Вісті Харківського ентомологічного товариства **2023, том XXXI, випуск 1** **ISSN 1726-8028**
The Kharkov Entomological Society Gazette **2023, volume XXXI, issue 1** **e-ISSN 2707-420X**
Известия Харьковского энтомологического общества **2023, том XXXI, выпуск 1** **entomology.kharkiv.ua**

UDC 595.7:582.623.2(477.52/.54) DOI: 10.36016/KhESG-2023-31-1-3

**© 2023 Yu. Ye. SKRYLNYK, K. Yu. ZHUPINSKA,
Ya. V. KOSHELYAEVA, V. L. MESHKOVA**

XYLOPHAGOUS INSECTS (INSECTA: COLEOPTERA, HYMENOPTERA, LEPIDOPTERA) OF *POPULUS* SP. (MALPIGHIALES: SALICACEAE) IN THE EASTERN REGIONS OF UKRAINE

Скрильник, Ю. Є., Жупінська, К. Ю., Кошеляєва, Я. В., Мєшкова, В. Л. Комахи-ксилофаги (Insecta: Coleoptera, Hymenoptera, Lepidoptera) рослин роду *Populus* sp. (Malpighiales: Salicaceae) у східних областях України. *Вісті Харківського ентомологічного товариства*. 2023. Т. XXXI, вип. 1. С. 24–30. DOI: 10.36016/KhESG-2023-31-1-3.
Під корою та в деревині тополь і осик виявлено 72 види комах-ксилофагів, зокрема Coleoptera (66 видів), Lepidoptera (5 видів) і Hymenoptera (1 вид). Із Cerambycidae — 40 видів, Buprestidae — 19, Curculionidae — 7, Sesiidae — 2, Cossidae — 3, Siricidae — 1 вид. Виявлено 5 монофагів, 14 олігофагів і 53 поліфага. Оцінено частоту трапляння всіх видів. Переважають поодинокі та рідкісні види (33 і 26 видів відповідно). До звичайних належать 9 видів, до масових — 4. Усі масові види — поліфаги. 3 рис., 1 табл., 46 назв.
Ключові слова: тополі та осика, стовбурові шкідники, частота трапляння, трофічна спеціалізація.

Skrylnyk, Yu. Ye., Zhupinska, K. Yu., Koshelyaeva, Ya. V., Meshkova, V. L. Xylophagous insects (Insecta: Coleoptera, Hymenoptera, Lepidoptera) of *Populus* sp. (Malpighiales: Salicaceae) in the eastern regions of Ukraine. *The Kharkov Entomological Society Gazette.* 2023. Vol. XXXI, iss. 1. P. 24–30. DOI: 10.36016/KhESG-2023-31-1-3.
72 species of xylophagous insects were identified under the bark and in the wood of poplars and aspens, including Coleoptera (66 species), Lepidoptera (5 species), and Hymenoptera (1 species). There were 40 Cerambycidae, 19 Buprestidae, 7 Curculionidae, 2 Sesiidae, 3 Cossidae, 1 Siricidae species. 5 monophagous, 14 oligophagous, and 53 polyphagous insects were identified. The frequency of occurrence of all species is estimated. Single and rare species predominate (33 and 26 species, respectively). There were 9 common species and 4 abundant species. All abundant species are polyphagous. 3 figs, 1 tab., 46 refs.
Keywords: poplars and aspen, stem pests, frequency of occurrence, trophic specialization.

Скрыльник, Ю. Е., Жупинская, К. Ю., Кошеляева, Я. В., Мешкова, В. Л. Насекомые-ксилофаги (Insecta: Coleoptera, Hymenoptera, Lepidoptera) растений рода *Populus* sp. (Malpighiales: Salicaceae) в восточных областях Украины. *Известия Харьковского энтомологического общества*. 2023. Т. XXXI, вып. 1. С. 24–30. DOI: 10.36016/KhESG-2023-31-1-3.
Под корой и в древесине тополей и осин выявлено 72 вида насекомых-ксилофагов, в том числе Coleoptera (66 видов), Lepidoptera (5 видов) и Hymenoptera (1 вид). Из Cerambycidae — 40 видов, Buprestidae — 19, Curculionidae — 7, Sesiidae — 2, Cossidae — 3, Siricidae — 1 вид. Выявлено 5 монофагов, 14 олигофагов и 53 полифага. Оценена частота встречаемости всех видов. Преобладают единичные и редкие виды (33 и 26 видов соответственно). К обычным отнесено 9 видов, к массовым — 4. Все массовые виды — полифаги. 3 рис., 1 табл., 46 назв.
Ключевые слова: тополя и осина, стволовые вредители, встречаемость, трофическая специализация.

I n t r o d u c t i o n . Poplars and aspens (*Populus* sp.) are common in many native ecosystems. These plants are characterized by fast growth, ease of propagation, the propensity to hybridize, and pleasing appearance (Isebrands, Richardson, 2014). Poplars and aspens provide wood, fiber, fuelwood, and other forest products, and benefit society in the rehabilitation of degraded land, restoration of forest landscapes, and mitigation of climate change (Charles *et al.*, 2014). They are grown in forest belts to protect fields and roads, in rural landscaping, as well as in special plantations as short rotation woody crops, promising tree species for biofuel and bioenergy production (Vysotska, Tkach, 2016).

Poplars are the host plants for over 500 species of insects and mites in Europe (Poplars …, 2022) and at least 300 species in North America (Mattson *et al.*, 2001). However, only a relatively small number of species regularly cause such severe physical damage to trees that they reduce their economic or environmental value and are justifiably called pests (Isebrands, Richardson, 2014).

Skrylnyk Yu. Ye. Ukrainian Research Institute of Forestry and Forest Melioration named after G. M. Vysotsky, 86, Pushkinska St., Kharkiv, 61024, Ukraine; e-mail: yuriy.skrylnik@gmail.com; ORCID: 0000-0001-8565-4860
Zhupinska K. Yu. State Biotechnological University, p/o ‘Dokuchaevske-2’, Kharkiv District, Kharkiv Region, 62483, Ukraine; e-mail: zhupinskaya95@gmail.com; ORCID: 0000-0001-8350-7496
Koshelyaeva Ya. V. State Biotechnological University, p/o ‘Dokuchaevske-2’, Kharkiv District, Kharkiv Region, 62483, Ukraine; e-mail: yana120783@i.ua; ORCID: 0000-0002-5164-3204
Meshkova V. L. Ukrainian Research Institute of Forestry and Forest Melioration named after G. M. Vysotsky, 86, Pushkinska St., Kharkiv, 61024, Ukraine; e-mail: valentynameshkova@gmail.com; ORCID: 0000-0001-6483-2736

Received 27.04.2023 **Accepted 29.05.2023 by Dr. A. G. Shatrovskyi** **Published 30.06.2023**

The galleries of wood-boring insects in the trunk or branches interrupt sap circulation, weaken the trees, and make them vulnerable to windthrow (Ostry, Anderson, 1995). The cracks in the bark promote the establishment of plant pathogens, which cause significantly more damage than the original insect (Steed, Burton**,** 2015). Trunk damage by insects may not significantly affect paper or pulp production but may render trees unsuitable for furniture and veneer production (Mattson *et al.*, 2001).

Applied studies of insects that develop under the bark and in the wood of poplars were carried out more than 50 years ago (Grechkin, Vorontsov, 1962; Zubkova, 1968; Pavlinov, 1973), particularly, in the eastern (Timchenko, Treml, 1963) and western regions of Ukraine (Lavrukh, 1966). The most common species of xylobionts were identified, which can weaken trees and lead to the deterioration of wood quality. The species composition of insects associated with poplars in the territory of Ukraine was identified by studying certain taxonomic groups, for example, Cerambycidae (Martynov, Pisarenko, 2003(2004); Bartenev, 2009; Bartenev, Terekhova, 2006, 2011; Danilevsky, 2020), Buprestidae (Yanytsky, 1996, 1998, 2003, 2006(2007); Kubán *et al.*, 2016; Prokhorov, 2007(2008), 2010; Prokhorov, Vasilyeva, 2015; Skrylnyk, Terekhova, 2011; Terekhova, Skrylnyk, 2014), Scolytidae (Knížek, 2011; Terekhova, Salniitska, 2014; Nikulina *et al.*, 2015; Mandelshtam *et al.*, 2019; Nikulina, Martynov, 2021).

At the same time, analysis of publications from different regions shows that insect species composition living on poplars is not constant (Timchenko, Treml, 1963; Charles *et al.*, 2014; Bochniarz, 2017; Zhupynska, 2019; Nikulina, Martynov, 2021). This is due to climate change, the penetration of alien insects and plants, and the adaptation of native insects to exotic host plants as well as exotic species to native host plants (Poplars …, 2022).

An assessment of the harmfulness of stem insects inhabiting oak (Meshkova, Kukina, 2011; Bieliavtsev, Meshkova, 2019), pine (Skrylnyk, 2013; Meshkova, 2017), and birch (Skrylnik, Koshelyaeva, Meshkova, 2019) showed that the same insect species can be not harmful or very harmful depending on environmental conditions and population density.

The purpose of this research was to clarify the species composition of potential stem pests of *Populus* sp. in the eastern part of Ukraine, their frequency of occurrence, and trophic specialization.

Materials and methods. The research was carried out in 2019–2022 at the territory of East-Ukrainian District of the forest-steppe zone of Ukraine (Fig. 1).

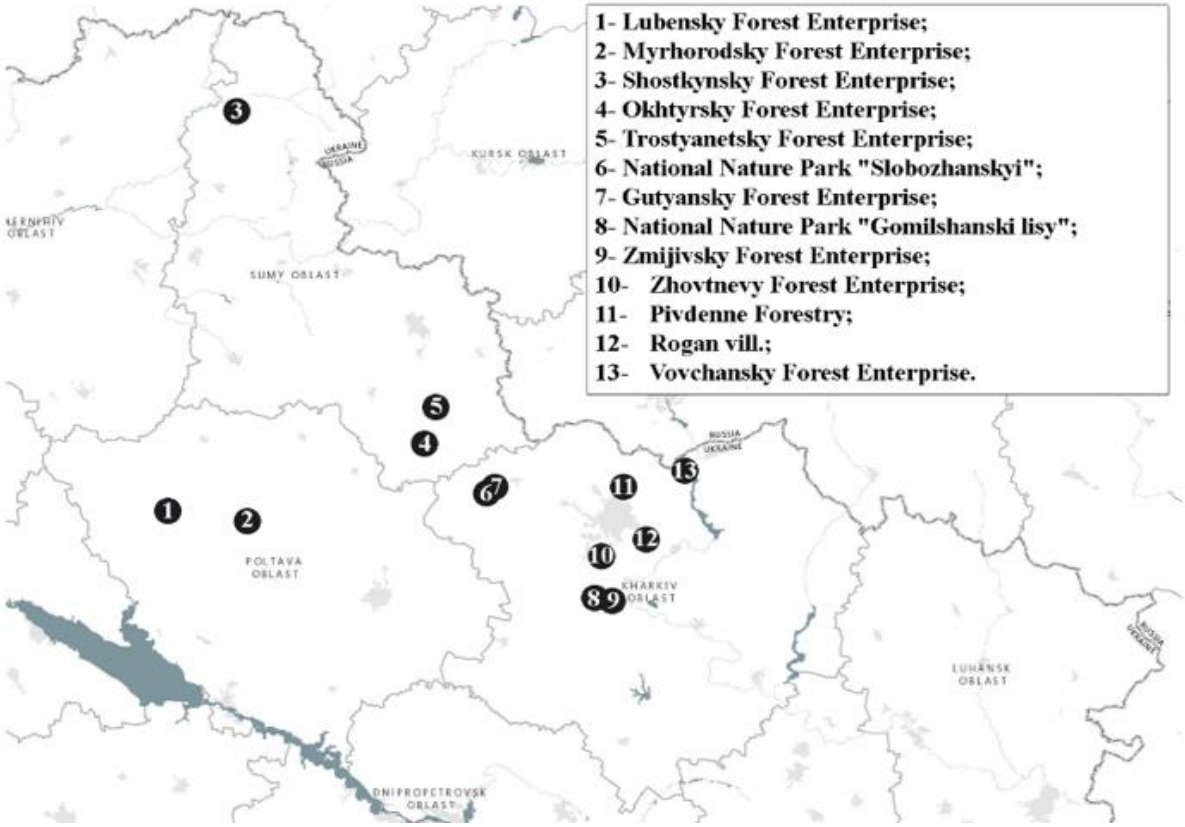

Fig. 1. Findings of xylophagous insects of the *Populus* genus.

Particularly it was in the forest fund of Myrhorodsky and Lubensky Forest Enterprises of Poltava Region, Trostyanetsky, Okhtyrsky, and Shostkynsky Forest Enterprises of Sumy Region, Zmijivsky, Gutyansky, Vovchansky, Zhovtnevy Forest Enterprises of Kharkiv Region, at the archive plantation of poplar clones created in 2014 in the Pivdenne Forestry of the Kharkiv Forest Research Station of Ukrainian Research Institute of Forestry and Forest Melioration named after G. M. Vysotsky, in the arboretum of the State Biotechnological University (Kharkiv Region) as well as in the field and road protective forest shelter belts of given regions. The collections of Yu. Ye. Skrylnyk since 2006 in the specified territory, particularly in Zmievsky District (since 2020 Chuguevsky) near the village Haidary, in National Nature Park 'Gomilshanski Lisy', in Krasnokutsky District (since 2020 Bogodukhivsky), near the village of Krasnokutsk, and Kharkovsky District, Dokuchaevo, 3 km W of the village Rogan was used.

Insects were collected by the following entomological methods: mowing, manual collection, using window traps, an inspection of plants, and collection of pre-imaginal stages under the bark and in the wood of trees. To recognize the trophic specialization for particular insect species, the segments of colonized trunks and branches were put in the laboratory (Meshkova *et al.*, 2009), and emerged adult insects were identified.

In the analysis, only those insect species were used, for which the development in the trunks and branches of *Populus* sp. was proved. The trophic specialization for individual insect species was determined both from our own observations and from publications (Yanytsky, 1996, 1998, 2003, 2006(2007); Martynov, Pisarenko, 2003(2004); Bartenev, Terekhova, 2006, 2011; Prokhorov, 2007(2008), 2010; Bartenev, 2009; Skrylnyk, Terekhova, 2011; Prokhorov, Vasilyeva, 2015; Terekhova, Salniitska, 2014; Terekhova, Skrylnyk, 2014; Nikulina *et al.*, 2015; Danilevsky, 2020).

According to trophic preferences, insect species that developed under the bark of *Populus* sp., were considered monophagous. The insect species that developed under the bark of Salicaceae (*Populus* sp. and *Salix* sp.), were considered oligophagous. Other insect species were considered polyphagous.

The frequency of occurrence of species was assessed on the following scale: single — up to 0.1% of the total, rare — 0.1–1%, common — 1–5%, abundant — more than 5% (Meshkova *et al.*, 2022).

Results and discussions. In total, 72 species of xylophagous insects were identified under the bark and in the wood of poplars and aspens. Representatives of the Coleoptera prevailed (66 species, or 92%), while 5 and 1 species (6% and 1%) of the Lepidoptera and Hymenoptera were found, respectively.

Among Coleoptera, longhorn beetles (Cerambycidae) and jewel beetles (Buprestidae) predominated — 40 and 19 species, respectively. The family Curculionidae was represented by seven species, among which one species is from the subfamily Cryptorhynchinae, and six species are from the subfamily Scolytinae. In two families of Lepidoptera — clearwing moths (Sesiidae) and cossid millers (Cossidae) — 2 and 3 species were represented, respectively, and from the Hymenoptera — one species from Siricidae (Table 1).

Table 1. Species composition, trophic preferences, and occurrence of xylophagous insects, which attack *Populus* sp. in the eastern regions of Ukraine

Family	Species	Host plants	Occurrence
Coleoptera			
Cerambycidae	*Aegosoma scabricornis* (Scopoli, 1763)	*Populus, Aesculus, Corylus, Juglans, Malus, Morus, Platanus, Quercus, Tilia*	single
	Prionus coriarius (Linnaeus, 1758)	*Populus, Salix, Quercus, Aesculus, Betula, Acer, Ulmus, Fraxinus, Alnus, Corylus, Malus*	single
	Rhamnusium bicolor bicolor (Schrank, 1781)	*Populus, Salix, Aesculus, Ulmus, Acer, Quercus, Juglans, Tilia*	rare
	Rhagium mordax (De Geer, 1775)	*Populus, Salix, Tilia, Betula, Fagus, Corylus*	single
	Dinoptera collaris (Linnaeus, 1758)	*Populus, Acer, Fraxinus, Malus, Quercus, Pyrus*	rare
	Rutpela maculata (Poda von Neuhaus, 1761)	*Populus, Salix, Corylus, Quercus, Alnus, Betula*	common
	Leptura aurulenta Fabricius, 1792	*Populus, Salix, Corylus, Quercus*	single
	Leptura quadrifasciata Linnaeus, 1758	*Populus, Betula, Alnus, Corylus*	rare
	Lepturalia nigripes (De Geer, 1775)	*Populus, Betula, Alnus*	single
	Strangalia attenuata (Linnaeus, 1758)	*Populus, Betula, Quercus, Tilia, Pinus, Alnus*	rare
	Stenurella melanura (Linnaeus, 1758)	*Populus, Salix, Betula, Acer, Quercus*	rare
	Necydalis major Linnaeus, 1758	*Populus, Salix, Alnus, Betula, Quercus*	single
	Trichoferus campestris (Faldermann, 1835)	*Populus, Quercus, Sorbus, Prunus*	rare
	Purpuricenus kaehleri (Linnaeus, 1758)	*Populus, Salix, Acer, Betula, Quercus*	single
	Cerambyx scopolii Fuesslins, 1775	*Populus, Salix, Quercus, Juglans, Prunus*	common
	Aromia moshata (Linnaeus, 1758)	*Salix, Populus*	single
	Obrium cantharinum (Linnaeus, 1767)	*Salix, Populus, Betula, Quercus, Robinia*	single

Continuation of Table 1

Family	Species	Host plants	Occurrence
Cerambycidae	*Ropalopus clavipes* (Fabricius, 1775)	*Populus, Salix, Acer, Juglans, Corylus, Quercus, Ulmus*	single
	Ropalopus macropus (Germar, 1824)	*Populus, Salix, Acer, Alnus, Juglans, Corylus, Malus, Prunus, Quercus, Ulmus*	rare
	Chlorophorus figuratus (Scopoli, 1763)	*Populus, Salix, Corylus, Malus, Prunus, Quercus, Sorbus, Ulmus, Viburnum*	common
	Chlorophorus varius (O. F. Müller, 1766)	*Populus, Salix, Alnus, Juglans, Quercus, Ulmus, Morus, Malus, Prunus*	rare
	Xylotrechus arvicola (Olivier, 1795)	*Populus, Ulmus, Juglans,Tilia, Morus, Sorbus, Prunus*	rare
	Rusticoclytus rusticus (Linnaeus, 1758)	*Populus, Salix, Acer, Betula, Quercus, Tilia*	abundant
	Mesosa curculionoides (Linnaeus, 1761)	*Populus, Salix, Acer, Alnus, Betula, Quercus, Prunus, Tilia, Ulmus*	common
	Mesosa nebulosa (Fabricius, 1781)	*Populus, Salix, Acer, Alnus, Betula, Malus, Quercus, Prunus, Tilia, Ulmus*	rare
	Lamia textor (Linnaeus, 1758)	*Salix, Populus*	single
	Anaesthetis testacea (Fabricius, 1781)	*Populus, Salix, Juglans, Corylus, Alnus, Betula, Malus, Quercus, Prunus, Tilia, Ulmus*	rare
	Pogonocherus hispidus (Linnaeus, 1758)	*Populus, Salix, Quercus, Alnus, Corylus, Ulmus, Morus, Juglans, Malus, Sorbus, Prunus, Tilia, Viburnum, Sambucus, Fraxinus*	rare
	Pogonocherus hispidulus (Piller et Mitterpacher, 1783)	*Populus, Salix, Alnus, Betula, Corylus, Malus, Quercus, Malus, Viburnum, Crataegus, Sambucus, Juglans*	rare
	Aegomorphus clavipes (Schrank, 1781)	*Populus, Tilia, Betula, Alnus, Fagus, Salix*	rare
	Leiopus punctulatus (Paykull, 1800)	*Populus, Salix, Alnus, Betula,*	single
	Tetrops praeusta (Linnaeus, 1758)	*Populus, Salix, Pyrus, Prunus, Malus, Rosa, Crataegus, Alnus, Ulmus*	common
	Saperda populnea (Linnaeus, 1758)	*Populus, Betula, Corylus*	single
	Saperda octopunctata (Scopoli, 1772)	*Populus, Tilia*	single
	Saperda perforata (Pallas, 1773)	*Populus, Salix, Betula,*	rare
	Saperda scalaris (Linnaeus, 1758)	*Populus, Salix, Alnus, Betula, Corylus, Malus, Quercus, Malus, Viburnum, Crataegus, Sambucus, Juglans*	common
	Saperda carcharias (Linnaeus, 1758)	*Populus, Salix*	rare
	Stenostola ferrea (Schrank, 1776	*Populus, Salix, Tilia*	single
	Menesia bipunctata (Zubkov, 1829)	*Populus, Salix*	single
	Oberea oculata (Linnaeus, 1758)	*Populus, Salix*	single
Buprestidae	*Acmaeoderella flavofasciata flavofasciata* (Piller et Mitterpacher, 1783)	*Populus, Salix, Acer, Prunus, Pyrus, Quercus, Ulmus*	rare
	Dicerca aenea aenea (Linnaeus, 1766)	*Populus, Salix, Alnus, Juglans, Robinia, Malus*	rare
	Dicerca alni (Fischer von Waldheim, 1824)	*Populus, Alnus, Betula, Corylus, Tilia, Juglans*	rare
	Poecilonota variolosa variolosa (Paykull, 1799)	*Populus, Salix, Ulmus*	rare
	Eurythyrea aurata (Pallas, 1776)	*Populus, Salix, Ulmus*	single
	Eurythyrea austriaca (Linnaeus, 1767)	*Populus, Quercus*	single
	Trachypteris picta picta (Pallas, 1773)	*Populus, Salix, Fraxinus*	rare
	Agrilus lineola lineola Kiesenwetter, 1857	*Populus Salix*	rare
	Agrilus viridis viridis (Linnaeus, 1758)	*Populus, Salix, Pyrus, Prunus, Malus, Rosa, Crataegus, Alnus, Ulmus*	abundant
	Agrilus convexicollis L. Redtenbacher, 1849	*Populus, Salix, Corylus*	single
	Agrilus cyanescens cyanescens (Ratzeburg, 1837)	*Populus, Salix, Pyrus, Prunus, Crataegus*	single
	Agrilus auricollis auricollis Kiesenwetter, 1857	*Populus, Salix, Pyrus, Prunus, Crataegus*	single
	Agrilus pratensis pratensis (Ratzeburg, 1837)	*Populus, Salix*	rare
	Agrilus pseudocyaneus Kiesenwetter, 1857	*Populus, Salix*	single
	Agrilus subauratus subauratus (Gebler, 1833)	*Populus, Salix, Pyrus, Prunus, Crataegus*	single
	Agrilus roscidus Kiesenwetter, 1857	*Populus, Salix, Pyrus, Prunus, Crataegus*	single
	Agrilus ater (Linnaeus, 1767)	*Populus, Salix*	single
	Agrilus guerini Lacordaire, 1835	*Populus Salix*	single
	Agrilus suvorovi Obenberger, 1935	*Populus*	rare
Curculionidae	*Cryptorhynchus lapathi* (Linnaeus, 1758)	*Populus*	single
	Anisandrus dispar (Fabricius, 1792)	*Populus, Salix, Alnus Betula*	abundant
	Anisandrus maiche Kurentzov, 1941	*Populus, Salix, Quercus, Alnus, Corylus, Ulmus*	rare
	Xyleborinus saxesenii (Ratzeburg, 1837)	*Populus, Salix, Quercus, Alnus, Corylus, Ulmus*	abundant
	Heteroborips cryptographus (Ratzeburg, 1837)	*Populus*	single
	Trypodendron signatum (Fabricius, 1787)	*Populus, Salix, Quercus, Alnus, Corylus, Ulmus*	common
	Trypophloeus granulatus (Ratzeburg, 1837)	*Populus, Salix*	single

Continuation of Table 1

Family	Species	Host plants	Occurrence
Lepidoptera			
Sesiidae	*Paranthrene tabaniformis* (Rottemburg, 1775)	*Populus*	rare
	Sesia apiformis (Clerck, 1759)	*Populus, Salix, Tilia, Betula, Fraxinus*	single
Cossidae	*Zeuzera pyrina* (Linnaeus, 1761)	*Populus, Salix, Acer, Aesculus, Fraxinus, Juglans, Malus, Prunus, Pyrus, Quercus, Robinia, Salix, Syringa, Tilia, Ulmus, Viburnum*	common
	Cossus cossus (Linnaeus, 1758)	*Populus, Salix, Acer Aesculus, Crataegus, Fraxinus, Juglans, Malus, Prunus, Pyrus, Quercus, Robinia, Salix, Syringa, Tilia, Ulmus, Viburnum*	common
	Acossus terebra (Denis et Schiff., 1775)	*Populus*	single
Hymenoptera			
Siricidae	*Tremex fuscicornis* (Fabricius, 1787)	*Populus, Salix, Alnus, Betula, Juglans, Quercus, Robinia, Ulmus*	single

By trophic specialization, polyphagous species predominate, and the number of oligophagous species is 3.8 times less (Table 1, Fig. 2).

Monophagous insects are represented by five species only, particularly *Agrilus suvorovi*, *Cryptorhynchus lapathi*, *Heteroborips cryptographus*, *Paranthrene tabaniformis* and *Acossus terebra*. Two of them (*A. suvorovi* and *P. tabaniformis*) are rare and three others are single (Table 1). Among xylophagous insects colonizing poplars and aspens, there are dangerous pests such as oligophagous *Saperda carcharias* and polyphagous *Sesia apiformis*, which can cause significant damage to energy crop plantations. However, *S. carcharias* was rare, and *S. apiformis* was single in our collections (Table 1).

By the frequency of occurrence, single and rare species predominate (Table 1, Fig. 3). Abundant species are *Xylotrechus rusticus*, *Agrilus viridis* and two bark beetle species: *Anisandrus dispar* and *Xyleborinus saxesenii*. All abundant species are polyphagous.

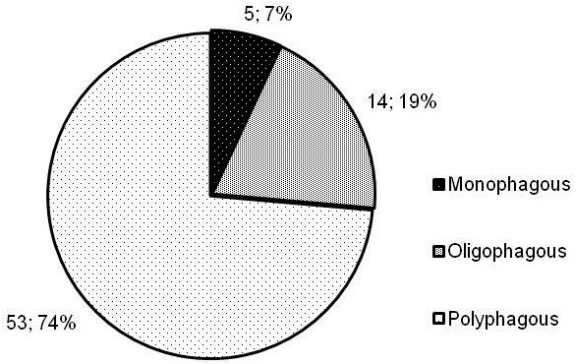

Fig. 2. Distribution of xylophagous insects feeding on *Populus* by trophic specialization (number of species; %).

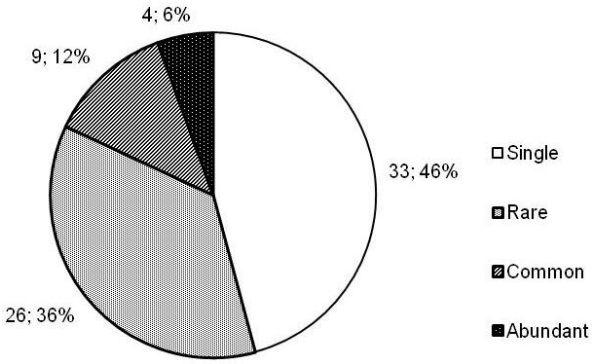

Fig. 3. Distribution of xylophagous insects feeding on *Populus* by the frequency of occurrence (number of species; %).

We assume that the distribution of insects to rare, single, common, and abundant species may depend on host plant composition, age of plantations, and weather conditions of the year. In further studies, we plan to refine the distribution of these insects by frequency of occurrence on host plant composition, forest age, and weather conditions.

Conclusions. 72 species of xylophagous insects were identified under the bark and in the wood of poplars and aspens, including Coleoptera (66 species), Lepidoptera (5 species), and Hymenoptera (1 species). There were 40 Cerambycidae, 19 Buprestidae, 7 Curculionidae 2 Sesiidae, 3 Cossidae, 1 Siricidae species.

Among them, 5 monophagous, 14 oligophagous, and 53 polyphagous species were identified. Monophagous species were: *Agrilus suvorovi*, *Cryptorhynchus lapathi*, *Heteroborips cryptographus*, *Paranthrene tabaniformis*, and *Acossus terebra*.

By the frequency of occurrence, single and rare species predominate (33 and 26 species, respectively). There were 9 common species and 4 abundant species. All abundant species are polyphagous. They are *Xylotrechus rusticus*, *Agrilus viridis*, *Anisandrus dispar*, and *Xyleborinus saxesenii*.

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