



RESEARCH ARTICLE

A review of the genus *Xorides* Latreille, 1809 (Hymenoptera, Ichneumonidae, Xoridinae) in the Ukrainian Carpathians

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Abstract: Species of the genus *Xorides* Latreille, 1809 in the Ukrainian Carpathians are reviewed. All eight recorded species are new for the studied region. *X. alpestris* (Habermehl, 1903), *X. brachylabis* (Kriechbaumer, 1889), *X. csikii* Clement, 1938, *X. irrigator* (Fabricius 1793), and *X. niger* (Pfeffer, 1913) are recorded as new to the Ukrainian fauna. Diagnostic features and illustrations of species are provided. Seasonal dynamics and high-altitude zone distribution of *Xorides* species in the Ukrainian Carpathians are discussed.

Key words: Parasitoids, Hymenoptera, Ichneumonidae, Xoridinae, *Xorides*, Ukraine, new records.

Introduction

The genus *Xorides* Latreille, 1809 (Ichneumonidae: Xoridinae) is a large cosmopolitan genus represented in the world by 159 species, and 37 species in the Western Palaearctic (Yu *et. al.* 2012).

Eight species of *Xorides* have so far been recorded from the territory of Ukraine by Kasparyan (1981): *Xorides ater* (Gravenhorst, 1829), *X. ephialtoides* (Kriechbaumer, 1882), *X. filiformis* (Gravenhorst, 1829), *X. fuligator* (Thunberg, 1824), *X. gravenhorstii* (Curtis, 1831) (as *X. securicornis* (Holmgren, 1860)), *X. praecatorius* (Fabricius, 1793), *X. propinquus* (Tschek, 1869), *X. stepposus* Kasparyan, 1981. The present study provides a list of eight *Xorides* species recorded from the territory of the Ukrainian Carpathians, all eight are new records for the region and five of them are new records for Ukraine. All eight recorded species belong to species group, known as the subgenus *Xorides* (sensu Townes (1969)). The main features of the group are: 1) nervulus distal of basal vein, 2) absence of distinct apical tooth on the trochantellus, 3) transversely wrinkled temples, at least in lower part.

Probably all species of the genus, as well as all xoridines, are idiobiont ectoparasitoids of larvae of wood-boring beetles. According to the literature several species of the families Cerambycidae and Buprestidae known as hosts of *Xorides*. These species are associated with coniferous and deciduous forests: *Arhopalus rusticus* (Linnaeus, 1758), *Callidium aeneum* (DeGeer, 1775), *Plagionotus arcuatus* (Linnaeus, 1758), *Anastrangalia dubia* (Scopoli, 1763), *Leptura aethiops* Poda, 1761, *Strangalia quadrifasciata* (Linnaeus, 1758), *Obrium brunneum* (Fabricius, 1793), *Rhagium inquisitor* (Linnaeus, 1758), and several *Tetropium* species, *T. castaneum* (Linnaeus, 1758), *T. fuscum* (Fabricius, 1787), *T. gabrieli* Weise, 1905, *Agrilus sulcicollis* (Lacordaire) (Constantineanu & Pisica 1977; Hilszczanski 2002; Kasparian 1981; Sedivy 1967).

Material and methods

This study is mainly based on specimens collected by sweep netting, Malaise traps and conical traps for collecting parasitoids of xylobionts (so-called Tereshkin's trap (Tereshkin 1990)) by the author in various locations in all high-altitude zones of the Ukrainian Carpathians in 2009-2013. *Ovipositor-hind tibia index* (in text OTI) is the length of the ovipositor projecting beyond the apex of the metasoma divided by the length of the hind tibia. Townes (1969) was followed for terminology. Specimens were identified using Kasparian's (1981) key; some species were compared with material deposited in the Schmalhausen Institute of Zoology (Kyiv), identified by D. R. Kasparian.

Results

Xorides alpestris (Habermehl, 1903) (Fig. 1)

Diagnosis: This species can easily be distinguished from other species of the subgenus *Xorides* by the combination of the following characters: body black, slender; face and frons entirely black; occipital carina apically incomplete; antenna with (female) or without (male) white ring; pterostigma long and narrow, about 4.0 times as long as wide (as on Fig. 7); hind coxa polished, without transverse wrinkles; hind tibia whitish basally; first tergite of metasoma about 3.5 times (female) and 4.0 times (male) as long as wide apically, with distinct dorsal carinae, reaching the apex of tergite (Fig. 1).

Material examined: ♂, UKRAINE: Ivano-Frankivsk Region, Bogorodchany District, Zhbyr, 48°47'4.92"N, 24°28'46.45"E, 400 m, mixed forest, 7-8 km SW of Bogorodchany, sweep netting, 23.V.2012; ♀, Nadvirna District, Gorgany, Elmy, 48°24'39.50"N, 24°24'50.28"E, 800-900 m, coniferous forest, 15 km SW of Yaremche, sweep netting, 21.VI.2012 (leg. Varga).

General distribution: Palaearctic (Yu *et al.* 2012), new record for Ukraine.

Xorides ater (Gravenhorst, 1829) (Figs 4–7)

Diagnosis: This species can be easily distinguished from other species of the subgenus *Xorides* by the combination of the following characters: body black (Fig. 5); face and frons black, with only small whitish stripes (Fig. 4); occipital carina complete; antenna with (female) or without (male) white ring; pterostigma long and narrow, about 4.0 times as long as wide (Fig. 7); fore and mid coxae and trochanters red with black spots; hind legs usually entirely black (male) (Fig. 5) or with variable coloration of hind coxae and femora (female);

first tergite of metasoma about 2.5 times (female) and 3.0 times (male) as long as wide apically, with indistinct dorsal carinae, reaching at most anterior 0.6 of tergite (Fig. 6).

Material examined: ♀, UKRAINE: Ivano-Frankivsk Region, Bogorodchany District, Mochary, 48°50'51.17"N, 24°35'26.91"E, 300-350 m, mixed forest, 5 km NE of Bogorodchany, sweep netting, 29.IV.2012; ♀, ibid., sweep netting, 6.V.2012; 2 ♀, ibid., sweep netting, 12.V.2012; 2 ♀, ibid., sweep netting, 31.V.2012; ♀, ibid., sweep netting, 24.VII.2012; ♂, ibid., sweep netting, 1.V.2013; ♂, ibid., sweep netting, 4.V.2013; ♀, ibid., sweep netting, 6.V.2013; ♀, Zhbyr, 48°47'4.92"N, 24°28'46.45"E, 400 m, mixed forest, 7-8 km SW of Bogorodchany, Tereshkin trap, 25.VII–16.VIII.2013; 3 ♂, Dibrova, 48°46'10.35"N, 24°30'20.28"E, 310 m, oak forest, 5 km SW of Bogorodchany, sweep netting, 23.VI.2011; ♂, ibid., sweep netting, 30.IV.2012; ♂, ibid., sweep netting, 10–11.V.2012; ♂, Zhuraky, 48°44'26.65"N, 24°30'13.46"E, 8 km S of Bogorodchany, 450-500 m, mixed forest, sweep netting, 22.V.2011 (leg. Varga).

General distribution: Palaearctic (Yu *et al.* 2012).

Xorides brachylabis (Kriechbaumer, 1889) (Figs 2–3)

Diagnosis: This species is similar to *X. ater*, but can easily be distinguished by the widely white-striped inner orbits (female) (Fig. 3) or entirely yellow face (male); swollen fore tibia, wider than mid femora; yellow fore and mid coxae and trochanters (Fig. 2), and usually red hind coxa and femur.

Material examined: ♂, UKRAINE: Ivano-Frankivsk Region, Bogorodchany District, Mochary, 48°50'51.17"N, 24°35'26.91"E, 300-350 m, mixed forest, 5 km NE of Bogorodchany, sweep netting, 1.V.2012; 2 ♂, Dibrova, 48°46'10.35"N, 24°30'20.28"E, 310 m, oak forest, 5 km SW of Bogorodchany, sweep netting, 19.V.2011; ♀, Gorgany, 48°33'32.30"N, 24°07'41.34"E, 1250-1300 m, coniferous forest, 11-12 km SW of Stara Guta, sweep netting, 20-22.V.2012; ♂, Nadvirna District, Gorgany, Elmy, 48°24'39.50"N, 24°24'50.28"E, 800-900 m, coniferous forest, 15 km SW of Yaremche, sweep netting, 8.VI.2013; ♀, Transcarpathian Region, Mizhgyrya District, Synevyr, 48°37'3.74"N, 23°41'0.36"E, 1000 m, coniferous forest, sweep netting, 18.VII.2010 (leg. Varga).

General distribution: Palaearctic (Yu *et al.* 2012), new record for Ukraine.

Xorides csikii Clement, 1938

Diagnosis: This species can easily be distinguished from other species of the subgenus *Xorides* by the combination of the following characters: body very small compared to most other *Xorides* species (body length nearly 4-5 mm), head and mesosoma black (face and temples usually partly and spots on mesopleuron and metapleuron red); vertex behind ocelli polished, clearly punctuate; occipital carina complete; female antenna with subapical angulation, with antennal segments 10-11 whitish, subapical segments 13-16 swollen, making an indistinct club with a total of 4-6 stout erect setae; antenna of male entirely black, simple, with short straight hairs (as on Fig. 14); pterostigma short and wide, about 3.0 times as long as wide (as on Figs 12, 15); first tergite of metasoma black in anterior half, with dorsal carinae and distinct mediolateral furrows (as on Fig. 13); the rest of metasoma red.

Material examined: ♀, UKRAINE: Ivano-Frankivsk Region, Bogorodchany District, Mochary, 48°50'51.17"N, 24°35'26.91"E, 300-350 m, mixed forest, 5 km NE of Bogorodchany, sweep netting, 6.V.2010; ♂, Transcarpathian Region, Vynohradiv District,



Figures 1–4. *Xorides* spp., female. **1**, *X. alpestris* (Habermehl, 1903), dorsal view of tergite I of metasoma; **2–3**, *X. brachylabis* (Kriechbaumer, 1889): **2**, ventral view of fore and mid legs; **3**, frontal view of head; **4**, *X. ater* (Gravenhorst, 1829), frontal view of head.



Figures 5–7. *Xorides ater* (Gravenhorst, 1829). **5**, male, lateral view of habitus; **6**, female, dorsal view of tergite I of metasoma; **7**, female, pterostigma.

Chorna Gora, 48°09'19.70"N, 23°04'22.47"E, 500 m, on *Quercus dalechampii*, sweep netting, 6.IV.2011 (leg. Varga).

General distribution: Europe, very rare species in collections, known only from several countries (France, Germany, Hungary, Poland, Switzerland, United Kingdom) (Yu *et al.* 2012), new record for Ukraine.

Xorides gravenhorstii (Curtis, 1831)

Diagnosis: This species is similar to *X. csikii*, but can be easily distinguished by having a rugulo-punctate vertex behind the ocelli; female antenna with white segments (10)11-13; antenna of male with long apically curved hairs (as on Fig. 11); entirely red metasoma (female) or with black base and apex (male).

Material examined: ♂, UKRAINE: Ivano-Frankivsk Region, Bogorodchany District, Gorgany, 48°36'42.77"N, 24°09'10.69"E, 1200 m, coniferous forest, 5 km SW of Stara Guta, sweep netting, 8-9.VI.2012; ♂, Transcarpathian Region, Rakhiv District, slopes of m. Sheshul, 48°09'23.13"N, 24°21'27.15"E, 1400-1500 m, subalpine zone, 6-7 km E of Kvasy, sweep netting, 15.VI.2013 (leg. Varga).

General distribution: Western Palaearctic, common species in Europe (Yu *et al.*, 2012).

Xorides irrigator (Fabricius, 1793) (Figs 13–16)

Diagnosis: This species can easily be distinguished from other species of the subgenus *Xorides* by the combination of the following characters: head and mesosoma black; occipital carina complete; female antenna with subapical angulation, with segments 9-12 whitish, subapical segments not swollen; antenna of male entirely black, simple, with short straight hairs (Fig. 14); pterostigma short and wide, about 3.0 times as long as wide, with wide basal whitish spot (Fig. 15); propodeum with strong lateromedian teeth (female) (Fig. 13); legs generally brownish-black, fore tibia swollen (female) (Fig. 16); first tergite of metasoma with distinct dorsal carinae and mediolateral furrows (Fig. 13); metasoma generally reddish-black, usually with reddish base and black apex.

Material examined: ♀, UKRAINE: Ivano-Frankivsk Region, Bogorodchany District, Mochary, 48°50'51.17"N, 24°35'26.91"E, 300-350 m, mixed forest, 5 km NE of Bogorodchany, sweep netting, 18.VI.2011; 2 ♂, *ibid.*, sweep netting, 28.IV.2012; ♀, *ibid.*, sweep netting, 29.IV.2012; ♀, *ibid.*, sweep netting, 19.VII.2012; ♂, Dibrova, 48°46'10.35"N, 24°30'20.28"E, 310 m, oak forest, 5 km SW of Bogorodchany, sweep netting, 23.VI.2011; ♂, ♀, Rosilna, 48°46'09.17"N, 24°24'25.00"E, 450 m, mixed forest, 11 km SW to Bogorodchany, sweep netting, 12.VII.2011 (leg. Varga).

General distribution: Palaearctic (Yu *et al.* 2012), new record for Ukraine.

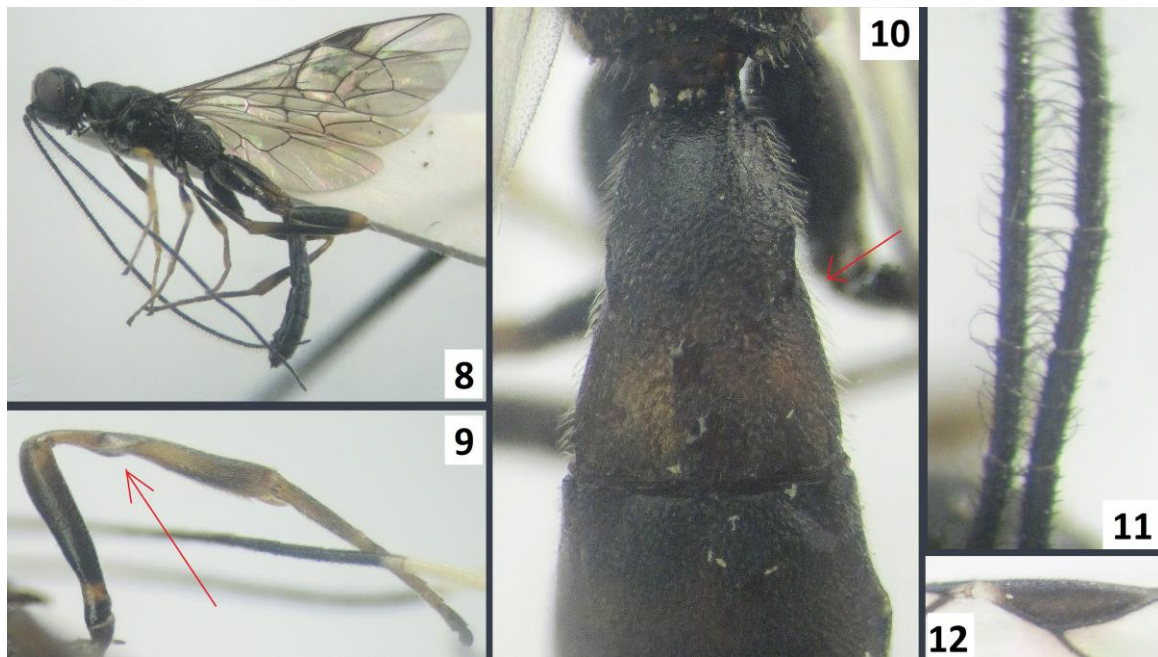
Xorides niger (Pfeffer, 1913) (Figs 8–12)

Diagnosis: This species is similar to *X. irrigator* but can be easily distinguished by the male's entirely black antenna, with long apically curved hairs (Fig. 11); pterostigma with smaller whitish basal spot (Fig. 12); propodeum without strong lateromedian teeth; less swollen fore tibia, with V-shaped groove ventrally in anterior half (Fig. 9); first tergite of metasoma with less distinct dorsal carinae (Fig. 10).

Material examined: 13 ♂, 2 ♀, UKRAINE: Ivano-Frankivsk Region, Bogorodchany District, Mochary, 48°50'51.17"N, 24°35'26.91"E, 300-350 m, mixed forest, 5 km NE of Bogorodchany, sweep netting, 28.IV.2012; 8 ♀, *ibid.*, sweep netting, 29.IV.2012; 2 ♀, *ibid.*,

sweep netting, 1.V.2012; 3 ♀, *ibid.*, sweep netting, 5.V.2012; 5 ♀, *ibid.*, sweep netting, 6.V.2012; 9 ♀, *ibid.*, sweep netting, 12.V.2012; 5 ♀, *ibid.*, sweep netting, 19.V.2012; ♀, *ibid.*, sweep netting, 31.V.2012; 2 ♂, *ibid.*, sweep netting, 10.VI.2012; ♀, *ibid.*, sweep netting, 30.IV.2013; 4 ♂, ♀, *ibid.*, sweep netting, 1.V.2013; 2 ♀, *ibid.*, sweep netting, 4.V.2013; 4 ♀, *ibid.*, sweep netting, 6.V.2013 (leg. Varga).

General distribution: Europe, known only from several countries (Yu *et al.* 2012), new record for Ukraine.



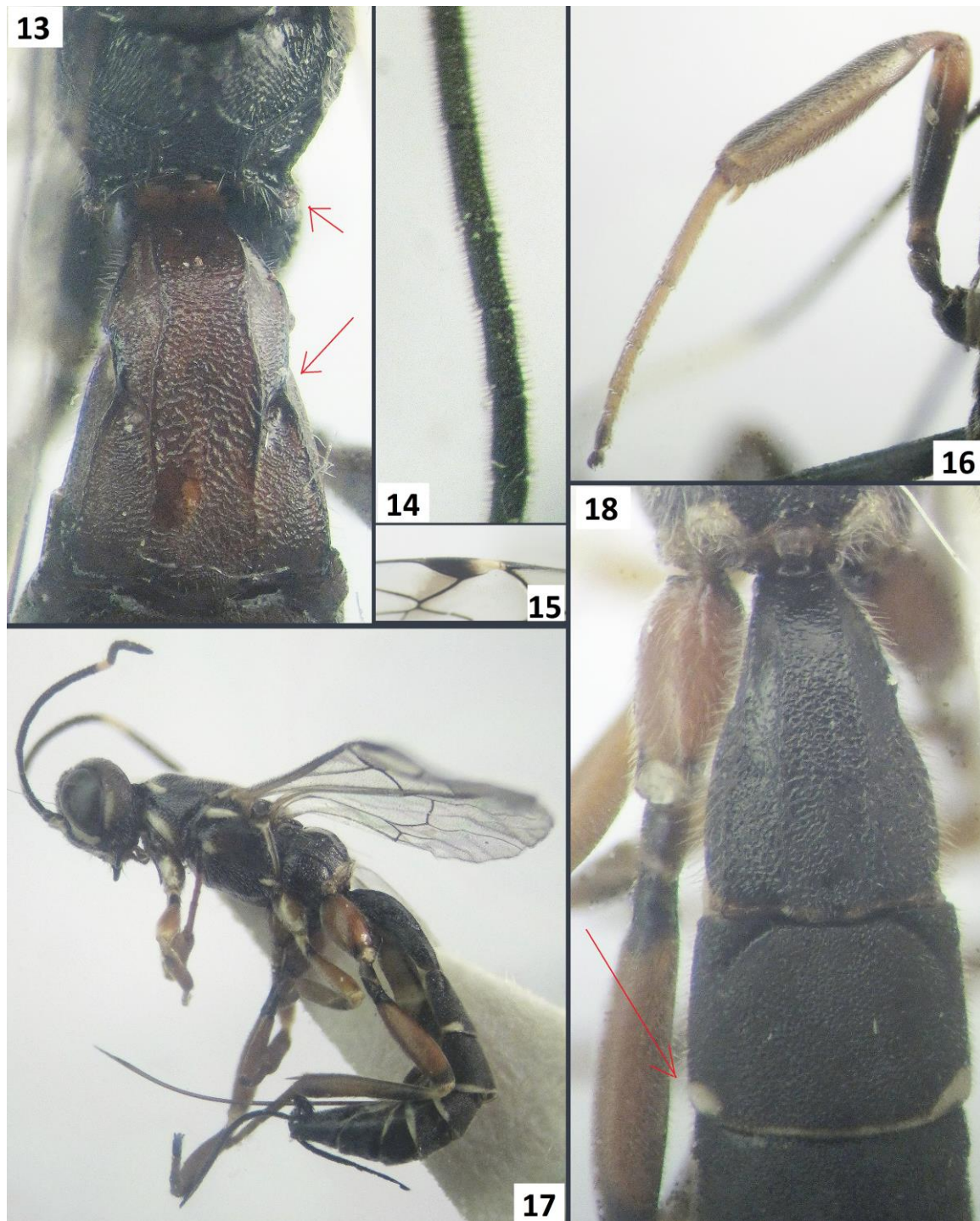
Figures 8–12. *Xorides niger* (Pfeffer, 1913). **8**, male, lateral view of habitus; **9**, female, dorsal view of fore leg; **10**, female, dorsal view of tergites I-II of metasoma; **11**, male, central segments of antenna; **12**, female, pterostigma.

***Xorides praecatorius* (Fabricius, 1793)** (Figs 17–18)

Diagnosis: This species can easily be distinguished from other species of the subgenus *Xorides* by the combination of the following characters: head and mesosoma black with abundant red and (or) yellow coloration (at least white-striped inner orbits of male and spots of mesopleuron and propodeum) (Fig. 17); occipital carina complete; antenna with (female) or without (male) white ring; male antenna with short straight hairs; pterostigma short and wide; legs generally red with yellowish-red trochanters and basally yellow hind tibiae; first tergite of metasoma with dorsal carinae and mediolateral furrows (Fig. 18); metasoma entirely black, with (female) or without (male) white spots at posterior corners of tergites (except first) (Fig. 18).

Material examined: ♂, UKRAINE: Ivano-Frankivsk Region, Bogorodchany District, Mochary, 48°50'51.17"N, 24°35'26.91"E, 300-350 m, mixed forest, 5 km NE of Bogorodchany, sweep netting, 1.V.2013; ♀, Transcarpathian Region, Rakhiv District, Chornogora, 48°10'19.08"N, 24°18'09.16"E, 1000 m, beech forest, 4 km NE of Kvasy, sweep netting, 16.VI.2013; ♀, Svydovets, 48°09'08.89"N, 24°15'58.35"E, 850-900 m, beech forest, 2-3 km NW of Kvasy, Malaise trap, 14.VII.-24.VIII.2013 (leg. Varga).

General distribution: Palaearctic, widespread and common species in Europe (Yu *et al.* 2012).



Figures 13–18. *Xorides* spp.. **13–16**, *X. irrigator* (Fabricius, 1793): **13**, female, dorsal view of propodeum and tergite I of metasoma; **14**, male, central segments of antenna; **15**, female, pterostigma; **16**, female, ventral view of fore leg; **17–18**, *X. praecatorius* (Fabricius, 1793), female: **17**, lateral view of habitus; **18**, dorsal view of tergites I-II of metasoma.

Discussion

High-altitude zone distribution and seasonal dynamics of *Xorides* species

During the investigations carried out in various locations of the Ukrainian Carpathians between 2009 and 2013 eight species of the genus *Xorides* were recorded. Five species were

reported for the first time from Ukraine. Generally 101 specimens were examined (*Xorides* species are rarely collected parasitoids). The most abundant *Xorides* species between 2009 and 2013 was *X. niger* (nearly 60 % of the total number of specimens).

Xorides species have been recorded in various high-altitude zones of the Ukrainian Carpathians (Table 1). *Xorides* species were most abundant in the foothill oak forest zone, reaching up to 150–400 m a. s. l. in Precarpathia and Transcarpathian lowland with mixed forests (where the main tree species are *Quercus robur*, *Q. rubra*, *Caprinus*, *Fraxinus*, *Picea abies*, *Abies alba*, and *Pinus sylvestris*) where all species, except *X. gravenhorstii*, were collected. Only one species, *X. praecatorius*, was found in monocultural stands of *Fagus sylvatica* in the beech forest zone (400–1300 m a. s. l.) in Transcarpathia. Three species, *X. alpestris*, *X. brachylabis*, and *X. gravenhorstii* were found in the coniferous boreal forest zone, situated at 900–1600 m a. s. l. in the mountainous part of the Carpathians, where the *Picea abies* community predominates. And only one species, *X. gravenhorstii* was collected in the subalpine zone, at 1400–2061 m a. s. l., known as polonynys, which are high altitude open grasslands, partly taken over by bush, mainly by *Pinus mugo*, *Dushekia viridis*, *Juniperus sibirica* and only single *Picea abies* trees, in which this species attacks its hosts.

Table 1. High-altitude zone distribution of *Xorides* species in Ukrainian Carpathians.

Species	foothill oak forest zone	beech forest zone	coniferous boreal forest zone	subalpine zone
<i>Xorides alpestris</i>	+		+	
<i>X. ater</i>	+			
<i>X. brachylabis</i>	+		+	
<i>X. csikii</i>	+			
<i>X. gravenhorstii</i>			+	+
<i>X. irrigator</i>	+			
<i>X. niger</i>	+			
<i>X. praecatorius</i>	+	+		

The flight season of *Xorides* adults is prolonged, lasting five months, from the first third of April to the last third of August (Table 2). The largest number of species, five, were collected during the first third of May. *Xorides* species were most abundant during May (in the foothill areas) and June (in the mountainous part of the Carpathians).

Table 2. Appearance of *Xorides* species adults in ten-day periods of the 2009-2013 season.

Species	Apr			May			June			July			Aug		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
<i>Xorides alpestris</i>						■			■						
<i>X. ater</i>			■			■			■			■	■	■	
<i>X. brachylabis</i>						■									
<i>X. csikii</i>	■			■											
<i>X. gravenhorstii</i>							■	■							
<i>X. irrigator</i>			■					■	■		■				
<i>X. niger</i>			■	■	■	■									
<i>X. praecatorius</i>				■				■			■	■	■	■	■

Flight periods of *X. ater* and *X. praecatorius* are the most prolonged, lasting from the end of April to the middle of August in *X. ater* and from the beginning of May to the end of August in *X. praecatorius*, moreover, these periods are disjunct. Flight periods of another two species are shorter, lasting in *X. brachylabis* from the first third of May to the first third of June and in *X. niger* from the end of April to the beginning of June. *X. alpestris* was collected only in the last third of May and the last third of June, *X. csikii* was found in the beginning of April and May, and *X. gravenhorstii* was collected only in the first and second thirds of June. The flight period of *X. irrigator* was more prolonged, but disjunct, this species was collected in the end of April, middle and last thirds of June, and in the middle of July (Table 2).

Acknowledgements

The authors are deeply grateful to Jacek Hilszczanski for help with identification of some species, Alex Gumovsky for the discussion of an earlier version of the manuscript, helpful suggestions and correction of the English text.

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Received: 07.02.2014 Accepted: 07.04.2014 Published: 10.04.2014

Cite paper: Varga A. 2014. A review of the genus *Xorides* Latreille, 1809 (Hymenoptera, Ichneumonidae, Xoridinae) in the Ukrainian Carpathians 2(7): 1-9.

<http://dx.doi.org/10.129/jib/2014.2.7>

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