ON THE PROBLEMS OF THE SPECIES *DASYSYRPHUS VENUSTUS* (ZETTERSTEDT) AND *D. HILARIS* (MEIGEN) (DIPT., SYRPHIDAE)

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ABSTRACT

Eight features distinguishing female *Dasysyrphus venustus* from *D. hilaris* are described. Individual features of characteristic specimens mutually correlate to a high significance. A greater number than hitherto of intermediate specimens was also discovered. The validity of both species is discussed.

INTRODUCTION

Dasysyrphus hilaris was described as *Scaeva hilaris* by Zetterstedt in 1843. As a distinguishing feature from the related species *Dasysyrphus venustus* (Meig. 1822) the author noted especially that its face was without a black median stripe. However, the frequent occurrence of intermediate specimens, has led some authors to doubt the validity of *D. hilaris*, notably van der Goot (1981), Stubbs & Falk (1983), Torp (1984, 1994), Speight & Lucas (1992). This species is not mentioned by some earlier authors e.g. Sack (1930), Séguy (1961), Hippa (1968) and Nielsen (1971). Sack (1932) includes *hilaris* as a synonym of *venustus*. On the other hand, *D. hilaris* is recognized as a species by Trojanowa-Bańkowska (1959, 1963), Vockeroth (1969), Stackelberg (1970), Violovitsh (1983, who has *D. hilaris* as *D. venustus* and *D. venustus* as *D. arcuatus* Fallén, 1817), Dušek & Láska (1967, 1987), Bastian (1986) and Čepelák (1986).

As a contribution towards the solution of this problem, we have sampled numerous individuals of both controversial species, categorised several distinguishing features, and statistically evaluated their mutual correlation.

MATERIAL AND METHODS

The material of *D. venustus* and *D. hilaris* we have studied originates from the Czech Republic, Slovak Republic, Norway, Sweden and Poland. From a total of 91 females we chose 15 females with a black median, sharply defined stripe reaching the base of the antennae, and 15 females with plain yellow face. The former are marked as *D. venustus* and the latter as *D. hilaris*. The remaining 61 females are considered as more or less intermediate forms with transitive characters (e.g. black but not sharply defined facial stripe) and/or combinations of features of both species (*D. venustus* and *D. hilaris*). It was not possible unambiguously to evaluate those transitive characters.

All 30 specimens examined were placed in pairs, with one specimen of *D. venustus* considered along side one randomly chosen *D. hilaris*.

With each pair the following distinguishing features were also evaluated: degree of brightness of mesonotum and abdomen; the size of

dusted spots on the frons; the width of yellow bands on tergite 2; the presence and shape of the black band on sternite 2; the presence or absence of a dark spot on the tibia of the hind legs; different plumpness of the abdomen and the overall length of the body.

The sign test (Weber 1961) was chosen for statistical evaluation because some relative features cannot be expressed objectively.

The smaller sample of males collected was not sufficient for evaluation.

Material examined

D. venustus. Czech Republic: Moravia c.: Velký Újezd nr. Olomouc, 6.v.1985, 1♀ and 25.v.1985 4♀♀ (Láska leg.); Hrubá Voda nr. Olomouc, 24.v.1966 1♀ (Láska leg.); Náměšť na Hané, 8.v.1993, 1♀ (Bičík leg.); Bohemia b.: Lestkov nr. Chomutov, 15.v.1993, 2♀♀ (Mazánek leg.). Norway: Oslo-fjord, insula Ostøya, 31.v.1984, 4♀♀ (Bičík leg.). Sweden: Tovetorp nr. Gnesta, 4.vi.1980, 1♀ and 13.vi.1980, 1♀ (Bičík leg.).

D. hilaris. Czech Republic: Mor. c.: Velký Újezd, 25.v.1985, 1♀ (Láska leg.); Hrubá Voda, 20.v.1981, 1♀ and 6.vi.1984 1♀ (Láska leg.); Horka nr. Olomouc, 1.vi.1991 1♀ (Bičík leg.); Brodek nr. Prerov, 31.v.1993, 1♀ (Bičík leg.); Mor. b.: Svetlá Hora nr. Bruntál, 14.vi.1977, 1♀ (Láska leg.); Boh. b.: Lestkov nr. Chomutov, 15.v..1993, 3♀♀ and 2.vi.1993 3♀♀ (Mazánek leg.). Slovak Republic: Plešivec nr. Rožňava, 2.vi.1981, 1♀ (Bezděčka leg.). Sweden: Tovetorp nr. Gnesta, 13.vi.1980, 1♀ (Bičík leg.). Poland m.: Otmuchow lake, 6.vi.1992, 1♀ (Bičík leg.).

RESULTS

The results are summarised in Table 1. From this table, it is possible to observe that individual features are not randomly distributed but occur together to a statistically significant degree ($p = 0.001–0.011$). This bonding of features suggests that we probably cannot speak about usual variability of one species.

On the basis of our results two potentially valid species can be characterized in the following way:

Dasysyrphus venustus

Face with black median sharply defined line reaching almost to base of antennae. Oral margin narrowly black. Frons shining black almost undusted, at most dusted narrowly along eye margin. Mesonotum brightly shining. Hind tibia all yellow. Abdomen (fig. 1) broad, rather round, shining, yellow band on 2nd tergite narrow. Second sternite with black sharply defined transverse band, not reaching hind margin of sternite. Length 7–10 mm.

Dasysyrphus hilaris

Face without black sharply defined median stripe, oral margin black at sides, facial tubercle yellow or indefinitely darkened. Frons shining black with apparent dust spots occupying about 1/2–4/5 of width of frons. Mesonotum shining but not as brightly as in *D. venustus*. Hind tibia yellow with dark spot in the beginning of lower half. Abdomen (fig. 1) less round and less shining than in *D. venustus*. Yellow bands on tergites slightly broader than in *D. venustus*, especially on 2nd tergite. Second sternite yellow or indefinitely darkened. Length 8.8–11.2 mm.

The holotype of *D. hilaris* in the Department of Systematics, Zoological Institute, Lund (Sweden) is a headless female otherwise with features as described above.

TABLE 1. — DIFFERENCES OF CHARACTERS IN PAIRS OF FEMALE *D. HILARIS* AND *D. VENUSTUS*.

Pair number	Body more matt	Dust spots on frons more developed	Dark spot on hind tibia more developed	Light band on 2nd tergite broader	2nd sternite lighter	Abdomen more prolonged	Length of body greater
1	+	+	+	+	+	+	+
2	+	+	+	+	+	+	+
3	+	+	+	+	+	+	+
4	+	+	+	+	+	+–	+
5	+	+	+	+	+	+	+
6	+	+	+	+	+	+	+
7	+	+	+–	+	+	+	+
8	+	+–	+	+–	+	+–	+
9	+	+	+	+–	+	+	+
10	+	+	+	+	+	+	+
11	+	–	+–	+	+–	+	+
12	+–	+	+	+	+	+	+–
13	+–	+	+–	+	+	–	+
14	+–	+–	+–	–	+–	–	+
15	–	+	+	+	+	+	+–
Significance (p)	0.003	0.002	0.001	0.002	0.001	0.011	0.001

\+ = Character is more expressive in *D. hilaris* than in *D. venustus*
– = Character is more expressive in *D. venustus* than in *D. hilaris*
+– = No differences

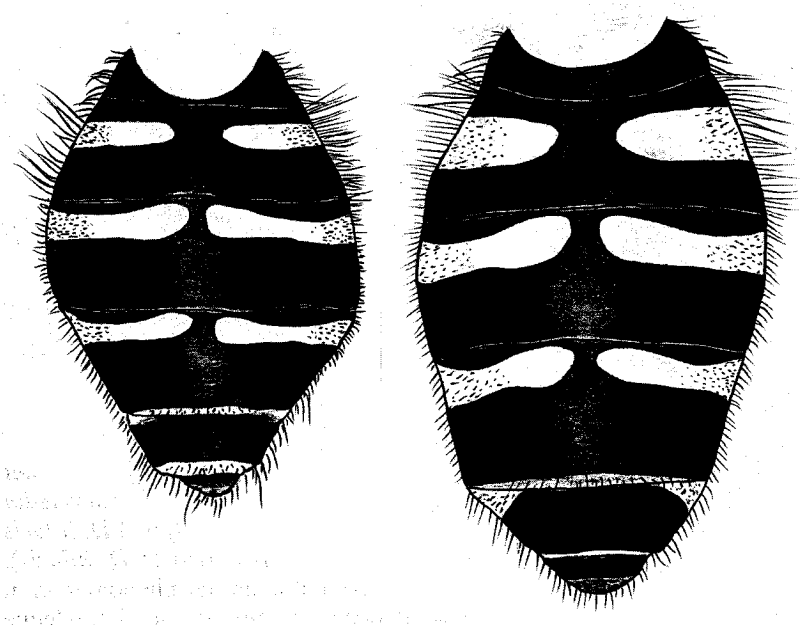

Fig. 1. — Abdomens of *Dasysyrphus venustus* (left) and *D. hilaris* (right).

DISCUSSION

On the basis of our present understanding we can conceive that *D. venustus* and *D. hilaris* are two related species living in the same localities, which could lead to crossbreeding or the possibility of crossbreeding. Hybrids can be probably less fertile or sterile. Most specimens may, however, be hybrids in certain localities. It is also known that related non-crossbreeding species, for example *Syrphus ribesii* (L.) and *S. vitripennis* Meig., live in the same localities.

The hybrid area of both species can be considerably broad. Crossbreeding of *D. venustus* and *D. hilaris* may be possible in all or a certain part of Europe. It is not excluded, for example, that in Siberia crossbreeding of these species does not take place or it just takes place sporadically. Violovitsh (1983), in his book about Siberian syrphids, has no doubts about the existence of two different species.

Trojanowa-Bańkowska (1959) differentiates males of *D. hilaris* and *D. venustus* also on the basic differences in the structure of the genitalia. The surstyli in *D. hilaris* are, in her opinion, narrower and more elongate than in *D. venustus*. This author separates females of *D. hilaris* from *D. venustus* not only by the absence of a distinct black facial stripe but also on the basis of facial pubescence. It is whitish-yellow in females of *D. hilaris* and brownish-black in *D. venustus*. These differences in colour of facial pubescence have not been statistically confirmed. Trojanowa-Bańkowska's statement that *D. hilaris* is a boreo-alpine species corresponds neither to her nor our findings.

Complicated genetic polymorphism in one species which is not caused by different temperatures during development in the immature stages, cannot be entirely excluded either. Such simpler polymorphism is known for example in *Adalia bipunctata* (L.), Coccinellidae, Coleoptera.

Without a detailed zoogeographical investigation, especially in the eastern Palaearctic, it cannot be stated with certainty at this stage whether we are considering two valid species. In order to solve this question we would require also experiments dealing with crossbreeding of both presupposed species and observation of the fertility of hybrids. This is, however, technically barely feasible.

In conclusion, we do not recommend referring both taxa we studied to *D. venustus* only. In those cases where *D. venustus* and *D. hilaris* are not considered by some authors as valid species, they should, at least, be referred to as forms of *D. venustus* (f. *venustus,* f. *intermedia* and f. *hilaris*) with the exploitation of the eight features we have given. A further possibility is to refer intermediate specimens to *D. venustus* f. *intermedia* (where the majority of features correspond to *D. venustus*) and *D. hilaris* f. *intermedia* (where the majority of features correspond to *D. hilaris*). Such a mode of reference is not customary but a similar phenomenon in taxonomy is not customary either. It helps to improve our knowledge about this remarkable syrphidological problem.

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[POSTSCRIPT. — After our manuscript had been submitted Dieter Doczkal in Germany began a study of the same problem. We understand that this author is of the same opinion that *Dasysyrphus venustus* and *D. hilaris* cannot be treated as one species. — P.L. & V.B.]