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Raphidioptera and Neuroptera (Insecta: Neuropterida) in three National Parks in the Balkan Peninsula: Results of short collection trips

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Abstract. During the course of three Balkan neuropterological expeditions in 2014, 2015 and 2017, short visits to three national parks were conducted. A survey of the collected neuropterid species (Neuropterida: Raphidioptera, Neuroptera) in the Fir of Drenova National Park, Albania, the Tara National Park, Serbia, and the Pelister National Park, North Macedonia, is presented. The distribution and ecological traits of some rare and interesting lacewing species are discussed.

Further key words. Nature conservation, Albania, North Macedonia, Serbia, *Phaeostigma thaleri*, *Hemerobius schedli*

Introduction

In some parts of the Balkan Peninsula, the Neuropterida are still insufficiently known and before this study, almost no survey has been made for any national park in the Western Balkan. In the past, only the Durmitor National Park in Montenegro has been surveyed thoroughly (Devetak 1991). From 2014 to 2017, zoologists from the Department of Biology of the University in Maribor, Slovenia, organized four neuropterological expeditions to Albania, North Macedonia and Serbia (Klokočovnik & Devetak 2015; Devetak 2016; Devetak & Rausch 2016; Devetak et al. 2017).

In June 2014, a one-day visit was made to the Fir of Drenova National Park, Albania (Albanian: *Parku Kombëtar Bredhi i Drenovës*; geographic coordinates: 40°34'08"N 20°48'59"E, altitudinal range 980–1 806 m above sea level). The park with an area of 10.3 km² is located in south-eastern Albania, near Korçë (Fig. 1). Characteristic are Illyrian deciduous forests and Dinaric Alpine mixed forests, dominated by the silver fir *Abies alba* Mill. (Figs 2a, b). Prior to our study, no lacewings had been recorded in this national park.

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In June 2015, a two days' excursion was made to the Tara National Park, Serbia (Serbian: *Nacionalni park Tara*; 43°54'18"N 19°24'13"E; 250–1 591 m a.s.l.). The park in western Serbia is delimited from Bosnia and Herzegovina by the river Drina with the Perućac lake (Perućačko jezero; Fig. 1). A large area of the park, comprising 376 km² is covered with deciduous, mixed and coniferous forests. Characteristic is the endemic "Pančić's spruce" *Picea omorika* (Pančić) Purk. (Figs 2c, d) Prior to our study, only one literature report on the presence of *Sisyra nigra* in the national park was known (Podlesnik et al. 2017).

In July 2017, a one-day visit was conducted to the Pelister National Park, North Macedonia (Macedonian: *Nacionalen park Pelister*; 40°58'52"N 21°11'28"E; 927–2 601 m a.s.l.). The park comprising 172 km² is positioned in the southern part of the country, in the Municipality of Bitola. Characteristic are coniferous forests composed mainly of five-needle pine *Pinus peuce* Griseb. (Macedonian or Balkan pine; Macedonian: Mo-

Figure 1. Position of the three national parks investigated in this study in the Balkan Peninsula. AL – Albania, MK – North Macedonia, SR – Serbia.

lika), endemic for the Balkan Peninsula (Figs 2e, f). Prior to our study, one single report on the occurrence of *Palpares libelluloides* in the area existed (Devetak 1996).

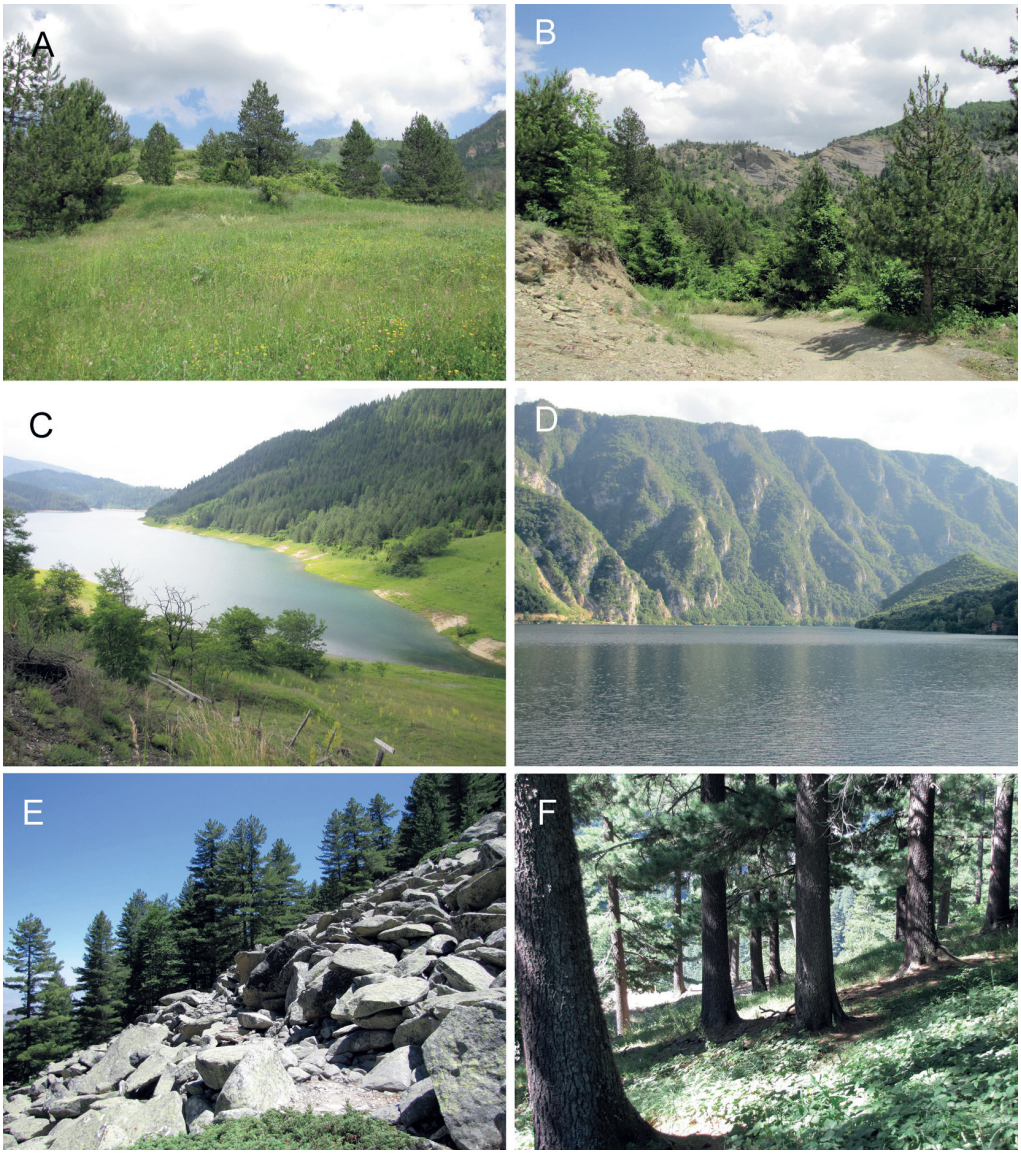

Figure 2. Habitats in the three National Parks. A, B – Fir of Drenova National Park, Albania; A: Coniferous trees where *Parvoraphidia microstigma* occurred; B: Pine trees, a habitat of *Phaeostigma thaleri*. C, D – Tara National Park, Serbia; C: In the surroundings of the Zaovine lake *Chrysopa gibeauxi* was found; D: Forests along the river Drina provide habitats for many lacewing species. E, F – Pelister National Park, North Macedonia; E: Endemic *Pinus peuce* is a substrate for *Hemerobius schedli*; F: *Pinus peuce*-forest was a collecting place of *Dilar turcicus*. Photos: DD

The aim of the study was to complete the knowledge on the inventory of the neuropterid fauna in Albania, North Macedonia and Serbia, which, at that time, had a sparse knowledge on their lacewing fauna.

Material and methods

Lacewings were collected using insect net in the three national parks during short visits in a period 2014-2017 (Drenova: 27.vi.2014, Tara: 26–27.vi.2015, Pelister: 06.vii.2017). Insects are preserved in the first author's collection. We followed the nomenclature and taxonomy proposed by *Lacewing Digital Library* (Oswald 2017). A distribution map was provided with Copernicus Land Monitoring Service.

Results and discussion

During two-days or one-day samplings, relatively high numbers of lacewing species were collected in all three national parks, viz. 26 species in the Fir of Drenova National Park, 29 species in the Tara National Park, and 30 species in the Pelister National Park (Table 1). In all three national parks, the most abundant were green (Chrysopidae) and brown lacewings (Hemerobiidae), and solely in the Tara National Park, spongillaflies (Sisyridae) occurred in large numbers. The neuropterid fauna of the three national parks was similar in the number of species but differed in the species composition (Table 1).

In the Fir of Drenova National Park, three interesting snakefly species were noted. *Phaeostigma* (*Phaeostigma*) *pilicollis* (1♂, 1♀) was found in a mixed forest with *Abies alba* Mill., *Acer obtusatum* Willd., *Fagus sylvatica* L. and *Pinus nigra* Arnold at 1 375 m a.s.l. It is a snakefly with Balkano-Pontomediterranean distribution, known from Albania, North Macedonia, Greece, Bulgaria and European Turkey.

Parvoraphidia microstigma (2♀) occurred in a mixed forest and forest edge at 1 130–1 375 m a.s.l. This species with a Pontomediterranean distribution was recorded in Albania, North Macedonia and Greece.

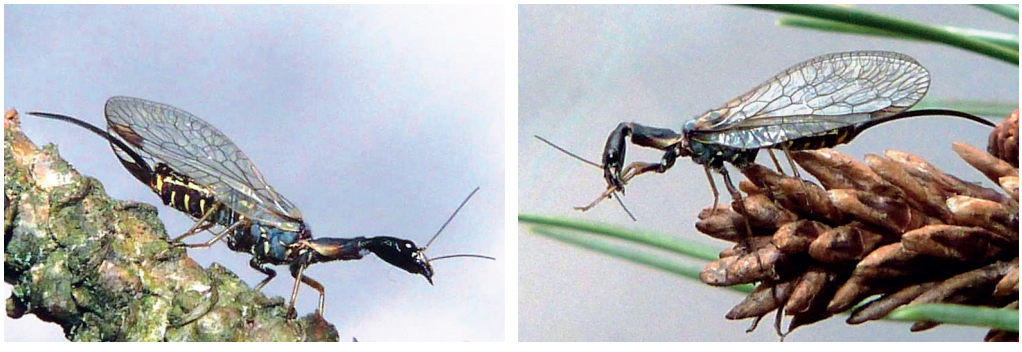

Figure 3. Two females of *Phaeostigma thaleri* in the Fir of Drenova National Park, Albania. Photos: HR

Table 1. Neuropterida collected in three national parks in 2014, 2015 and 2017. AL – Fir of Drenova National Park, Albania; SR – Tara National Park, Serbia; MK – Pelister National Park, North Macedonia. *See Podlesnik et al. (2017); ** Collected in 1988 (Devetak 1996).

Taxon / Species	AL	SR	MK
Raphidioptera			
Raphidiidae			
Phaeostigma (Phaeostigma) pilicollis (Stein, 1863)	X		
Phaeostigma thaleri (Aspöck & Aspöck, 1964)	X		
Dichrostigma flavipes (Stein, 1863)	X		
Parvoraphidia microstigma (Stein, 1863)	X		
Neuroptera			
Osmylidae			
Osmylus fulvicephalus (Scopoli, 1763)	X	X	X
Chrysopidae			
Nothochrysa fulviceps (Stephens, 1836)			X
Nothochrysa capitata (Fabricius, 1793)	X		X
Hypochrysa elegans (Burmeister, 1839)		X	
Nineta flava (Scopoli, 1763)			X
Nineta principiae Monserrat, 1981		X	
Chrysopa perla (Linnaeus, 1758)	X	X	X
Chrysopa dorsalis Burmeister, 1839	X	X	
Chrysopa gibeauxi (Leraut, 1989)		X	
Pseudomallada flavifrons flavifrons (Brauer, 1851)	X		X
Pseudomallada prasinus (Burmeister, 1839)		X	X
Pseudomallada abdominalis (Brauer, 1856)		X	X
Pseudomallada ventralis (Curtis, 1834)	X		X
Cunctochrysa albolineata (Killington, 1935)			X
Peyerimhoffina gracilis (Schneider, 1851)	X		X
Chrysoperla cf. *carnea* (Stephens, 1836) s.str.	X	X	
Chrysoperla lucasina (Lacroix, 1912)	X	X	X
Chrysoperla pallida Henry, Brooks, Duelli & Johnson, 2002	X		X
Chrysoperla cf. *agilis* Henry, Brooks, Duelli & Johnson, 2003			X
Hemerobiidae			
Hemerobius humulinus Linnaeus, 1758		X	X
Hemerobius stigma Stephens, 1836	X		X
Hemerobius pini Stephens, 1836		X	
Hemerobius contumax Tjeder, 1932	X		
Hemerobius schedli Hölzel, 1970			X
Hemerobius handschini Tjeder, 1957	X	X	
Hemerobius micans Olivier, 1793	X	X	X
Hemerobius lutescens Fabricius, 1793			X
Hemerobius gilvus Stein, 1863			X

Taxon / Species	AL	SR	MK
Wesmaelius subnebulosus (Stephens, 1836)	X		
Sympherobius fuscescens (Wallengren, 1863)		X	
Megalomus tortricoides Rambur, 1842	X	X	
Micromus variegatus (Fabricius, 1793)			X
Micromus angulatus (Stephens, 1836)		X	
Micromus paganus (Linnaeus, 1767)			X
Micromus lanosus (Zelený, 1962)		X	X
Sisyridae			
Sisyra nigra (Retzius, 1783)		X*	
Coniopterygidae			
Aleuropteryx loewii Klapálek, 1894	X	X	
Helicoconis (Helicoconis) lutea (Wallengren, 1871)		X	
Helicoconis (Ohmopteryx) pseudolutea Ohm, 1965		X	
Helicoconis sp.			X
Coniopteryx (Coniopteryx) pygmaea Enderlein, 1906	X		
Coniopteryx (Metaconiopteryx) arcuata Kis, 1965		X	
Coniopteryx (Metaconiopteryx) esbenpeterseni Tjeder, 1930		X	
Coniopteryx (Metaconiopteryx) lentiae Aspöck & Aspöck, 1964		X	
Coniopteryx sp.			X
Conwentzia pineticola Enderlein, 1905		X	X
Semidalis aleyrodiformis (Stephens, 1836)		X	
Dilaridae			
Dilar turcicus Hagen, 1858			X
Myrmeleontidae			
Palpares libelluloides (Linnaeus, 1764)			X**
Myrmeleon formicarius Linnaeus, 1767	X	X	X
Euroleon nostras (Geoffroy in Fourcroy, 1785)	X	X	
Distoleon tetragrammicus (Fabricius, 1798)	X		
Ascalaphidae			
Libelloides macaronius (Scopoli, 1763)	X		X
Total number of species	26	29	30

In the Fir of Drenova National Park, the most interesting snakefly species was *Phaeostigma thaleri* (2♂, 1♀) (Fig. 3). A description of this species is based on a single male collected a century ago in Northern Albania (Aspöck & Aspöck 1964; Penther 1914). The recent spectacular finding (exactly 100 years after the first finding!) was the second record of the species and the first of the female (Devetak & Rausch 2016). This interesting species was collected on coniferous trees (*Pinus nigra*) and on *Salix*-bushes close to a rivulet, at an elevation of 1 015–1 425 m a.s.l.

In the Tara National Park, a finding of two green lacewing species, *Nineta principiae* (3♂) and *Chrysopa gibeauxi* (1♂) represented the first record of these two species in Serbia. Despite of the fact that *Nineta principiae* does not seem to be a rare species in Europe, it was previously known in the Balkan Peninsula only from Greece (Aspöck et al. 2001). Another species, *Chrysopa gibeauxi*, which was only recently reinstated as a valid species (Tillier et al. 2014; Devetak et al. 2015; Canard & Thierry 2017) was known only in a few Balkan countries.

In the Pelister National Park, a record of two species was interesting. A dilarid species, *Dilar turcicus* (1♂), occurred in a *Pinus peuce*-forest at an elevation of 1 630 m. The presence of this species in North Macedonia has been already known (for a review of distribution, see Aspöck et al. 2015), but the endemic *Pinus peuce* was a new plant substrate species. A surprise was the occurrence of a brown lacewing, *Hemerobius schedli*, in large numbers of individuals (35♂, 32♀). This species is well distinguished from the closely related *Hemerobius handschini* by the shape of ectoproct. In *H. schedli*, anaprocessus and cataprocessus of ectoproct are equally long (Fig. 4). *Hemerobius schedli* was collected on the five-needle pine molika *Pinus peuce* at an elevation of 1 205–1 738 m a.s.l. The finding of this species in the Pelister National Park is the first report for North Macedonia and the second locality in the Balkan Peninsula (for review of distribution, see Popov et al. 2018).

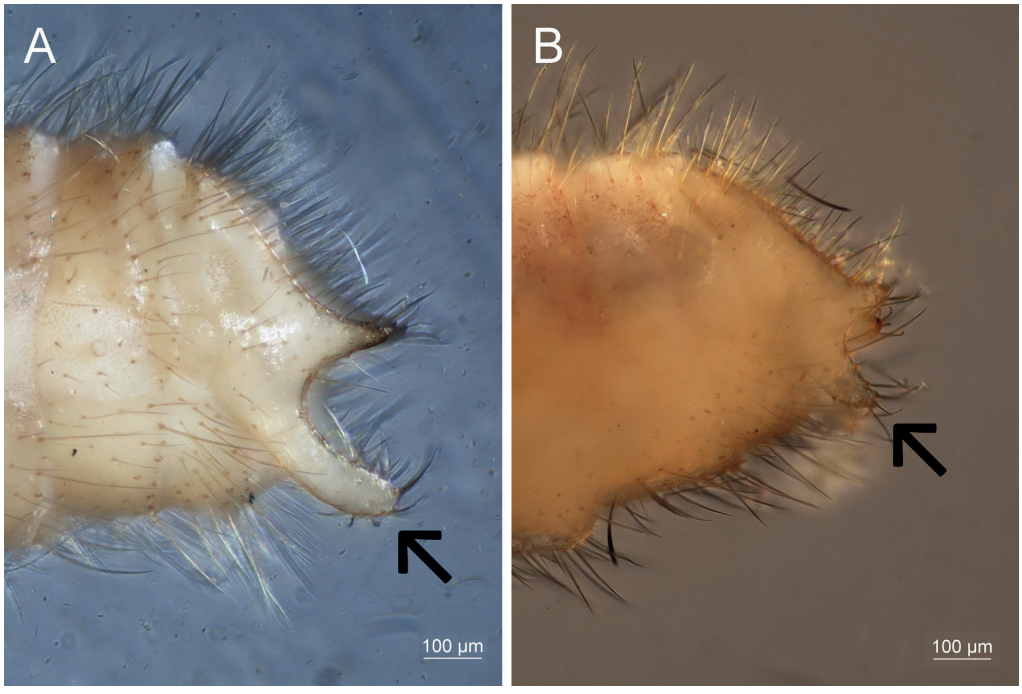

Figure 4. Ectoprocts of A – *Hemerobius handschini* (Jasen Reserve, North Macedonia) and B – *Hemerobius schedli* (Pelister National Park, North Macedonia). The species differ in the length of the cataprocessus (arrows). Photos: DD

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