

Reappraisal of *Xylota caeruleiventris* Zetterstedt, 1838, with remarks on the distribution of this species and *X. jakutorum* Bagatshanova, 1980 in Europe

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Re-examination of the type material of *Xylota caeruleiventris* of Zetterstedt confirms that this is not the same species as that referred to as "*X. coeruleiventris*" in most recent European literature. The interpretation of this latter taxon as *X. jakutorum* Bagatshanova, proposed by Mutin and Gilbert (1999), is accepted, but the lack of features distinguishing females of *X. jakutorum*, without pale marks on the tergites, from the only certain, known female of *X. caeruleiventris*, namely the paralectotype collected in cop with the lectotype male, makes determinations of unmarked females unreliable. The only records of *X. caeruleiventris* we can confirm are from Norway, Sweden, Finland, northern European Russia and Siberia. It is apparent that *X. jakutorum* may also occur in those same regions, but is the only one of these two species for which reliable records exist elsewhere in Europe. There is need for re-appraisal of material standing under the name "*X. coeruleiventris*" in European collections, particularly material from the Alps. A key to aid in the separation of these two taxa is provided, but it is noted that females can remain unidentifiable.

Zusammenfassung

Untersuchungen des Typenmaterial von *Xylota caeruleiventris* Zetterstedt, 1838 bestätigen, dass es sich dabei nicht um die in der europäischen Literatur als "*X. coeruleiventris*" bezeichnete Art handelt. Dieses Taxon wird, wie von Mutin & Gilbert (1999) vorgeschlagen, als *X. jakutorum* Bagatshanova, 1980 bezeichnet. Allerdings ist die Unterscheidung der Weibchen von *X. jakutorum* ohne helle Zeichnung auf dem Abdomen vom einzigen bekannten Weibchen von *X. caeruleiventris* (Paralectotypus, gefangen in Kopula mit dem Lectotypus) unverlässlich. Die einzigen sicheren Nachweise von *X. caeruleiventris* stammen aus Norwegen, Schweden, Finnland, dem nördlichen europäischen Russland und Sibirien. Dagegen gibt es von der dort ebenfalls vorkommenden *X. jakutorum* auch sichere Nachweise aus dem übrigen Europa. Es ist deshalb nötig, die unter dem Namen "*X. coeruleiventris*" in europäischen Sammlungen stehenden Tiere nachzubestimmen; insbesondere gilt das für Material aus den Alpen. Ein Bestimmungsschlüssel wird hier vorgelegt; Weibchen sind allerdings nicht immer sicher bestimmbar.

Introduction

In 1832 J. W. Zetterstedt undertook his second expedition to northern Sweden, from Umeå up along river Umeälven, and back partly along the river Ångermanälven. On July 27, when leaving Åsele, he collected the copulating pair of *Xylota* (Zetterstedt, 1833) which he later (Zetterstedt, 1838) described as *Xylota caeruleiventris*. He subsequently (Zetterstedt, 1843) described also a male "variant b" of *X. caeruleiventris*, stating that the original "var. a" had been found at many places in Sweden as well as in Norway, but was most often, however, quite rare. Var. b had only been found in Naess / Norway, where it was very rare. In Zetterstedt (1843) the spelling of the name "*caeruleiventris*" had somehow changed into "*coeruleiventris*". In Andersson (1988) the original spelling was re-introduced.

In Mutin and Gilbert (1999), *X. coeruleiventris* var. b of Zetterstedt (1843) is declared to be a junior synonym of *X. jakutorum* Bagatshanova 1980, the latter species being regarded by these authors as the *X. coeruleiventris* of most recent European literature. However, this designation was seemingly carried out without the type material of *X. caeruleiventris* being examined. Similarly, these same authors (l.c.) figure the male terminalia of the taxon they interpret as *X. caeruleiventris*, without reference to examination of the type material. They do not figure the male terminalia of *X. jakutorum*. Their paper has consequently resulted in some confusion as to both the identity and distribution of *X. caeruleiventris* and *X. jakutorum*. Our objective here is to define, so far as we can, the differences between *X. caeruleiventris* and *X. jakutorum* sensu Mutin and Gilbert (1999), and to review European distribution data for these two taxa, based on material we have ourselves examined.

Material and methods

We have examined material identified as *X. caeruleiventris* / *X. coeruleiventris* or *X. jakutorum* from Austria, the Czech Republic, Finland, France, Great Britain, Ireland, Italy, Liechtenstein, Norway, Russia (including Siberia), Sweden, Switzerland and parts of the former Yugoslavia. We have also examined the type material of *X. caeruleiventris* of Zetterstedt and the material he later referred to as "var b" of that species. Dr Mutin has kindly informed us that his concept of *X. jakutorum* is based on examination of the type of that species, so we have based our concept of *X. jakutorum* upon males determined by Mutin as belonging to *X. jakutorum*.

Xylota caeruleiventris Zetterstedt, 1838

Type material: Åsele lappmark, one pair in copula, 27. 7. 1832, leg. Zetterstedt, in the collections of the Zoological Museum, Lund and mounted on the same pin. The pin carries the following labels: red, "Lectotypus *Xylota* ♂ *caeruleiventris* Zetterstedt

1838 design.1987 Andersson"; "Paralectotype ♂ *caeruleiventris* Zetterstedt 1838 design.1987 Andersson" and a white label "*X. caeruleiventris* ♂♀ Åsele".

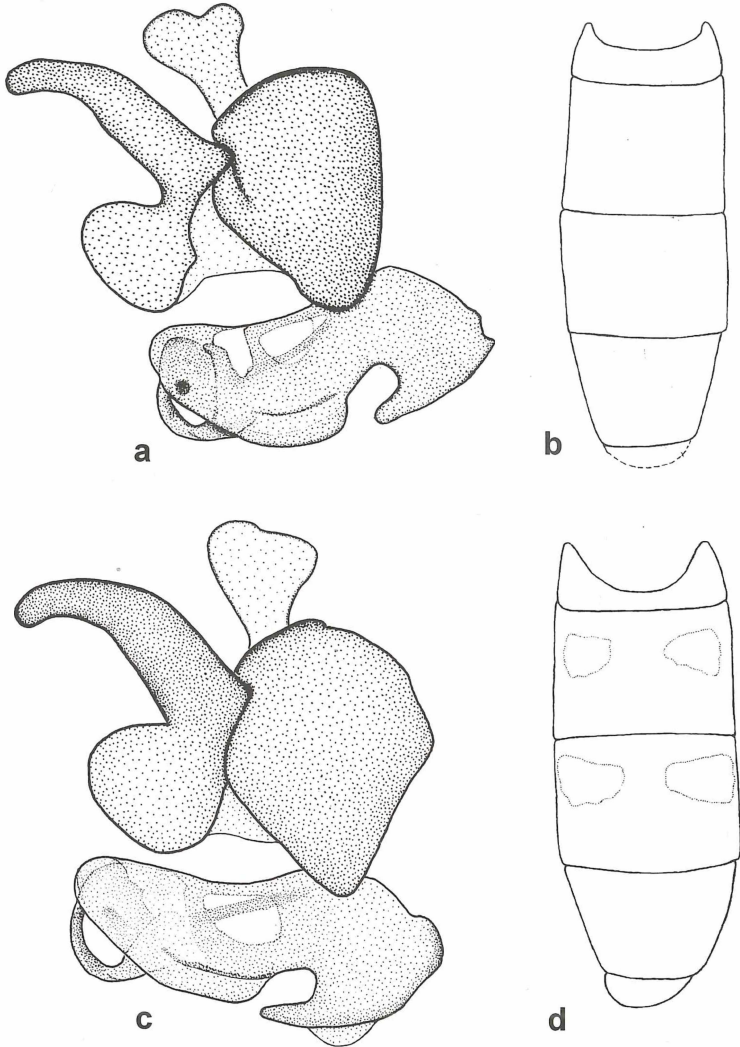


Fig. 1: *Xylota* spec. – a,c male terminalia; b,d male abdomen, dorsal view. – a,b. *Xylota caeruleiventris* (lectotype); c,d. *Xylota jakutorum*.

The male lectotype of *X. caeruleiventris* resembles males of *X. jakutorum*, except in the following features: the abdomen is shining black, with only a pair of faint bluish markings (reflections) on tergites 2-4; the basitarsus of the fore leg has a long, white, bristly hair, dorso-apically, close to the antero-lateral margin of the basitarsus; the abdomen seems to be more slender than in *X. jakutorum*, the ratio width (measured close to base) : length of tergite 1 in *X. caeruleiventris* (n=3) being 1.0. The male abdomen is shown in fig 1b. In male *X. jakutorum* (n=12) this ratio is 1.2 (1.19). The male abdomen of *X. jakutorum* is shown in fig.1d. The surstyli of *X. caeruleiventris* are rather slender, as shown in fig.1a, not broadening so much towards the base as in *jakutorum*, shown in fig. 1c.

Xylota jakutorum Bagatshanova, 1980

The only material that is certainly "*Xylota caeruleiventris* Zetterstedt variant b", in the Zetterstedt collection in the Zoological Museum, Lund, is a male, with a small, square, green label (indicating that it was collected during Zetterstedt's journey to Jämtland and Norway, in 1840) and a white label "Var. b. Zett. abd.punct 4 rufus. Næs". This male has pale markings on the tergites and examination of the terminalia confirms that it is a specimen of *X. jakutorum*. Standing under the same name there is also a female with a small, square green label, a white label "Næs" and a white label "*X. caeruleiventris* Ztt. det. H. Andersson -87". This is presumably a specimen collected by Zetterstedt with the male of "variant b". It has faint, pale marks on the tergites. Accompanying this female there are two others, also with faint markings on the tergites. One of them carries a small, square yellow label and two white labels. The white labels bear the information "*X. caeruleiventris* ♀. Ostrog" and "*X. caeruleiventris* Ztt. det. H. Andersson -87". The last of these females carries a small, brown label and two white labels, one of which states "Öland" and the other "*X. caeruleiventris* Ztt. det. H. Andersson -87".

Specimens examined, determined as *X.jakutorum* by Mutin: **Russia:** Gobskitza, nr Luga, male, 19.8.1954, leg.Stackelberg, det Mutin 1996, in coll BNMH, London; Leningrad Prov.: Tolmatshevo, female, 10.7.1954, leg.Stackelberg, det Mutin 1996, in coll. BMNH, London; Chabarovsk area, 2 males, 1 female, leg. and det. Mutin, in coll. T.R.Nielsen. **Scotland:** L.Leven, male, 14.7.1912, det Mutin 1996, in coll RSM; "Scotland", male and female, 1904, det Mutin 1996, in coll.RSM; Nethy Bridge, female, 11.8.1898, leg.Yerbury, det Mutin 1996, in coll. RSM; L.Leven, male, 28.7.1909, leg. J.W.Bowhill, det Mutin 1996, in coll.RSM; AE Forest D.F.S., male, 1.9.1984, leg A.B.Duncan, det Mutin 1996, in coll.RSM; Golspie, male, 1.8.1900, leg.Yerbury, det Mutin 1996, in coll RSM.

These males all have reddish brown spots on tergite 2-4 and differ from *X. caeruleiventris* in having a somewhat broader abdomen and in features of the terminalia (see above). The females include some with pale markings on the tergites and others without. We are unable to find characters which separate the unmarked females from the female paralectotype of *X. caeruleiventris* and Dr Mutin (pers.comm.) informs us that he can suggest no feature that certainly distinguishes unmarked females of these two species. In both sexes *X. jakutorum* closely resembles *florum*, but the abdomen is a little

shorter and stouter. Tergites 2-3 are slightly broader than long, with reddish brown maculae. Male: hind femur with anterodorsal longer hairs on about basal third only (on the basal half or more in *X. florum*), ventrally with short, black spines for almost its entire length (on the apical half in *florum*). Female: frontal dust spots meeting anteriorly, posteriorly only narrowly separated (the dust spots are widely separated in *florum*). The hind femur has long, white, anterodorsal hairs on the basal third only (on the basal half or more in *florum*).

Distinctions between *X. caeruleiventris* and *X. jakutorum*

Males of these two species are relatively easy to separate. In *X. caeruleiventris* the abdominal tergites are entirely without pale markings and where these would occur in other *Xylota* species there are brightly shining, undusted patches. In *X. jakutorum*, tergites 2 and 3 always carry a pair of pale marks. There are also small differences in the terminalia (see key and Figs 1a, 1c) which may be used to confirm the identity of doubtful specimens. Males of *X. jakutorum* vary somewhat in size and in other characters that might otherwise be used to characterise them. For instance, the hair covering of the hypopygium can vary from all-black to predominantly white. The hair covering of the mesoscutum is generally pale, except above the wing-bases, but we have seen one male of *X. jakutorum* with two extensive areas of black hairs on the mesoscutal dorsum (one each side of the mid-line, postero-dorsally).

Separation of the females of *X. caeruleiventris* and *X. jakutorum* is entirely another matter. Females collected in parts of Europe from which no males of *X. caeruleiventris* have been found, but from which large numbers of males of *X. jakutorum* have been collected, vary in the extent to which they exhibit pale markings on the tergites, from a condition in which tergites 2 and 3 each have a pair of large, obvious, pale marks, to a condition in which no trace whatever of pale marks can be discerned. There is no basis for assuming that these unmarked females belong to any species other than *X. jakutorum*. Certainly, there are no discernable differences between these and other females consigned to *X. jakutorum*, apart from in the lack of pale markings on the tergites. Further, such variability in the degree of development of pale markings on the tergites is not uncommon in females of other European *Xylota* species, occurring in both *X. abiens* and *X. florum*, for instance. However, there is equally no consistent difference between unmarked female specimens of *X. jakutorum* and the female caught by Zetterstedt in cop. with the male lectotype of *X. caeruleiventris*. The Zetterstedt female is proportionally narrower than are many females of *X. jakutorum*, but without more females definitely belonging to *X. caeruleiventris*, it is not possible to be sure that this narrower form is characteristic. Essentially, then, a proportion of females of *X. jakutorum* without pale markings on the tergites cannot at present be distinguished from females of *X. caeruleiventris*, making records based on unmarked females unreliable.

1	Hairs on the antero-dorsal surface of the hind femora including many at least as long as half the maximum depth of the hind femur (mesanepisternite 1 usually mostly dusted, dull; fore basitarsus without a long, white, bristly hair dorso-apically; in the male the hypopygium is black-haired)	<i>X. florum</i> (Fab.) (male, plus female <i>pro parte</i>)
–	hairs on the antero-dorsal surface of the hind femora all shorter than half the maximum depth of a hind femur	2
2	Males (eyes meeting above the antennae)	3
–	females (eyes not meeting above the antennae)	8
3	Tergites entirely without pale markings (surstyli narrow throughout their length, as in Fig. 1a; tergites 3–4 varying from slightly longer than broad to slightly broader than long; fore basitarsus with one or two long, white, bristly hairs, dorso-apically, close to the antero-lateral margin of the basitarsus)	<i>X. caeruleiventris</i> Zett. (male)
–	a pair of pale (yellowish to reddish) markings on at least tergite 3 (and usually also on tergite 2)	4
4	Tergite 2 longer than wide	5
–	tergite 2 wider than long	6
5	Fore basitarsus with a long, white, bristly hair dorso-apically, which reaches to the apical margin of the second tarsal segment; the pale hairs on the basal half of the antero-dorsal surface of the hind femora are of uniform length, none of them longer than one quarter the maximum depth of a hind femur; wing membrane not infuscated	<i>X. tarda</i> Mg. (male)
–	fore basitarsus without a long, white, bristly hair on the dorsal surface; the pale hairs on the basal half of the antero-dorsal surface of the hind femora of uneven length, some of them as long as one third the max.depth of the femur; wings brownish over much of the apical half of the surface	<i>X. meigeniana</i> Stack. (male)
6	Genital capsule at least partly black-haired; antero-dorsal surface of hind femora with hairs longer than half the depth of the femur clustered within the basal quarter of the length of the femur (tergites 2 and 3 with pale, reddish spots always more-or-less developed; surstyli broad basally, narrowing towards apex, as in Fig. 1d; basitarsus of fore leg usually with only short setae dorso-apically, on the antero-lateral margin of the basitarsus)	<i>X. jakutorum</i> Bagatshanova (male)

- genital capsule entirely (or almost entirely) whitish-haired; hairs on antero-dorsal surface of hind femora include some as long as half the maximum depth of the femur, these hairs scattered over more than the basal half of the length of the femur 7
- 7 Dorsum of mesoscutum with a transverse band of black hairs between the wing bases *X. triangularis* Zett. (male *pro parte*)
- dorsum of mesoscutum pale-haired *X. abiens* Mg. (male)
- 8 Mesanepisternite 1 (ma1) with most of surface undusted, brightly shining 9
- ma1 with either entire surface, or most of surface dull, dusted 10
- 9 Abdominal tergite 3 with a transverse, orange band across anterior half of the tergite; hind femora with middle third of ventral surface covered in black, spiny hairs *X. tarda* Mg. (female)
- abd.tg.3 with a pair of pinkish markings, which may be reduced, or obscure; hind femora with middle third of ventral surface almost entirely covered in adpressed, yellow, spiny hairs, any black spiny hairs intermixed being mostly along the lateral margins *X. meigeniana* Stack. (female)
- 10 Hind tarsi with basitarsus and second tarsomere partly or mostly brownish-yellow dorsally (always pale apically), contrasting sharply in colour with the more distal, black segments (pale hairs on tergites 2 + 3 yellow or whitish) *X. triangularis* Zett. (female, *pro parte*)
- hind tarsomeres almost entirely black dorsally (pale hairs on tergites 2 + 3 whitish) 11
- 11 Basitarsus of fore leg with black setae ventro-laterally (along the postero-lateral margin of the basitarsus) 12
- basitarsus of fore leg without black setae ventro-laterally 14
- 12 Tergites 2 and 3 with pale (reddish) marks (these pale marks may be well-developed or much reduced and hardly visible) *X. jakutorum* (female, *pro parte*)
- tergites 2 and 3 without pale markings, with shining, bluish-black maculae 13
- 13 Mesoscutum with a patch of black bristly hairs above the wing-base, laterally *X. jakutorum* (female *pro parte*)
- mesoscutum pale (yellowish-white) haired above the wing-base, laterally *X. caeruleiventris* (female) and *X. jakutorum* (female, *pro parte*)
- 14 Longest hairs on antero-dorsal surface of hind femora noticeably more than one third as long as the maximum depth of the femur (nearly ½ the depth of the femur); hind tibiae pale (whitish-yellow) on approximately the basal third of their length *X. florum* (Fab.) (female, *pro parte*)
- longest hairs on the anterodorsal surface of the hind femora no more than one quarter as long as the maximum depth of the femur; hind tibiae pale (whitish yellow) on at most the basal fifth of their length *X. abiens* Mg. (female)

Material of *X. caeruleiventris* examined (males only)

Finland: Nyland, Sibbo, Stormossen (Pinus – ledum bog), 5-11. 7. 1987. leg. A. Albrecht, in coll. Zool.Mus.Helsinki (ZMH); Ostrobothnia kajansensis, Ruhtinansalmi, 4 males., no date, leg. O. Sorsakoski, in coll. H. Hippa; Karelia australis, Vehkalahti 22. 6. 1960, leg. L. Tiensuu, in coll. H. Hippa; Savonia australis, Ruokolahti, 22.6.1948, leg. W. Hellén, in coll.ZMH. **Norway:** Oslo (Kristiania), leg. Siebke, male, in coll. Zool.Mus., Oslo. **Russia:** Karelia rossica: Kolatselkä (ca lat. 61 degr.), NE lake Ladoga, 22. 6. 1943, Karhumäki (probably similar time) (Russian Medvedzhogorsk, ca lat 63 degr., N lake Onega,), all leg. L. Tiensuu, in coll. H. Hippa; Leningrad Prov: Korupoho, 24.8.1979, leg. Stackelberg, in coll.BMNH, London. **Sweden:** Värmland, Eda, near Bråten, 16. 7. 1976. leg. L. Hedström, in coll. Zool.Mus.Uppsala; Jämtland, Berg, Österbergsbodarna, 24. 6. 1970, leg. L. Gustafsson, in coll. H. Bartsch (= *X. spec.* in Bartsch 1997); Åsele lappmark, lectotype (details given above); Lycksele lappmark, Ruskträsk, 15. 7. 1998, leg. M. Sörensson, in coll M. Sörensson.

We are unable to confirm the occurrence of *X. caeruleiventris* in either Great Britain or Switzerland. Gilbert (pers.comm.) has kindly provided the information that he has, himself, seen no material of *X. caeruleiventris* from Britain and that the museums visited by Mutin, whilst in Britain, were the Natural History Museum (BM), in London and the Royal Scottish Museum (RSM), in Edinburgh. We have been unable to find any males, determined as *X. caeruleiventris* by Mutin, in the collections of the BM. From the RSM collections we have examined the four Scottish specimens determined as *X. caeruleiventris* by Mutin. The single male among them is now missing almost all of its diagnostic features, being without abdomen (or hind legs). However, the fore basitarsus of this specimen does not have the long anterolateral hair that seems consistently present in males of *X. caeruleiventris*. The three females all possess a patch of black hairs above the wing bases, indicative of *X. jakutorum*. None of these specimens thus appear to belong to *X. caeruleiventris*, but would more reasonably be consigned to *X. jakutorum*. There are also 5 males and 2 females, determined by Mutin as *X. jakutorum*, in the collections of RSM. These specimens, all from Scotland, are consistent in character with *X. jakutorum* material we have examined from elsewhere. Interestingly, in one of these females, pale marks are entirely absent from the tergites and there are no discernable differences between this specimen and other females in the RSM collections determined by Mutin as *X. caeruleiventris*. As to Switzerland, the Swiss material we have examined (plus material from adjacent parts of Austria and Liechtenstein) all belongs to *X. jakutorum* and the extensive collections in Lausanne contain no males that could be consigned to *X. caeruleiventris* (P. Goeldlin, pers.comm.). We have not been able to locate Swiss specimens determined by Mutin as *X. caeruleiventris* (no indication is given in Mutin and Gilbert, 1999, of the whereabouts of the Swiss material they refer to, or of whether it included any males), but we have had no opportunity to examine material in the collections of Zurich or Geneva. Given the apparent rarity of *X. caeruleiventris* in Fennoscandia there is no reason to suppose it would be a frequent species in the Alps, should it occur there. There is an evident need for re-appraisal of all existing male specimens, standing under the name "*X. caeruleiventris*", that originate in the Alps. At present, although it would seem quite

possible that *X. caeruleiventris* might occur there, its presence in the Alps cannot be confirmed.

Biology of *X. caeruleiventris*

Little is known of this species. It has been collected in taiga forest and a *Pinus sylvestris*/*Ledum* bog. Most traceable records are apparently from forested sites where *Pinus sylvestris* dominated and there was bog in the immediate vicinity, though the specimens themselves were some of them collected from meadows along forest margin. There is no certain information on circumstances of capture, though in one instance a specimen was probably collected from the foliage of either *Rubus idaeus* or *Aegopodium* and in another possibly from flowers of either *Anthriscus* or *Geranium sylvaticum*. All verified Fennoscandian records seem to be from within the boreal zone. Its flight period appears to be from June to August, with slightly more records from July than from the other months. The apparent extreme scarcity of this species is quite puzzling, and likely to remain unexplained until more is known of its requirements. The cryptic colouration of the adult flies is typical of insects associated with the burnt wood of pine trees, and it is tempting to suggest *X. caeruleiventris* might be a burnt forest specialist associated with *Pinus sylvestris*, and now excessively rare due to the infrequency of forest fires. In this regard it is unfortunate that the Diptera have not received the attention accorded to some other insect Orders, in study of burnt forest fauna (e.g. see Similä et al. 2002) in northern Europe. The closely-related *X. jakutorum* can apparently make use of the tunnels of saproxylic beetles like *Hylobius*, and if the larvae of *X. caeruleiventris* were similarly associated with tunnels of some saproxylic species specialising in burnt wood, this could easily account for the scarcity of *X. caeruleiventris* and for the existing records being both scattered and from Scandinavia, where rare components of the European burnt pine forest fauna still survive (Ehnström and Walden 1986), despite the drastic decrease in forest burning and consequent changes in forest structure that have occurred (see, for example, Uotila et al. 2002) during the last century.

Material of *X. jakutorum* examined

We have examined more than 1000 specimens. The material is too extensive to list in detail here. With the exception of the few specimens detailed above, under *X. caeruleiventris*, all Fennoscandian males examined proved to belong to *X. jakutorum* (Nielsen 1999 and Bartsch 2001 show the confirmed distribution of *X. jakutorum* in Norway and Sweden, respectively). In addition, all male specimens examined, from the following parts of Europe, proved to belong to *X. jakutorum*: Austria, Belgium, the Czech Republic, France, Germany, Great Britain, Ireland, Italy, Liechtenstein, Switzerland and parts of the former Yugoslavia. These specimens include material from the Alps,

the Apennines, the Jura, the Pyrenees and the Vosges. We have also examined specimens of *X. jakutorum* from parts of European Russia (Karelia, St Petersburg region, Viborg). We have not studied any Danish material, but the coloured illustrations of "*X. caeruleiventris*" provided by Torp (1994) show typical *X. jakutorum* with reddish spots, and we thus conclude that *X. jakutorum* occurs in Denmark. Similarly, the figures of male terminalia of *X. jakutorum*, shown in Vujic and Milankov (1999), correspond clearly with the terminalia of *X. jakutorum* as recognised here and we thus follow those authors in concluding that, while *X. jakutorum* is present in countries of the former Yugoslavia (Bosnia Herzegovina, Montenegro, Serbia, Slovenia), *X. caeruleiventris* is not.

Biology of *X. jakutorum*

This species is much better known than *X. caeruleiventris*, and available data are summarised in Speight (2001). Over most of its known range in Europe it is associated with cool climate, humid conifer forest, occurring in both natural forest of *Abies*, *Picea* and *Pinus* species and in association with mature conifer plantations. In the latter situation its presence would appear to be largely dependent upon the presence of the untreated, cut stumps of harvested trees. However, Vujic and Milankov (1999) report the occurrence of *X. jakutorum* in high altitude, humid *Fagus* forest in the Balkans, the implication being that this syrphid may under some circumstances develop in the rotting wood of deciduous trees, though this remains unproven. In Fennoscandia, *X. jakutorum* can apparently occur sympatrically with *X. caeruleiventris*. *X. abiens* Mg., *X. florum* (Fab.) and *X. meigeniana* Stackelberg can also all be found together, in the company of *X. jakutorum*, leading to considerable potential for misdetermination.

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