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Chrysopids and Hemerobiids (*Plannipenia*) of young spruce forests in the eastern part of the Czech Republic

J. HOLUŠA[1], Ľ. VIDLIČKA[2]

[1]*Forestry and Game Management Research Institute, Jíloviště-Strnady, Czech Republic*
[2]*Institute of Zoology, Slovak Academy of Sciences, Bratislava, Slovak Republic*

ABSTRACT: Chrysopids and Hemerobiids were studied using Malaise traps in young spruce forests in the eastern part of the Czech Republic. A total of 12 species were found. The most abundant species were eurytopic *Chrysopa carnea*, *Chrysopa perla, Hemerobius humulinus* and *Hemerobius pini* associated with conifers. The seasonal flight activity of these species is discussed.

Keywords: Chrysopidae; Hemerobiidae; Malaise trap; spruce forests; seasonal flight activity; Czech Republic

In the past, only several records of Chrysopids and Hemerobiids in the eastern part of the Czech Republic were published (KLAPÁLEK 1904; TEYROVSKÝ 1964; ZELENÝ 1965, 1969, 1971). Recently, ŠEVČÍK, HUDEČEK (1995) have recorded larger data from northern Moravia and Silesia and summarized older papers dealing with Plannipenia in this territory. Later, ŠEVČÍK (1997) added several data.

The larvae and mostly adults are predaceous insects. Their feeding relations to plants are indirect, and they are not necessarily confined to particular plant species by their feeding requirements. Despite of this, the occurrence of neuropteroids is primarily determined by the character of vegetation (ZELENÝ 1984b). Some authors studied neuropteroids in oak forests (BARNARD et al. 1986; NEW 1967; PANTALEONI 1996; SAURE, KIELHORN 1993; SOUTHWOOD et al. 1982), mixed forests with predominant oak (CZECHOWSKA 1985, 1990, 1997), pine forests (CZECHOWSKA 1985, 1994; DOBOSZ 1993; SAURE, KIELHORN 1993) and beech forests (DOBOSZ 1993). Only several data are known from spruce forests that cover a large part of Central Europe as a result of artificial planting. MARTINEK (1960) studied the invertebrate animal communities of young spruce forests of Central Europe but this author found only several larvae of *Hemerobius* sp., *Boriomyia* sp. and *Chrysopa carnea*, and characterized them as untypical spruce species that only feed on aphids. BEZDĚK et al. (1997) recorded several species caught by sweeping in a spruce forest.

To investigate seasonal changes in Plannipenia communities the sweeping method was used (e.g. ZELENÝ 1965; JEDLIČKA, JEDLIČKOVÁ 1973; SZABÓ, SZENTKIRÁLYI 1981; CZECHOWSKA 1990), but catching into traps is considered the most efficient and reliable method (NEUENSCHWANDER 1984). Different traps were used: light traps (ANDERSEN, GREVE 1975; SZABÓ, SZENTKIRÁLYI 1981; ZELENÝ 1984a), suction traps (NEW 1967), yellow pan traps (CZECHOWSKA 1985, 1986, 1990, 1994, 1997; SAURE, KIELHORN 1993), pitfall traps (SZABÓ, SZENTKIRÁLYI 1981) as well as pyrethroid fogging (BARNARD et al. 1986; SOUTHWOOD et al. 1982). In the climate of Central Europe, the seasonal flight activity of Plannipenia species was studied using Malaise trap by VIDLIČKA (1994, 1995, 1998) in Slovakia. There is a possibility of using yellow sticky traps (MCEWEN 1995; NEUENSCHWANDER 1982) as well as white sticky traps for coniopterigids (HOLUŠA unpubl.).

In this paper the chrysopids and hemerobiids species composition as well as their seasonal flight activity found out using Malaise traps in spruce forests in the eastern part of the Czech Republic in 1998 are presented.

MATERIAL AND METHODS

The study was carried out in the intensively cultivated hills (Ostravská pánev basin, Podbeskydská pahorkatina hills) with forest coverage 9–20%, where Norway spruce (*Picea abies* L.) is a eudominant species (30–50%). The mean annual temperature in the investigated area ranges between 7 and 8°C, total rainfall mean between 700 and 1,000 mm (CULEK 1996). A total of 8 localities were investigated (Table 1).

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Table 1. Studied localities

Locality	Nearest village	Grid mapping square (PRUNNER, MÍKA 1996)	Altitude (m)
Kabátice (hill)	Chlebovice	6375	550
Lipina (wood)	Oprechtice	6275	260
Loucký les (wood)	Albrechtice	6277	230
Palesek (wood)	Stará Bělá	6275	260
Paskovský les (wood)	Paskov	6275	275
Stolářka Mt.	Lhotka	6475	700
Václavovický les (wood)	Sedliště	6276	310
Zámrklí (wood)	Fryčovice	6375	315

The material was caught using Malaise traps – model by TOWNES (1972) (J. Holuša lgt.). The traps (one trap per locality) were placed in young spruce forests (height 3–6 m, age 10–20 years). The thick growth of herbaceous plants, grass and bushes among spruce trees is a result of open canopy of young forests. Single specimens of other tree species (oak, larch, willow, beech, hornbeam, ash, linden, elm etc.) often grow in the forests or in forest borders as well as in the close proximity (e.g. pine stands at the locality of Stolářka Mt.). The traps were working continuously from March to June 1998 and were emptied every three days. In two localities (Paskovský les and Palesek), the collection continued to November 1998 but the traps were emptied irregularly. The data from these two localities are presented together in some species because of close proximity of localities and their identical habitats. The same method was used for two localities at a higher altitude (Kabátice and Stolářka Mt.).

The nomenclature by ASPÖCK et al. (1980) was used (det. Ľ. Vidlička, coll. Institute of Zoology).

The names Moravia and Silesia in this paper mean the historical countries of former Czechoslovakia (see HANZA, FIŠER 1998).

RESULTS AND DISCUSSION

A total of 332 adults of *Hemerobiidae* and *Chrysopidae* in 12 species were captured (Table 2). All species are widespread throughout Europe (ASPÖCK et al. 1980). Almost all species (except *Sympherobius fuscescens*) are recorded by ŠEVČÍK (1997, 1998) or ŠEVČÍK and HUDEČEK (1995) from the 1990s in the territory of northern Moravia and Silesia. The majority of them is eurytopic or they prefer spruce. The exceptions are discussed below.

A relatively high number of the species of hemerobiids and chrysopids (12) showed that Malaise traps were a suitable method for the study of species composition in spruce forests.

Males of the most abundant species (*Chrysopa carnea*, *Chrysopa perla*, *Hemerobius humulinus*, *Hemerobius pini*) prevail in the samples (Table 2), which is probably a result of higher vitality and activity of males.

Chrysoperla carnea is a eurytopic species widespread throughout Europe. It occurs in varied habitats and altitudinal zones. It is the most common species in the Czech Republic (ZELENÝ 1971, 1984b). It has been confirmed in five studied localities (Table 2).

In accordance with the literature data (VIDLIČKA 1994, 1995; ZELENÝ 1971, 1984a) the overwintering individuals appeared from the second half of April to the mid-May. Adults of the first generation were captured in August and September (Fig. 1).

Chrysopa viridana. One caught female of *Chrysopa viridana* could confirm the relatively rare occurrence of this species. Only two records have been known in Moravia and Silesia (ŠEVČÍK 1997; ZELENÝ 1971, 1995). This species prefers oaks (ZELENÝ 1984b). Single oak

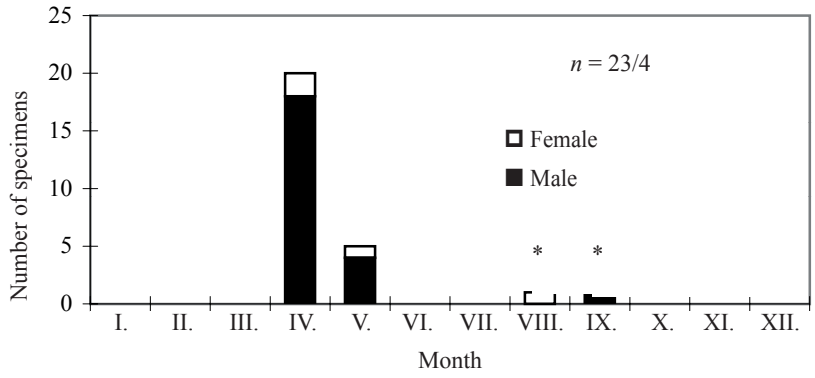

Fig. 1. Seasonal flight activity of *Chrysoperla carnea* in spruce forests of the eastern part of the Czech Republic in 1998 (* only two localities)

Table 2. Survey of species

	Locality								
	Kabátice	Lipina	Loucký les	Palesek	Paskovský les	Stolářka	Václavovický les	Zámrklí	Total
Family: CHRYSOPIDAE									
Chrysoperla carnea s. l. (STEPHENS, 1836)	3/0	4/0	7/1		6/1		3/2		23/4
Chrysopa perla LINNAEUS, 1758	4/1	10/1	50/1	11/1	53/3	3/0	10/2	0/1	141/10
Chrysopa viridana SCHNEIDER, 1845				0/1					0/1
Chrysopidia ciliata (WESMAEL, 1841)				1/0					1/0
Family total	7/1	14/1	57/2	12/2	59/4	3/0	13/4	0/1	165/15
Family: HEMEROBIIDAE									
Hemerobius humulinus LINNAEUS, 1758	3/0	1/2	0/1	4/1	2/2	2/0	3/1	2/0	17/7
Hemerobius pini STEPHENS, 1836	30/5	1/0	3/0	12/2	15/6	28/1	3/0	7/0	99/14
Hemerobius lutescens FABRICIUS, 1793					0/1				0/1
Micromus angulatus (STEPHENS, 1836)			1/0		2/3				3/3
Micromus paganus (LINNAEUS, 1767)	3/0								3/0
Wesmaelius (*Kimminsia*) sp.	0/1				0/1	0/1			0/3
Sympherobius fuscescens (WALLENGREN, 1863)						0/1			0/1
Drepanopteryx phalaenoides (LINNAEUS, 1758)				1/0					1/0
Family total	36/6	2/2	4/1	17/3	19/13	30/3	6/1	9/0	123/29
A total number of specimens	50	19	64	34	95	36	24	10	332

trees grow in the close proximity of the studied locality, therefore adults could fly to the spruce forests.

Chrysopa perla was the most numerous chrysopid in spruce forests (found in all studied localities) (Table 2); this eurytopic species occurs commonly in spruce monocultures (ZELENÝ 1984b). It is our most abundant species besides *Ch. carnea* (ZELENÝ 1971).

The seasonal distribution of adults (Figs. 2 and 3) is in accordance with data from Slovakia (VIDLIČKA 1994). In Central Europe, this species has one generation per year with the flight activity in May and June. Occasionally several specimens were caught later (VIDLIČKA 1994) similarly like a multivoltine part of the population in south-western France (CANARD, PRINCIPI 1984). Presented results confirmed ŠEVČÍK's (1998) opinion that it is an abundant species in June and July, when *Chrysopa carnea* is not present (ŠEVČÍK 1998) (Figs. 2 and 3).

Chrysopidia ciliata. Single male was caught in Palesek locality probably as a result of the preference of deciduous trees (*Carpinus betulus*, *Corylus avelana*, *Fagus sylvatica*, *Quercus* sp., *Tilia* sp., *Ulmus* sp.) (ZELENÝ 1984b) that grow singly in the surroundings.

Hemerobius humulinus is the most common hemerobiid in the Czech Republic; extended above the forest limit (ŠEVČÍK 1998). As well in Slovakia it is a common species with two generations (VIDLIČKA 1998). It occurs on

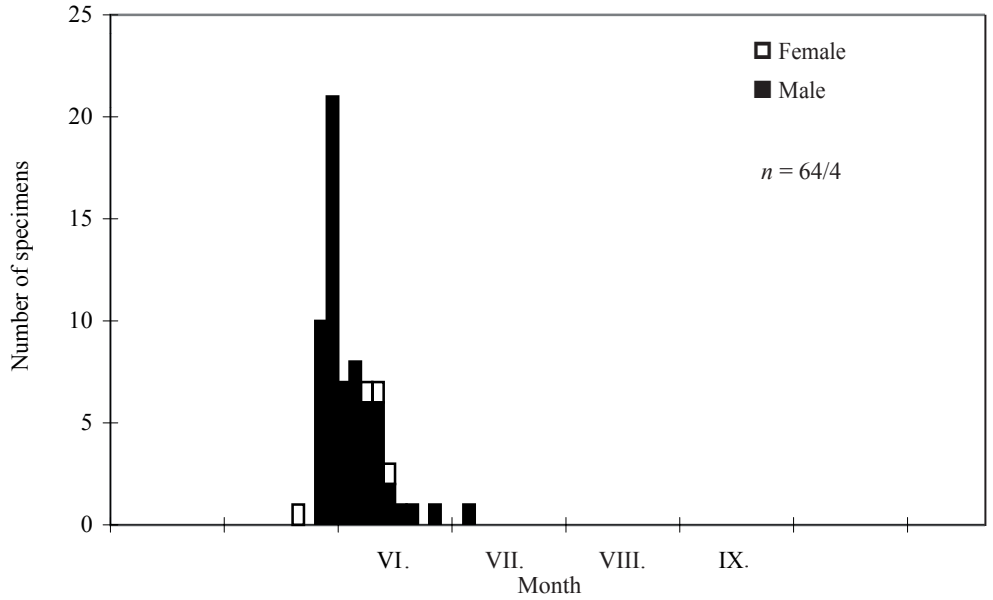

Fig. 2. Seasonal flight activity of *Chrysopa perla* in spruce forests of Paskovský les and Palesek in 1998

deciduous trees and bushes as well as on spruce (ZELENÝ 1963). This species was found in all studied spruce forests, but not abundantly (Table 2).

The flight distribution is a result of two generations. The activity of the 1st generation in April and May (Fig. 4) is in accordance with other known data (VIDLIČKA 1994, 1995; ZELENÝ 1984a). The adults of the 2nd generation were found mainly in July (Fig. 4).

Similarly in Devínska Kobyla hills (Slovakia), the 2nd generation was recorded from June to September but their abundance rate was far below that of the 1st generation (VIDLIČKA 1995).

Hemerobius pini occurs in coniferous forests on larch, spruce, pine and fir (ZELENÝ 1963). It is common on spruce in the Hrubý Jeseník Mts. from lower altitudes to the forest limit (ŠEVČÍK 1998). It was the most numerous hemerobiid in all studied spruce forests (Table 2).

The distribution of caught adults confirmed two generations per year. Adults of the first generation gradated in May, and those of the second generation in July (Figs. 5 and 6). ZELENÝ (1984a) observed later seasonal activity in the town of Praha-Ruzyně, from the second half of May to November with the distinct peak in September. The peak of spring distribution in the second half of May was featureless (ZELENÝ 1984a).

Hemerobius lutescens is an uncommon species inhabiting deciduous trees as well as mixed forests (ZELENÝ 1963; ŠEVČÍK 1998). This species never inhabits coniferous trees (ASPÖCK et al. 1980). One female caught on 31 August in Paskovský les (Table 2) represents an occasional finding.

Micromus angulatus occurs on herbaceous plants and on low bushes in meadows, and on edges of coniferous and deciduous forests. This species is not common, but it is distributed throughout Europe (ZELENÝ 1963). The findings of several specimens (from June to October) are a result of dense herb layer in young spruce forests.

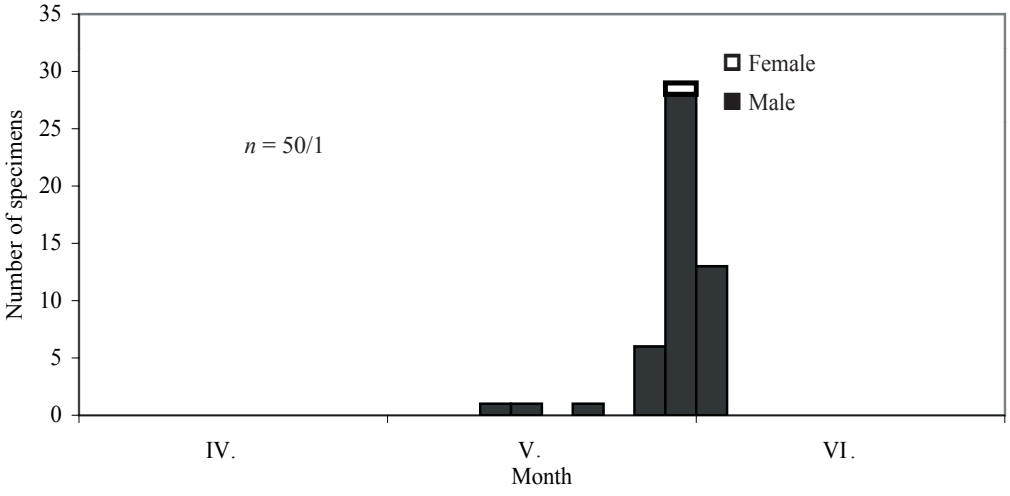

Fig. 3. Seasonal flight activity of *Chrysopa perla* in spruce forests of Loucký les from 12th April to 10th June 1998

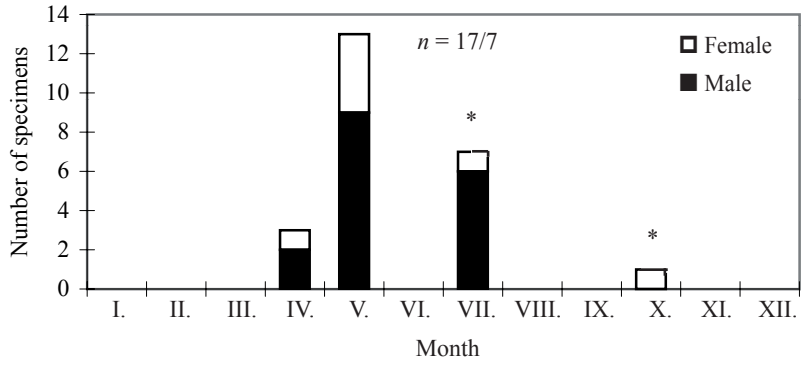

Fig. 4. Seasonal flight activity of *Hemerobius humulinus* in spruce forests of the eastern part of the Czech Republic in 1998 (* only two localities)

Micromus paganus lives on herbaceous plants and on deciduous bushes and trees from May to September (ZELENÝ 1963), but not on coniferous trees (ASPÖCK et al. 1980). Three males were caught in the locality of Kabátice on 30 May and 1 July, which confirms the mountain character of this species (ZELENÝ 1963; VIDLIČKA 1994; ŠEVČÍK 1998).

Sympherobius fuscescens is distributed sparsely in Europe (ZELENÝ 1962, 1963), but sometimes it is locally abundant (ASPÖCK et al. 1980). It flies from May to September in coniferous forests (ZELENÝ 1962, 1963), but its life history is associated with pine (ASPÖCK et al. 1980). One female was caught on 21 May in the locality of Stolářka, where pine trees are planted in a close proximity.

Drepanopteryx phalaenoides is distributed throughout Europe. It is found only rarely and always singly on shrubs, deciduous and coniferous trees (ZELENÝ 1962, 1963), but it prefers deciduous trees (ASPÖCK et al. 1980). We found a single male during the study on 16 July.

The data dealing with *Drepanopteryx phalaenoides* are rare, therefore we summarized all published data as well

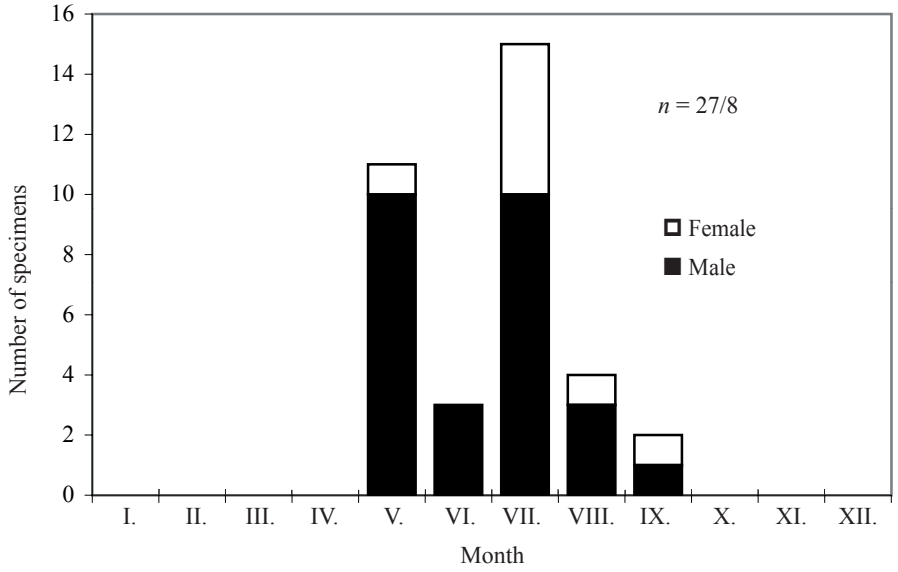

Fig. 5. Seasonal flight activity of *Hemerobius pini* in spruce forests of Palesek and Paskovský les in 1998

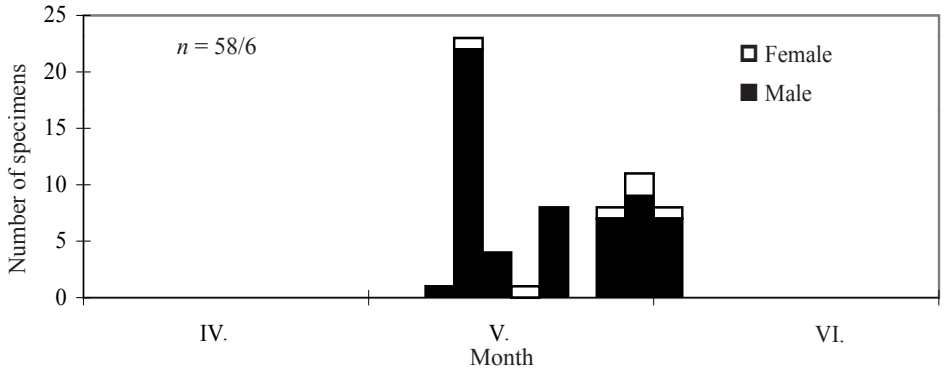

Fig. 6. Seasonal flight activity of *Hemerobius pini* in spruce forests of Kabátice and Stolářka Mt. from 12th April to 10th June 1998

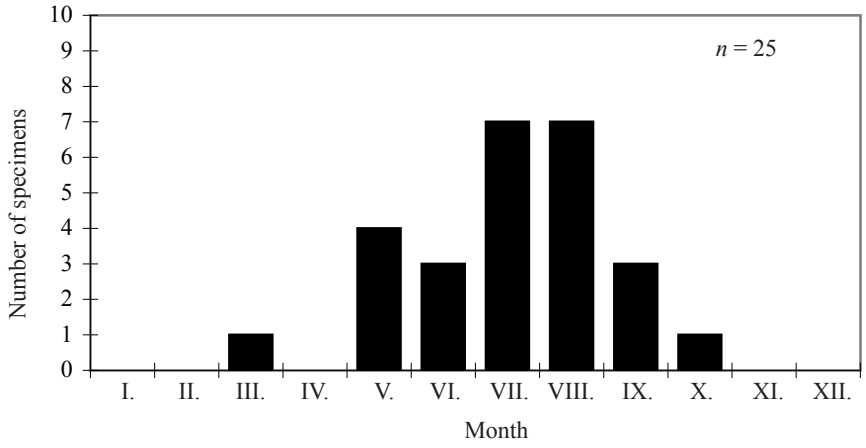

Fig. 7. Seasonal flight activity of *Drepanopteryx phalaenoides* in Moravia and Silesia

as other unpublished records from Moravia and Silesia, where this species occurs from lowlands to mountains. Distribution of seasonal flight activity is based on these data (Fig. 7).

Published data:

Brno (code of faunistic field 6,766), 28. IX. 1936, 1 ex. (MAYER 1937); Přerov (6,570), Vinary (6,570), Javůrek (6,764) (HUDEČEK 1939); Líšeň (6,766), 26. V. 1980, 1 ex. (CHLÁDEK 1995); Opava (park along the museum) (6,073), 1. VIII. 1985, 1 ex. (ŠEVČÍK, HUDEČEK 1995); Město Albrechtice (5,871), 24. VIII. 1961 (TEYROVSKÝ 1964); Praděd Mt. (Divoký důl) (5,969), 27. VIII. 1997 (ŠEVČÍK 1997); Polanka nad Odrou (protected area of Polanská niva) (6,275) (ŠEVČÍK 1999).

Unpublished data (all J. Holuša lgt., det. et coll. unless mentioned otherwise):

Březová (Studený hill) (6972), 24. VII. 1999, 2 ex., O. Holuša lgt.;

Frýdek-Místek (wood Frýdecký les) (6276), 23. III. 1999, 1 ex., 21. VIII. 2000, 1 ex., O. Holuša lgt.;

Kyjovice (U patra) (6174), 18. VIII. 1996, 1 ex.;

Luhačovice (at the valley reservoir) (6872), 13. VII. 1996, 1 ex., Ševčík lgt., det et coll.;

Lysá hora Mt. (6476), V. 2002, 1 ex. (Malaise trap);

Michálkovice (6176), 9. VII. 2000, 1 ex., Ševčík lgt., det et coll.;

Nový Hrozenkov (Vranča) (6675), 6. VI. 1995, 1 ex.;

Nýdek (Prašivá hora hill) (6378), V. 2002, 1 ex. (yellow sticky boards);

Oprechtice (wood Paskovský les) (6275), V. 2002, 1 ex. (Malaise trap);

Ostravice (Válcovny hotel) (6476), 13. VI. 2002, 1 ex. (light trap), Ševčík lgt., det et coll.;

Ostravice (Muchovice) (6476), 28. VIII. 1998, 1 ex., O. Holuša lgt.;

Ostravice (protected area of Mazák) (6476), 4. VIII. 2000, 1 ex.;

Podhradí (6172), 12. X. 1996, 1 ex., Ševčík lgt., det et coll.;

Skřipov (U Leskoveckého chodníku) (6173), 4.–10. VIII. 1999, 1 ex. (Malaise trap);

Staré Hamry (Ledové sluje) (7161), 3. IX. 1992, 1 ex.;

Střen (6368), 13. VIII. 1996, 1 ex., Ševčík lgt., det et coll.;

Šilheřovice (protected area of Černý les) (6075), 3. IX. 1997, 1 ex., Ševčík lgt., det et coll., 25. VI. 2000, 2 ex., O. Holuša lgt.;

Vítkov (Bělidlo) (6272), 27. VII. 2000, 1 ex., O. Holuša lgt.;

Vsetín (Bobrky) (6673), 30. VII. 1998, 1 ex., O. Holuša lgt.

The seasonal flight activity lasts from March to September (Fig. 7), which is in accordance with data from former Czechoslovakia (ZELENÝ 1962, 1963). Finding of one specimen in March indicates overwintering of this hemerobiid in the adult stage. The existence of two generations per year is possible.

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Zlatoočky (*Plannipenia: Chrysopidae*) a denivky (*Plannipenia: Hemerobiidae)* mladých smrkových porostů ve východní části České republiky

J. HOLUŠA[1], Ľ. VIDLIČKA[2]

[1]*Výzkumný ústav lesního hospodářství a myslivosti, Jíloviště-Strnady, Česká republika*

[2]*Ústav zoológie Slovenskej akadémie vied, Bratislava, Slovensko*

ABSTRAKT: Druhové spektrum zlatoočeka a denivek mladých smrkových porostů bylo sledováno pomocí Malaiseho lapačů ve východní části České republiky. Celkem bylo zjištěno 12 druhů. Nejpočetnějšími druhy byly eurytopní *Chrysopa carnea*, *Chrysopa perla*, *Hemerobius humulinus* a *Hemerobius pini*, který je vázán na jehličnany. Sezonní letová aktivita těchto druhů je diskutována.

Klíčová slova: Chrysopidae; Hemerobidae; Malaiseho lapač; smrkové porosty; sezonní letová aktivita, Česká republika

Druhové spektrum zlatoočeka a denivek mladých smrkových porostů bylo sledováno pomocí Malaiseho lapačů (Townesův typ) ve východní části České republiky (Ostravská pánev, Podbeskydská pahorkatina; lesnatost 9–20 %, zastoupení smrku [*Picea abies* L.] 30–50 %). Pasti byly instalovány od března do června 1998 na osmi lokalitách (tab. 1) a byly kontrolovány každé tři dny. Na dvou lokalitách (Paskovský les a Palesek) byly odběry prováděny i nadále v nepravidelných intervalech až do listopadu. Údaje u některých druhů z těchto dvou lokalit (a podobně i dvou lokalit ve vyšších nadmořských výškách – Kabátice a Stolářka) byly sestaveny dohromady, neboť se jedná o lokality s identickými biotopy, ležící nedaleko od sebe.

Celkem bylo zjištěno 332 exemplářů 12 druhů. Všechny druhy jsou rozšířeny v celé Evropě a kromě denivky *Sympherobius fuscescens* byly již z oblasti severní Moravy a Slezska publikovány v 90. letech. Většina z nich je eurytopní nebo preferují jehličnany. Relativně vysoký počet zjištěných druhů potvrzuje, že užití Malaiseho lapačů je odpovídající studijní metodou v mladých smrkových porostech.

Ve vzorcích nejpočetnějších druhů (*Chrysopa carnea*, *Chrysopa perla*, *Hemerobius humulinus*, *Hemerobius pini*) převažují samci (tab. 2), což je pravděpodobně důsledkem vyšší vagility a aktivity samců.

Přezimující dospělci *Chrysoperla carnea* se objevovali od druhé poloviny dubna do poloviny května. Dospělci nové generace byli zjištěni v srpnu a září.

Jediná zjištěná samice *Chrysopa viridana* potvrzuje relativně vzácný výskyt této zlatoočky. Tento druh sice preferuje duby, které však rostou v bezprostřední blízkosti lokality.

Sezonní výskyt dospělců *Chrysopa perla* (především koncem května a v červnu) souhlasí s údaji ze Slovenska, kde má tento druh jednu generaci do roka.

Jeden samec *Chrysopidia ciliata* chycený na lokalitě Palesek je pravděpodobně důsledkem preference listnáčů tímto druhem.

Letová aktivita *Hemerobius humulinus* je výsledkem dvou generací do roka. Aktivita první generace v dubnu a květnu souhlasí se známými údaji. Podobně jako na Devínské Kobyle byli jedinci druhé generace zjištěni hlavně v červnu.

Odchyty *Hemerobius pini* potvrdily dvě generace do roka. Dospělci první generace se vyskytují v květnu a v první polovině června.

Protože *Hemerobius lutescens* nikdy neobývá jehličnaté lesy, byla zjištěna jedna samice, která představuje náhodný nález.

Micromus angulatus se vyskytuje na bylinách a nízkých keřích na loukách a okrajích jehličnatých

i listnatých lesů. Protože nebývá hojný, bylo odchyceno několik jedinců.

Tři samci *Micromus paganus* chycení na lokalitě Kabátice od 30. V. do 1. VI. potvrzují horský charakter tohoto druhu.

Byla zjištěna jen jedna samice druhu *Sympherobius fuscescens*, protože tento druh je vázán na borovice, které se vyskytují rovněž na lokalitě Stolářka.

Během studia byl zjištěn pouze jeden samec *Drepanopteryx phalaenoides* 16. VII., ale podle dalších nálezů (i publikovaných) se vyskytuje řídce na celé Moravě a ve Slezsku od nížin do hor. Sezonní letová aktivita v této oblasti trvá od března do září. Nález jednoho exempláře v březnu připouští možnost přezimování tohoto druhu ve stadiu dospělce. Je možné, že tento druh má dvě generace do roka.

Corresponding author:

Ing. JAROSLAV HOLUŠA, Ph.D., Výzkumný ústav lesního hospodářství a myslivosti, Jíloviště-Strnady, Pracoviště Frýdek-Místek, Nádražní 2811, 73801 Frýdek-Místek, Česká republika
tel. + fax: + 420 558 628 647, e-mail: holusaj@seznam.cz