Xylota caeruleiventris Zetterstedt, 1838 (Diptera, Syrphidae) found in central Europe, with remarks on identification of the female

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Xylota caeruleiventris is recorded from two sites in SW Germany. Its occurrence in pre-alpine bogs is relictual. The females of these populations are morphologically distinct from central European *X. jakutorum* Bagatshanova.

Key words: *Xylota caeruleiventris*, central Europe, description of female, Syrphidae.

Zusammenfassung

Xylota caeruleiventris wird aus zwei oberschwäbischen Mooren nachgewiesen. Das Vorkommen der Art in Mooren des Alpenvorlands ist ein Borealrelikt. Die morphologischen Unterschiede der Weibchen dieser Populationen von *X. jakutorum* Bagatshanova werden dargestellt.

Introduction

Mutin & Gilbert (1999) claimed that the name *Xylota coeruleiventris* was erroneously applied by European authors to a species whose correct name is *Xylota jakutorum* Bagatshanova, 1980, whereas *X. caeruleiventris* Zetterstedt is a distinct species hitherto overlooked by European workers. They mention the occurrence of *X. caeruleiventris* in Great Britain, Switzerland, Estonia, Western Siberia, Amurland and Primorye, but provide no locality data from these European specimens. However, most of their records of *X. caeruleiventris* from Europe appear to have been published in error, because in a letter to C. Claußen dated from 5 November 1999 V. Mutin wrote: "… the phrase '32 males and 18 females, Great Britain, Switzerland, Estonia, Western Siberia, Amurland, Primorye' (page 49) belongs to *Xylota jakutorum* Bag.", and "I know specimens of *X. coeruleiventris* Ztt. from Finland, the environs of St.-Petersburg, Southern Siberia and the Far East and think that this species is absent in Central and Western Europe."

The paper of Mutin & Gilbert (1999) also caused some confusion among European syrphidologists because of the lack of a clear diagnosis of the differences between *X.*

caeruleiventris and *X. jakutorum*. Bartsch et al. (2002) re-examined a considerable number of specimens of the taxa in question from many European countries and studied the type material of *X. caeruleiventris*. They concluded that *X. caeruleiventris* Zetterstedt was correctly interpreted by Mutin & Gilbert (1999), but that their records of this taxon from Great Britain and Switzerland are dubious. At present, the only verified European records of *X. caeruleiventris* are from the boreal zone in Scandinavia. Further, Bartsch et al. (2002) could not find reliable characters for separating the females of *X. caeruleiventris* and *X. jakutorum.* The single character mentioned by Mutin & Gilbert (1999) – the absence/presence of red integumental spots on tergites 2 and/or 3 – is obviously unreliable as there are numerous females without red spots from areas where males of only *X. jakutorum* are known.

The present article reports the occurrence of *X. caeruleiventris* Zetterstedt in central Europe [1)] and considers the morphological differences between the females of *X. caeruleiventris* and *X. jakutorum,* as observed in these central European populations.

Material

The specimens of *X. caeruleiventris* studied are from two sites in Baden-Württemberg (SW Germany): (1) Bad Buchau, nature reserve Federsee, n "Banngebiet Staudacher", 580m, 9°36'19''E 48°05'10''N, Malaise trap, 27 May-14 July 2003, 14♂ 7♀ (coll. C. Claußen, D. Doczkal, M.C.D. Speight, J.-H. Stuke). – (2) Isny, nature reserve Taufach-Fetzach-Moos, 698 m, Malaise traps, all leg. and coll. D. Doczkal: (a) 10°02'08"E 47°45'19"N, 19 May-3 June 2003 1♀, do. 3 June-14 July 2003 3♀; (b) 10°01'58"E 47°45'20"N, 3 June-14 July 2003 1♂ 3♀; (c) 10°02'18"E 47°45'20"N, 3 June-14 July 2003 4♀. – The ca. 170 specimens examined of *X. jakutorum* are from numerous sites from SW Germany and the central Alps.

Identification

The identification of males is based on the characters given in Mutin & Gilbert (1999) (including distinction from *X. pseudoignava* Mutin) and Bartsch et al. (2002) and on comparison with a male specimen of *X. caeruleiventris* from Russia (Far East?) identified by V. Mutin (coll. C. Claußen). According to Bartsch et al. (2002) the males of *X. caeruleiventris* differ from *X. jakutorum* in four characters: (1) the absence of red integumental spots on tergites 2 and 3, (2) the narrower abdomen, with tergite 2 as long as wide basally, (3) the presence of one or two long bristly hairs at the anterodorsal corner of the fore basitarsus and (4) the basally more slender surstylus.

[1)] After the manuscript was finished I was informed on the article of Doležal & Romig (2004) who also discovered *Xylota caeruleiventris* from central Europe (Bohemia). Their description of the habitat is remarkably similar to the situations where this species was found in Germany.

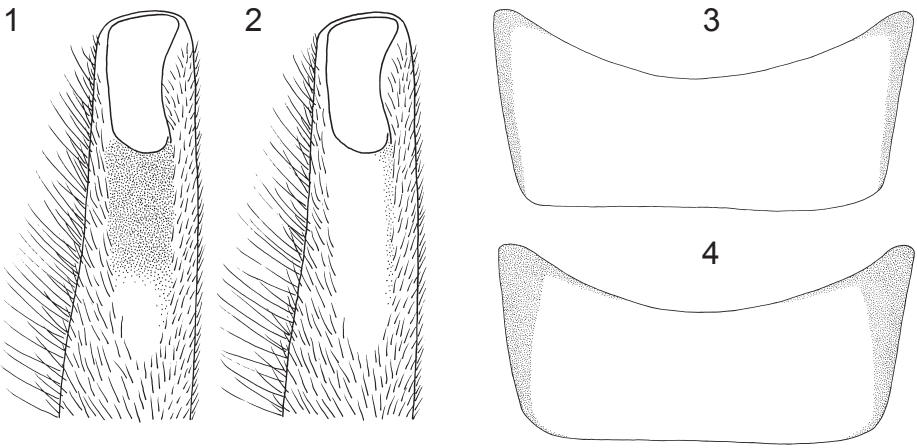
Characters 1, 3 and 4 are present in all specimens of *X. caeruleiventris* examined here. Character 2 is correct for most specimens, too, but the range of intra-specific variation in this feature overlaps between these two species (table 2). A long bristly hair at the anterodorsal corner of the fore basitarsus also occurs in a few specimens of *X. jakutorum* and is therefore of limited value for identification. However, the lack of red integumental spots and the slender surstyli found in male *X. caeruleiventris* are clearly different from *X. jakutorum*. The males are well characterised and offer no serious problems of identification.

Due to the fact that among the many male specimens from the Federsee there are no specimens of *X. jakutorum* one would expect that all the females caught in the same trap would also belong to *X. caeruleiventris*. Using the same logic, females of *X. jakutorum* have been chosen for comparison from populations where males of this species were abundant but no males of *X. caeruleiventris* were found. Based on this assumption the characters in which the females of *X. caeruleiventris* differ from *X. jakutorum*, as mentioned by Mutin & Gilbert (1999) and Bartsch et al. (2002), have been checked and additional characters have been searched for. The results obtained from this approach are summarized in table 1. They have subsequently been tested against the material from the Taufach-Fetzach-Moos and the numerous female specimens from other sites in SW Germany and the Alps. All specimens with the character states of *X. caeruleiventris* are from the Federsee and the Taufach-Fetzach-Moos (where the presence of that taxon is proved by a single male specimen) whereas no specimen from other sites display this combination of character states. In other words: the distribution of males and females identified as *X. caeruleiventris* is identical. This is strong evidence for the correct classification of probably each specimen.

According to Mutin & Gilbert (1999) the females of *X. caeruleiventris* and *X. jakutorum* differ only in the absence/presence of red integumental spots on tergites 2 and/or 3. But using this character Bartsch et al. (2002) found no clear distinction between females of these species, finding many female specimens lacking integumental spots

character / species	*X. caeruleiventris*	*X. jakutorum*
red integumental spots on tergites 2 and 3	absent	absent or present
bristles at the supraalar area	all yellow or a few (usually <10) black	always with numerous (>10) black bristles
length : width of tergite 2	0.73 – 0.86	0.63 – 0.81
apicoventral unhaired area on mid femur	covered by microtrichia across full width at least at apex (fig. 1)	largely bare of microtrichia (fig. 2)
microtrichose ("dusted") area on sternite 1	usually confined to the outermost lateral and anterior margins (fig. 3)	anterior corners usually extensively dusted (fig. 4)

Tab. 1: Summary of diagnostic characters of females of *X. caeruleiventris* and *X. jakutorum*.



Figs 1-2: Ventral aspect of mid femur. – 1. *X. caeruleiventris*; – 2. *X. jakutorum*. – **Figs 3-4: Sternite 1.** – 3. *X. caeruleiventris*; – 4. *X. jakutorum*. Stippling showing distribution of microtrichia.

from regions where only males of *X. jakutorum* are known. This is confirmed by the present material: Only 22 specimens of *X. jakutorum* out of a total of 79 (=28%) have well developed red spots clearly visible with the naked eye, 36 specimens (=45%) have rudimentary red spots visible only on close examination and 21 specimens (=27%) are entirely without any trace of red integumental spots. As each specimen of *X. caeruleiventris* is without any trace of red spots, too, the presence of a red spot, even if very faint, is diagnostic for *X. jakutorum*.

Another character mentioned by Bartsch et al. (2002) is the absence / presence of black bristly hairs above the wing base. According to their key, couplet 13, specimens "with a patch of black bristly hairs above the wing-base, laterally" belong to *X. jakutorum*, whereas specimens which are yellow-haired there are either *X. caeruleiventris* or *X. jakutorum*. In the present study the female specimens have been assigned to one of three categories: (1) supra-alar area without black hairs, (2) supra-alar area with 1-9

	X. caeruleiventris		*X. jakutorum*	
	males	females	males	females
n	15	17	30	31
$\bar{x}$	0.9	0.79	0.84	0.71
min - max	0.85 – 0.96	0.73 – 0.86	0.76 – 0.95	0.63 – 0.81
SD	0.033	0.034	0.04	0.044

Table 2: Statistics of the length : width ratio of tergite 2 of *X. caeruleiventris* and *X. jakutorum.*

black hairs, (3) supra-alar area with 10 or more black hairs. Each specimen (n=79) of *X. jakutorum* falls into category 3 while 5 specimens (= 28%) of *X. caeruleiventris* have no black hairs, 10 specimens (= 56%) have less than 10 black hairs, and 3 specimens (= 17%) 10 or more black hairs. The figures gained from the females are nearly identical with those obtained from the males. Therefore, specimens without, or with very few, black hairs on the supra-alar area can be identified as *X. caeruleiventris*, at least if derived from the study area. In many hoverfly species northern specimens are often darker than central European ones. So care is needed using this character when specimens from other parts of the range of these species are identified.

Bartsch et al. (2002) also mention a potential difference in the proportions of the tergites: "The Zetterstedt female [caught in copula with the lectotype of *X. caeruleiventris*] 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." For the males, these authors report that the width : length ratio of tergite 2 (in their article erroneously called tergite 1) is 1.0 for *X. caeruleiventris*, and 1.2 for *X. jakutorum*. However, the number of specimens measured was rather low (3 and 12) and there is no range of variation given. In the present study, all available specimens of *X. caeruleiventris* and 30 specimens of each sex of *X. jakutorum* have been measured. The length was taken from the mid-line, the width from the anterior edge of tergite 2. The results are the same for both sexes: there is a clear difference in the mean values but the ranges of variation are greatly overlapping between the species (table 2). Therefore, only a minor proportion of specimens, the narrowest of *X. caeruleiventris* and the broadest of *X. jakutorum*, are identifiable using this character alone. However, as the extreme values are represented by exceptional specimens the length : width ratio is more useful for identification if this character is used in conjunction with the other characters. In fact, only three females (=10%) of *X. jakutorum*, but 13 females of *X. caeruleiventris* (=76%) have a ratio >0.77.

A search for additional morphological differences between *X. caeruleiventris* and *X. jakutorum* revealed two useful characters:

(1) The unhaired area on the apico-ventral part of the mid femur is more or less extensively covered with microtrichia in *X. caeruleiventris*, with at least the apical part being "dusted" across its full width (fig. 1). In *X. jakutorum* this area is largely or entirely bare of microtrichia, specimens having this area partly "dusted" nearly always have an undusted stripe reaching the apex of the femur (fig. 2). A few intermediate specimens have been observed.

(2) The "dusted" area on sternite 1 is restricted to the outermost lateral and anterior margins in *X. caeruleiventris* (fig. 3), whereas the anterior corner is extensively microtrichose in *X. jakutorum* (fig. 4). The range of intraspecific variation is slightly overlapping.

Altogether, the set of characters now available allows for identification of female specimens. But there are two restrictions:

(1) None of the characters is fully diagnostic for both taxa. While certain character states occur in one of the species only, e.g. red integumental spots, others can occur in both species. But due to the existence of five complementary characters, specimens with a "wrong" state of one character are identifiable when the complete set of characters is considered together.

(2) The validity of these differential characters is regarded as proven for the populations from the study area. It is uncertain whether they are also reliable in parts of the ranges of the species remote from SW Germany. However, a female specimen from Estonia (caught together with a male specimen) is within the range of variation observed among the females of *X. caeruleiventris* from SW Germany.

Habitat

At each of the sites three Malaise traps were installed, from the beginning of May to mid July. At the Federsee all specimens of *X. caeruleiventris* were caught in one trap. At Taufach-Fetzach-Moos this species occurred in all three traps.

The nature reserve Federsee is one of the largest protected areas in SW Germany, with nearly 1,400 ha. It is the remnant of a 30 km² sized lake that occurred between two large moraines when the glaciers of the last ice-age retreated. Today this lake covers ca. 140 ha. Its size was several times as large until 200 years ago, when it was for the first time subject to drainage. The land exposed as a consequence of that drainage now bears a variety of vegetation types, described in detail by Grüttner & Warnke-Grüttner (1996). Because of the very high ground-water level, which often resulted in the area being flooded for months, the land in the vicinity of the lake could only be used as litter meadows (land where *Phragmites* was harvested to provide litter for penned livestock), a practice that ceased some decades ago when modern agricultural regimes replaced traditional ones. While most of the newly gained land is now covered by fen certain sites southwest of the lake are transition mires. The trap that caught *X. caeruleiventris* (but not *X. jakutorum*) was placed at the south-facing edge of a small wood regarded by Grüttner & Warnke-Grüttner (1996) as belonging partly to the boreal-alpine conifer woods (Vaccinio-Piceetea), and in particular to an atypical form of the Vaccinio uliginosi-Pinetum sylvestris community, and partly to a *Lythrum salicaria-Picea abies* association (in contrast to the pines the spruce are very probably planted). The adjoining open land bears a *Carex elata-Sphagnum magellanicum* association. For understanding of the habitat requirements of *X. caeruleiventris* it might be important that two other traps did not catch this species, while one of them caught a single male specimen of *X. jakutorum*. The latter, 400 m apart from the trap that caught *X. caeruleiventris*, was placed at the southern edge of a *Lythrum salicaria-Betula pubescens* association mixed with a few *Pinus sylvestris* and bordered by a certain type of transition mire identified as a *Carex elata-Carex appropinquata*-Scheuchzerietalia association by Grüttner & Warnke-Grüttner (1996). The third trap, which contained no specimens of *Xylota* spec.,

was placed by a young *Betula pubescens* tree, within a transition mire vegetation like that at the second trap but with much reed (*Phragmites australis*) mixed in. According to Grüttner & Warnke-Grüttner (1996) the mentioned types of vegetation were difficult to name because of their atypical composition, when compared with other fens and bogs in the northern pre-alpine region. They suspect this results from the young age of the transition mire.

The Taufach-Fetzach-Moos is a nature reserve of ca. 315 ha, close to the northernmost foothills of the Alps. It is composed of two lakes and various types of fen, transition mire, bog, and wood. The bogs in particular are for the most part more or less disturbed due to former exploitation by peat cutting. One trap was placed at the border of a *Betula/Pinus* swamp with an acid fen, a very wet site that was flooded even in Mid July, after several weeks of sunny and hot weather. Another trap was installed at the southern edge of a mixed forest (*Picea abies, Pinus sylvestris, Betula pubescens,* and various scrub species) next to a regenerating cutover bog. The third trap was placed within a drained bog, now dominated by *Calluna vulgaris, Vaccinium myrtillus* and *V. uliginosus,* with many invading *Picea abies* and *Pinus sylvestris*.

Both the Federsee and the Taufach-Fetzach-Moos have a boreal local climate in common. Their mean temperatures are significantly lower than those in the surrounding areas and frost occurs during several nights even in summer. This corresponds well with the information given by Bartsch et al. (2002) for Scandinavia where "all verified records [of *X. caeruleiventris*] … seem to be from within the boreal zone". A re-examination of about 170 specimens of *X. coeruleiventris* auctt. from numerous sites in SW-Germany and the central Alps revealed no further specimens of *X. caeruleiventris*. It seems that in SW Germany *X. caeruleiventris* has a relictual distribution in pre-alpine bogs with a boreal local climate. The collecting sites are at present the only ones that have been investigated using Malaise traps. Perhaps the species also occurs in other pre-alpine bogs. However, the few large bogs left in S Germany are now all nature reserves where collecting is forbidden. This might be a reason why the presence of *X. caeruleiventris* has been overlooked there until now. Originally (transition) bog with *Pinus sylvestris* covered extensive areas in the northern pre-alpine region. Today only a few per cent are left. While in the past it was obviously possible for *X. caeruleiventris* to colonise the newly emerged *Pinus sylvestris* woods at the Federsee, the occurrence of appropriate habitats is very scattered and isolated now.

Although *X. jakutorum* is the second most abundant *Xylota* species in humid conifer woods in S Germany it was remarkably scarce at both sites, which yielded only a single specimen each. This is strong evidence for fundamentally different habitat requirements. The sites where *X. caeruleiventris* has been caught have the occurrence of *Pinus sylvestris* in common. This is in accordance with the observations of Bartsch et al. (2002): "Most traceable records are apparently from forested sites where *Pinus sylvestris* dominated and there was bog in the immediate vicinity …". Except for one trap in the Taufach-Fetzach-Moos the collecting sites are wetter than is usual for places

where *X. jakutorum* is abundant, and all sites have an especially boreal local climate. However, more data are required for *X. caeruleiventris* in order to evaluate these potentially different habitat requirements. But from the observations in S Germany the hypothesis of Bartsch et al. (2002), that *X. caeruleiventris* might be associated with burnt pine wood, is not supported. There are no signs of forest fires in the recent past at any of the sites where *X. caeruleiventris* was found.

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