



## FIRST DATA FOR PARASITISING ON *SYMPETRUM MERIDIONALE* (SÉLYS) BY *ARENURUS* (ACARI: HYDRACHNIDIA) LARVAE FROM MONTENEGRO

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water mites,  
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### SYNOPSIS

Six specimens (males) of *Sympetrum meridionale* from Montenegro were found with 158 parasitic larvae of *Arrenurus papillator*. All the larvae were attached to lower surface of wings. More larvae were attached to the 2<sup>nd</sup> pair of wings (85 larvae) and a little fewer were attached to the 1<sup>st</sup> pair of wings (56 larvae). The water mite larvae preferred Cu<sub>1</sub> veins for attaching followed by M<sub>4</sub> veins.

### INTRODUCTION

There are many publications about parasitization of aquatic insects by water mite larvae, but a little refer to *Arrenurus papillator* (O.F. Müll.) (Münchberg 1935, 1963, 1982; Cassagne-Méjean 1966; Davids 1997; Zawal, Dyatlova 2006). Five of them refer parasitism of *A. papillator* on *Sympetrum meridionale* (Münchberg 1935, 1963, 1982; Cassagne-Méjean 1963, 1966). In another way there are only a few records from Mediterranean area (Pavlyuk 1968, Oliger 1975, Zawal, Dyatlova 2006), but all of them refer Ukrain. Therefore even small amounts of information enrich our knowledge on this topic. This paper give new records about parasitization of *Sympetrum meridionale* by *Arrenurus papillator* larvae from Balkans.

### MATERIALS AND METHODS

Six males of dragonflies (*Sympetrum meridionale*) were collected on the beach in Velika Plaza, SE Montenegro, 02.09.2006. They were infected by 158 larvae of *Arrenurus papillator*. The water mite species was identified using Zawal's key (2008).

The following abbreviations are used throughout: wings 1, 1<sup>st</sup> pair of wing; wings 2, 2<sup>nd</sup> pair of wings; W1/Rs, Rs vein on 1<sup>st</sup> pair of wings; W1/R, R vein on 1<sup>st</sup> pair of wings; W1/M4, M4 vein on 1<sup>st</sup> pair of wings; W1/Cu1, Cu1 vein on 1<sup>st</sup> pair of wings; W2/Sc, Sc vein on 2<sup>nd</sup> pair of wings; W2/R, R vein on 2<sup>nd</sup> pair of wings; W2/M4, M4

vein on 2<sup>nd</sup> pair of wings; W2/Cu1, Cu1 vein on 2<sup>nd</sup> pair of wings; W2/Cu2, Cu2 vein on 2<sup>nd</sup> pair of wings; DC, discoidal cell on 2<sup>nd</sup> pair of wings; AL, anal loob; AT, anal triangle.

## RESULTS

On six males of *Sympetrum meridionale* were found 158 larvae of *Arrenurus papillator*. All of parasites were attached to bottom side of the wings (Fig. 1). The number of larvae contained between 9 and 69 individuals, average = 29.2, median = 19.0 (Table 1, Fig. 2). More larvae were attached to the wings 2 (90 individuals, average = 7.5, median = 4.5) than to the wing 1 (68 individuals, average = 5.7, median = 4.5) (Table 1, Fig. 3), but the differences are not statistically substantial (Kruskal-Wallis test:  $H(8, N=12)=10.75383$   $p=0.2160$ ). There are large differences between numbers of water mite larvae found on particular veins and parts of the wings and they are statistically substantial (Kruskal-Wallis test:  $H(11, N=45)=20.75361$   $p=0.0360$ ). The most number of larvae were found on W1/Cu1 followed by W2/Cu2 and W2/M4 (Table 1, Fig. 4), but the differences between these veins are not statistically substantial ( $p(W1/Cu1-W2/Cu1)=0.528419$ ,  $p(W1/Cu1-W2/M4)=0.959597$ ,  $p(W2/Cu1-W2/M4)=0.933799$ ).



Fig. 1. *Sympetrum meridionale* with larvae of *Arrenurus papillator* (photo R. Jaskuta)

The size of body of water mite larvae contained between 596  $\mu\text{m}$  to 1504  $\mu\text{m}$ . The most differ in size of body larvae occurred on W1/Cu1 followed by W2/Cu1, W2/M4 and W2/Cu2 (Fig. 5). The most number of larvae contained in 1000-1050  $\mu\text{m}$  range followed by 1200-1250  $\mu\text{m}$  range (Fig. 6). On the wings 1 the most number of water mite larvae contained in 1000-1050  $\mu\text{m}$  range followed by 1200-1250  $\mu\text{m}$  and 950-1000  $\mu\text{m}$  range. On the wings 2 the most number of parasites contained in 1200-1250  $\mu\text{m}$  range followed by 1150-1200  $\mu\text{m}$  and 1000-1050  $\mu\text{m}$  range (Fig. 6). Both the largest and smallest *Arrenurus* larvae were found on W1/Cu1 and W2/Cu2. On W1/Cu1 the most number of parasites contained in 1000-1050  $\mu\text{m}$  range followed by 1200-1250  $\mu\text{m}$  and 950-1000  $\mu\text{m}$  range. On W2/Cu1 the most number of parasites contained in 1150-1200  $\mu\text{m}$  range followed by 1200-1250  $\mu\text{m}$  and 1000-1050  $\mu\text{m}$

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Host number	W1/Rs the left	W1/R the left	W1/M4 the left	W1/Cu1 the left	W1/Cu1 the right	W2/Sc the left	W2/R the left	W2/M4 the left	W2/Cu1 the left	W2/Cu2 the left	DC the left	AT the left	AL. the left	W2/R the right	W2/M4 the right	W2/Cu1 the right	W2/Cu2 the right	DC the right	AT the right	AL. the right	Total
1				6	4				4							5					19
2				1	3				3							2					9
3				5	8			4	1				2	1		12					33
4	3	3	5	7	10	1	3	5	6	4	2	1		2	5	5	2	1	1	3	69
5	1			4	3	1	2		3							2					16
6				2	3				4							3					12
Total	4	3	5	25	31	2	5	9	21	4	2	1	2	3	5	29	2	1	1	3	158

Table 1. General data of collecting material (abbreviations in text).

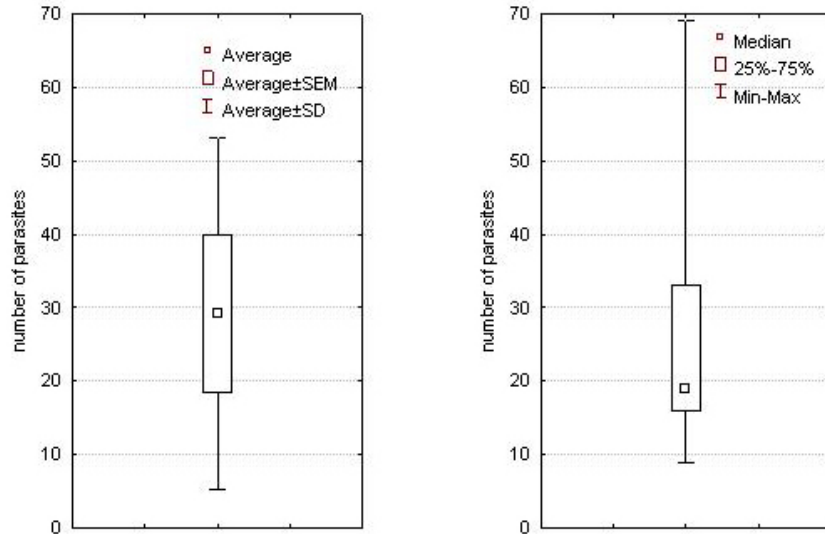


Fig. 2. Statistical characteristics of all the collected parasites

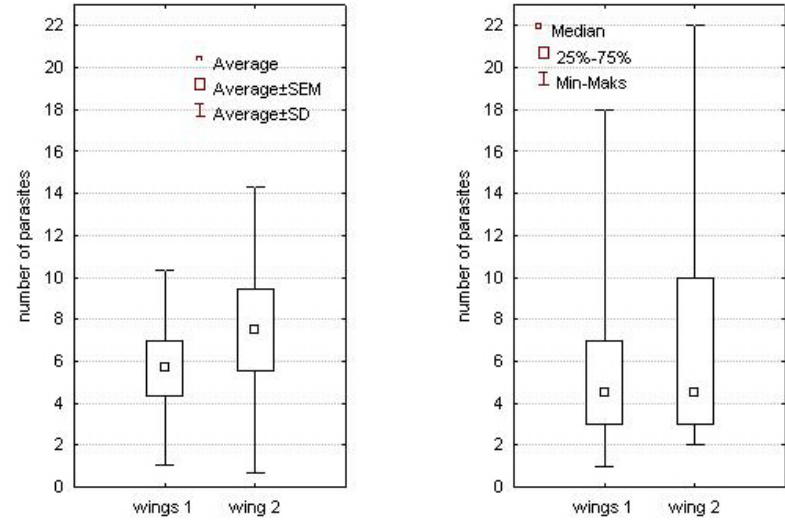


Fig. 3. Statistical characteristics of parasites found on the wings of the first and second pair

range. On W2/M4 the most number of parasites contained in 1000-1050  $\mu\text{m}$  range followed by 950-1000  $\mu\text{m}$  and 1100-1050  $\mu\text{m}$  range (Fig. 6).

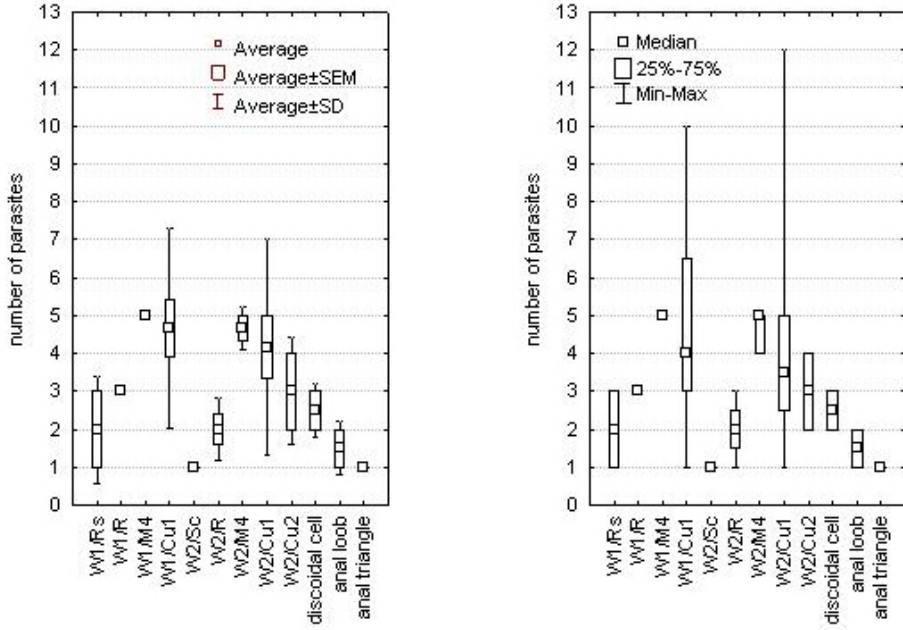


Fig. 4. Statistical characteristics of parasites occurring on the different parts of wings

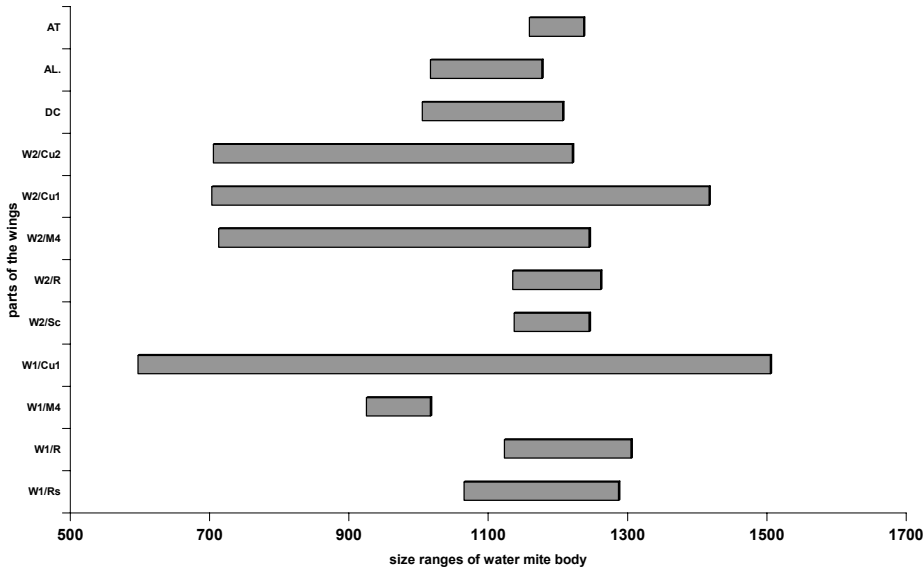


Fig. 5. Range of the body size of parasites found on the different parts of wings

## DISCUSSION

The parasitising larvae of *Arrenurus papillator* were found mainly on *Sympetrum fonscolombeii* (Sél.) and *S. meridionale*, which belong to Holomediterranean species (Dévai 1976). Other hosts, used seldom by the parasite were: *Lestes dryas* Kirby., *L. sponsa* (Hansem.), *L. barbarus* (Fabr.), *L. macrostigma* Ever., *Coenagrion mercuriale*

Charp.), *Ischnura elegans* (Vander L.), *Sympetrum flaveolum* (L.), *S. sanguineum* (O.F.Müll.), *S. striolatum* (Charp.), *S. vulgatum* (L.), *S. danae* (Sulz.) (Münchberg 1935, 1963, 1982; Cassagne-Méjean 1966; Davids 1997; Zawal, Dyatlova 2006). All of them come from Holomediterranean or Syrian refugial area (Dévai 1976). In the other side *Arrenurus papillator* is widespread, Palearctic species, but not very abundant. Such list of hosts suggests derivation the water mite species from Mediterranean area, and probably such widespread occurrence of *A. papillator* is connected with parasitising mainly on *Sympetrum meridionale* and *S. fonscolombei* which are very migrational species.

*S. meridionale* and *S. fonscolombei* are only host species which *Arrenurus papillator* attached the wings. In cases of other hosts, both damselflies (Zygoptera) and dragonflies (Anisoptera) *Arrenurus papillator* attached their thorax or abdomen (Münchberg 1935, 1963; Cassagne-Méjean 1966). Other water mite species connected with dragonflies attached their thorax and abdomen as well (Mitchell 1959, 1961, 1965; Conroy 1977; Forbes et al. 1999, 2002).

The number of larvae on individual hosts varied to a great degree. At the same time the shift of the median in relation to the mean (Fig.1) shows the incidental individual character of the highest number of parasites found on one host (Table 1). It should be accepted that the general rule is the lower intensity of infestation, within the limits of 20 parasites per host. It is corroborated by earlier literature data showing the mean infestation intensity of several individuals while single cases of very high infestation intensity (up to 100 parasites on one host) are also recorded (Münchberg 1935, Cassagne-Méjean 1966). Differences in the number of parasites on wings of the first pair and wings of the second pair are statistically not significant, differences between the values of means and medians showing (Fig.3) that on the most intensively infested dragonfly water mite larvae chiefly gathered on the wings of the second pair. The literature data (Münchberg 1935, Cassagne-Méjean 1966) confirm the uniform infestation of the two pairs of wings. Of the veins on wings the parasites preferred W1/Cul, W2/Cul and W2/M4. The numbers of water mite larvae found there were distinctly higher compared with the remaining parts of wings (Table 1, Fig.4). These data partly confirm earlier reports, the difference being noted in the numerous occurrence of water mite larvae also on R and M3 (Münchberg 1935, Cassagne-Méjean 1966). Most water mite larvae are decisively characterized by the body size within the range from 1000 to 1250  $\mu\text{m}$ , however, the size distribution shows positive skewness and the traits of the two-modal distribution with peaks between 700-750 and 1000-1050  $\mu\text{m}$ . Separate distributions for wings of the first and second pair present similar traits because of the characteristic distributions for W1/Cul, W2/Cul and W2/M4 (Fig.6). These veins are most numerously colonized by *A. papillator* larvae and hence because of the scarcity of place a part of the larvae cannot attain normal large sizes, this leading to the appearance of a certain number of larvae of a small body size (Fig.5). Therefore, the differences in the size of water mite larvae do not result from the varied rate of their growth but from the lack of space for attaining maximal body sizes by them.

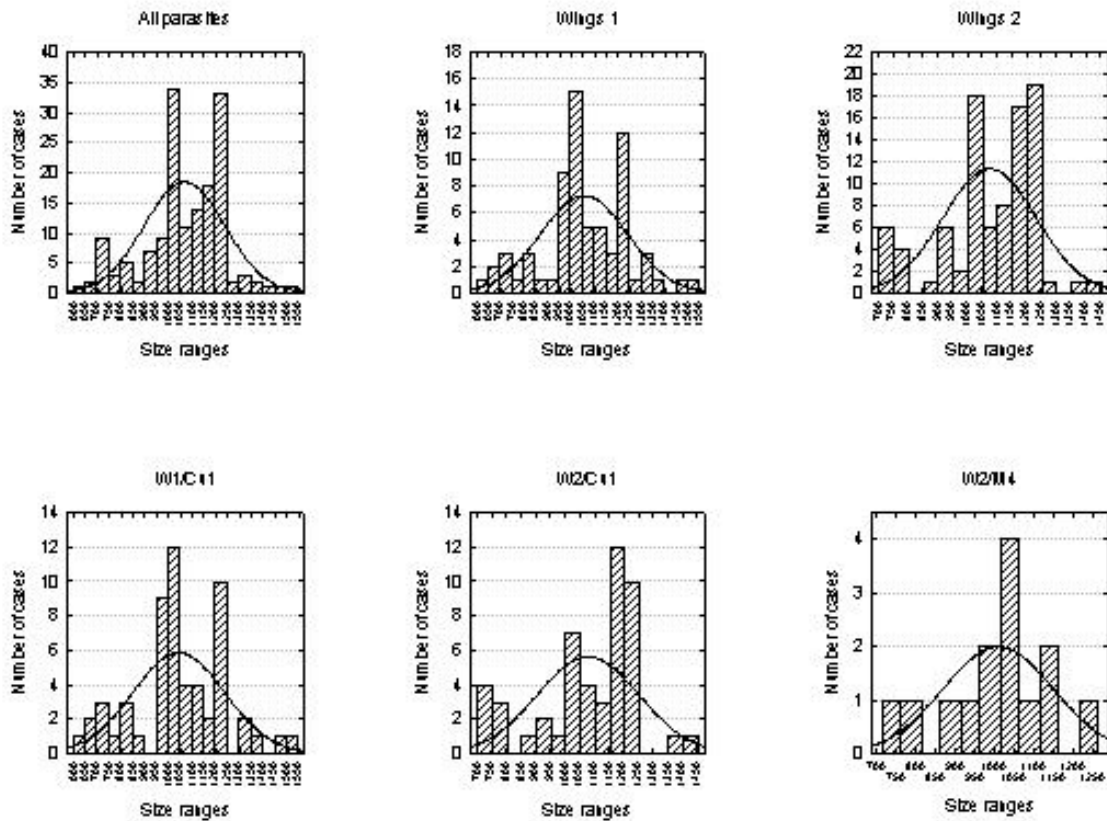


Fig.6. Distributions of the body size of parasites for: the whole material, for individual wings and for the veins on wings

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