

# The Synonymy, Relationship, and Distribution of *Drosophila confusa* Stæger 1844 (Dipt.)

by

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In 1844 Stæger described a rather large, yellow species of *Drosophila* naming it *Drosophila confusa*. Stæger's description was written in Danish and has only been read by a few foreign dipterists, who mostly had their knowledge of *Drosophila confusa* from Zetterstedt's redescription in Latin (1847). Stæger chose the name *confusa* for his new species because he believed that it was identical with some specimens of *Drosophila* which had been wrongly identified as *Drosophila fenestrarum* Fallén by Meigen (1830). Furthermore Stæger held the opinion that his *D. confusa* was identical with the light variety of *D. funebris* Fabr. which Fallén had described in 1823. Whether the yellow species of *Drosophila* erroneously called *D. fenestrarum* by Meigen was actually Stæger's *D. confusa* and whether the latter is the same as Fallén's light variety of *D. funebris* Fabr. may perhaps never be settled and it is indeed a problem of minor interest.

Shortly after the publication of Stæger's paper Zetterstedt (1847) recorded *Drosophila confusa* from Sweden and in 1864 it was mentioned by Schiner from Austria. Later on, however, the name *D. confusa* became uncommon in the literature probably due to doubt about its identity. In the many important recent papers on the European fauna of *Drosophila* the name does not occur at all.

So far as the author knows, the most recent occurrence of the name in the taxonomic literature dealing

with the European species of *Drosophila* is in Duda's monograph from 1935. Duda accepted Stæger's point of view that *D. confusa* was identical with Fallén's variety of *D. funebris* Fabr. But contrary to Stæger, Duda did not regard it as a species different from *D. funebris* but merely as "young unhardened specimens of *funebris*".

The present author has had the opportunity of examining Stæger's collection of *Drosophilidae* which now belongs to the Zoological Museum of Copenhagen. This collection contains a series of specimens of *Drosophila* labelled *Drosophila confusa*. As was Stæger's custom, the series was not designated as a type series. It is, however, beyond reasonable doubt that the series really are the specimens on which Stæger based his description of *Drosophila confusa*. Thus it has been possible to determine the identity of this species.

Examination of the series showed that Stæger's *D. confusa* is clearly different from *D. funebris* Fabr. The two species are, however, of almost equal size and the shapes of the wings are very much alike, a fact to which Fallén paid much attention. Nevertheless, no modern observer would doubt that he was dealing with two different species. Firstly *D. confusa* is what in recent literature is called a yellow species whereas *D. funebris* is reddish brown. Secondly it may be mentioned that nothing like the curved teeth which are so conspicuous on the male anal plates of *D. funebris* occurs in *D. confusa*. On the basis of these two facts it is impossible to accept Duda's statement that the flies which Stæger called *D. confusa* were but young specimens of *D. funebris*. Furthermore Stæger explicitly characterized *D. confusa* as a forest species taken mainly on tree trunks in woods whereas *D. funebris* is a domestic species which is rather strictly confined to human habitation.

To the author Stæger's series showed a striking resemblance to *Drosophila grischuna* Burla 1950 which the

author had seen in Dr. Hans Burla's collection in Zürich. Stæger's specimens of *D. confusa* were therefore compared to Burla's description of *D. grischuna* and it was found that they agreed with this description on all points except two. The major disagreement was between the 4-c-indices, that of *D. grischuna* was stated to be 1.4 whereas that of *D. confusa* was about 0.7. The other and minor disagreement was in the colour pattern of the fifth and sixth tergites in the males. According to Burla's description *D. grischuna* has a dark marginal band on each of these two tergites whereas the specimens in Stæger's series show a variation from rather clearcut bands to almost completely yellow tergites.

At the author's request Dr. Burla kindly made new measurements of the 4-c-index in the type and syntypes of *D. grischuna* and found it to be about 0.7. The value 1.4 given in the original description is due to an error. Dr. Burla also kindly supplied the author with syntypes of *D. grischuna* for comparison with Stæger's *D. confusa*. This comparison disclosed no essential differences between the two species. The author was therefore of the opinion that they were identical, the continuous variation in the pattern of the two last tergites in males being of no consequence.

In order to test this statement Dr. Burla offered to examine the male genitalia of *D. confusa* and he has generously provided the author with the drawings shown in figure 2 and 3 of the genitalia of one of the specimens from Stæger's series. The preparations on which these drawings are based as well as the rest of the specimen are in the possession of the Zoological Museum of Copenhagen. This animal has now been chosen as a lectotype for *Drosophila confusa* Stæger 1844. In a covering letter Dr. Burla wrote that "Männchen von *grischuna* aus meiner Sammlung sind bis auf unbedeutende individuelle Abweichungen mit den Verhältnissen identisch, wie sie

in den Abbildungen zu sehen sind". Thus it has been demonstrated that *Drosophila grischuna* is but a redescription of *Drosophila confusa* Stæger.

The identity of *D. confusa* with *D. grischuna* having been proved, it became once more of importance to examine the difference between *D. confusa* = *D. grischuna* and *D. vibrissina* Duda 1924. Burla (1950) discussed the relation between *D. vibrissina* and his *D. grischuna* and reached the conclusion that they were two separate species. As *D. vibrissina* had been found only in Russia, Hungary, and Bohemia, Burla assumed that this species was confined to Eastern Europe only. This assumption was, however, invalidated when Basden found *D. vibrissina* in England (Basden *in litt.*). This information made it especially urgent to check once more the relationship between *D. confusa* = *D. grischuna* and *D. vibrissina* Duda.

Burla in comparing his *D. grischuna* with Duda's description of *D. vibrissina* from 1935 gave the following list of differences between the two species.

<i>D. vibrissina</i>	<i>D. grischuna</i>
1) Ocellar triangle lighter yellow than frons.	Ocellar triangle between the ocelli brown.
2) Middle orbital bristle very near to lower orbital.	Middle orbital relatively far behind the lower orbital.
3) Fifth and sixth tergites in ♀♀ completely yellow.	Fifth and sixth tergites with dark posterior bands.
4) Posterior margin of sixth tergite in ♂♂ with long black and strong bristles. In ♀♀ with fewer bristles.	The bristles on the posterior margin of sixth tergite in ♂♂ are not essentially different from those of the fifth tergite. There is no evident difference between ♂♂ and ♀♀ in this respect.
5) Ovipositor with basal dorsal indentation.	No indentation.
6) Second femur ventrally with a long thin bristle.	No such bristle.

The characteristics given above for *D. vibrissina* originate from Duda's description from 1935 which is more detailed than the original description from 1924.

In order to test the validity of these differences the author asked for the type of *D. vibrissina* Duda in "Deutsches Entomologisches Institut", Berlin. Prof. Dr. W. Hennig kindly send the author five specimens of *D. vibrissina* from Duda's collection. Two of these animals, a male and a female, were mounted together and labelled "Typus". It was not evident whether the male or the female was the type and they may therefore be regarded as syntypes. Besides the label which designated them as types they were labelled: "Mehadia 15. 7. 12, *D. vibrissina* n. nom. f. *histrion* Old. DET. Dr. O. Duda", "Coll. Oldenberg", and "Dtsch. Entomol. Institut Berlin".

Examination of the syntypes of *D. vibrissina* and comparison with Stæger's syntypes of *D. confusa* and with specimens of that species collected by the author revealed the following:

1) The ocellar triangle in *D. vibrissina* is not lighter than the frons. In the ♀ syntype it has almost the same colour as the frons whereas in the ♂ syntype it is brown and evidently darker than the frons.

2) The middle orbital bristle in *D. vibrissina* does not stand very near to the lower orbital. The position of the three orbitals is exactly the same as in *D. confusa*: the middle orbital stands slightly nearer to the upper orbital than it does to the lower orbital. It is worth mentioning that Duda in 1924 wrote that the position of the orbitals was normal. It was not before 1935 that he described the middle orbital as being very near to the lower.

3) The colour patterns on the fifth and sixth tergites in the ♀ syntypes of *D. vibrissina* are very weakly developed though it can be seen without doubt on the anterior of these two tergites. The colour pattern falls, however, well within the range of variation found in *D. confusa*. This variation is somewhat greater than it appeared from Burla's material. Again on this point there is a dif-

ference between Duda's two descriptions of *D. vibrissina*. In 1924 he described only the sixth tergite as definitely without posterior bands whereas he described 2nd—5th tergites as "dull yellow, bandless or with . . . black often very indistinct posterior bands" indicating a great variation.

4) There is no essential difference between the number and size of the bristles on the posterior margin of the sixth and fifth tergites in the ♂ syntype of *D. vibrissina*. Neither could any difference be seen between the ♂ and the ♀ syntypes in this respect.

5) The ♀ syntype of *D. vibrissina* shows a rather strong indentation in the ovipositor. This is, however, at least partly an artificial phenomenon due to shrinkage. All degrees of indentation can be seen among the specimens of Stæger's type series. Burla probably missed this "character" in his description of *D. grischuna* because he worked with relatively fresh material.

6) The syntypes of *D. confusa* — as well as the type and syntypes of *D. grischuna* (according to Dr. Burla) — possess the long thin bristle on the second femur mentioned by Duda. It is, however, often very difficult to see.

It appears that Burla (1950) was mistaken in supposing that there were differences between his *D. grischuna* and Duda's *D. vibrissina*. On the basis of the detailed comparison of *D. vibrissina* to the type series of *D. confusa* the author does not hesitate to consider that the two species are identical. Mr. E. B. Basden, of the Institute of Animal Genetics, Edinburgh, has kindly examined two specimens from Stæger's type series and the two syntypes of *D. vibrissina*, and has stated that "there is no doubt at all that *D. vibrissina* Duda is the same species as *confusa* Stæg. in Zett." (*in litt.*, May 4th, 1955).

Thus the following identity has been demonstrated:  
*Drosophila confusa* Stæger 1844 = *D. vibrissina* Duda 1924  
 = *D. grischuna* Burla 1950.

Below a full description of *D. confusa* is given.

***Drosophila confusa* Stæger 1844.**

The type series is kept in Coll. Stæger in the Zoological Museum of Copenhagen. A male specimen from the type series is designated *lectotypus* by me. The tip of the abdomen of this specimen has been removed in order to make a microscope preparation of the genitalia.

External Morphology of the Imagoes: ♀, ♂: Antennae yellow, arista with 7—10 branches, 9 being the most frequent number. In this case occur, besides the end fork, 5 long bristles above and 2 below the stem. Frons mat yellow, broadest posteriorly. The distance between the eyeborders measured at the limit between the frons and the face is approximately one half the width of the whole head measured at the same level. The orbital stripes are paler yellow than the frons. Anteriorly they diverge strongly from the eye margins so that the ends are separated from the eyes by a distance equal the width of the stripes. Middle orbital bristle is about one third the length of the lower orbital and about one fourth the length of the upper orbital. Middle orbital is placed slightly nearer to the upper than to the lower orbital. The limit of the ocellar triangle is well defined; between the ocelli the triangle is light brown, slightly shiny. Face yellow, slightly darker than the frons and somewhat shiny. Carina well developed, nose-shaped, paler than the face. Cheeks pale yellow, their greatest width about one fourth the greatest diameter of the eyes. Eyes dark red with a short sparse yellowish pile.

Mesonotum, scutellum, and pleura yellow, the dorsum often slightly darker than the other parts and somewhat shiny at least centrally. Pleura and lateral parts of mesonotum dusted white. Acrostichal hairs in 8 somewhat irregular rows. Two pairs of dorsocentral bristles, the anterior about half the length of the posterior. The two pairs

of scutellar bristles are equally long; anterior scutellars parallel or a little diverging. Two strong humeral bristles of almost equal length, if any difference is visible, the upper is the longer. Sterno-index: 0.6—0.8. Legs yellow, except last joint of tarsi which is brownish. First and second femora bear ventrally at their base a very fine long hair, which is almost as long as the width of the femora. All three pairs of tibiae with very fine and indefinite preapicals. First pair of tibiae without apical bristle. Second and third pairs of tibiae with a strong apical bristle, especially that of second tibiae.

Wings yellowish, veins yellowish brown. The strong costal fringe covers from two fifths to one half of the third costal segment. Second costal break with two almost equally long bristles, the upper of which is the stronger. Costal-index: 3.5; 4th-vein-index: 1.5; 4-c-index: 0.7; 5-x-index: 1.2.

Abdomen yellow, slightly shiny. First tergite may be completely yellow or may show some darkening along the posterior margin. Second to fifth tergites with broad brown posterior bands which often are less distinct on second and fifth tergites than on third and fourth tergites. The posterior bands are centrally interrupted both in males and in females and in males they usually do not reach the side margins of the tergites which are left yellow. In the females the bands on second to fifth tergites are more or less clearly interrupted also laterally but the most lateral section of the bands reaches the side margin of the tergite. The sixth tergite in females is most often entirely yellow but it may occasionally show traces of a darker band. The small hidden seventh tergite in females is entirely dark. In males the sixth and seventh tergites are dark brown. The colour patterns of the tergites vary considerably and a broad variation may be seen in a sample of specimens from one locality. The margins of the tergites bear long marginal hairs of about equal size on all tergites.



Body length (living specimens): 4—5 mm, the female being the larger.

Wing length: 3.7—4.5 mm.

Ovipositor is normally strongly exerted. Rather slender, long triangular, narrowly rounded at apex. Distal half and the whole ventral edge shiny brown chitinised; basal half, especially dorsally, less strongly chitinised. Sometimes the ovipositor shows dorsally an indentation which is due to shrinkage of the softer parts and which is most common and most evident in dried specimens.

25—30 small teeth along the edge (see figure 1). On the side of the ovipositor a row of 4—5 somewhat longer but finer teeth or hairs. Ventrally with a single long hair (on each side) which projects from the inner side of the edge.

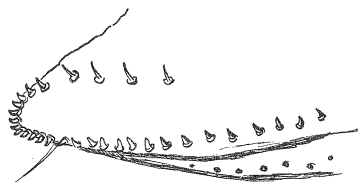


Figure 1: Ovipositor of *Drosophila confusa*, seen from the side and somewhat from below.

Male Genitalia are shown in figures 2 and 3. They have been considered from a comparative point of view by Nater (1953). In the following account the English terminology of Breuer & Pavan (1950) is used. The genital arch is drawn out ventrally in a pointed toe which possesses many long black bristles. The anal plates are completely free of the genital arch and their ventral corners are somewhat bluntly pointed. The forceps is halfmoon-shaped and bears a comb of about 8 primary teeth. Ventrally to the comb stands a cluster of about 14 strong teeth. The penis is almost three times as long as the apodeme. The arch of the hypandrium is rather slender, halfmoon-shaped. The shells of the hypandrium have each a strong hypandrial bristle.

Internal Characters of Imagines: Testes with three dark orange-coloured inner gyres and two and a half thicker orange-coloured outer gyres. The ejaculatory bulb without diverticulum.

Spermathecae small, yellowish brown. Ventral receptacle with three larger coils and a bulb of thinner coils.

The posterior Malpighian tubes fused, forming a loop around the gut.

The eggs have four thin filaments.

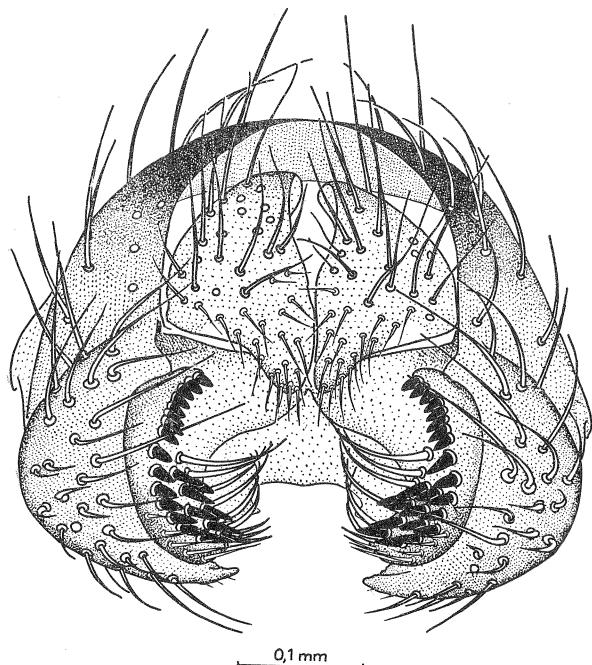


Figure 2: The dorso-terminal parts of the male genitalia of the lectotype of *D. confusa*: Genital arch, anal plates, forceps, and genital bridge. Preparation and drawing by Dr. H. Burla.

The puparium is brown. The length of the anterior spiracles is about one fourth the length of the puparium. The anterior spiracles bear each 16—18 branches.

Chromosomes: According to Burla (1950) the metaphase plate has five pairs of rods, one of which is the sex chromosomes, and a single pair of dots. The salivary gland chromosomes are made up of one very short and five very long arms.

Relationship: The following complex of characters indicates that *D. confusa* without any doubt belongs to the subgenus *Drosophila*: 1) four egg filaments, 2) long and coiled ventral receptacle, 3) spiral testes, 4) fused

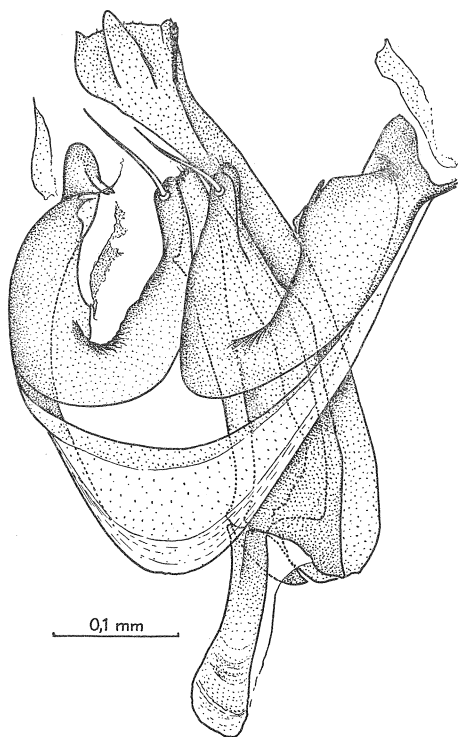


Figure 3: The ventral parts of the male genitalia of the lectotype of *D. confusa*: Penis, apodeme, arch of hypandrium, and shells of hypandrium. Preparation and drawing by Dr. H. Burla.

posterior Malpighian tubes, 5) centrally interrupted posterior bands on the tergites, 6) high sterno-index, and 7) long anterior spiracles on the puparium.

Inside the subgenus *Drosophila* it is, however, very difficult to fit the species into any of the existing species groups.

Nater (1953) has suggested a relationship with *D. pallida* Zett. based mainly on the ventral parts of the genitalia. Also the dorso-terminal genitalia of these two species have something in common, the toe of the genital arch is very pointed in both species and the dentation of the forceps of the two species may perhaps be homologous. On the other hand, *D. confusa* has no trace of the tooth-like bristles on the anal plates such as occur in *D. pallida*. Nater called attention also to the similarity of the anal plates of *D. confusa* to those of *D. emarginata* which, however, belongs to the *Saltans* group of the subgenus *Sophophora*.

The genitalia of *D. confusa* resemble most those described by Malogolowkin (1953) for the *Quinaria*, the *Guttifera*, the *Tripunctata*, the *Cardini*, the *Guarani*, and the *Calloptera* groups which constitute a cluster of closely related species groups in the subgenus *Drosophila*. Though it is not possible to fit *D. confusa* into any of these groups as they are defined today, it is most probable that *D. confusa* belongs to the same section of the subgenus *Drosophila*.

Distribution: *Drosophila confusa* is widespread over Europe where it is known from the following countries: Denmark (Stæger 1844, Zetterstedt 1847, Frydenberg 1956), Sweden (Zetterstedt 1847), Austria (Schiner 1864), Switzerland (Burla 1950, *D. grischuna*), Spain, France (Hadorn *et al.* 1951, *D. grischuna*), Hungary, Eastern Germany (Duda 1935, *D. vibrissina*), and England (Basden *in litt.*, several specimens in British Museum labelled *D. vibrissina*, examined by the author).

Biological Notes: In Denmark *D. confusa* has only been collected in woods. Several specimens in the collection of British Museum appeared to have been reared from fungi. Thus the species may be regarded as a fungus-feeder.

Synonyms: *D. vibrissina* Duda 1924 and *D. grischuna* Burla 1950. The former synonym has been used by Duda also in his monograph of 1935 and by Patterson & Stone (1952). The "*D. vibrissina*" treated by Balkaschina & Romaschoff (1935) and by Frolowa (1926) is most probably quite another species. The synonym *D. grischuna* Burla has been used by Hadorn *et al.* (1952) and by Nater (1953). The proper name *D. confusa* has been used erroneously quite often. This seems to be the case in the papers by Chatton (1912), Chatton & Alilaire (1908), Chatton & Léger (1911 a and b), and Delcourt (1909).

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