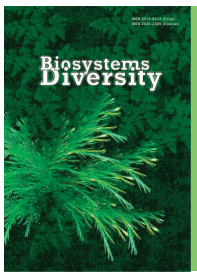

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# *Peyerimhoffia vagabunda* – new sciarid species (Sciaridae, Diptera) for the entomofauna of Ukraine

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*Peyerimhoffia vagabunda* (Winnertz, 1867) is a widespread sciarid species (Diptera, Sciariadae) which occurs in 20 European countries and Asia (recorded in Kazakhstan, Altai, Primorsky Krai and China). Previously, *P. vagabunda* as well as the other species from the genus *Peyerimhoffia* Kieffer, 1903 was unknown to the Ukrainian entomofauna. In the framework of taxonomic and ecological research on Sciaridae in Ukraine some chorological and faunistic peculiarities of *P. vagabunda* have been studied. We collected material during expeditions and excursions in different biotopes of Ukraine from 2013 to 2018 by the method of non-count sweeping with an entomological net. Collected imagoes were placed into 5 ml vials with 76% ethanol. In the laboratory, the fixed material was dehydrated in absolute ethanol and mounted on slides in Euparal. We have found five new localities of *P. vagabunda* in three regions – Kyiv (one locality in the National Natural Park "Holosiivskyi"), Volyn (four localities in the National Natural Park "Tsumanska Puscha") and Odesa (one locality in the National Natural Park "Tuzlovski Lymany"). All findings were registered in four biotope types: G1.A16 Sub-continental hornbeam-oak forests, E5.22 Mesophile fringes – post forest-felling mixed-species grassland, G1.95 Birch fresh and dry forests and G1.C3 *Robinia* plantations. Accordingly, in Ukraine we discovered three separate *P. vagabunda* populations located in Kyiv, Odesa and Volyn regions. Between the specimens from these populations we have detected some morphological differences. Male imagoes from Volyn and Odesa regions fully match previous descriptions of the species, but the specimen from the Kyiv population is somewhat different. Specifically this concern to the wing structure – the stM length of the Kyiv specimen is only a bit longer than the length of M-fork; one seta is present on the y; c is longer than was previously described and occupies 3/4w, but not 2/3w. Our discovery of *P. vagabunda* in Ukraine partially eliminates the disjunctive nature of the species' range and implies its continuity. Imagoes of this species occur mainly in wet and shaded forests, but can enter the nearest coastal or ecotone meadows or penetrate caves. Our discovery of *P. vagabunda* in Ukraine is the first record of any *Peyerimhoffia* representative in our country. In Europe nine *Peyerimhoffia* species are known and they can potentially be detected in the territory of Ukraine. Considering this, a key to identification of these species is given in the article.

*Keywords*: Mycetophiloidea; black fungus gnats; species richness; chorology; ecology

## Introduction

Sciarids or black fungus gnats are small (length of imago up to 8 mm), mainly dark coloured insects from the Sciaridae Billberg, 1820 family (Diptera). Sciarid larvae usually develop in rotting plant remains permeated by fungal hyphae (Meunier, 1904; Mohrig, 1967; Shin et al., 2013). The world fauna includes more than 2,200 sciarid species from 83 genera (Roskov et al., 2017). 31 genera and 654 species are registerred in Europe (Menzel & Heller, 2013). Frank Menzel and Werner Mohrig conducted the latest Palearctic sciarid fauna revision in 1999 and listed 836 sciarid species from 28 genera (Menzel & Mohrig, 2000).

The comprehensive faunistic investigation of sciarids in Ukraine was not carried out before. These gnats were studied only in Crimea by Bukowski & Lengersdorf (1936) and in Transcarpathia by Mohrig & Mamaev (1970). According to the literature, only a few records of sciarids are known from other regions of Ukraine: three species were registered in Podolia (Winnertz, 1868) and one in western regions, excluding the Carpathians (Osmola, 1970).

*Peyerimhoffia vagabunda* (Winnerz, 1867) is a middle-sized black fungus gnat from the Sciaridae family. This species is widespread in the Palearctic and occurs from Norway in the west to the Russian Far East and from Finland in the north to China in the south (Fig. 1). It has been recorded in 20 European countries (Luxemburg, Germany, Sweden, France, Spain, Finland, Great Britain (Lundy Is.), Italy, Norway, the Netherlands, Albania, Austria, Bulgaria, the Czech Republic, the Danish mainland, the Greek mainland, Hungary, Ireland, Slovakia, Switzerland) and in Asia (Kazakhstan, Altai and Primorsky Krai) (Donisthorpe, 1913; Edwards, 1925; Tuomikoski, 1960; Mohrig & Röschmann, 1994; Mohrig & Blasco-Zumeta, 1995; Komarova, 2003; Menzel et al., 2006; Sataeva, 2006; Komarov, 2011; Heller & Weber, 2013; Menzel & Heller, 2013; Deady et al., 2014; Shi et al., 2014). The range of *P. vagabunda* has disjunctions between the European and Asian parts. Namely, there are three known areas of distribution of this species in Eurasia: in Western Europe, Kazakhstan and Alatau (Russian Federation) and in China. Obviously, such disjunctions are caused not by ecological features of this sciarid, but only by the scant knowledge about its distribution (Fig. 1).

Among modern scientists there is no consensus about the systematic position of *P. vagabunda*. At first, this species was described as *Sciara vagabunda* Winnertz, 1867 from Frankfurt am Main (Winnertz, 1867). Later, based on the protologue, J. J. Kieffer separated a new genus

*Peyerimhoffia* Kieffer, 1903 that contained two species: *P. brachyptera* Kieffer, 1903 (new name of *S. vagabunda*) with indication of typical locus as Archail (France) and *P. aptera* Kieffer, 1903 (Kieffer, 1903). Based on material of 26 males and 2 females, R. Frey described a new species *Peyerimhoffia alata* Frey, 1948 and indicated 2 males and 1 female as types (Frey, 1948). However, the revision of Frey's collection conducted by R. Tuomikoski revealed the similarity between Frey's *P. alata* and Keifer's *P. brachyptera*, which allowed the author to bring these species into synonyms (Tuomikoski, 1960). R. Tuomikoski also changed the level of the *Peyerimhoffia* taxon and downgraded it from genus to subgenus of *Plastosciara* s. l. (sensu Frey, 1948), thus, according to Tuomikoski, the new name of the species was *Plastosciara* (*Peyerimhoffia*) *brachyptera* Tuomikoski, 1960. F. Menzel and W. Mohrig transferred the subgenus *Peyerimhoffia* from *Plastosciara* to *Cratyna* Winnertz, 1867 genus and returned the species its original name *Cratyna* (*Peyerimhoffia*) *vagabunda* (Winnertz, 1867) from Winnertz's protologue (Menzel & Mohrig, 2000). According to the results of cladistic analysis of 64 adult males morphological characters from 67 species, P. Vilkamaa and H. Hippa concluded that subgenus *Peyerimhoffia* has generic level with 14 species included (Vilkamaa & Hippa, 2005).

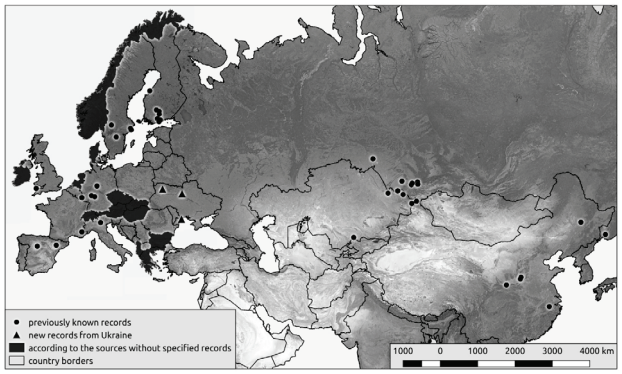


**Fig. 1.** Distribution of *Peyerimhoffia vagabunda* in the Palearctic

In our work we consider *Peyerimhoffia* Kieffer, 1903 as a separate genus according to the latest revision (Vilkamaa & Hippa, 2005).

## Materials and methods

Material was collected during expeditions and excursions in different biotopes in Ukraine from 2013 to 2018. Male imagoes were caught using a Malaise trap, by the method of non-count sweeping with an entomological net and with exhauster directly from substrate. Collected imagoes were placed into 5 ml vials with 76% ethanol. Fixed material was dehydrated initially in 96%, then in absolute ethanol and mounted on the slides in Euparal. The morphology was studied with MBS-9 and Biolam D11 microscopes equipped with Nikon D90 camera; images were processed using NKRemote Ver. 2.2.1, AxioVision Rel. 4.7 and Photoshop CC 2015 programs; pictures were stacked by Enfuse and Hugin open source software. The range map of the species was built using QGIS 2.8.1-Wien program.

Within the studied material we identified seven *P. vagabunda* specimens from five localities: № 39, Ukraine, Kyiv reg., NNP "Holosiivskyi" 50°22.319′ N, 30°30.315′ E, altitude ca 180 m, oak-hornbeam forest, herpetobium (near rotten tree trunk), 1 male, 10 June 2015, leg. A. Babytskiy; No 215, Ukraine, Volyn reg., outskirts of Klubochyn village, Partyzanske forestry, NNP "Tsumanska Puscha" 50°57.738′ N, 25°49.843′ E, altitude ca 205 m, oak-hornbeam forest, herpetobium (herbal tier and low undergrowth near rotten tree trunk), 1 male, 27 June 2017, leg. A. Babytskiy; No 237, Ukraine, Volyn reg., outskirts of Zhabka village, NNP "Tsumanska Puscha" 50°48.955′ N, 25°26.08′ E, altitude ca 220 m, old forest road, meadow between two forest massifs, hortobium (tall and low grasses), 1 male, 29 June 2017, leg. A. Babytskiy; No 248, 249, 250, Ukraine, Volyn reg., outskirts of Zhabka village, NNP "Tsumanska Puscha" 50°49.428′ N, 25°25.760′ E, altitude ca 200 m, birch forest, hortobium, 3 males, 29 June 2017, leg. A. Babytskiy; No 295, Ukraine, Odesa reg., outskirts of Lebedivka village, the bank of Burnas estuary, NNP "Tuzlovski Lymany" 45°50.47′ N, 30°8.39′ E, altitude ca 10 m, honeylocust-robinia forest with oak admixture, above fruit body of *Agaricus* sp., 1 male, 20 Jul 2017, leg. A. Babytskiy. All studied material is kept in Andriy Babytskiy's Private Collection, Kyiv (PABK) and deposited for public viewing on the Ukrainian Biodiversity Information Network (www.ukrbin.com).

## Results

In Ukraine we have found five new localities of *P. vagabunda* in three regions – Kyiv (one locality in the National Natural Park "Holosiivskyi"), Volyn (four localities in the National Natural Park "Tsumanska Puscha") and Odesa (one locality in the National Natural Park "Tuzlovski Lymany"). All findings were registered in four biotope types:

1. G1.A16 Sub-continental hornbeam-oak forests (EUNIS, 2012). Specimens from this biotope were caught in NNP "Holosiivskyi" (Kyiv city) and NNP "Tsumanska Puscha" (Volyn reg.). Imagoes from these localities were collected in herpetobium – the space above leaf litter with low undergrowth around rotten trunks. Thick two-tiered tree stands with different ratios of dominant species are typical for these forests. Tree crown serried is 0.7–1.0. The first tier is up to 28 m high, formed by *Quercus robur* L. and *Carpinus betulus* L. with addition of *Acer platanoides* L., *Fraxinus excelsior* L., *Tilia cordata* Mill. and *Ulmus glabra* Huds. The second shrubby tier is up to 16–18 m high consisting of *Corylus avellana* L., *Frangula alnus* Mill., *Euonymus verrucosa* Scop., and *E. europaea* L. Herbal tier is thick, its total projective cover is 20–95% with domination of *Asperula odorata* L., *Carex pilosa* Scop., *Aegopodium podagraria* L., *Galeobdolon luteum* Huds., *Asarum europaeum* L.

2. E5.22 Mesophile fringes – post forest-felling mixed-species grassland (EUNIS, 2012). This is the meadow between two forest arrays on the old road with vegetation cover that consists of *Melampyrum nemorosum* Baumg., *Agrimonia eupatoria* L. and *Trifolium medium* L. as dominant species. In the admixture the following species are present *Asarum europaeum*, *Aegopodium podagraria*, *Pulmonaria obscura* Dumort., *Dactylis glomerata*, *Trifolium pratense* L. and others. There is an ecotone mesophilic margin biotope with dense projective cover (75–100%). Imagoes were collected with sweeping net above hortobium – tall and low grasses.

3. G1.95 Birch fresh and dry forests (EUNIS, 2012). This is a light forest with one tier tree stand formed by *Betula pendula* as dominant and *Pinus sylvestris* L., *Quercus robur*, *Fraxinus excelsior*, *Acer platanoides* and *Acer negundo* L. in admixture. The herbal tier is dense (projective cover up to 100%) with domination of *Poa nemoralis* L. and *Dactylis glomerata*. Specimens were collected in hortobium – the grass space in the biotope.

4. G1.C3 *Robinia* plantations (EUNIS, 2012). Planted honeylocust and false acacia forest with oak admixture. Dominants in the tree stand are *Gleditschia triacanthos* L., *Quercus robur* and *Fraxinus excelsior*. The shrubby level is formed by *Caragana arborescens* Lam., *Acer tataricum* L., *Robinia pseudoacacia* L., *Cotinus coggygria* Scop. and *Cornus mas* L. The herbal tier is gramineous. Specimens were collected above the fruit body of *Agaricus* sp. grown on the edge of a tract near the forest road.

## Discussion

Consequently, in Ukraine we have found three separated *P. vagabunda* populations – in Kyiv (specimen from NNP "Holosiivskyi", Fig. 2–7), Odesa (NPP "Tuzlovski Lymany") and in Volyn regions (specimens from NNP "Tsumanska Puscha", Fig. 8–13).

The specimens from these populations have some morphological differences. Male imagoes from Volyn and Odesa regions fully comply with previous descriptions of the species, however the specimen from the Kyivan population differs. Comparative morphological description of studied specimens is provided below.

Males of *P. vagabunda* are 2.0–2.8 mm in length (Fig. 8), females reach up to 3.0 mm in length.

Head capsule is slightly elongated. Compound eyes with short setae, united above antennal bases with a characteristic eye bridge. Eye bridge consists of 3 or 4 rows of ommatidia (facets). Antenna are long, mono-

tonous dark brown, 16-membered and divided on biarticulated "handle" (scapus), which consists of scape and pedicel, both globular, and flagellum that consists of 14 flagellomeres. Flagellomeres are subcylindrical, with dark setosed body and non-setosed, short, mono-colored cervix (Fig. 2). Setae length is 4/5 of flagellomere width. The length/width of 4th flagellomere is 2.3–2.6 (Fig. 11). Maxillary palpus is short-clavated and brown, in most cases consists only of only palpomere, however sometimes the terminal palpomere is separated from the primary one by a narrow but noticeable bridge (Fig. 10). The primary palpomere is bordered with 4–6 setae, 2 of them are significantly longer than the others. Patch of narrow sensilla is small.

Thorax is dark brown with dark, strong and long setosity. Postpronotum is setosed. Mesonotum has dark setae and bears with strong lateral, central and scutellar setae (Fig. 3).

Legs are slender, with uniform setosed vestiture and thin short spurs. Tibia is lighter than thorax, but significantly dirty gray to brown; front tibial ($t_1$) organ is unbordered, with dense vestiture (Fig. 4). Spurs of $t_2$ and $t_3$ have the same length. Tarsal claws without teeth.

Wings are well developed in male, females usually are indicated as wingless or brachypterous (Kieffer, 1903); posterior veins and wing membrane without macrotrichia; stM are longer than M-fork; M-fork is shortly-triangular, widely opened; $M_1$ and $M_2$ are slightly curved; x and y both are non-setosed, x/y = 1.0–1.5 (Fig. 11); stCu/x = 0.67–1.00; r1/r = 0.8–1.0 (Fig. 5, 12), r is noticeable and prior the base of M-fork falls into C (Fig. 5); c = 2/3w (Fig. 5, 13). Haltere is brownish covered with very short setae. According to Keifer's description, female wings show only a single vein (Kieffer, 1903).

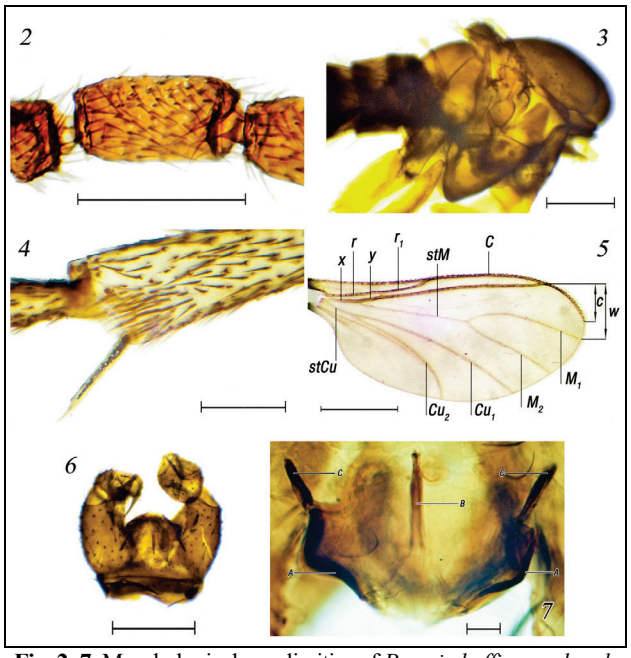


**Fig. 2–7.** Morphological peculiarities of *Peyerimhoffia vagabunda* (specimen from NNP "Holosiivskyi"): *2* – the fifth flagellomere of the flagellum (scale bar – 0.10 mm); *3* – thorax (scale bar – 0.20 mm); *4* – front tibial ($t_1$) organ (scale bar – 0.05 mm); *5* – wing structure (scale bar – 0.50 mm); *6* – general view of hypopygium (scale bar – 0.20 mm); *7* – tegmen: *A* – parameres of tegmen; *B* – aedeagus; *C* – apodemas of tegmen parameres (scale bar – 0.02 mm)

Hypopygium is significantly larger in width than in height, without basallobus – intercoxal lobe (sternite 9), or ventral intercoxal setosed area (Fig. 6, 9). Valves (gonocoxite) are much shortened; ventral external valve margins are wide, semicircle in shape; their internal side has very short setae. Stylus (gonostylus) is shortened and thickened, slightly tumid, the broadest on mesial part, approximately 1.5 times longer compared to its width, triangular and bubble shaped flattened; the tip of the stylus with a single strong and long apical tooth (as long as the gonostylus' width); apical tooth with long medial seam and without blade shaped elevation. The inner side of the stylus is without serrations but with many strong and long setae that often reach the top of the tooth. The genital plate (tegmen) is greater in width than in height, trapezoidal, laterally strongly s-shape curved. The genital plate in its upper half is very membranized, in the middle with 2 horizontally sclerotic areas that converge from the edges of the genital plate to its center, the serrated field is small and inconspicuous, with unimucronate serrations. The aedeagus is very short with a weakly sclerotized base (Fig. 7).

Specimens from Ukraine are clearly identified as *P. vagabunda* due to the main morphological features, but in the vein structure of the specimen from NNP "Holosiivskyi" some discrepancies with previous descriptions are present. Specifically, the length of stM is only a bit longer than the length of M-fork, on the y one seta is present, c is longer than was previously described and occupies 3/4w, but not 2/3w (Fig. 5). However, other important morphological features such as the structure of hypopygium (especially tegmen and aedeagus) give no reasons to doubt the correctness of the identification of this specimen. These discrepancies may be inherent only for the specimen from NNP "Holosiivskyi" and the other six specimens fully comply with previous descriptions of the species. This indicates some morphological difference between Kyiv and other *P. vagabunda* populations discovered in Ukraine.

According to our findings and literature sources, the ecological preferences of *P. vagabunda* tend towards forests or other wet shaded areas. We detected imagoes of this gnat in the forest biotopes (hornbeam-oak, birch and honeylocust-oak forests) and in one grassland habitat that is a post forest-felling wet meadow surrounded by tree stands on both sides. All habitats where *P. vagabunda* imagoes were collected are wet and shaded territories; the species does not favour sunny and dry biotopes. Moreover, in honeylocust-oak forest, which is drier than the other registered places of *P. vagabunda*'s occurrence, we detected its imagoes only above an *Agaricus* sp. fruit body, which can imply possible existence of trophic links between *P. vagabunda* larvae and agarics fungi.

The results of our ecological studies are fully consistent with previously known data. Imagoes of *P. vagabunda* were described for different biotopes with a high level of moisture: juniper forest in Spain (altitude of 300–400 m), beech forest on limestone in Germany (larvae were detected in dead beech wood and leaf litter), the Botanical Garden of Helsinki University and on the bank of Vihtijarvi lake on a woodpile, Finland (Tuomikoski, 1960; Mohrig & Blasco-Zumeta, 1995; Hövemeyer & Schauermann, 2003).

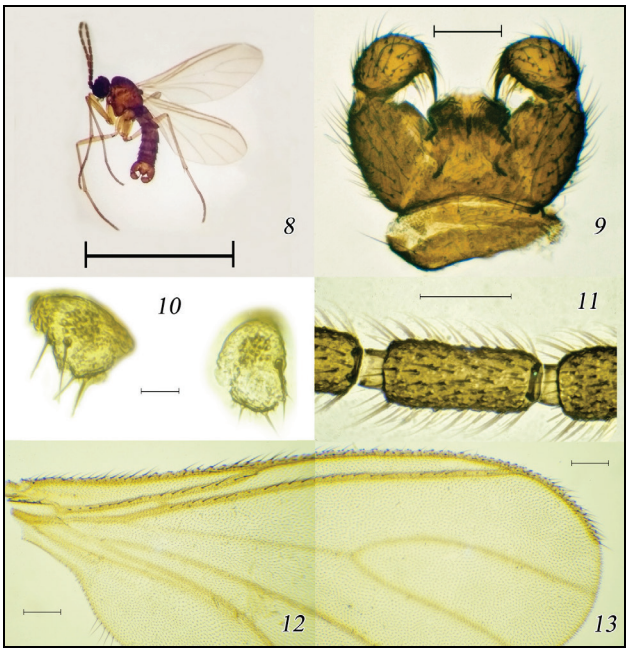


**Fig. 8–13.** Morphological peculiarities of *Peyerimhoffia vagabunda* (specimens from NNP "Tsumanska Puscha"): *8* – male imago (scale bar – 2.00 mm); *9* – ventral view of hypopygium (scale bar – 0.10 mm); *10* – maxillary palpus, ventral view (scale bar – 0.02 mm); *11* – the fourth flagellomere of flagellum (scale bar – 0.05 mm); *12* – proximal part of wing (scale bar – 0.10 mm); *13* – distal part of wing (scale bar – 0.10 mm)

In the Altai, *P. vagabunda* was recorded in the relict mountain tallgrass aspen-fir black forest (altitude of 700 m) and in the intrazonal ribbon-like pine forest in four localities (Komarova, 2003; Komarov, 2011):

1. The valley of the Biya River and Teletskoye Lake, near Verh-Biysk village. Habitat is relict tallgrass aspen-fir black forest (altitude of 700 m) with complex structure and rich flora. In the tree stand, the dominants are *Abies sibirica* Ledeb., *Populus tremula* L. and rarely *Pinus sibirica* Du Tour. In the underbrush, high shrubs as *Prunus padus* L. or *Sorbus* sp. are present. There is well-developed tallgrass with *Aconitum excelsum* Rchb., *Saussurea latifolia* Ledeb., *Heracleum dissectum* Ledeb., *Archangelica decurrens* Ledeb., *Thalictrum minus* L. as dominants and with some ferns (*Athyrium felix-femina* (L.) Roth ex Mert., *Matteuccia struthiopteris* (L.) Todaro) as admixture. In addition, there are a number of ancient relict herbaceous plants. Moss grass is absent.

2. The Alei River source, near Novoaleiskoe village. Habitat is relict tallgrass aspen-fir black forest (altitude of 350–400 m). Unlike the previous biotope, this black forest has richer underbrush with domination of some *Rosa* L. species, *Lonicera tatarica* L., *Daphne altaica* Pall., *Caragana frutex* (L.) K. Koch, *Viburnum opulus* (Mill.) DC.

3. The mountain pass and the vicinity of Gorno-Altaysk town. Habitat is tallgrass aspen-fir black forest on the southwestern slope of Iolgo mountain chain.

4. Between the Biya River and Kanonerskoe Lake. Habitat is intrazonal ribbon-like pine forest. This biotope is characterized by total domination of *Pinus* L., well-developed underbrush (*Spiraea* sp., *Caragana arborescens*, *C. frutex*, *Viburnum* sp., *Sorbus* sp.) and low grass (ferns and tall Apiaceae as *Angelica silvestris* L. and *Pleurospermum uralense* Hoffm.).

Also *P. vagabunda* was recorded near some water bodies: Teletskoe and relict Kanonerskoe lakes, Katun and Koksa rivers (Komarova, 2003).

The presence of *P. vagabunda* in Kazakhstan was recorded in five forest biotopes – dark coniferous fir forest, dark coniferous cedar forest, coniferous larch forest (altitude of 1600–1900 m), poplar riverine forest along the Irtysh River and riverine forest on the foothills of the Talasskiy Alatau mountain range (imagoes of *P. vagabunda* in the last biotope type were caught in early spring, when soil moisture is still sufficient for active plant vegetation) (Sataeva, 2006). Moreover, in Kazakhstan *P. vagabunda* was registered only in low and middle altitude mountains (at an altitude up to 2500 m), but never in high mountains (Sataeva, 2006).

In addition, *P. vagabunda* imagoes were caught in some specific places. On Lundy Island (Great Britain) H. Donisthorpe found a female under a stone in the nest of *Lasius alienus* (Foerster, 1850) in June (Donisthorpe, 1913). Also in Luxemburg, Heller & Weber (2013) collected some specimens of *P. vagabunda* in caves and included this species to the eutrogloxen cavernicolous insects (which occasionally occur in caves).

Thus, *P. vagabunda* tends mainly to inhabit shaded and wet forests. This species can enter coastal or ecotone meadows from the forests located not far from them, or penetrate caves or other stations, where the moisture level is sufficient for its larval development. By its trophic specialization *P. vagabunda* can be referred to the phytosaprophagous species because its larvae feed predominantly on leaf litter and rotten wood. Moreover, our finding of a *P. vagabunda* imago near the fruit body of *Agaricus* sp. can imply possible existence of trophic links between the larvae of this species and agarics fungi.

Our finding of *P. vagabunda* is the first record of *Peyerimhoffia* Kieffer, 1903 representatives in Ukraine. The European fauna includes nine *Peyerimhoffia* sensu Vilkamaa and Hippa species (*Plastosciara hybrida* Mohrig & Mamaev, 1974 is not included to *Peyerimhoffia*), which possibly can be detected on the territory of Ukraine (Menzel & Heller, 2013). Considering this, we compiled a key to these 9 species. We based this on the Vilkamaa & Hippa (2005) key. From this key we excluded the species which were not registered in Europe and added *P. macera* Rudzinski & Baumjohann, 2009, first recorded in Spain (Table 1) (Vilkamaa & Hippa, 2005; Hippa & Vilkamaa, 2005; Rudzinski & Baumjohann, 2009).

## Conclusions

Knowledge about the distribution, ecology and biology of *P. vagabunda* is incomplete, but currently known records of this species reveal its wide Palearctic range with presence in the forest zone. Our findings of *P. vagabunda* on the territory of Ukraine are located between two previously known areas and imply the continuity of the general species range. Thus, the apparently disjunctive range of *P. vagabunda* area can be explained not by ecological features of the species, but by inadequate knowledge about its distribution.

**Table 1**
Key to European *Peyerimhoffia* species

| | | |
|---|---|---|
| 1 | There are megasetae on the mesial side of the gonostylus | *P. sepei* Hippa & Vilkamaa, 2005 |
| – | The mesial side of the gonostylus only with long sclerotized setae | 2 |
| 2 | Apical tooth of gonostylus modified, its mesial margin smoothly sigmoid | 3 |
| – | Apical tooth of gonostylus simple, its mesial margin evenly curved | 4 |
| 3 | Apical tooth of gonostylus very strong, sensillae of maxillary palp and modified setae at apex of front tibia in distinct depression | *P. crassistylata* (Frey, 1948) |
| – | Apical tooth of gonostylus weaker, sensillae of maxillary palp and modified setae at apex of front tibia at most in shallow depression | *P. menzeli* Vilkamaa & Hippa, 2005 |
| 4 | Gonostylus very tumid, broader on apical part, apical tooth short, approximately half as long as the width of gonostylus, intercoxal area lobe-like produced, tegmen longer than broad, with lateral setigerous papillae | *P. alpina* Mohrig, 1978 |
| – | Gonostylus more slender, narrowed towards apex, apical tooth longer than half of the gonostylus width, intercoxal area not produced, tegmen shorter than broad, without lateral setigerous papillae | 5 |
| 5 | Gonostylus with hyaline setae in addition to elongated setae on its mesial side, tegmen with straight lateral sides | *P. obtusicauda* (Strobl, 1900) |
| – | Gonostylus without hyaline setae in addition to elongated ones, tegmen at least slightly curved laterally | 6 |
| 6 | Tegmen is very strongly curved and sclerotized, the flagellomere setae length is no more than 4/5 of flagellomere width | *P. vagabunda* (Winnertz, 1867) |
| – | Tegmen is more weakly curved and sclerotized, flagellomere setae length is more than flagellomere width | 7 |
| 7 | Apical tooth of gonostylus is entire, not divided into basal and apical part | *P. macera* Rudzinski & Baumjohann, 2009 |
| – | Apical tooth of gonostylus divided into a broader basal part and a longer narrow apical part | 8 |
| 8 | Apex of gonostylus is broad, maxillary palp with 2 segments (palpomeres) | *P. infera* Vilkamaa & Hippa, 2005 |
| – | Apex of gonostylus is narrow, maxillary palp with 3 segments (palpomeres) | *P. thula* Vilkamaa & Hippa, 2005 |

The discovered Ukrainian populations of *P. vagabunda* have some morphological differences in the wing structure. The population from NNP "Holosiivskyi" (Kyiv region) has y with 1 seta, shorter stM and longer c than in the known specimens. Morphological structure of male imagoes from other populations from NNP "Tsumanska Puscha" (Volyn region) and NNP "Tuzlovski Lymany" (Odesa reg.) fully comply with previous descriptions of the species.

*P. vagabunda* occurs at an altitude up to 2,000 m. Its ecological preferences tend mainly to the forest biotopes, however it can enter the nearest coastal or ecotone meadows, penetrate caves or other stations, where moisture level is sufficient for its larval development. This species is considered as phytosaprophagous because its larvae feed mostly on leaf litter and rotten wood. Also some trophic links between *P. vagabunda* larvae and agarics fungi should be considered.

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