

***Dasysyrphus neovenustus* sp. n. (Diptera: Syrphidae) a new species
in the *venustus* species group**

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ABSTRACT. Both sexes of *Dasysyrphus neovenustus* sp. n. are described and illustrated, and the characters separating them from the similar *D. venustus* are given. The distinctiveness of the new species is confirmed also by geometric morphometric analysis of the wing venation. The new species is known from Poland and Siberia (Russia).

KEY WORDS: taxonomy, *Dasysyrphus*, new species, wing venation.

INTRODUCTION

The species of *Dasysyrphus* ENDERLEIN, 1938 are widely distributed, mainly in the Holarctic. To date 43 are known (LOCKE & SKEVINGTON 2013), twelve of which occur in Europe (SPEIGHT et al. 2010). The known *Dasysyrphus* larvae are predators of aphids and other small soft-bodied insects. Like most hoverflies, the adults are important pollinators feeding on the pollen and nectar of various plants. The species of the *D. venustus* group, which include four known from Europe, are highly variable and can be difficult to distinguish. In particular, the species of the *venustus-hilaris* complex are problematic in their determination (LÁSKA & BÍČEK 1996). The Holarctic *D. venustus* (MEIGEN, 1822) is known to be the most frequent and widely distributed species of the genus. Some previous studies have indicated a very high morphological (BARKALOV 2007, LOCKE & SKEVINGTON 2013) and genetic variability of *D. venustus*, suggesting that it is a complex of species (LOCKE & SKEVINGTON 2013). There are no studies comparing *Dasysyrphus* species from the Palaearctic and the Nearctic.

Acknowledgements

We would like to express our thanks to Mirosław Soszyński, Przemysław Żurawlew, Tadeusz Osicki, Cezary Bystrowski and Cezary Nowak, who kindly provided us with many specimens of Syrphidae, including *D. neovenustus*. The material from Russia was collected with the financial support of the Polish State Forests PGL LP during the expedition of the Forest Entomological Section at the Department of Forestry, Agricultural University, Kraków. The study was partly funded by the research grant BM-4566.

MATERIALS AND METHODS

Nearly all the specimens of *Dasysyrphus* were collected in Poland using an entomological net from 1966 to 2013. In June 2012 some specimens were collected along Lake Baikal in the Far East of Russia. The specimens were pinned and deposited in the private collections of BOGUSŁAW SOSZYŃSKI and ŁUKASZ MIELCZAREK. The holotype and four paratypes (2 males, 2 females) of the new species are deposited at the Museum of Natural History, Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Kraków. The specimens were identified using the taxonomic keys of VAN VEEN (2004) and BARKALOV (2007).

The phenologies of *D. neovenustus* and *D. venustus* were compared by investigating one site in central Poland – Ceteń in the Spalski Landscape Park – at regular intervals during one season (2010). At this site the environment is suitable for both species. In addition, the entomological collection of one of the authors (BS) was re-examined and the dates of capture of all individuals of *D. neovenustus* retrieved.

89 specimens were used in the analysis of wing venation. Representing five species, all the specimens were males: *D. hilaris* (4 ex.), *D. neovenustus* sp. n. (38 ex.), *D. pauxillus* (7 ex., from Poland), *D. pinastri* (11 ex. from Poland) and *D. venustus* (29 ex.). The wings were dissected and mounted in glass photographic frames. The mounted wings were scanned using a Nikon Coolscan 5000 ED photographic scanner equipped with an SF-210 slide feeder (in high image resolution 2400 dpi). The coordinates of 13 vein junctions in every wing image (Fig. 1) were determined using DrawWing software (TOFILSKI 2004). The vein junctions were used as landmarks for the geometric morphometric analysis. The landmarks were aligned according to generalized orthogonal least-squares procedures using MorphoJ software (KLINGENBERG 2011). Canonical Variate Analysis and Discriminant Function Analysis were applied to the aligned coordinates using Past software (HAMMER & HARPER 2005).

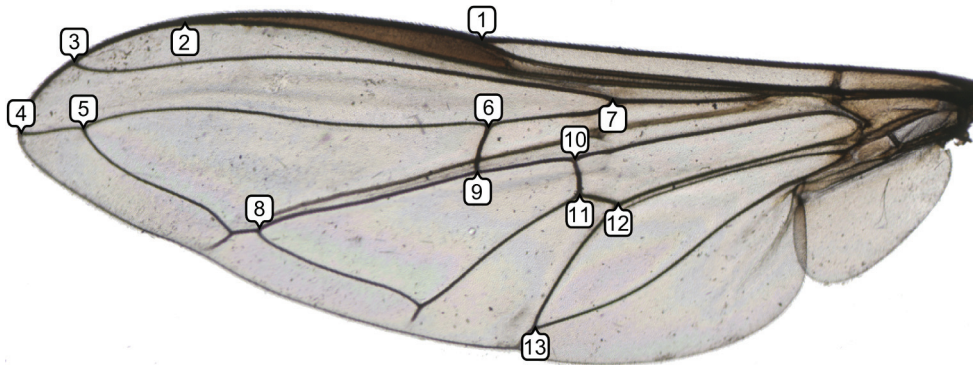


Fig. 1. Wing of *Dasysyrphus neovenustus* sp. n. Numbers indicate landmarks used for wing measurements.

SYSTEMATICS

Dasysyrphus neovenustus SOSZYŃSKI & MIELCZAREK sp. n.

Diagnosis

Dasysyrphus neovenustus sp. n. can be distinguished from the similar *D. venustus* and *D. hilaris* mostly by the shape of black rectangular band on the second abdominal sternite, which is always distinct in *D. neovenustus* (Figs 2b, 2d); this is usually only weakly marked as a small irregular spot in *D. venustus* (Figs 3b, 3d) and is usually absent in *D. hilaris*. The differences between *D. neovenustus* and *D. venustus* are summarized in Table 1. Specimens of *D. pauxillus*, in which the yellow abdominal spots reach the margin of the abdomen, may be confused with *D. neovenustus*.

Description

Male. Body length 7-9 mm.

Head. Eyes with dense white hairs of equal length, holoptic. Angle of approximation of eyes 90-92°. Frons black, shiny with very thin dusting and black hairs. Antennae yellow. Arista yellowish, pubescent, with very minute hairs (virtually bare). Antennal fossa yellow. Lunula black. Face broad, about 1.8x of eye width measured at the base of lunula. Face yellow, shiny, with black median stripe. Width of the black median stripe 1/3 width of the face in the middle. Face covered with yellow and black hairs, most of the yellow hairs are present in the middle. Mouth edge, genae and clypeus black. Occiput covered with white hairs.

Thorax. Mesonotum and pleurae glossy black. Most hairs in mesonotum wavy at the ends and yellow. Scutellum yellow, black in the front corners, hairs yellow, about

as long as scutellum. Legs mainly yellow, only base of femora darker at 1/2 length. Hairs on legs yellow, only a few black ones present on the ventral side of femora 2 and 3. Wings hyaline, entirely covered in microtrichia, with brownish stigma. Squamulae white, white haired. Halteres whitish, darker at base.

Abdomen. Tergites glossy black with widely separated yellow spots on the middle of tergites 2-5. Spots reaching margin of tergites in full of their width. Hind margin of tergites 5-6 yellow. Most tergites short, black haired. Hairs on spots and tergites 1-2 are yellow and much longer. Sternites yellow with black bands reaching the margin of sternites. Sternites covered with long white and yellowish hairs; many black hairs present only on sternite 4.

Genitalia. Distyphallus with small tubercle at the base (Fig. 4b).



Fig. 2. Abdomen of *Dasysyrphus neovenustus* sp. n.: a – male, dorsal view, b – male, ventral view, c – female, dorsal view, d – female, ventral view.

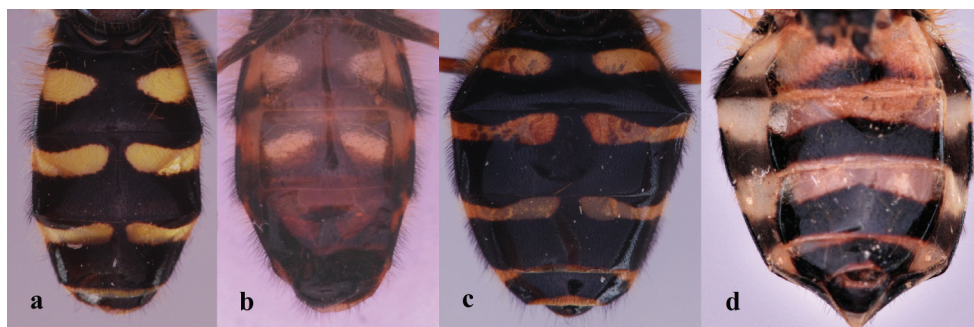
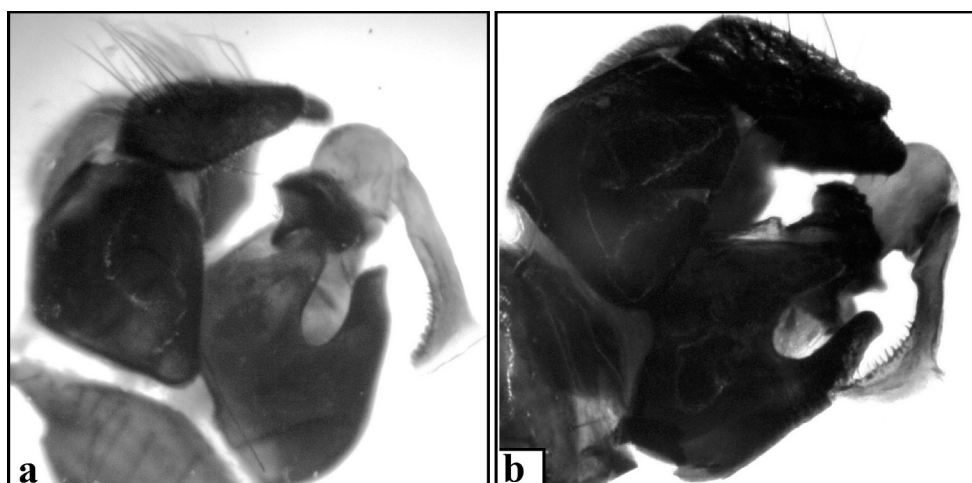


Fig. 3. Abdomen of *Dasysyrphus venustus*: a – male, dorsal view, b – male, ventral view, c – female, dorsal view, d – female, ventral view.

Table 1. Characters distinguishing *Dasysyrphus neovenustus* from *D. venustus*.

<i>D. neovenustus</i>	<i>D. venustus</i>
Female frons with small weakly marked dusted spots.	Female frons with distinct dusted spots.
In males hind femora black from base to 1/2 of their length; in females femora often entirely yellow.	Hind femora black from base to 3/4 of their length in males and 2/3 of their length in females.
Hind tibia yellow.	Hind tibia dark at mid-length.
Pterostigma usually yellowish.	Pterostigma brownish.
Second sternite with distinct transverse stripe.	Second sternite usually with dark oval spot.
Spots on tergites II and IV straight, parallel to the front of the tergite.	Spots on tergites II and IV slightly curved, narrower in the middle.
Distiphallus as in Fig. 4 b, with small tubercle.	Distiphallus as in Fig. 4 a, without tubercle.
Body length 7-9 mm.	Body length 7-10 mm.

**Fig. 4.** Male genitalia: a – *Dasysyrphus venustus*, b – *D. neovenustus* sp. n.

Female. Resembles male with usual sexual differences. Characters distinguishing males and females are given below.

Head. Eyes dichoptic. Frons black, shiny with two weakly marked triangular dusted spots; each spot covers about 1/3 of the frons width. Width of frons about 4/5 width of eye at the height of lunula. Frons narrowing towards top of head, covered with straight black hairs. Lunula brown. Face broad, about 1.7x of eye width at the base of lunula. Width

of stripe 1/5 width of the face in the middle. Face mainly yellow haired, only hairs on upper part and a few along eye rim are black.

Thorax. Legs yellow, only base of femora darker at 1/4-1/5 length. Third femur dark anterodorsally, often completely yellow. Wings hyaline, entirely covered in microtrichia, with yellowish to light brown stigma.

Abdomen: Sternites covered with long white hairs.

Etymology

The species name originates from Greek "νέος" which means "new" and also from the specific name of *Dasysyrphus venustus*, the most similar species.

Material examined

91 males, 114 females.

HOLOTYPE

POLAND, CENTRAL POLISH LOWLANDS, Ceteń near Tomaszów Mazowiecki, UTM DC50, 51.515235°N, 20.299535°E, 1.05.2012, male, leg. Mirosław Soszyński.

PARATYPES

POLAND, MAŁOPOLSKA UPLAND. Przedborski Landscape Park. Chałupy, DB25, 11.06.2008, 1 female, leg. T. Osicki. Oleszno Nature Reserve, DB34, 28.04.2007, 1 male, leg. B. Soszyński. CENTRAL POLAND LOWLANDS. Jodły Oleśnickie Nature Reserve, CC64, 24.04.2009, 5 males, leg. B. Soszyński. Łódź, Las Lublinek, CC83, 17.04., 1 male, 4.05.2007, 1 male, leg. B. Soszyński. Nakielnica, CC74, 26.05.2013, 2 females, leg. M. Soszyński. Łąznów Nature Reserve, DC12, 28.04., 2 males, 1 female, 25.05.2009, 1 female, leg. M. Soszyński. Spalski Landscape Park. Teofilów, DC40, 30.04.2012, 1 female, leg. B. Soszyński. Fryszerka near Inowłódz, DC40, 13.05.2006, 1 female, leg. M. Soszyński. Konewka Nature Reserve, DC41, 29.05.2005, 3 females, 28.04.2012, 1 male, 1 female, leg. M. Soszyński. Ceteń near Inowłódz, DC50, 16-18.04.2008, 1 female, 24.04., 1 male, 1 female, 25.04., 3 males, 21.05.2010, 1 female, 1.05.2012, 1 female, leg. M. Soszyński. LUBLIN UPLAND. Borowiec, River Tanew, FA48, 02.05.2013, 1 male, 1 female, leg. A. Tofilski.

SOUTHERN BALTIC COASTLANDS. Nadmorski Landscape Park. Białogóra Nature Reserve, UTM CF07, 30.04.2000, 2 males, BS. Widowo Nature Reserve, CF17, 6.05.2000, 1 male, BS. Bielawa Nature Reserve, CF27, 2.05.2000, 2 males, BS.

EASTERN BALTIC LAKELANDS. Rubcowo near Augustów, FE66, 5-6.05.1977, 3 males, BS. Wigry NP. Krusznik, FE38, 3.06.2005, 1 female, BS.

MAŁOPOLSKA UPLAND. Przedborski Landscape Park. Policzko, DB25, 2.05.1998, 1 male, BS. Gustawów, DB25, 30.04., 1 male. Przedbórz, DB25, 2.05., 1 male, 5.05.2008, 2 males, leg. T. Osicki. Murawy Dobromierskie Nature Reserve, DB25, 27.04.2007, 1 male, 2.05.2008, 1 male, BS. Oleszno Nature Reserve, DB34, 28.04., 1 male, 14.05.2007, 1 female, ŁM, Kajetanów, DB34, 3.05.2008, 1 female, ŁM, Ewelinów near Włoszczowa,

DB44, 27.04., 1 male, 1 female, 7.05.2011, 1 female, ŁM. Jeżowice near Włoszczowa, DB23, 1.05.2008, 1 male, Łachów near Włoszczowa, DB23, 1-2.05.2006, 3 females, 2 males, Kurzelów near Włoszczowa, DB14, 7-11.06.2006, 2 females, 1 male, 25-26.04.2009, 2 males, 1 female, leg. ŁM & C. Nowak. Lipno near Włoszczowa, DB32, 26.04.2009, 1 female, leg. C. Nowak. Włoszczowa, DB33, 20.05.2006, 2 females, 18.04.2009, 1 male, ŁM.

LUBLIN UPLAND. Szumy Nature Reserve, FA58, 2.05.2010, 6 males, 1 female, ŁM. Borowiec, River Tanew, FA48, 02.05.2013, 18 males, 11 females, leg. A. Tofilski.

CENTRAL POLISH LOWLANDS. Lubiec near Szczerców, CB79, 1.05.1977, 1 male, BS. Winnica Nature Reserve, CC40, 9.05.1975, 1 male, BS. Jodły Oleśnickie Nature Reserve, CC64, 24.04.2009, 3 males, 4 females, BS. Tadzín, DC14, 20.05.2009, 2 females, BS. Łódź, Las Lublinek, CC83, 4.05.2007, 1 female, BS. Nakielnica, CC74, 26.05.2013, 2 females, leg. MS. Grądy nad Lindą Nature Reserve, CC84, 26.04.2009, 1 male, 1 female, MS. Łaznów Nature Reserve, DC12, 28.04., 1 female, 14.05.2009, 1 female, MS. Spalski Landscape Park. Dęba Opoczyńska, DC40, 30.04.1993, 1 male. Gielzów near Inowódz, DC40, 14.06.2008, 1 female, 9.05.2009, 2 females, 22.05.2010, 2 females, MS. Fryszlerka near Inowódz, DC40, 13.05.2006, 1 male, 1 female, 27.04.2008, 1 male, MS. Konewka Nature Reserve, DC41, 1.05.2001, 1 male, BS, 28.04.2012, 1 female, MS, Ceteń near Inowódz, DC50, 25.04.1998, 1 male, BS, 16-18.04, 2 females, 1.06.2008, 1 female, 1.05., 4 females, 3.05., 1 male, 1 female, 10.05., 2 females, 17.05.2009, 1 male, 24.04., 1 male, 1 female, 25.04., 3 males, 1 female, 21.05., 1 female, 23.05.2010, 1 female, 20.05.2011, 1 female, 1.05., 1 female, 20.05.2012, 1 female, MS. Sulejowski Landscape Park. Struga Młynki n. Stobnica, DB17, 18.05.1996, 1 female. Reducz n. Ręczno, DB17, 16.05.2005, 1 male, 4 females. Lubień Peatbog, DB18, 28.05.2004, 3 females, 10.05.2012, 1 female. Włodzimierzów, DB19, 21.05.2005, 1 female. Czarny Las Peatbog, Justynów near Skotniki, DB27, 29.05.2004, 1 female. Lubiaszów Nature Reserve, DB29, 22.05.2005, 1 female. Błogie Nature Reserve, DB29, 5.06.2010, 1 female, BS. Pleszew, XT95, 30.04.2012, 5 males, 17 females, leg. P. Żurawlew. Puszcza Kampinoska, Truskaw, DC89, 25.04.2004, 1 male, leg. C. Bystrowski.

OUTER WESTERN CARPATHIANS. Krynica Zdrój, DV97, 11-15.05., 2 males, 9.05.2008 1 female, ŁM.

RUSSIA, Lake Baikal, Olchon, 17-20.06.2012, 1 male, 4 females, ŁM.

Abbreviations: BS – Bogusław Soszyński, MS – Mirosław Soszyński, ŁM – Łukasz Mielczarek.

D. neovenustus occurs earlier in the spring than *D. venustus*. In central Poland adults of *D. neovenustus* were observed between 16 April and 3 June (Fig. 5) while *D. venustus* occurred between 25 April and 13 June (Fig. 6). In both species males occurred earlier than

females. *D. neovenustus* was not collected from 1966 to 1974. In recent years the number of specimens collected has increased markedly (Fig. 7).

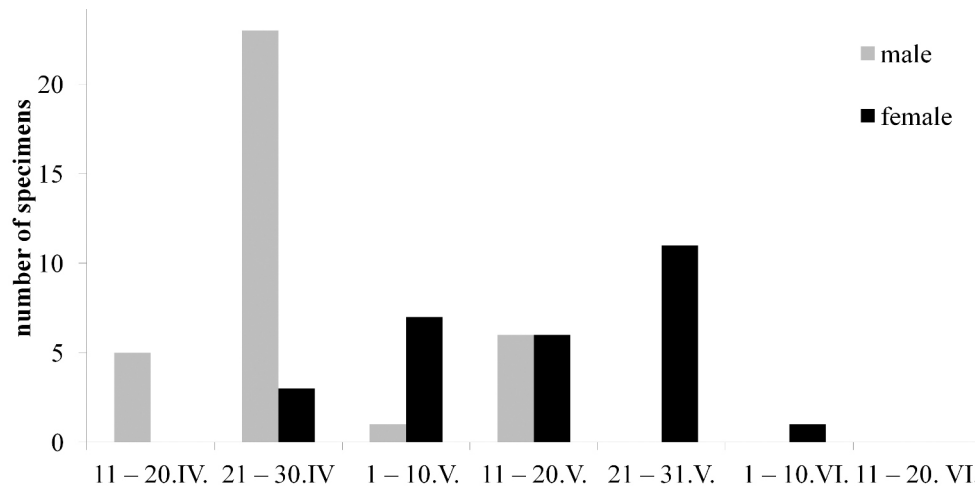


Fig. 5. Seasonal dynamics of *Dasyrphus neovenustus* sp. n. in 2010 in Poland, at Ceteń in the Spalski Landscape Park.

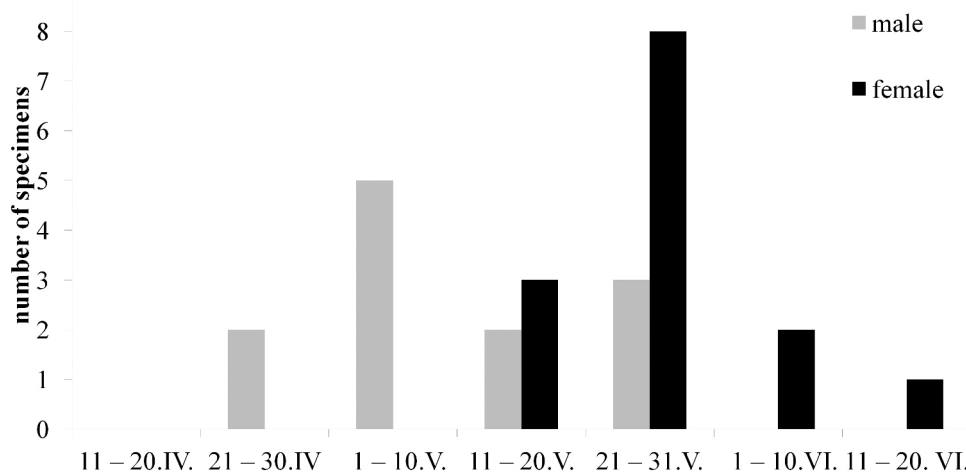


Fig. 6. Seasonal dynamics of *Dasyrphus venustus* in 2010 in Poland, at Ceteń in the Spalski Landscape Park.

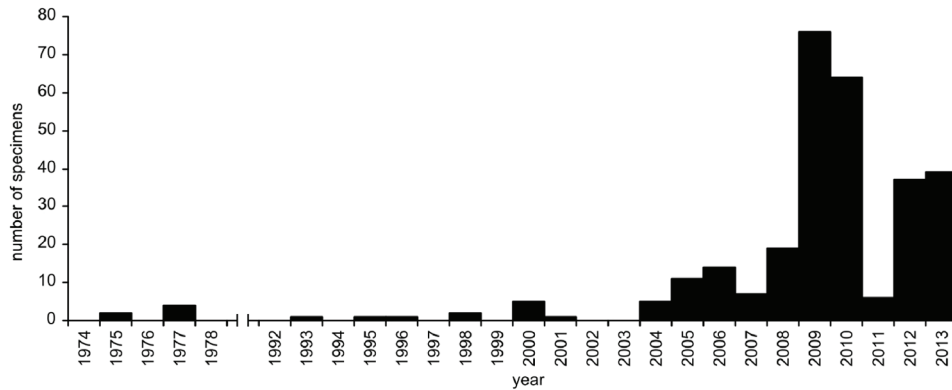


Fig. 7. Specimens of *Dasysyrphus neovenustus* collected from 1975 to 2013.

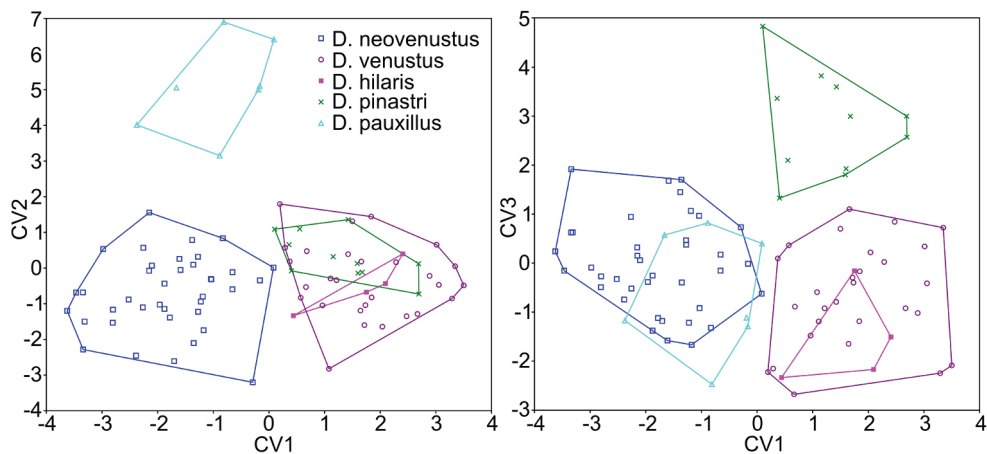


Fig. 8. Differences in wing venation between five species of *Dasysyrphus* shown by Canonical Variate Analysis. The first canonical variate (CV1) discriminated *D. neovenustus*, the second canonical variate (CV2) discriminated *D. pauxillus* and the third canonical variate (CV3) discriminated *D. pinastri* from other species. The analysis was based on the coordinates of the 13 landmarks shown in Fig. 1.

Wing analysis

Canonical Variate Analysis of the wing measurements showed that *D. neovenustus*, *D. pauxillus* and *D. pinastri* are very well differentiated (Fig. 8). Only *D. hilaris* and *D. venustus* are similar to each other. This suggests that *D. neovenustus* and *D. venustus* are separate species. Discriminant function analysis with leave-one-out cross-validation

enabled 86.8% of *D. neovenustus* males to be correctly classified. This value was lower than in *D. pinastri* but higher than in *D. pauxillus*, *D. venustus* and *D. hilaris*. The percentage of correctly classified individuals of the last species based on wing venation was particularly low (Table 2).

Table 2. Discrimination of five species of *Dasysyrphus* using discriminant function analysis with leave-one-out cross-validation. The discrimination was based on the coordinates of the 13 landmarks shown in Fig.1.

species						%
	<i>D. hilaris</i>	<i>D. neovenustus</i>	<i>D. pauxillus</i>	<i>D. pinastri</i>	<i>D. venustus</i>	correct
<i>D. hilaris</i>	1	1	0	0	2	25.0
<i>D. neovenustus</i>	0	33	1	1	3	86.8
<i>D. pauxillus</i>	0	0	6	1	0	85.7
<i>D. pinastri</i>	0	0	0	11	0	100.0
<i>D. venustus</i>	6	2	1	2	18	62.1

DISCUSSION

In this paper we describe a new distinct species of *Dasysyrphus*, which we have named *D. neovenustus*. The characters, which we use to describe the new species lie within the wide range of variation of *D. venustus* described in older publications (STACKELBERG 1988, BARKALOV 2007). The variation of the diagnostic characters within *D. neovenustus* is very low, in particular the rectangular black band on the second sternite (Figs 2b, 2d) was present in all the specimens examined. Only two males, one from Russia and another from Poland, differed markedly from typical specimens. The wings of the two males were brownish, which is probably a rare form of melanism. *D. neovenustus* and *D. venustus* differ not only in morphology but also in phenology, with *D. neovenustus* appearing earlier in spring (Figs 5-6).

Wings measurements confirmed that the new species is 1) distinct from other species, and 2) is most similar to *D. venustus* (Fig. 8). The wing measurements also revealed that *D. hilaris* and *D. venustus* are very similar (Fig. 8), and that they cannot be distinguished using wing measurements alone (Table 2). The differences in other diagnostic characters of the two species are also relatively small; in our opinion, therefore, they need to be carefully examined in future.

D. neovenustus probably appeared in Poland in the 1970s. This species is absent from the years 1966-1974 in the large entomological collection of one of the authors (BS); the number of specimens collected has increased markedly in recent years (Fig. 7). A similar increase in abundance has also been observed in other species of Syrphidae in Poland including: *Melangyna pavlovskyi* (VIOLOVITSH, 1956) (BYGEBJERK 2011, MIELCZAREK 2011), *Melangyna lucifera* NIELSEN, 1980 and *Pipiza accola* VIOLOVITSH, 1985 (unpublished data).

REFERENCES

- BARKALOV A.V. 2007. Hoverflies of the genus *Dasysyrphus* ENDERLEIN, 1937 (Diptera, Syrphidae) from the Urals, Siberia and the Far East. *Eurasian Entomological Journal* **6**: 273-298.
- BYGEBJERK R. 2011. A new European species in the genus *Melangyna* VERRALL, 1901 (Diptera: Syrphidae). *Entomologiske Meddelelser* **79**: 143-151.
- DOCZKAL D. 1996. Schwebfliegen aus Deutschland: Erstnachweise und wenig bekannte Arten (Diptera, Syrphidae). *Volucella* **2**: 36-62
- HAMMER Ø., HARPER D.A.T., RYAN P.D. 2001. PAST: Paleontological Statistics Software Package for Education and Data Analysis. *Palaeontologia Electronica* **4**: 1-9.
- HIPPA H., STAHL G. 2005. Morphological characters of adult Syrphidae: descriptions and phylogenetic utility. *Acta Zoologica Fennica* **215**.
- KLINGENBERG C.P. 2011. MorphoJ: an integrated software package for geometric morphometrics. *Molecular Ecology Resources* **11**: 353-357.
- KONDRACKI J. 2000. *Geografia regionalna Polski*. Wydawnictwo Naukowe PWN, Warszawa, 441 pp.
- LÁSKA P., BÍCIK V. 1996. On the problems of the species *Dasysyrphus venustus* (MEIGEN) and *D. hilaris* (ZETTERSTEDT) (Dipt., Syrphidae). *Entomological Monthly Magazine* **132**: 305-310.
- LOCKE M.M., SKEVINGTON J.H. 2013. Revision of Nearctic *Dasysyrphus* ENDERLEIN (Diptera: Syrphidae). *Zootaxa* **3660**: 1-80.
- MIELCZAREK Ł. 2011. Pierwsze stwierdzenie *Melangyna pavlovskyi* (VIOLOVITSH, 1956) (Diptera: Syrphidae) w Europie. *Dipteron* **27**: 43-47.
- SPEIGHT M.C.D., MONTEIL C., CASTELLA E., SARTHOU J.-P. 2010. [In:] SPEIGHT M.C.D., CASTELLA E., SARTHOU J.-P., MONTEIL C. (eds). *Syrph the Net on CD, Issue 7. The database of European Syrphidae*. Syrph the Net Publications, Dublin.
- STACKELBERG A.A. 1988. Family Syrphidae. [In:] BEI-BENKO G.YA. *Keys to the insects of the European part of the USSR. Vol. V. Diptera and Siphonaptera, Part II*: 11-147.
- TOFILSKI A. 2004. DrawWing, a program for numerical description of insect wings. *Journal of Insect Science* **4**: 1-5.
- VAN VEEN M.P. 2004. *Hoverflies of Northwest Europe: Identification keys to the Syrphidae*. KNNV Publishing, Utrecht, The Netherlands, 254 pp.

Received: 3 November 2013

Accepted: 17 November 2013