

Notes on the biology of palaeartic flies of the genera *Chalcosyrphus* Curran and *Xylota* Meigen (Diptera, Syrphidae), with the description of immature stages of *Xylota atricoloris* Mutin, 1987

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The larva and puparium of *Xylota atricoloris* Mutin are described. The species breeds under the bark of ash. Pupation happens in surface soil saturated with sap or under the bark of roots. The key to larvae of 7 species of genera *Xylota* Meigen and *Chalcosyrphus* Curran is worked out. The data on the biology of 14 species of abovementioned genera are given.

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Introduction

The representatives of the genera *Chalcosyrphus* Curran and *Xylota* Meigen (Hippa, 1978) involve about 50 palaeartic species. Literature data (Mutin, 1987, 1990; Peck, 1988) show that the fauna of East Palaeartic is the richest but insufficiently studied.

The species of the both genera breed in decaying wood in dust saturated with sap, under the bark and inside tree holes. One of the earliest works including data on immature stages of *Ch. nemorum* (Fabr.) and *Ch. piger* (Fabr.) was presented by Heiss (1938). Short key for the larvae of 4 species — *Ch. piger* (Fabr.), *Ch. nemorum* (Fabr.), *X. florum* (Fabr.) and *X. segnis* (L.) was worked out by Dusek and Laska (1961).

Hartley (1961) detailly described the larva and pupa of *X. segnis* (L.); Dixon (1960) was the first to describe *X. sylvarum* (L.); this description was later added by the former author. The larva of *Ch. nemorum* (Fabr.) and *X. xanthocnema* Collin were described by Hartley (1961), and the larva of *X. tarda* Meig. — by Rotheray (1991). The key to the larvae and pupae of 6 species — *Ch. nitidus* (Portschinsky), *Ch. piger* (Fabr.), *Ch. rufipes* (Loew), *Ch. nemorum* (Fabr.), *X. florum* (Fabr.) and *X. sylvarum* (L.) was presented by Krivosheina, Mamaev (1967).

Additional data on the biology of 14 species of *Chalcosyrphus* Curran and *Xylota* Meig. are given below. The larva and pupa of *X. atricoloris* Mutin are described. The key to immature stages of abovementioned genera is worked out.

Materials and methods

This study is based on the materials on immature stages of Syrphidae collected in 1959—1982 on the territory of the former Soviet Union and kept in the Institute of Ecology and Evolution and materials of reared imago partly kept in the same Institute and in Zoological Museum of Moscow University.

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Morphology of larva and pupa

Xylota atricoloris Mutin, 1987

Material. 3 larvae, **Russia**, Suputinskiy Reserve, N 73, 25.IV.1969, under the bark of ash; 17 larvae, 20 pupae, Suputinskiy Reserve, N 89, 25.IV.1969, in ash.

Larva. Body length 13.0—16.0 mm, width 2.5—3.0 mm, length of breathing tube 1.0 mm. Body yellow-white, cylindrical, tapering anteriorly and posteriorly in such a way that the maximal width fits abdominal segments III—V (Fig. 1). Anterior part is covered with dark curved small hooks, their size decreasing posteriorly (Figs 1, 5, 9). Anterior thoracal spiracles cylindrical, with 3 apical spiracular openings (Fig. 10). Integument between anterior spiracles is covered with simple light semi-transparent papillae. Large sclerotized hooks laterally from anterior spiracles, which are typical for the majority of the representatives of the genus, absent. Thoracal prolegs with 2 rows of large and 2—3 irregular rows of small hooks, the distance between them not exceeding 1.5 diameter of the leg (Fig. 5). Dorsal papillae well developed, larger on abdominal segments and branched apically. Lateral papillae are of the same size (Figs 12—15). Prolegs of abdominal segments developed, with 4 rows of hooks, the distance between them is about their diameter (Figs 3, 4). The three posterior abdominal segments narrow, pubescent, the length of the last

bogy segment is only slightly exceeding its width (Fig. 2). Each of the three segments carrying two large lateral relatively large conical papillae covered with dark spine-like setae. There is a group of long black setae in the base of terminal papillae. Breathing tube relatively short, 3.5 times as long as wide (Fig. 2). Cephalopharyngeal skeleton shows that the larvae are of saphrophagous type. Clypeal sclerites rounded, tentorial sclerites broad, cybarium massive (Fig. 8). Posterior spiracles are situated at the top of the breathing tube; each has 3 mounding slits, perispiracular glands well developed (Fig. 11).

Puparium. Body length 8.0 mm, width 3.0 mm, breathing tube 1.0 mm. Brownish. Convex dorsally and flattened ventrally, anteriorly with 2 spiracles, posteriorly narrowed, with uniform integument without significantly developed papillae, only with raising small prolegs and 3 pairs of terminal papillae (Fig 7). Prolegs like small tubercles covered with hooks. Anterior thoracal spiracles cylindrical long not narrowed apically with longitudinal rows each consisting of 7 spiracular openings (Fig 6). Posterior spiracles like in the larva.

Diagnosis. Larva of *X. atricoloris* Mutin has no large sclerotized hooks laterally from anterior spiracles. This character brings it together with the larva of *X. florum* Fabr. However the presence of developed dorsal papillae, pubescence of terminal body segments, group of dark setae in the base of terminal pair of papillae serve good diagnostic characters for the differentiation of the larvae of these two species. The puparium of *X. atricoloris* has cylindrical not narrowed apically anterior spiracles with 7 spiracular openings in each longitudinal row.

Key to larvae of genera *Xylota* Meigen and *Chalcosyrphus* Curran

1. Large sclerotized hooks laterally from anterior spiracles not developed or separated 2
 - Large sclerotized hooks laterally from anterior spiracles developed and united 4
2. Two large sclerotized hooks laterally from anterior spiracles separated. Small sclerotized hooks dorsally from the mouth opening split apically *X. sylvarum* L.
 - Large sclerotized hooks laterally from anterior spiracles absent. Small sclerotized hooks

- dorsally from the mouth opening simple 3
3. Small sclerotized hooks dorsally from the mouth opening blunt, dorsal papillae reduced, dorsal integument of terminal segments not pubescent, only with rare isolated spines, all sclerotized structure uniform *X. florum* Fabr.
- Small sclerotized hooks dorsally from the mouth opening pointed, dorsal papillae well developed, terminal body segments pubescent, groups of dark setae present in the base of terminal papillae *X. atricoloris* Mutin
4. Two large sclerotized hooks united on one plate present laterally from each anterior spiracle, besides there is one smaller hook situated ventrally from the former group *Ch. nitidus* Portsch.
- Only two large sclerotized hooks united on one plate present laterally from anterior spiracles 5
5. Cuticular structures of the body — papillae and spines — brown or black, as a result the body of the larva seems to be brownish. The field of small sclerotized spines posteriorly from mouth opening turns into the field of dense erected thin hairs which turn into small spines. Anterior spiracles with 9 spiracular openings *Ch. piger* Fabr.
- Curicular structures of the body light, body yellow-white. The field of erected hairs absent. Anterior spiracles with 5—6 openings 6
6. Large sclerotized hooks laterally from anterior spiracles not fused in base though situated on one plate. One of the hooks 2 times larger than the other. Anterior spiracles with 6 openings *Ch. rufipes* Loew
- Large sclerotized hooks laterally from anterior spiracles fused in base. One of the hooks only a little smaller than the other. Anterior spiracles with 5 openings *Ch. nemorum* Fabr.

Biology

Genus *Chalcosyrphus* Curran, 1925

Chalcosyrphus carbonus (Violovitsh, 1975)

Material. 1 ♀, **Russia**, Kundur, *Amurskaya Province*, larva in the wood of lime-tree, N 14, 21.IV.1975.

The species is distributed on the south of Amurskaya Province, Khabarovsk and Primorskiy Kray.

Chalcosyrphus femoratus (Linnaeus, 1758)

(=*curvipes* Loew, 1854)

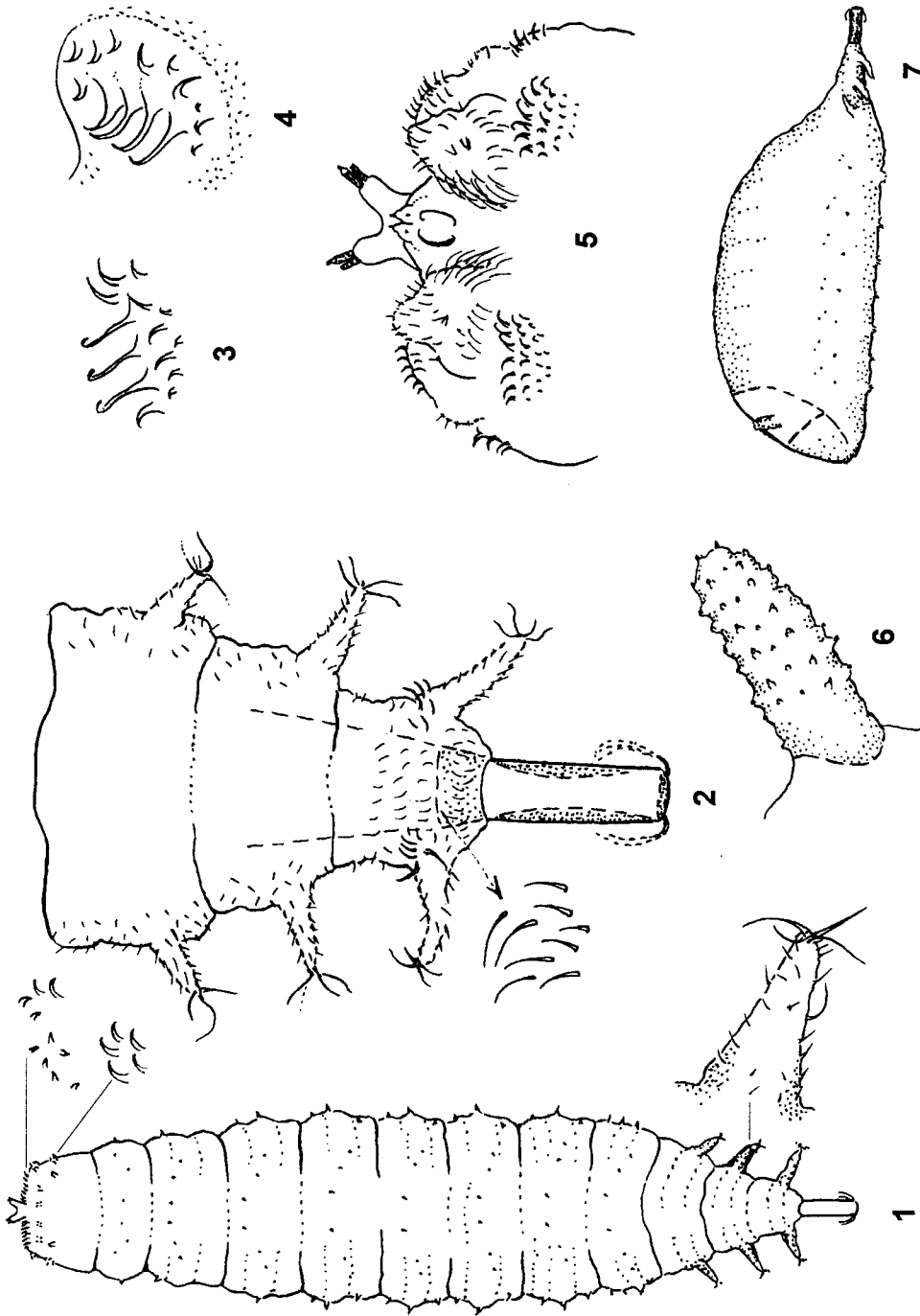
Material. 1 ♀, **Russia**, Khizhkihtskiy Reserve, Khabarovsk Kray. Puparium in wood dust of birch, 11.V.1976, emergence of imago 25.VI.1976; 1 ♀, Mendeleevo, Kunashir, larvae in wood of birch, N 86, 23.IV.1977.

The species is considered following Mutin and Barkalov (1999). It is distributed from Northern Europe to Sakhalin, southern Kuril Islands, Japan, Korea and China. The data on the biology were previously unknown.

Chalcosyrphus nemorum (Fabricius, 1805)

Material. 1 ♂, **Russia**, *Vologodskaya Province*, Nikolskoe, larvae under the bark of spruce, N 198, 18.VI.1983; 2 ♀, Malinki, *Moskovskaya Province*, larvae under the bark of birch, 8.VII.1965; 1 ♂, 1 ♀, Ubinskaya, Krasnodar Krai, larvae in wood of beech, N 147, 9.VII.1970; 1 ♀, Ishtikhem near Shagonar, Tuva, larvae in wood of birch, N 288, 8.VII.1974, emergence of imago 2.II.1975; 2 ♀, Ussurijskiy Reserve, Primorskiy Kray, larvae in wood of Ulmus, N 95, 30.IV.1969; 1 ♂, Mendeleevo, Kunashir, larvae under the bark of birch, N 11, 11.IX.1972; 1 ♀, the same place, larvae under the bark of fir, N 37, 19.IV.1977; Tellerman, *Voronezhskaya Province*, larvae in wood of Ulmus branch, 29.IX.1960; 1 ♀, *Moskovskaya Province*, Shekino, Tulskie Zaseki, under the bark of birch, 8.VII.1965; 1 ♀, in birch branch, 20.VI.1958.

The species has Holarctic distribution, it is registered from West Europe to Sakhalin, southern Kuril Islands and Japan. Larvae breed inside moist bark of fallen trunks (Hartley, 1961) in strongly decayed wood of deciduous trees, often inside galleries of other insects (Krivosheina, Mamaev, 1967). The larvae collected in Vologodskaya Province were found in fallen trunks of spruce, the trunks being partly submerged in water. The larvae were discovered along cracks of bark in dark brown bast on the border of water together with larvae of Anisopodidae and Ceratopogonidae (*Forcipomyia*). The



Figs 1—7. Morphology of larva (1—5) and pupa (6—7) of *Xylota atricoloris* Mutin.
1, mature larva, dorsal view; 2, terminal segments of larva, dorsal view; 3, proleg of abdominal segment I; 4, proleg of abdominal segment VI; 5, anterior part of larva, ventral view; 6, anterior pupal spiracle; 7, puparium, lateral view.

larvae from Tuva bred in light wood of fallen birch, where they concentrated in the surface wood near soil. On the territory of Ussurijskiy Reserve the larvae were discovered in wood of *Ulmus* together with the larvae of *Ch. nitidus* Portschiński.

Chalcosyrphus nitidus (Portschiński, 1879)

Material. 4 ♂, **Russia**, Ussurijskiy Reserve, Primorskiy Krai, larva and pupae in wood of alder, N 224, 9.X.1964, emergence of imago 2.I.1965; in brown wood (strongly rotten), N 31, 13.IV.1967, emergence of imago 2.V.1967; in wood of lime-tree, N 89, 21.IV.1967, emergence of imago 5.V.1967; in wood of *Ulmus*, N 85, 24.IV.1969 and N 95, 30.IV.1969; 1 ♂, Kundur, Amur Region, larvae in brown wood of deciduous trees, N 244, 21.IV.1975.

Larvae breed in light and brown wood in rotten fallen trunks of deciduous trees without bark, often covered with moss; always in old galleries of other insects, for example, *Temnostoma* Lep. et Serv. Larvae of *Boletina ingrata* Stack. (Mycetophilidae) were found together with *Ch. nitidus*, they occupied cavities in surface wood.

Chalcosyrphus piger (Fabricius, 1794)

Material. 3 ♂, 2 ♀, **Russia**, Artybash, bank of Teletskoye Lake, Altay, larvae and pupae under bark of Siberian cedar, N 23, 1.V.1982, N 47, 18.V.1982, emergence of imago 25—26.V.1982; 2 ♂, Ishtikhem near Shagonar, Tuva, larvae under the bark of larch, 10—19.VI.1979.

The species has Holarctic distribution, it is registered in Northern Europe and North America, typical for southern regions of Far East and Siberia. Larvae breed under the bark of coniferous trees, such biology determines distribution of the species in northern territories of Europe.

Chalcosyrphus rufipes (Loew, 1873)

Material. 1 ♂, 1 ♀, **Russia**, Kedrovaya Pad Reserve, Primorskiy Krai, larvae in wood of lime-tree. N 55, 27.VIII.1964, emergence of imago 8.II.1965; 2 ♂, 1 ♀, Ussurijskiy Reserve, Primorskiy Krai, larvae in wood of lime-tree, N 89, 21.IV.1967,

emergence of imagoes 5.V.1967; N 89, 30.IX.1968, larvae in moist dust in tree hole; N 81, 24.IV.1969, larvae in wood of poplar, emergence of imago 10.V.1969.

The species is distributed from Europe to Kamchatka and Mongolia. The larva was described by Krivosheina, Mamaev (1967). Larvae inhabit rotten old trunks with easily separating bark and dark bast. Larvae breed inside wood in galleries of other insects or in dust inside moist bark together with larvae of Anisopodidae, Syrphidae, for example *Brachyopa vittata* Ztt., Pleciidae — *Plecia thulinigra* Hardy and Hesperinidae — *Hesperinus rohdendorfi* Kriv. et Mam.

Genus *Xylota* Meigen, 1822

Xylota atricoloris Mutin, 1987

The species was described from Khabarovsk Krai and registered in Primorskiy Krai. Larvae bred in stump of ash (trunk had been cut 2 years before) under the bark saturated with sap. Mature larvae concentrated in surface soil saturated with sap and along roots under the bark, bordering with bast where larvae of *Acanthonerva* Macq. (Trypetidae) lived and diluted the substrate.

Xylota amamiensis Shiraki, 1968

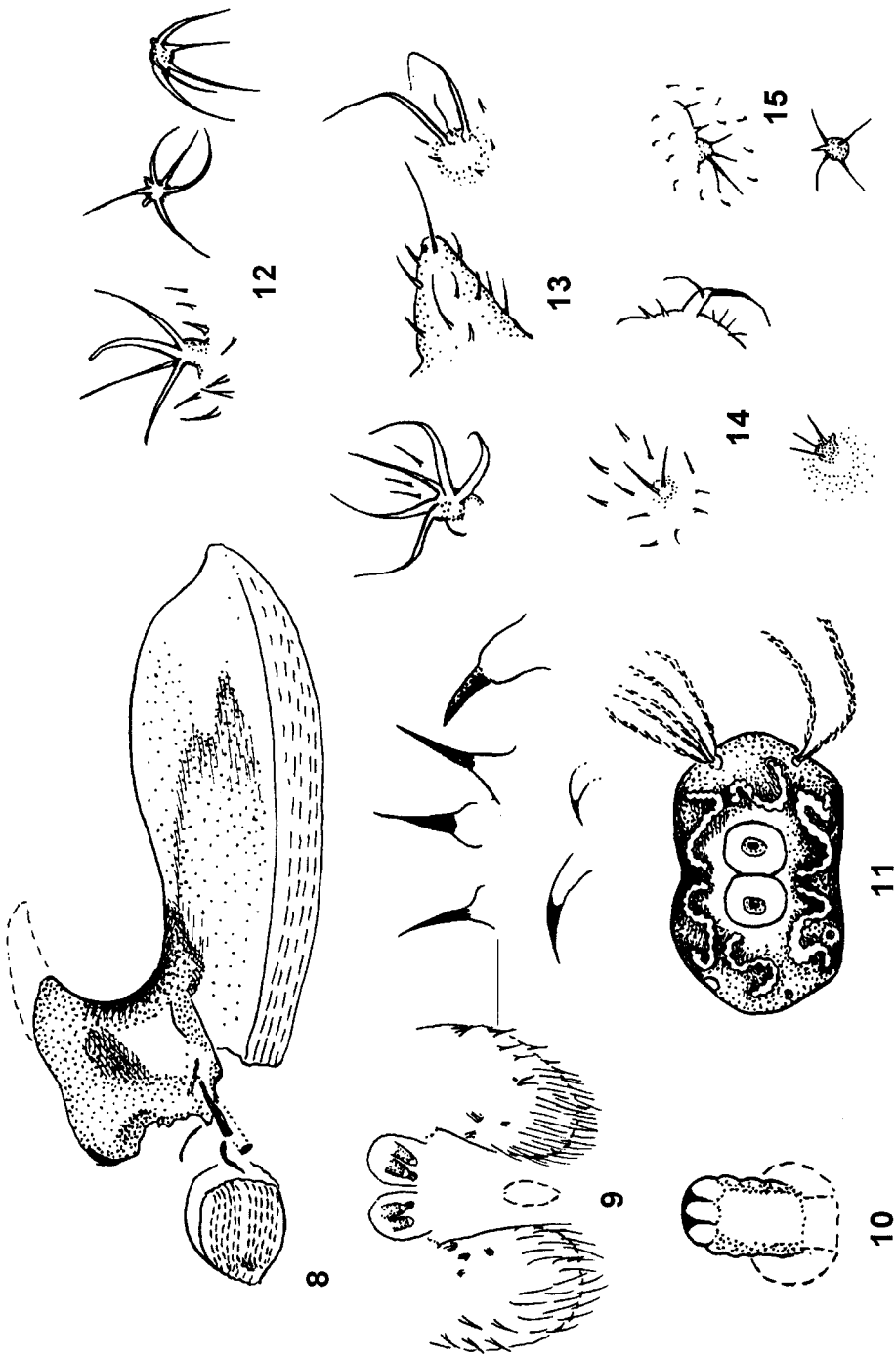
Material. 1 ♀, **Russia**, Ussurijskiy Reserve, Primorskiy Krai, larvae under the bark of ash stamp, 25.IV.1969, together with larvae of *X. atricoloris* Mutin.

The species was registered in Japan and Korea, in Russia known from Khabarovsk Krai, Primorskiy Krai, Sakhalin and southern Kuril Islands.

Xylota florum (Fabricius, 1805)

Material. 1 ♀, **Ukraine**, near Rakhov, Carpaty. Pupae under the bark of spruce, N 97, 21.IV.1966, emergence of imago 28.VI.1966; 1 ♀, **Russia**, Arkhangelskaya Province, Oboserskaja, pupae in pine stem, 5.VII.1959, emergence of imago 15.VII.1959.

Larvae breed in moist wood of fallen trees and in dust under the bark near soil together with the larvae of Anisopodidae.



Figs 8—15. Morphology of larva of *Xylota atricoloris* Mutin.

8, cephalopharyngeal skeleton, lateral view; 9, cuticular structures around mouth opening; 10, prothoracic spiracle; 11, posterior spiracle; 12, dorsal papillae of abdominal segment VII; 13, lateral papillae of abdominal segment VII; 14, lateral papillae of abdominal segment V; 15, dorsal papillae of abdominal segment V.

***Xylota meigeniana* Stackelberg, 1964**

Material. 1 ♀, **Russia**, Vologodskaya Province, Cadnikovskiy, larvae under the bark of asp, N 232, 14.VII.1962, emergence of imago 4.VIII.1962; 1 ♂, the same place, 16.VII.1962.

The species is distributed from Europe to Sakhalin and Southern Primorje. Larvae were registered in fallen trunks in moist bark near soil, where they bred together with larvae of *Brachyopa* Meigen, *Hammerschmidtia* Schummel (Syrphidae) and larvae of Anisopodidae.

***Xylota segnis* (Linnaeus, 1758)**

Material. 1 ♂, **Azerbaijan**, Avrorra, near Lenkoran, pupae under the bark of oak, 26.IV.1980, emergence of imago 8.V.1980.

The species is distributed on the south of Europe, in North Africa and adjacent islands. In Russia it was registered in Caucasus, Southern Siberia and Sakha. Pupa of the species was found in saturated with sap dust under the bark of oak. The piece of trunk where it was found was settled by *Cariolus* fungi and by Colydiidae and Histeridae beetles; under the bark — by larvae of capricorn beetles. According to Hartley (1961) and other authors (Blackith and Blackith, 1989) larvae can breed in fermenting sap under the bark or in fermenting sap on trunks as well as in semiliquid substata — moist silage or decaying potatoes.

***Xylota sylvarum* (Linnaeus, 1758)**

Material. 2 ♂, **Ukraine**, Lemskoe, near Rakhov, Carpaty, larvae in red-brown wood 26.VI.1966; 1 ♂. **Russia**, Kostromskaya Province, Ugory, pupae in hole of pine, 6.V.1981; 1 ♂, Novoprohladnoje, Krasnodar Kray, larvae in macerated wood of oak stump, emergence of imago 23.V.1959.

According to Hartley (1961) and Krivosheina, Mamaev (1967) larvae were known to breed in sap concentrations in dust under the bark and in tree holes, often together with larvae of *Myatropa florea* L.

***Xylota xanthocnema* Collin, 1939**

Material. 1 ♂, 2 ♀, **Russia**, Krasnaya Polana, Krasnodarsk Kray, larvae in water in the hole of fir tree, N 123, 8.VIII.1966.

The species is distributed in Central Europe, European part of Russia and on Caucasus. Larvae of the species were discovered in sap concentrations and in tree holes of common yew (Hartley, 1961).

***Xylota tarda* Meigen, 1822**

Material. 1 ♀, **Russia**, Ubinskaya, Krasnodar Kray, larva in wood of beech., N 147, 9.VII.1970.

The species is distributed from Europe to Kamchatka and Primorskiy Kray. Rotheray (1991) reported about breeding of larvae in sap under the bark of asp.

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