012). Chalcolestes parvidens is only mentioned from one location in the northwest of the delta. The large numbers of Lestes macrostigma are of particular importance given the species' vulnerable status on the European Red List (Kalkman et al. 2010); it has a patchy distribution, is very local in parts of its range and is possibly declining (Sahlén et al. 2004). Orthetrum brunneum is only mentioned along the Sulina branch in the northern part of the Danube delta. Selvsiothemis nigra is not mentioned by Manci (2012) at all but it has been discovered by Phil Benstead in 2013 at several locations in the Danube delta (unpublished data), and is included in Boudot & Kalkman (2015). Only individuals were found on this trip, but populations may occur in both the coastal habitat and the saline steppe lakes near Mahmudia and Murighiol. Anax ephippiger had not been reported before from the Romanian Danube delta at all. Manci (2012) provides three records from the west and south of Romania and mentions that the species only occurs in Romania during irregular migrations. We found no previous evidence of successful breeding in the country. During this visit, however, A. ephippiger was recorded regularly and several individuals were very fresh. This is considered to be a strong indication of local origin, meaning that successful breeding must have occurred. Enallaama cyathigerum, recorded Murighiol, is only mentioned from the northern part of the delta with one recent record (Sulina).

Other species

Manci (2012) mentions 49 species for the Romanian Danube Delta, to which one species (Selysiothemis nigra) is added in Boudot & Kalkman (2015). For 10 of these only old records from before 1979 are mentioned (Coenagrion ornatum, C. scitulum, Erythromma lindenii, Aeshna cyanea, A. grandis, Brachytron pratense, Ophiogomphus cecilia, Cordulia aenea, Libellula depressa and L. fulva). In the Ukrainian part of the Danube delta, which forms an adjacent and similar habitat, other known species are Erythromma lindenii, which can be locally common, and Anax ephippiger, which occurs incidentally (Gorb & Ermolenko 1996, Dyatlova & Kalkman 2008b). Species mentioned by Manci (2012) for Sfantu Gheorghe but not found during this visit are Chalcolestes viridis, Ischnura pumilio (old record), Coenagrion pulchellum, Erythromma lindenii (old record), Aeshna mixta and Sympetrum depressiusculum. The occurrence of C. viridis in the Danube delta is however uncertain (De Knijf 2007). Coenagrion pulchellum and Sympetrum depressiusculum may have been missed due to their earlier flight period, which may have affected the abundance of species like Sympecma fusca, Aeshna mixta and A. isoceles (Boudot & Kalkman 2015).

This visit consisted of a relatively extensive exploration of different habitat types and we therefore believe it is representative for the dragonfly fauna of the Sfantu Gheorghe region present at that time of the year. It is however not a complete or systematic documentation, so no conclusions can be drawn as to the presence of the additional species mentioned above. The opportunistic character of the data furthermore



Figure 6. Chalcolestes parvidens, Sfantu Gheorghe, Romania, 13 July 2016.

Oostelijke pantserjuffer (Chalcolestes parvidens), Sfantu Georghe, Roemenië, 13 juli 2016 (Photo: Jan van Leeuwen).

causes some uncertainty in the abundance assessments. Our visits to the other three regions consisted of short visits of a few hours only, so it is highly likely that more species than the ones mentioned here occur regularly.

Conclusions

During this trip, a total of 25 species were recorded. Twenty-three of these were recorded in the surroundings of Sfantu Gheorghe village. Additional records were taken near Caraorman, Mahmudia and Murighiol. Calopteryx splendens, Chalcolestes parvidens, Lestes sponsa, L. macrostigma, Coenagrion puella, Sympecma fusca, Aeshna affinis, A. isoceles, Anax ephippiger, Orthetrum brunneum and Selysiothemis nigra were not reported for Sfantu Gheorghe by Manci (2012). Of Anax ephippiger only three vagrant records had been reported for Romania before. The seven fresh imagoes found on this visit at Sfantu Gheorghe and Caraorman could be an indication of breeding. Chalcolestes parvidens is only reported from one location in the northern Danube delta, but was the only Chalcolestes species found at Sfantu Gheorghe on this visit. Lestes macrostigma was found at several locations, including a large population in the coastal marshes. Selvsiothemis nigra, which was newly discovered for Romania in 2013, was present at several locations at Sfantu Gheorghe, Mahmudia and Murighiol.

Acknowledgements

We would like to thank Cosmin Manci and Vincent Kalkman for their advice and support. Furthermore, we would like to thank Alexandra Panait and Razvan Crimschi of Rewilding Europe Danube Delta for their advice and assistance with permissions and local arrangements which enabled our visits to Sfantu Gheorghe and Caraorman. This report was part of a JNM - Jongeren in de Natuur youth camp, and would not have been possible without the enthusiastic participants of this trip. Observations by Gijs Baller, Lonnie Bregman, Rick Buesink, Wouter van der Ham, Elwin Koning, Diedert Koppenol, Jan van Leeuwen, August van Steensel and Reinier de Vries were used as data in this study

References

- Boudot J.P. & V.J. Kalkman (eds.) 2015. Atlas of the European dragonflies and damselflies, KNNV publishing, the Netherlands.
- Bulankova E., P. Beracko & T. Derka 2013. Occurrence of protected species (*Gomphus flavipes*, Odonata and *Palingenia longicauda*, *Ephemeroptera*) in the Danube River and its deltas (Romania, Slovakia). Scientific Annals of the Danube Delta Institute 19: 21-24, doi: 10.7427/DDI.19.03.
- De Knijf G., U. Flenker, C. Vanappelghem, C.O. Manci, V.J. Kalkman & H. Demolder 2011. The status of two boreo-alpine species, *Somatochlora alpestris* and *Somatochlora arctica*, in Romania and their vulnerability to the impact of climate change (Odonata: Corduliidae). International Journal of Odonatology 14: 95-101.
- De Knijf G. 2007. Verslag van het Europees libellenkamp in Roemenië. Libellenvereniging Vlaanderen Nieuwsbrief 1 (3): 12-13.
- Dijkstra K. -D.B. & R. Lewington 2006. Field guide to the Dragonflies of Britain and Europe. Britisch Wildlife Publishing, Gillingham.
- Dyatlova E.S. & Kalkman V.J. 2008b. The Odonata of southwestern Ukraine, with emphasis on the species of the EU Habitats Directive. Libellula 27: 275-290.
- Dyatlova E.S. & V.J. Kalkman 2008a. Massive migration of *Aeshna mixta* and *Sympetrum meridionale* in the Ukrainian Danube delta (Odonata-Anisoptera: Aeschnidae, Libellulidae). Entomologische berichten 68: 188-190.
- Flenker U. 2011. Odonata of the Romanian Carpathians with notes on *Somatochlora alpestris* and on the first Romanian record of *Aeshna subarctica* (Odonata: Corduliidae, Aeshnidae). Libellula 30: 183-202.
- Gorb S. & V. Ermolenko 1996. Odonata from "Dunajskie Plavni" nature reserve, Danube delta, Odessa province, SW Ukraine. Notulae Odonatologica 4: 125-136.
- Gyulavári H.A., T. Felföldi, T. Benken, L.J. Szabó, M. Miskolczi, C. Cserháti, V. Horvai, K. Márialigeti & G. Dévai 2011. Morphometrical and molecular studies on the populations of two damselfly taxa, Chalcolestes viridis and C.parvidens (Odonata, Zygoptera), including intermediate forms. International Journal of Odonatology 14: 329-339.

- Kalkman V. J., J.-P. Boudot, R. Bernard, K.-J. Conze,
 G. De Knijf, E.S. Dyatlova, S. Ferreira, M. Jovic,
 J. Ott, E. Riservato & G. Sahlén 2010. European
 Red List of Dragonflies. Office for Official Publications of the European Union, Luxembourg
- Manci C.O. 2012. Dragonfly Fauna (Insecta: Odonata) fauna from Romania. PhD Thesis Abstract, "Babes-Bolyai" University, Cluj-Napoca, Romania.
- Matushkina N. 2006. New records of rare Odonata in Ukraine (Insecta). Proceedings of zoological museum 4: 155-161.
- Murányi D., G. Katona, J. Fekete & T. Kovács 2015. Review and contribution to the Odonata fauna

- of Sălaj county, Romania. Studia Universitatis "Vasile Goldiş", Seria Ştiinţele Vieţii, 25: 250-253.
- Sahlén G., R. Bernard, A. Cordero-Rivera, R. Ketelaar & F. Suhling 2004. Critical species of Odonata in Europe, International Journal of Odonatology 7: 385-398.
- Rakosy L., M. Heiser, C.O. Manci & T. Schmitt 2012.

 Strong divergences in regional distributions in Romania: recent ecological constraints in dragonflies (Odonata) versus ancient biogeographical patterns in butterflies (Lepidoptera: Rhopolocera). Insect conservation and diversity 6: 145-154. doi: 10.1111/j.1752-4598.2012.00197.x.

Summary

The Danube Delta is one of the most important wetlands of Europe, but its Odonata fauna is still relatively poorly known. This article presents Odonata observations from a visit to the Romanian Danube Delta in July 2016. Records are from around the village of Sfantu Gheorghe as well as from around the villages of Caraorman, Murighiol and Mahmudia. 25 species were recorded in total. In the Sfantu Gheorghe region we found eleven species that had not been reported previously from this part of the delta. These include the first records of *Anax ephippiger* from the Romanian Danube delta, as well as records of *Lestes macrostigma*, *Chalcolestes parvidens* and *Selysiothemis nigra*.

Samenvatting

De Vries J. P. R., R. Buesink, J. van Leeuwen, G. Baller 2017. Libellenwaarnemingen in de Donau delta, Roemenië, in juli 2016. Brachytron 19 (1): 35-43.

De Donaudelta is een van de belangrijkste moerasgebieden van Europa, maar over de libellen in dit gebied is nog relatief weinig bekend. Dit artikel bespreekt libellenwaarnemingen gedaan tijdens een bezoek aan de Roemeense Donaudelta in juli 2016. De waarnemingen zijn in de omgeving van de dorpen Sfantu Gheorghe, Caraorman, Murighiol en Mahmudia gedaan. In totaal werden 25 soorten waargenomen. Rond Sfantu Gheorghe zijn 11 soorten gevonden die nog niet eerder gemeld zijn in dit deel van de delta, waaronder *Lestes macrostigma*, *Chalcolestes parvidens* en *Selysiothemis nigra*. De waarnemingen van *Anax ephippiger* zijn de eerste voor de Roemeense Donaudelta.

Keywords: Odonata, Romania, Danube delta, faunistics, Anax ephippiger