

DRAGONFLY OBSERVATIONS IN THE RAKA AREA, LOWER CARNIOLA, EASTERN SLOVENIA, WITH A NOTE ON THE BEHAVIOUR OF *SOMATOCHLORA MERIDIONALIS* NIELSEN (ANISOPTERA: CORDULIIDAE)

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Abstract An annotated list is given of 28 spp. from 17 localities in the area (alt. 150-300 m). In Slovenia, *S. meridionalis* was so far known from a single specimen, taken in NW Istria in the early 1960s, therefore the strong populations reported here are of some interest. Coupled with the recent records from northern Italy (Friuli), these could represent an additional evidence for the current northward range extension of this sp. Various types of male behaviour are outlined in some detail.

Introduction

During August 1-10, 1992, the traditional summer workshop of Biology students of the University of Ljubljana was held at the village of Raka, near the Ljubljana-Zagreb highway, some 30 km W of the international border with Croatia. The report of the small "odonatological team" is presented here. Evaluating the data, it should be emphasised that they are based on a very brief survey, hardly a few hours were spent on each one locality.

The exceptionally hot summer of 1992, the hottest since decades, completely dried up most

of the irrigation ditches and other small water bodies for a period of at least 6 weeks. The temperatures were 30-35°C during the day, and close to 25°C in the mornings and evenings. Consequently, in the "normal" years species distribution, abundance and population densities may deviate considerably from the situation recorded.

Some localities have not been checked for the larvae. The comments on ecology and behaviour are given where considered of some interest.

List of localities

The localities are situated at an altitude of 150-300 m a.s.l.

- (1) Štritovsko jezero, WL 28; 3-VIII-1992. – Man-made eutrophic lake (depth 3 m), in a natural depression, fed by rain and heavily stocked with fish, without submerged vegetation. It is surrounded by a thick vegetation wall, with the usual fishermen entrances at 10-30 m intervals.
- (2) Prilipe, backwaters of Sava R., WL 58; 5-VIII-1992. – It is one of the few backwaters of the Sava R. preserved in Slovenia, and consists of 2 parts (length 600 and 150 m, resp.), connected by a stagnant water canal. At the time of our visit, less than 10% of the water surface was covered with floating vegetation. The vegetation is typical of backwaters, submerged vegetation modest.
- (3) Dobra mlaka nr Škocjan, backwater of the Radulja R., WL 28; 4/8-VIII-1992. – Actually a series of pools, connected by channels that are dry most of the time, fed by Radulja at floods only. Water depth varies with the seasons, the surface is covered with *Lemna* sp., and there is a strong growth of submerged vegetation.
- (4) Dobovski potok, fishery ponds, WL 17; 4-VIII-1992. – Over-populated with fish and probably regularly emptied.
- (5) V. Koren, flint sand pits, WL 38; 7-VIII-1992. – The depressions in the abandoned sections were filled by rain water (depth 30-40 cm, surface up to 200 m²). *Potamogeton natans* and *Eleocharis* sp. occur in some of the puddles. Young Libellulidae instars were recovered from the bottom mud.
- (6) Dobra mlaka nr Škocjan, Radulja rivulet, WL 28; 4-VIII-1992. – Depth 70 cm, width 5-8 m, modest current, mostly loamy bottom. In the shallow sections near the banks, there are long chains of green algae, reaching the surface at the low water. The steep banks are regularly cut, therefore there are no bushes or trees.
- (7) Hrvaški brod, the Martinek and Račna streams, WL 28; 9-VIII-1992.
- (8) Kostanjevica, the Obrh stream, WL 37; 7-VIII-1992. – Same as (8).
- (10) D. Gradišče, Čadraški potok, WL 27; 7-VIII-1992. – Lowland stream in a grassland, overgrown by trees.
- (11) Ardno nr Raka, the Lokavec stream, WL 38; 5-VIII-1992. – Lowland stream with 2 branches. The one in the meadow forms a pool, where exuviae of *Aeshna cyanea* and *Anax imperator* were found. The other branch flows on the meadow/forest border.
- (12) Mikote-Koprivnik, the Lokavec stream, WL 38; 2-VIII-1992. – (A) The first km from the village of Mikote is an artificial, 2 yr old canal, of modest velocity and with some pools (depth 30 cm, width 2 m). The floor consists of small gravel, covered with mud near the bank. *Typha* sp., *Eleocharis* sp. and *Potamogeton natans* stands occur locally. The banks are cleared annually. – (B) The natural lower section of the stream runs through an oak forest, it is completely shaded and has no aquatic vegetation.
- (13) Klevevž (castle), Radulja rivulet, WL 18; 4-VIII-1992.
- (14) Senuša stream, between the village of Brod-v-podbočju and the Krka R., WL 38; 4-VIII-1992.
- (15) Brestanica, fishpond, WL 39; 5-VIII-1992.
- (16) Krakovski gozd, southern part, WL 38; 3-VIII-1992. – Normally a marshy forest with numerous small natural water bodies. Save for the 2 largest streams, it was completely dry at the time of our visit.
- (17) Arto, Štagina stream, upward the village, WL 39; 6-VIII-1992.

Annotated list of species

[x = > 50 individuals; – xx = "immense density"]

Calopteryx splendens (Harr.) ssp. – (1): 4 ♂, 3 ♀; – (2): 4 ♂; – (4): x ♂, x ♀, all at inlet

and outlet; - (6): x ♂, x ♀; - (7): x ♂, x ♀; - (8): x ♂, x ♀; - (9): 2 ♂; - (10): 6 ♂; - (12): x ♂, x ♀; - (14): x ♂, x ♀.

C. virgo (L.) ssp. - (6): x ♂, x ♀; - (7): x ♂, x ♀; - (9): 7 ♂, 3 ♀; - (10): 10 ♂, 4 ♀; - (11) x larvae, x ♂, x ♀; - (12): x ♂, x ♀; - (13): 1 larva, x ♂, x ♀.

Platycnemis pennipes (Pall.). - (1): x ♂, x ♀, 2 cop.; - (2): x ♂, x ♀, x cop.; - (3): x ♂, x ♀, 1 cop.; - (6) xx ♂, xx ♀, xx cop., xx ovip.; - (7): x ♂, x ♀; - (12): x larvae, x ♂, x ♀; - (13): x ♂, x ♀; - (14): x ♂, x ♀, x cop., x ovip.; - (16): xx ♂ juv., xx ♀ juv.

Cercion lindenii (Sel.). - (6): 7 ♂; - (14): 1 ♂.

Coenagrion puella (L.). - (1): x ♂, 7 ♀, 3 cop.; - (2): x ♂; - (3): 5 ♀ (4-VIII), 7 ♂ (7-VIII).

Erythromma viridulum (Charp.). - (2): x ♂, x ♀, 1 cop., 1 ovip.; - (3): x ♂, 2 ovip. (4-VIII), x ♂ (7-VIII); - (6): x ♂, 4 ovip. - Found only at the 2 backwaters. Those observed at (6) have surely migrated from (3), as they have been concentrated at the place nearest to it.

Enallagma cyathigerum (Charp.). - (5): 8 ♂, 1 ovip.

Ischnura elegans (Vander L.). - (1): x ♂, x ♀, 5 cop., 5 ovip.; - (2) x exuviae, xx ♂, x ♀, x ovip.; - (5): 1 cop.; - (6): 1 ♂; - (12): 5 ♂.

I. pumilio (Charp.). - (5): x ♂, 1 ♀.

Lestes sponsa (Hans.). - (2): 1 ♂ juv., 1 ♀.

L. viridis (Vander L.). - (4): 1 cop., 1 ovip.

Aeshna cyanea (Müll.). - (11): 1 ♂ exuviae, 1 ♀ exuviae; - (16): 1 ♀ juv.

A. grandis (L.). - (1): 2 ♂; - (2): 1 ♂; - (3): 2 ♂ exuviae, 1 ♀ exuviae, 2 ovip.

A. mixta Latr. - (16): 1 ♀.

Gomphus vulgatissimus (L.). - (12 A): 4 F-0 larvae.

Onychogomphus f. forcipatus (L.). - (1): 1 ♀ juv.; - (2): 1 ♂; - (6): 10 ♂, 1 ♀; - (12A): xx larvae, 2 exuviae, x ♂, 1 ♀; - (13): 1 larva, 2 ♂; - (14): 3 ♂. - In the clean gravel, in the middle of a stream at (12), 2-3 larvae were counted per dm². Near the bank, where gravel is covered with up to 3 cm of mud, 5-10 larvae were found per dm². Apparently, water management measures (low bank vegetation and full sunshine throughout the year) have led to a higher

activity of adults on this particular stretch of the stream, resulting in the higher density of larvae. The uniform, slow to modest velocity and suitable bottom structure allow the larvae to spread out, the competition is lower and the survival rate higher. Since the development in this and in the former species takes more than 2 years, it remains to be seen whether this process will result in high emergence rates in the forthcoming years. The 2 exuviae were clinging vertically to grass stems, a few cm above the water. At the spot, no horizontal structures, suitable for ecdysis, are available.

Cordulegaster sp. - At (10), (11) and (12 B) the adults were sighted, at (17) a copula was noticed. No voucher specimens could be secured.

Somatochlora flavomaculata (Vander L.). - (2): x ♂; - (3): 1 ♂.

S. meridionalis Nielsen. - (3): 5 ♂, 1 cop.; - (4): 10 ♂; - (5): 7 ♂; - (10): 7 ♂; - (11): 5 ♂; - (12): 4 ♂, 1 ♀; - (13): 6 ♂; - (14): 5 ♂. - So far a single ♀ of this species has been brought on record from Slovenia, taken in 1961 near the city of Piran in NW Istria (KIAUTA, 1963). At that time, that was by far the northernmost locality known. Recently, however, a number of populations were reported from northern Italy, notably also from the province of Friuli, N of Udine, where the species co-occurs with *S. metallica* (Vander L.) (cf. PECILE, 1988). Since the Friulian fauna has been thoroughly surveyed in the 1960s and *meridionalis* has not been found there then, it is likely that this is another (of the rather numerous) odonate species that are currently expanding their range northward. Its abundance in the Raka area could be significant also from this point of view. - Breeding sites of *S. meridionalis* are often associated with slow running streams, on the grassland/forest border. All records given here, except for localities (3) and (4), would fall within this frame, although males were not always sighted near the water. Males at such localities were behaving in 3 ways, viz. (a) If the whole stretch of stream was shaded, they slowly patrolled, at a height of ca 80 cm, upstream or downstream, for distances over 50 m. Occasionally they made a stop at the same spot for a couple of seconds, for closer inspection of areas under overhanging branches. If there were any sunny spots, the males

somehow tried to avoid them. If this was impossible, they turned around to fly back, or they overflew the place with much greater speed — to slow down in the next shade. — (b) The majority of males was patrolling at 50-250 cm height over meadow edges shaded by a line of trees. If undisturbed, they stayed at the same place (10-30 m) for a very long time. Any intruding ♂ was immediately attacked, and this always resulted in a furious chase to heights of 20 m or more. After a couple of seconds one of the males usually returned to the same place. — (c) On locality (3), the males were patrolling close to the shaded bank, and carefully examined spots under branches of overhanging trees and bushes. Sunny places were "jumped over", or the males returned. The other sunny bank was ignored. When a female attempted to oviposit, she was immediately seized by one of the males, and the couple flew away. — It was cloudy on locality (4) during our visit. The males were flying much more over open water, the chasing after intruding males was less furious, and a defending male after a few metres returned to continue his route. Not a single

insect was ever seen settling down.

Libellula depressa L. — (5): 10 ♂, 3 cop., 3 ovip.; — (8): 1 ♀; — (13): 1 ♂; — (16): 1 ♂.

Orthetrum albistylum (Sel.). — (1): x ♂, 5 ♀, 2 cop., 10 ovip.; — (6): 3 ♂; — (15): 1 ♂.

O. brunneum (Fonsc.). — (2): xx ♂, 3 cop.; — (5): 10 ♂, 1 ♀, 3 cop., 3 ovip.; — (6): x ♂, 10 ♀, 10 cop., 10 ovip.; — (12 A): x ♂, 1 ♀.

O. cancellatum (L.). — (1): x ♂, 1 ♀, 2 cop., 10 ovip.; — (6): 3 ♂; — (15): 1 ♂.

O. coerulescens (Fabr.). — (12 A): 2 ♂.

Crocothemis erythraea (Brullé). — (1): 2 ♂; — (2): 4 ♂; — (15): 1 ♂.

Sympetrum sanguineum (Müll.). — (1): 5 ♂, 2 ♀, 1 cop., 2 ovip.; — (2): x ♂, 5 cop.; — (3): x ♂, 2 ovip.; — (7): 1 ♂; — (10): 5 ♂, 1 ♀.

S. vulgatum (L.). — (3): 1 ♂, 1 cop.

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