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# New Distributional Data for the Rare Polish Empidid Flies (Empididae: Hemerodromiinae, Clinocerinae) in the Pieniny Mountains with Notes on Ecology and Phenology

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## ABSTRACT

A study of Hemerodromiinae and Clinocerinae (Diptera: Empididae) in the Pieniny Mts. (Southern Poland) recorded eleven rare species. Two of them are rediscovered in Poland for the first time since 19th century: *Chelifera aperticauda* Collin, 1927 and *Clinocera fontinalis* (Haliday, 1833). Six other species are rare or recently regarded as rare in Poland: *Chelifera subangusta* Collin, 1927, *C. pectinicauda* Collin, 1927, *Hemerodromia oratoria* (Fallén,1815), *Kowarzia plectrum* Mik, 1880, *Wiedemannia jazdzewskii* Niesiołowski, 1987, *W. thienemanni* Wagner, 1982. Three species: *Chelifera angusta* Collin, 1927, *Hemerodromia melangyna* Collin, 1927 and *Wiedemannia phantasma* (Mik, 1880) are in Poland confined to the Pieniny Mts. with no records from elsewhere in the country. Drawings of some male genital structures as well as short ecological and phenological notes are presented.

*Key words*: Hemerodromiinae, Clinocerinae, Poland, Pieniny Mts., check-list, distribution, ecology, phenology.

## INTRODUCTION

Empididae is one of the largest dipteran families with almost 5,000 described species worldwide (Yang *et al*., 2007; Chvála, 2013). It includes three subfamilies (Sinclair and Cumming, 2006), but only two of them: Hemerodromiinae and Clinocerinae are predominantly aquatic.

Hemerodromiinae and Clinocerinae are relatively well known groups in Europe. At present the occurrence of over 200 species belonging to these subfamilies have been recorded on the continent (Chvála and Wagner, 1989; Yang *et al.*, 2007; Chvála, 2013).

In Poland, both subfamilies have been investigated for many years and the general distribution of most species in the country is fairly well known (Wagner and Niesiołowski, 1987; Niesiołowski, 1990, 1992, 2005; Klasa *et al.,* 2000; Palaczyk and Klasa, 2003; Krysiak, 2005a-b; Krysiak *et al*., 2010; Słowińska-Krysiak, 2012, Palaczyk and Słowińska-Krysiak, 2013). Up to now, 65 species have been recorded in Poland (Niesiołowski, 2005). Most species occurring in the country have wider European or Palaearctic distributions. However, the empidid fauna of some regions of Poland, including the Pieniny Mts. remains poorly known.

This study was conducted because there was no data on Hemerodromiinae and Clinocerinae of the Pieniny mountain range. Samples were collected at various altitudes mainly in the area of the Pieniny National Park and its buffer zone.

## MATERIAL AND METHODS

### Pieniny National Park

The investigation was carried out in the area of the Pieniny Mountains (Outer Western Carpathians, Southern Poland) which are composed of Jurrasic and Cretaceous limestone. This mountain massive is a unique geological unit, six kilometres wide and 35 kilometres long, and belongs to the Pieniny Klippen Belt. The Dunajec River gorge divides the Pieniny range into three parts: Pieniny Spiskie, Małe Pieniny and Pieniny Właściwe. According to the unique character of fauna and flora, including both high level of endemic species richness and species diversity, Pieniny Właściwe are the most interesting part of the Pieniny Mts., in which the Pieniny National Park is located (Razowski, 2000). The Pieniny National Park is one of the smallest national parks in Poland, with an area of 23,46 km$^2$, and its buffer zone covers an area of 26,82 km$^2$. The study area is placed entirely in the drainage basin of the Dunajec River.

The research was carried out between April 1998 and November 2004 at 29 sampling sites along the streams: Łonny, Biały, Ociemny, Kirowy, Macelowy, Kotłowy, Sobczański, Huliński from their sources to their outlets as well as along sections of the Krośnica stream, the Dunajec River and the Grajcarek stream (Małe Pieniny Mts.). Adults were captured using an entomological hand net in bushes overgrowing the stream and river banks or collected with tweezers directly from boulders, stones protruding from water, moss overgrowing rocks, trees, tree trunks, etc. The detailed coordinates for all localities are given in Table 1. The localities are also shown in Fig. 1 and 2.

For the phenological analysis each month was divided into three 10-day periods.

The material (1779 individuals) was preserved in 75% alcohol and deposited in the Department of Invertebrate Zoology and Hydrobiology of the University of Łódź (Łódź, Poland).

All individuals were collected and identified by the author. Species were identified according to the keys from the following papers: Engel (1938-1946), Collin (1961), Vaillant (1981), Horvat (2002).

## RESULTS

During the study period 17 species of Hemerodromiinae and 24 species of Clinocerinae were recorded in the Pieniny Mts. Eleven of these species are rare or recently regarded as rare in Poland, known only from single localities or from very old data, and these are discussed here.

Table 1. Study sites in the Pieniny National Park (PNP) and its buffer zone.

| *Station number* | *Localities* | *Altitude (m)* | *GPS location* |
|---|---|---|---|
| 1 | PNP, Łonny stream | 560 | 49°25'51"N 20°24'46" E |
| 2 | PNP, Łonny stream | 520 | 49°25'53" N 20°24'44" E |
| 3 | PNP, Łonny stream | 463 | 49°26'11" N 20°24'45" E |
| 4 | PNP, Biały stream, source | 750 | 49°25'12" N 20°23'09" E |
| 5 | PNP, Biały stream | 640 | 49°25'31" N 20°23'09" E |
| 6 | PNP, Biały stream | 560 | 49°25'38" N 20°23'14" E |
| 7 | PNP, Biały stream | 515 | 49°25'52" N 20°23'43" E |
| 8 | PNP, Ociemny stream (source) | 510 | 49°25'48" N 20°25'55" E |
| 9 | PNP, Ociemny stream | 480 | 49°25'49" N 20°25'59" E |
| 10 | PNP, Ociemny stream (outlet to the Dunajec River) | 445 | 49°25'54" N 20°26'19" E |
| 11 | PNP, Kirowy stream (source) | 770 | 49°25'02" N 20°23'10" E |
| 12 | PNP, Kirowy stream | 680 | 49°24'51" N 20°23'09" E |
| 13 | PNP, Kirowy stream | 610 | 49°24'45" N 20°23'10" E |
| 14 | PNP, Macelowy stream | 587 | 49°24'38" N 20°23'15" E |
| 15 | PNP, buffer zone, Macelowy stream | 560 | 49°24'35" N 20°23'17" E |
| 16 | PNP, buffer zone, Macelowy stream, Sromowce Niżne village | 460 | 49°24'04" N 20°24'35" E |
| 17 | PNP, Sobczański stream (source) | 750 | 49°25'01" N 20°24'08" E |
| 18 | PNP, Sobczański stream | 655 | 49°24'55" N 20°24'09" E |
| 19 | PNP, Sobczański stream | 590 | 49°24'50" N 20°24'16" E |
| 20 | PNP, Sobczański stream | 530 | 49°24'38" N 20°24'31" E |
| 21 | PNP, Sobczański stream (outlet to the Macelowy stream), Sromowce Niżne village | 455 | 49°24'19" N 20°24'45" E |
| 22 | PNP, Kotłowy stream (source) | 610 | 49°24'39" N 20°24'02" E |
| 23 | PNP, Kotłowy stream | 570 | 49°24'31" N 20°24'01" E |
| 24 | PNP, Krośnica stream, Krościenko village | 440 | 49°26'23" N 20°24'49" E |
| 25 | PNP, Dunajec River, Krościenko village | 420 | 49°26'27" N 20°25'50" E |
| 26 | Małe Pieniny, Grajcarek stream, Jaworki village | 580 | 49°24'26" N 20°33'14" E |
| 27 | PNP, Huliński stream | 680 | 49°25'06" N 20°25'05" E |
| 28 | PNP, Huliński stream | 630 | 49°25'15" N 20°25'04" E |
| 29 | PNP, Huliński stream (outlet to the Pieniński stream) | 587 | 49°25'25" N 20°25'13" E |

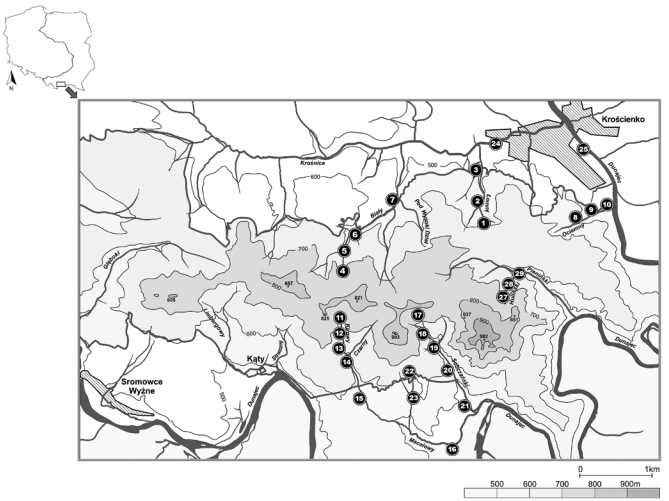


Fig. 1. Study sites in the Pieniny National Park (PNP) and its buffer zone.

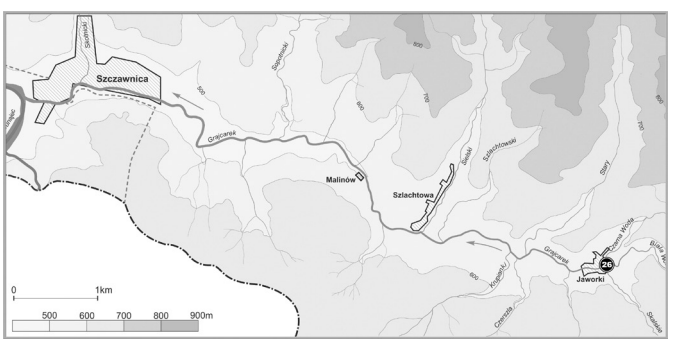


Fig. 2. Study site in the Małe Pieniny Mts.

## Subfamily Hemerodromiinae

### *Chelifera aperticauda* Collin, 1927

Material examined: 1 individual. Station 24, 23.VI.2002, 1♂

Distribution: Austria, Belgium, British Isles, Germany, Montenegro, Poland, Slovenia (Horvat, 1990; Yang *et al*., 2007; Chvála, 2013).

Habitat: a male of this species was found on the leaves of butterbur (*Petasites hybridus*) growing on the bank of stream together with *Chelifera precatoria* (Fallén, 1816), *C. stigmatica* Schiner, 1862, *Hemerodromia oratoria* (Fallén, 1815), *H. unilineata* Zetterstedt, 1842 and *Dolichocephala irrorata* (Fallén, 1816).

Remarks: this is clearly an extremely rare species, or at least one which is rarely found in Poland. All specimens of *C. aperticauda* from Poland deposited in museums' collections were collected in the 19th century by Nowicki from the Tatra Mts., Grzegorzek

from Tarnów and Scholtz from Długopole Zdrój village near Bystrzyca Kłodzka (Kłodzka Valley, Sudeten Mts.). They were originally labelled as *Chelifera precatoria* (Fallén, 1816), *H. monostigma* (Meigen, 1822), and *Hemerodromia oratoria* (Fallén, 1815). Niesiołowski (1990) examined these old collections, and identified all three specimens mentioned above as *C. aperticauda*. Unfortunately, there are no more precise data on the sites and dates of capture in all these cases.

Phenology: in the Pieniny Mts. this species is known only from one site, collected in the third 10-day period of June.

***Chelifera subangusta* Collin 1927**

Material examined: 2 individuals. Station 12, 9.VIII.2001, 1♂; station 17, 17.VIII.2000, 1♀.

Distribution: British Isles, Belgium, Czech Republic, Germany, Norway and Slovenia (Yang *et al*., 2007; Chvála, 2013). Moreover it was reported in Claix waterfall in Vercors mountain massif in the French Alps (Vaillant, 1981).

Habitat: adults of this species were found on the leaves of bushes in the vicinity of Kirowy stream and Sobczański stream source, together with *Chelifera precabunda* Collin, 1961, *C. trapezina* (Zetterstedt, 1838) and *C. flavella* (Zetterstedt, 1838).

Remarks: it is a rare species in Poland, it has hitherto been known from only three sites in Poland: the Gorce Mts. (800 m), Górczyn village (West Pomeranian Region) (Niesiołowski, 1990) and the Bieszczady Mts. (1100 m) (Słowińska-Krysiak, 2013). Data indicate that this species is confined primarily to stream sources and upper stream sections.

Phenology: in the Pieniny Mts. this species was collected only in August, but records from other areas of Poland indicate that *C. subangusta* is active also in the third 10-day period of July.

***Chelifera angusta* Collin 1927**

Material examined: 4 individuals. Station 1, 2.VIII.2002, 1♂; station 10, 27.VII.2003, 3♂♂.

Distribution: British Isles, Germany, Democratic Republic of Korea, (Yang *et al*., 2007; Chvála, 2013). It probably also occurs in Denmark (Wagner, 1997).

Habitat: adults of this species were found on the leaves of bushes and trees in the vicinity of streams together with *Chelifera precabunda*, *C. concinnicauda* Collin, 1927, *C. trapezina*, *Heleodromia immaculata* Haliday, 1833 and also with *Trichopeza longicornis* (Meigen, 1822) (Brachystomatidae: Trichopezinae).

Remarks: it is an extremely rare species, currently known in Poland only from Pieniny Mts. Based on the individuals caught by the author, Niesiołowski (2005) reported this species from Pieniny Mts. as new for Polish fauna, but recorded the altitude incorrectly. The male terminalia of individuals found in the Pieniny Mts. agree with the detailed description presented by Collin (1961), however, beside long yellow hairs there are 4 short, stout setae in the apical part of epandrium (Fig. 3).

Phenology: flight records indicate that *C. angusta* is active in the third 10-day period of July and the first 10-day period of August.

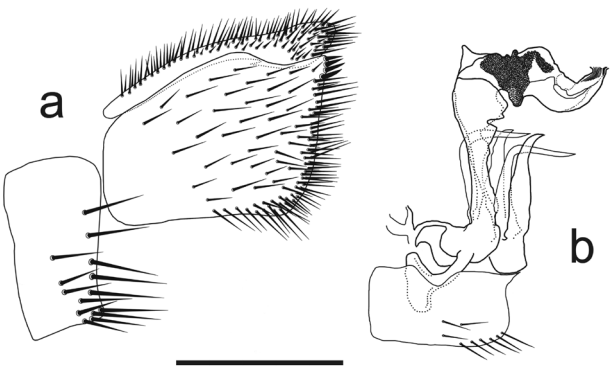


Fig. 3. *Chelifera angusta* - male terminalia, lateral view; scale bar = 0,25 mm; a - epandrium and cercus, b - hypandrium with phallus

### *Chelifera pectinicauda* Collin, 1927

Material examined: 1 individual. Station 11, 25.VII.03, 1♂.

Distribution: British Isles, France, Germany, Ireland, Italy, Macedonia, Poland, Serbia and Slovakia (Horvat, 1990; Yang *et al*., 2007; Chvála, 2013).

Habitat: a male of this species was found on the leaves of bushes in the vicinity of a stream together with *Chelifera flavella*.

Remarks: it is a rare species previously known in Poland from only three locations: the Pomeranian Lake District (Ryczewo village near Słupsk, 23.VI.1913, 1♂) (Vaillant, 1968), in the Gorce Mts. (a spring near the Borek Pass, 900 m, 1.VIII.1986, 1♂) (Niesiołowski, 1990) and in the Bieszczady Mts. (Pataraczakowski stream, 1100 m, 24.VII.1994, 1♂) (Słowińska-Krysiak, 2013).

Phenology: in the Pieniny Mts. there is one record from the third 10-day period of June. However, Polish specimens of *C. pectinicauda* have been collected from June to August.

### *Hemerodromia oratoria* (Fallén, 1815)

Material examined: 21 individuals. Station 10, 14.IX.2001, 1♂, 1♀; 27.VI.2002, 1♂, 1♀; station 24, 23.VI.2002, 4♂♂, 2♀♀; 27.VII.2002, 4♂♂; 28.VII.2003, 4♂♂, 3.VIII.2003, 3♂♂.

Distribution: Austria, Belgium, Bosnia and Herzegovina, British Isles, China, Croatia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Poland, Romania, Russia (Far East), Slovakia, Slovenia, Spain, Sweden, Turkey (Yang *et al*., 2007; Chvála, 2013) and also Serbia (Horvat, 1990).

Habitat: adults of this species were found on the leaves of bushes and trees in the vicinity of streams together with *Chelifera precatoria*, *C. precabunda*, *C. stigmatica*, *C. concinnicauda*, *C. aperticauda*, *C. trapezina* and *Hemerodromia unilineata*.

Remarks: it is a rare species in Poland. It was previously recorded from only four locations. It was reported by Grzegorzek (1873) from Skrudzina village (near Stary Sącz) and Wiklina village, but without detailed information. Furthermore it has been

recorded in the Widawka River (Niesiołowski, 1990) and Płytnica River (Niesiołowski, 2005), but there is no data on the dates of capture and number of individuals. Records from the Pieniny Mts. are confined to a small area of two streams, and the species has not been rediscovered since 2004, despite conducted field research in recent years.

Phenology: in the Pieniny Mts. adults were active in the third 10-day period of June and July, the first 10-day period of August and the second 10-day period of September.

### ***Hemerodromia melangyna* Collin, 1927**

Material examined: 3 individuals. Station 13, 16.VIII.2000, 1♂; station 19, 5.VIII.2002, 1♂; station 20, 17.VIII.2000, 1♂.

Distribution: British Isles, Croatia, Czech Republic, France, Germany and Slovenia (Yang *et al*., 2007). Chvála (2013) recorded it also in the European part of Turkey.

Habitat: males of this species were found on the leaves of bushes in the vicinity of streams, together with *Chelifera stigmatica* and *C. trapezina*.

Remarks: it is an extremely rare species in Poland. Based on the individuals caught by the author and listed above, Niesiołowski (2005) reported this species from Pieniny Mts., but he did not provide precise data on the sites and dates of capture. So far as is currently known, this species is restricted in Poland to the Pieniny mountains range, where it inhabits only the Sobczański stream occurring at 530-610 m.

The male terminalia of individuals from the Pieniny Mts. agree with the detailed description presented by Collin (1961). One modification to Collin's description pertains to thorax. In contrast to the specimens described by Collin, where males of *H. melangyna* have greish yellow thorax lack stripes, the individuals found in the Pieniny Mts. have three dark brown, narrow stripes located longitudinally on the thorax (Fig. 4).

Phenology: flight records indicate that *H. melangyna* is active only in the first and the second 10-day periods of August.

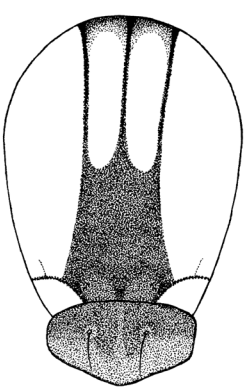

Fig. 4. *Hemerodromia melangyna* (male) - thorax, dorsal view; scale bar = 0,25 mm.

## Subfamily Clinocerinae

### *Clinocera fontinalis* (Haliday, 1833)

Material examined: 2 individuals. Station 1, 2.VIII.2002, 1♂; station 11, 5.VIII.2002, 1♂.

Distribution: British Isles, Austria, Czech Republic, France, Germany, Ireland, Poland, Slovakia, Spain, Sweden and Switzerland (Yang *et al*., 2007; Chvála, 2013). Jonassen (1987) reported it from Norway.

Habitat: males of this species were found sitting on stones protruding from water together with *Clinocera wesmaeli* (Macquart, 1835), *Kowarzia plectrum* Mik, 1880 and *Wiedemannia zetterstedti* (Fallén, 1826).

Remarks: it is an extremely rare species previously known in Poland from only one location. Two males and two females of *C. fontinalis* are in Nowicki's collection and were collected in the 19th century probably from the Tatra Mts. (Niesiołowski, 1992). Unfortunately, this material does not possess any collecting data.

Phenology: in the Pieniny Mts. it was caught only in the first 10-day period of August.

### *Kowarzia plectrum* Mik, 1880

Material examined: 1,423 individuals. Station 1, 14.VIII.1998, 4♂♂, 1♀; 26.IX.1998, 3♂♂, 3♀♀; 15.VIII.99, 1♀; 19.IX.1999, 5♂♂, 2♀♀; 11.VIII.2000, 2♂♂, 2♀♀; 26.IX.2000, 1♂, 2♀♀; 2.VIII.2001, 2♂♂, 1♀; 14.IX.2001, 3♂♂, 5♀♀; 6.VI.2002, 3♀♀; 2.VIII.2002, 2♂♂, 4♀♀; 6.X.2002, 1♂, 2♀♀; 16.VI.2003, 1♀; 1.VIII.2003, 1♂, 3♀♀; station 2, 30.VII.1998, 9♂♂, 15♀♀; 26.IX.1998, 13♂♂, 8♀♀; 6.VI.1999, 1♂, 2♀♀; 15.VIII.1999, 6♂♂, 6♀♀; 19.IX.1999, 13♂♂, 14♀♀; 11.VIII.2000, 1♂, 1♀; 26.IX.2000, 2♂, 2♀; 2.VIII.2001, 6♂♂, 10♀♀; 14.IX.2001, 18♂♂, 24♀♀; 31.VII.2002, 20♂♂, 19♀♀; 6.X.2002, 7♂♂, 6♀♀; 16.VI.2003, 1♂, 1♀; 1.VIII.2003, 2♂♂, 2♀♀; station 3, 8.VIII.1998, 4♂♂, 1♀; 26.IX.1998, 6♂♂, 5♀♀; 15.VIII.1999, 1♂; 19.IX.1999, 1♂, 1♀; 11.VIII.2000, 3♂♂, 2♀♀; 26.IX.2000, 2♂♂,3♀♀; 3.VI.2001, 1♀; 2.VIII.2001, 2♂♂; 14.IX.2001, 3♂♂, 4♀♀; 6.X.2002, 1♀; 13.VI.2003, 10♂♂, 5♀♀; station 4, 13.VIII.1998, 3♀♀; 25.IX.1998, 2♀♀; 14.VIII.1999, 1♀; 22.IX.1999, 3♀♀; 18.VIII.2000, 4♂♂, 3♀♀; 27.IX.2000, 3♂♂, 3♀♀; 31.V.2001, 10♂♂, 5♀♀; 6.VIII.2001, 8♂♂, 9♀♀; 15.IX.2001, 5♂♂, 8♀♀; 22.VI.2002, 1♂, 2♀♀; 12.VIII.2002, 7♂♂, 11♀♀; 2.X.2002, 4♂♂, 6♀♀; station 5, 25.IX.1998, 5♂♂, 13♀♀; 14.VIII.1999, 1♀; 22.IX.1999, 1♂, 1♀; 2.VI.2000, 1♀; 27.IX.2000, 1♂, 3♀♀; 31.V.2001, 1♂, 2♀♀; 6.VIII.2001, 3♂♂, 3♀♀; 15.IX.2001, 5♂♂, 11♀♀; 26.VI.2002, 1♂, 1♀; 12.VIII.2002, 3♂♂, 1♀; 2.X.2002, 3♂♂, 2♀; station 6, 31.VII.1998, 1♀; 25.IX.1998, 6♂♂, 2♀♀; 22.IX.1999, 3♂♂, 3♀♀; 27.IX.2000, 2♂♂, 1♀; 15.IX.2001, 2♂♂, 2♀♀; 8.VI.2002, 1♀; 2.X.2002, 1♂, 1♀; station 7, 7.VIII.1998, 1♂; 25.IX.1998, 4♂♂, 10♀♀; 22.IX.1999, 2♂♂, 3♀♀; station 8, 19.IX.2000, 1♂, 1♀; 3.VIII.2001, 1♂, 1♀; 29.IX.2002, 1♀; station 9, 10.VIII.1998, 1♂; 19.IX.2000, 1♂, 1♀; 3.VIII.2001, 2♀♀; 29.IX.2002, 1♀; station 11, 13.VI.1998, 1♀; 12.VIII.1998, 5♂♂, 4♀♀; 22.IX.1998, 3♂♂, 5♀♀; 30.V.1999, 1♂; 18.VIII.1999, 1♂, 1♀; 21.IX.1999, 1♂, 1♀; 16.VIII.2000, 3♂♂, 3♀♀; 22.IX.2000, 4♂♂, 4♀♀; 9.VIII.2001, 7♂♂, 8♀♀; 17.IX.2001, 5♂♂, 5♀♀; 5.VIII.2002, 2♂♂, 8♀♀; 11.X.2002, 6♂♂, 6♀♀; station 12, 13.VI.1998, 1♀; 12.VIII.1998, 2♀♀; 22.IX.1998, 3♂♂, 6♀♀; 30.V.1999, 2♂♂; 18.VIII.1999, 1♂, 2♀♀; 21.IX.1999, 13♂♂, 16♀♀; 30.V.2000, 1♂, 1♀; 16.VIII.2000, 3♂♂, 4♀♀; 22.IX.2000, 6♂♂, 8♀♀; 30.V. 2001, 5♂♂, 5♀♀; 9.VIII.2001, 9♂♂, 5♀♀, 17.IX.2001, 25♂♂, 51♀♀; 28.VI.2002, 1♂, 3♀♀; 5.VIII.2002, 16♂♂, 13♀♀, 11.X.2002, 22♂♂, 18♀; 16.VI.2003, 4♂♂, 4♀♀; station 13, 12.VIII.1998, 1♀; 22.IX.1998, 1♂, 2♀♀; 30.V.1999, 1♀; 18.VIII.1999, 1♀; 21.IX.1999, 4♂♂, 4♀♀; 22.IX.2000, 5♂♂, 3♀♀; 30.V.2001, 1♂, 1♀; 9.VIII.2001, 2♂♂, 5♀♀; 17.IX.2001, 7♂♂, 7♀♀; 5.VIII.2002, 1♂, 1♀; 11.X.2002, 5♂♂, 2♀; station 14, 22.IX.1998, 1♀; 21.IX.1999, 1♀; 21.IX.2000, 2♂♂, 2♀♀; 9.VIII.2001, 1♀; 17.IX.2001, 1♂, 2♀♀; 5.VIII.2002, 1♂; 4.X.2002, 2♂♂, 3♀♀; station 15, 21.IX.1999, 1♂; 21.IX.2000, 2♂♂, 1♀; 9.VIII.2001, 2♂♂; 4.X.2002, 4♂♂, 2♀♀; station 16, 4.VIII.1998, 1♂; station 17, 16.VI.1998, 1♂, 1♀; 11.VIII.1998, 2♂, 2♀♀; 23.IX.1998, 5♂♂, 1♀; 2.VI.1999, 1♂; 18.IX.1999, 1♂, 2♀♀; 17.VIII.2000, 2♀♀; 24.IX.2000, 2♂♂, 2♀♀; 4.VI.2001, 1♂, 1♀; 10.VIII.2001, 3♂♂, 7♀♀; 5.X.2002, 3♂♂, 2♀♀; station 18, 16.VI.1998, 1♂, 1♀; 11.VIII.1998, 2♂♂, 7♀♀; 23.IX.1998, 2♂♂, 1♀; 2.VI.1999, 1♀; 21.VIII.1999, 1♀; 18.IX.1999, 2♂♂, 3♀♀; 17.VIII.2000, 3♂♂, 2♀♀; 24.IX.2000, 3♂♂, 2♀♀;

4.VI.2001, 1♂; 10.VIII.2001, 13♂♂, 7♀♀; 11.IX.2001, 25♂♂, 42♀♀; 5.VIII.2002, 31♂♂, 17♀♀; 5.X.2002, 3♂♂, 4♀♀; station 19, 11.VIII.1998, 1♂, 1♀; 23.IX.1998, 1♂, 4♀♀; 20.VIII.1999, 1♂, 1♀; 18.IX.1999, 3♂♂, 2♀♀; 17.VIII.2000, 1♂, 1♀; 24.IX.2000, 2♂♂, 3♀♀; 10.VIII.2001, 3♂♂, 4♀♀; 11.IX.2001, 8♂♂, 7♀♀; 5.VIII.2002, 6♂♂, 4♀♀; 5.X.2002, 5♂♂, 4♀♀; 18.VI.2003, 1♀; 1.VIII.2003, 4♂♂, 1♀; station 20, 11.VIII.1998, 2♀♀; 21.VIII.1999, 2♂♂, 4♀♀; 10.VIII.2001, 8♂♂, 6♀♀; 11.IX.2001, 1♂, 3♀♀; 6.VIII.2002, 4♂♂, 3♀♀; station 21, 10.VIII.2001, 1♂, 1♀; 6.VIII.2002, 1♂, 2♀♀; station 22, 23.IX.1999, 1♂, 1♀; 5.VI.2001, 2♂♂, 3♀♀; 13.VIII.2001, 15♂♂, 6♀♀; 7.VIII.2002, 1♂, 1♀; 30.IX.2002, 1♂, 1♀; station 23, 30.V.1999, 1♀; 10.VIII.1999, 2♂♂, 1♀; 23.IX.1999, 1♂, 5♀♀; 8.VIII.2000, 2♂♂, 2♀♀; 23.IX.2000, 2♂♂, 3♀♀; 5.VI.2001, 2♂♂, 2♀♀; 13.VIII.2001, 7♂♂, 3♀♀; 17.IX.2001, 7♂♂, 9♀♀; 7.VIII.2002, 6♂♂, 4♀♀; 30.IX.2002, 7♂♂, 4♀♀; station 26, 1.VIII.2001, 1♂; station 27, 18.IX.2001, 4♂♂, 5♀♀; 2.VIII.2003, 4♂♂, 2♀♀; station 28, 18.IX.2001, 9♂♂, 10♀♀; 20.VI.2002, 1♀; 2.VIII.2003, 5♀♀; station 29, 18.IX.2001, 4♂♂, 5♀♀; 20.VI.2002, 1♀.

Distribution: Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Italy, Poland, Romania, Slovakia, Slovenia, Turkey and the Caucasian Mts. (Georgia) (Joost, 1981; Yang *et al*., 2007; Chvála, 2013).

Habitat: adults of this species were found sitting on boulders and stones protruding from water together with *Clinocera wesmaeli* (Macquart, 1835), *Wiedemannia jazdzewskii* Niesiołowski, 1987, *W. thienemanni* Wagner, 1982 and *W. zetterstedti* (Fallén, 1826).

Remarks: formerly regarded as a very rare (Niesiołowski, 1992). In Poland it is currently known from the Porąbka Dam (Vaillant, 1968), the Gorce Mts. (860 m) (Niesiołowski, 1990), as well as from Mount Babia at Zawoja-Markowa village, and at Pośredni Forest (700-750 m) (Palaczyk and Klasa, 2003), and in the Ojców National Park (Palaczyk, 2008). The very few records combined with small number of *K. plectrum* individuals from Poland suggested that it is rather rare species, except Pieniny Mts., where it may be numerous (Krysiak, 2005b).

Phenology: the flight period of *K. plectrum* in the Pieniny Mts. extends from May to October. This species probably has three generations per year with one peak, not clear, in June and conspicuous gap in the first and the second 10-day periods of July and two distinct emergence peaks in the first 10-day period of August and the second 10-day period of September and a gap in the first 10-day period of September (Fig. 5).

### *Wiedemannia (Chamaedipsia) jazdzewskii* Niesiołowski, 1987

Material examined: 241 individuals. Station 2, 30.VII.1998, 4♂♂, 1♀; 15.VIII.1999, 1♂; 4.VI.2000, 1♂; 11.VIII.2000, 4♂♂; 3.VI.2001, 1♂; station 4, 14.VIII.1999, 1♂; 18.VIII.2000, 1♂; station 5, 9.VI.1998, 4♂♂; 13.VIII.1998, 1♂; 7.VI.1999, 3♂♂; 14.VIII.1999, 3♂♂; 2.VI.2000, 1♂, 1♀; 18.VIII.2000, 1♂, 3♀♀; 31.V.2001, 3♂♂; 6.VIII.2001, 3♂♂, 2♀♀; 26.VI.2002, 21♂♂, 18♀♀; 12.VIII.2002, 8♂♂, 6♀♀; station 6, 31.V.2001, 8♂♂, 2♀♀; 6.VIII.2001, 1♂, 1♀; 8.VI.2002, 1♂, 5♀♀; station 11, 12.VIII.1998, 2♂♂, 2♀♀; station 12, 9.VIII.2001, 1♂; 28.VI.2002, 3♂♂, 2♀♀, 16.VI.2003, 1♂; station 13, 30.V.1999, 2♀♀; 9.VIII.2001, 1♂; station 18, 16.VI.1998, 2♂♂; 11.VIII.1998, 4♂♂; 2.VI.1999, 4♂♂; 6.VI.2000, 3♂♂; 17.VIII.2000, 3♂♂; 4.VI.2001, 1♀; 10.VIII.2001, 1♂; station 19, 16.VI.1998, 1♀; 10.VIII.2001, 1♂, 1♀; station 20, 16.VI.1998, 1♂, 1♀; 11.VIII.1998, 1♂, 1♀; 2.VI.1999, 1♂; 17.VIII.2000, 3♂♂, 1♀; station 27, 20.VI.2002, 6♂♂, 2♀♀; 2.VIII.2003, 1♀; station 28, 20.VI.2002, 26♂♂, 46♀♀; 2.VIII.2003, 3♂♂, 3♀♀.

Distribution: currently known only from Poland.

Habitat: adults of this species were found sitting on boulders and stones protruding from water, together with *Clinocera appendiculata* (Zetterstedt, 1838), *C. wesmaeli*, *Kowarzia plectrum*, *Wiedemannia pieninensis* Krysiak et Niesiołowski, 2004*, W. thienemanni* and *W. zetterstedti*.

Remarks: formerly regarded as a rarity of Poland, and known from only five sites. It was originally described by Niesiolowski (1987) from the Tatra Mts. (Central Western Carpathians, Southern Poland). Besides, it has been recorded from Bieszczady Mts., Gorce Mts., Nowotarska Valley and from the Mount Babia (Niesiołowski, 1990; Klasa *et al*., 2000; Palaczyk and Klasa, 2003). *W. jazdzewskii* has not been reported outside Poland and it is considered to be endemic to the country. In the Pieniny Mts. it occurs at 520-770 m. Records from the Pieniny Mts. indicate that this species may be only locally numerous (Krysiak, 2005b).

Phenology: the flight period of *W. jazdzewskii* in Poland extends from May to September. In the Pieniny Mts. it is probably bivoltine, with distinct emergence peaks in the second 10-day period of June and August and a gap in July (Fig. 5).

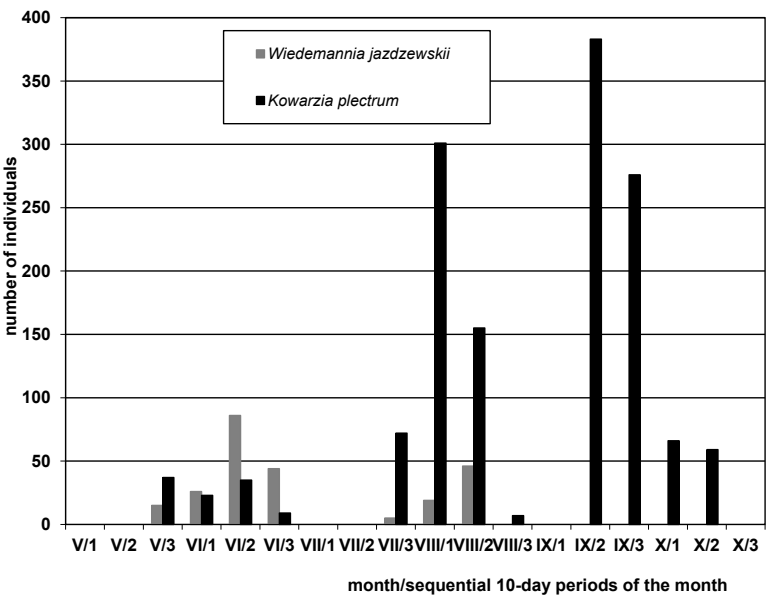


Fig. 5. Emergence patterns of *Kowarzia plectrum* and *Wiedemannia jazdzewskii* during the study period 1998-2004 (V - May, VI - June, VII - July, VIII - August, IX - September, X - October; 1 - the first 10-day period of the month, 2 - the second 10-day period of the month, 3 - the third 10-day period of the month).

### *Wiedemannia (Chamaedipsia) thienemanni* Wagner, 1982

Material examined: 76 individuals. Station 1, 10.VI.1998, 1♀, 6.VI.1999, 1♂, 4♀♀, 19.IX.1999, 1♂, 4.VI.2000, 1♂, 1♀, 26.IX.2000, 2♂♂, 3.VI.2001, 9♂♂, 6♀♀, 6.VI.2002, 1♂, 6.X.2002, 1♂, 16.VI.2003, 2♂♂, 1♀; station 2, 6.VI.1999, 1♂, 1♀, 4.VI.2000, 2♀♀, 3.VI.2001, 1♂, 2♀♀, 16.VI.2003, 1♂, 1♀, station 3, 3.VI.2001, 1♀, 6.VI.2002, 1♀, 16.VI.2003, 5♂♂, 1♀; station 4, 2.VI.2000, 1♂, 3♀♀, 31.V.2001, 2♂♂, 1♀; station 5, 22.IX.1999, 1♂; station 8, 8.VI.2002, 1♀; station 9, 23.IX.1999, 1♀; station 11, 13.VI.1998, 1♀, 30.V.1999, 2♂♂, 30.V.2001, 2♂♂, 2♀♀; station 12, 30.V.1999, 1♀, 30.V.2000, 1♀, 30.V.2001, 1♂; station 13, 30.V.2001, 1♀, 16.VI.2003, 1♂; station 17, 6.VI.2000, 2♀♀, 4.VI.2001, 1♂; station 18, 18.VI.2003, 3♂♂.

Distribution: this species has previously been reported only from Austria, Bosnia and Herzegovina, Germany, Poland and Slovenia (Horvat, 1995; Yang *et al*., 2007; Chvála, 2013).

Habitat: adults of this species were found sitting on boulders and stones protruding from water together with *Clinocera appendiculata*, *C. wesmaeli*, *Kowarzia plectrum, Wiedemannia jazdzewskii*, *W. pieninensis* and *W. zetterstedti*.

Remarks: this appears to be a rather rare species in Poland. For many years it was known from only one record: in the Tatra Mts. (small stream on the Rynias Forest Clearing, 900 m, 17.VI.1984, 4♂♂) (Niesiołowski, 1990). Since then it has been found at twelve sites only in the Pieniny Mts., where it occurs at 460-770 m. Records from this mountain massive indicate that this species may be only locally numerous (Krysiak, 2005b).

Phenology: the flight period of *W. thienemanni* in Poland extends from May to October. In the Pieniny Mts. it is probably bivoltine, with two peaks: in the first 10-day period of June and the third 10-day period of September and extended period without emergence in between.

***Wiedemannia (Philolutra) phantasma* (Mik, 1880)**

Material examined: 5 individuals. Station 10, 3.VIII.2001, 1♂ ; station 25, 14.VIII.2000, 2♂♂, 6.X.2002, 2♂♂.

Distribution: Austria, Germany, Hungary, Italy, Slovakia and Scotland (Collin, 1961; Yang *et al*., 2007; Chvála, 2013).

Habitat: adults of this species were found sitting on boulders protruding from water together with *Wiedemannia bistigma*, *W. braueri*, *W. tricuspidata*, *W. fallaciosa* and *W. pirata*.

Remarks: it is extremely rare species in Poland (Fig. 6). Based on the individuals caught by the author, Niesiołowski (2005) reported this species from the Pieniny Mts., but did not provided precise data on the sites and dates of capture.

Phenology: flight records indicate that *W. phantasma* is active in the Pieniny Mts. in August and in October.

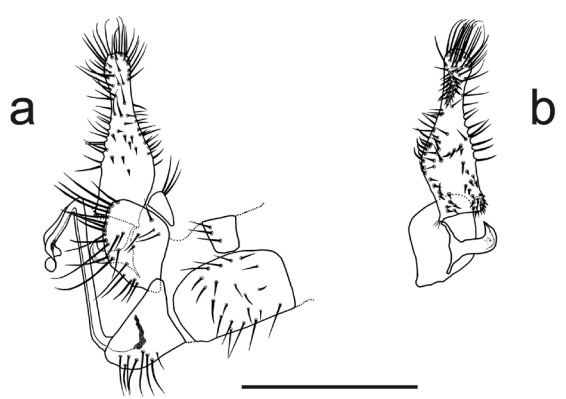


Fig. 6. *Wiedemannia phantasma* - male terminalia; scale bar = 0,5 mm; a - hypopygium, lateral view, b - epandrium and clasping cercus, inner side.

## DISCUSSION AND CONCLUSION

Until the end of the 20th century Hemerodromiinae and Clinocerinae of the Pieniny Mts. were scarcely studied. Only one species - *Wiedemannia tricuspidata* was reported by Vaillant (1968), who captured 2 males (19.VIII.1965) from stones situated on the Dunajec River bank, near Szczawnica (400 m).

In 1998-2004 during my studies in the Pieniny Mts. over 40 species from both subfamilies were recorded. More than half of them were previously known from Poland and were considered to be quite common. The others are rare and they have a very small area of distribution or are known only from single sites. Two previously described species, *Wiedemannia pieninensis* and *Wiedemannia jakubi*, have type localities in the Pieniny Mts. (Krysiak and Niesiołowski, 2004; Krysiak, 2005a). Three species: *C. angusta*, *H. melangyna* and *W. phantasma* are in Poland confined to the Pieniny Mts. with no records from elsewhere in the country. Two species, *Chelifera aperticauda* and *Clinocera fontinalis*, had not been recorded in Poland for over a hundred years. Moreover, one species - *W. jazdzewskii* is probably endemic to Poland.

Prior to this study *Kowarzia plectrum*, *W. jazdzewskii*, *W. thienemanni* were known in Poland from a few locations, and they were regarded as rare in the country. Althought quite abundant at some locations, these species appear to be confined to a small range of the Pieniny Mts. Records from this mountain massive indicate that they may be only locally numerous, it especially concerns *K. plectrum*. It is worth noticing that this species is distributed along an altitudinal gradient between 445 m and 770 m along streams. It prefers upper stream sections, near the stream sources and it corroborates the results given by Ivković *et al*. (2013). The Pieniny Mts. appears to be the refuge for this species in Poland. It may have a somewhat restricted distribution on account of its habitat requirements, although it's may be a false assumption, and it may prove to be widespread in other mountain areas if boulders and stones are searched carefully.

Phenological data are similar to those from other regions of Central Europe (Casper and Wagner, 1982; Wagner, 1982; Wagner and Gathmann, 1996; Ivković *et al*., 2013). Seasonal emergence revealed that recorded species were active in the Pieniny Mts. mainly in spring and summer, however a few species, like *W. jazdzewskii*, *W. thienemanni* and *K. plectrum* emerged in summer and early autumn. In the Pieniny Mts. emergence of *K. plectrum* starts in May and lasts until October and the species probably has three generations per year. In contrast *K. plectrum* was found in Croatia in spring only (Ivković *et al*., 2013). Moreover *W. thienemanni* was active in the Pieniny Mts. from May until October with a gap in June and July, while in Bośnia and Herzegovina it was collected only in October (Horvat, 1993). None of the species was presented throughout the entire year, despite detailed field research in recent years.

The number of species recorded from the Pieniny Mts. demonstrated that the Hemerodromiinae and Clinocerinae fauna of the Carpathians is not completely documented and still it is possible to found new and rare species.

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