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A RECLASSIFICATION OF THE SUBFAMILIES AND GENERA OF THE NORTH AMERICAN SYRPHIDAE.

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The present classification is very largely based upon the original collection of Syrphidae used by Williston when writing his "*Synopsis of North American Syrphidae*." This collection, now in the U. S. National Museum, and supplemented by the accumulated material, both European and North American, of more recent years has supplied the writer with genotypes of all but twenty-four genera. Where genotype material was not available well-known species of their respective genera were resorted to. Access to several rare species was obtained through the kindness of Dr. J. M. Aldrich and Mr. C. T. Greene. In addition, the collections of Cornell University, the joint collection of Dr. E. G. Anderson and the author, as well as the collection of Mr. W. R. Walton, which he has given to the National Collection.

I wish here to record my name as being among the long list of young men whom Dr. Eugene A. Schwarz has favored with his great kindness and assistance in many ways. Besides helping me greatly in many indirect ways, Dr. Schwarz undertook to read my manuscript, thus aiding greatly in smoothing the language, insuring correct usage of terminology and helping in the construction of scientific names and phrases.

Williston, in his well-known "*Synopsis of North American Syrphidae*," 1886, page xiii, states: "While, as a general rule, the

Syrphidae present excellent specific characters, there is a remarkable dearth of generic or group characters."

Metcalf in his "*Syrphidae of Ohio*" (Ohio State Univ. Bull. xvii, no. 31), the largest treatise to appear on the North American *Syrphidae* since Williston's Synopsis, also speaks of the great difficulty in breaking up the family into subfamilies. He states: "It seems to me almost certain that a complete study of larval characteristics and habits, together with what is known of the imagoes, will make possible a satisfactory division of this large family into subfamilies, which is conceded impossible from a consideration of the imagoes alone. The family characters are simple and very definite. The species are also for the most part reasonably distinct. But the presence of many vexing, intermediate forms makes it almost impossible to break the family up into satisfactory subfamilies or in some cases to group the species into genera."

In the present study of the *Syrphidae* an earnest attempt has been made to discover structural characters for dividing the family into subfamilies which would contain natural groups of genera, and, in addition, to give characters for the definition of the genera themselves. Rather a notable success has been made with one group, namely, the *Syrphinae*. This group is characterized by having the humeral calli, and the region between them, destitute of pile; abdomen of both sexes always composed of five visible segments exclusive of genitalia; and, further, it contains all of the aphidophagous species except those of *Pipiza*—a biological character of considerable significance. By using these and supplementary characters, given in the table of subfamilies, the *Syrphinae*, in the old sense, have been split in two; the genera removed therefrom have mostly been considered here as composing the subfamily *Chilosinae*. By this division the classification of the *Syrphinae* and *Chilosinae* has been greatly facilitated; however, there is still much to be desired in classifying the genera of the *Syrphinae*, even as they now stand.

The genus *Chrysotoxum*, which has been variously associated with *Microdon*, *Sphecomyia* and *Callicera*, and also has been considered as a separate subfamily unto itself, is undeniably a member of the *Syrphinae*.

Characters of the family Syrphidae.

Antennae three-jointed; usually with a dorsal arista, rarely with a terminal style; third vein of the wings without an anterior branch; anal cell acute and prolonged nearly to the wing margin; either a spurious vein present between the third and fourth veins, or a subsquamal plumose filament (the plumula) present, usually both present; empodium bristle-like; hypopygium asymmetrical, an elongated meso-coxal projection present on middle coxae.

TABLE OF SUBFAMILIES OF SYRPHIDAE.

1. Chitinous parts of body thickly punctate; prostigma placed on cephalic aspect of thorax, thorax being foreshortened; abdomen of both sexes consisting of four visible segments; arista as short as the width of third antennal joint; spurious vein of anal cell (elsewhere called the anal furrow, see figure of *Chilosia* wing) very short, not extending as far as anal lobe incision; eyes faintly pubescent. Medium-sized flies.....**Nausigasterinae.**
 - Body not punctate and otherwise not as above.....2.
2. Antennae very elongate and with a terminal style; anterior crossvein joining discal cell at or beyond the middle; usually an adventitious branch extending into discal cell from third vein; face produced downwards, bare; plumula absent; males holoptic, and with only four visible abdominal segments; females with five abdominal segments.
Ceriodinae.
 - Antennae without a terminal style, excepting in *Callicera* and *Pelecocera*, but these genera have the anterior crossvein joining the discal cell well before the middle.....3.
3. Antennae very elongate, with a bare dorsal arista; face evenly and gently arched, never produced forward at oral margin and entirely clothed with pile; a stigmatal crossvein present; third vein usually (absent only in *Mixogaster*: rather slender flies with yellow abdominal bands) with an adventitious and free branch projecting into the discal cell; apical crossvein upright or recurrent; both sexes with three to four visible abdominal segments exclusive of genitalia; males dichoptic.....**Microdontinae.**
 - Antennae not elongate and possessing dorsal arista, excepting in a few genera, which are without a stigmatal crossvein, and the apical crossvein is parallel with the wing margin

- (*Chrysotoxum* and *Sphecomyia*); or, if the apical crossvein is upright or recurrent (*Chrysogaster*: small, broad, black species), then the mouth is produced forward.....4.
4. The humeral calli and region between them distinctly destitute of pile, the head being "cupped" over the anterior end of thorax, causing the pile to end abruptly behind the posterior margin of humeral region (the head may have to be removed to permit examination); antennae placed well above middle of head; arista usually a little shorter than length of antennae; abdomen of *both* sexes with five visible segments exclusive of genitalia; anterior crossvein placed well before middle of discal cell.....**Syrphinae.**
- Pile extending upon the humeral region; abdomen of males with only four visible segments exclusive of hypopygium, females with five.....5.
5. Apical crossvein recurrent at distal end; marginal cell closed; arista with either long or very dense plumosity; face protruding downwards; wings broad; alula very broad; squamae usually very broad; thorax frequently bearing bristles**Volucellinae.**
- Apical crossvein parallel with wing margin, or, if recurrent (*Chrysogaster*, *Eumerus* and *Merodon*), the arista is bare6.
6. Arista long plumose for at least the greater two-thirds of its length; marginal cell open; anterior crossvein placed near or beyond middle of discal cell; either yellow markings present on abdomen, or with dense pile more or less yellow, except *Pyritis*, which has long dense brownish pile; face protruding downwards, or swollen, or tuberculate; *the right prong (or style, Metcalf) of the forceps of the genitalia is longer than the left one and tapers to a sharp point, the left prong developed as an obtuse lobe.*..**Sericomyinae.**
- Arista rarely long plumose for one-half its length or more, in such cases some (certain species of *Eristalis*) may be excluded by the closed marginal cell; others (certain *Chilosia*) can be excluded by the absence of yellow body markings or yellow pile, and by having the anterior crossvein placed well before middle of discal cell; finally, the prongs of the genitalia are similar.....7.
7. Very large yellow and black species; the post stigma very elongate, being very nearly twice as long as broad; marginal cell closed; third vein with a downward loop into discal cell; sixth vein recurrent beyond anal cell; shape of

head, position of antennae and length of arista similar to the *Xylota* type (figure 4), but the face is broadly covered with loose pile (*Milesia* only).....**Milesinae.**

- Length of post stigma one and one-half times or less that of width, and otherwise without above combination of characters8.

8. Third longitudinal vein with a deep downward loop into discal cell; face, except for a medium stripe, clothed with long pile; sixth vein entering margin of wing a short distance beyond anal cell, *i.e.*, usual distance; thorax never bearing bristles; marginal cell closed in *Eristalis* and *Meromacrus*.

Eristalinae.

- Third longitudinal vein usually straight, but in such cases where it is looped downwards (*Pterallastes* and *Teuchocnemis*) the face is bare, except for a few hairs along eye margins, and sixth vein is prolonged well forward beyond anal cell. (The bare face also excludes *Tropidia* and *Syritta* from *Eristalinae*, while the bristles on the thorax and the brassy color excludes *Chrysochlamys*).....9.

9. Anterior crossvein placed before middle of discal cell; third vein always straight; antennae sometimes with terminal style (*Callicera* and *Pelecocera*).....**Chilosinae.**

- Anterior crossvein joining discal cell at or beyond middle; face rarely covered with pile and in such cases third vein is always straight.....**Xylotinae.**

Remarks on the family, subfamilies and genera.

The present paper is the outcome of a search that was made for characters which would more clearly show from which family, or group of families, the *Syrphidae* were derived, and to what group it gave rise, if any. The quest in this direction has, so far, given meager results. Apparently the existing families of *Diptera* are, for the most part, so isolated from each other that it is impossible to closely trace true lines of descent.

The long anal cell, extending nearly to the wing margin, undoubtedly connects the *Syrphidae* to those families of the *Brachycera* that have a long anal cell. Likewise the broad, flat abdomen, common to most *Syrphidae*, with the sides of the tergites not folding downwards and under, indicate close affinities to the *Brachycera*. But between its closest allies of the *Brachycera*,

probably the *Bombyliidae*, there is a tremendous gap, and apparently no connectant links are existent today. The short anal cell and enfolding (arched) tergites of the *Empididae* and *Dolichopodidae* preclude allying these families with the *Syrphidae*.

There is good evidence that the *Platyphezidae* and *Pipunculidae* are closely related to the *Syrphidae*, but they are probably independent groups derived from the ancestral stock of the *Syrphidae* and not, as is frequently considered, offshoots of the *Syrphidae* through *Baccha* and *Paragus*; nor are they the ancestral stock as has been supposed by some authors.

Pipunculus, through its wing venation, parasitic habits, and the possession of a chitinous ovipositor, leads naturally to *Dalmania* of the *Conopidae*; and probably the other extreme of the *Conopidae*—i.e., *Conops* et al.—lead on to *Pyrgota* (*Ortalidae*).

The similarity in appearance between *Nephrocerus* and *Baccha* is, at the best, only superficial, since *Nephrocerus* does not possess any of several characters peculiar to *Baccha* and the *Syrphinae* in general. The pile present on the humeral calli in *Nephrocerus* is as long as elsewhere on the mesonotum; there is no plumula; no tongue-like projection of thin chitin on the middle coxa (see below), and no short vertical fold in the wing just beyond the post anal section of the sixth vein; the tergites are arched, i.e., folding under.

The asserted relationship between *Syrphidae* and *Conopidae*, through *Ceroides* and *Conops*, is utterly erroneous. There is nothing in common between the two genera except their great superficial resemblance!

Without doubt the *Syrphidae* represent a free branch of the *Diptera*, specializing in their own *Syrphidid* way, which is at an angle from the central line of descent of the order, and not leading through any subbranch or its main branch to any of the other cyclorrhaphous families.

A number of the accepted genera of the *Syrphidae* are, in reality, composed of merely aberrant species or represent at best subgenera. Some of them are heterogeneous groups based upon superficial resemblances. There have been a number of instances where new genera could have been described on characters as

strong, and even stronger, than some of those heretofore used. For the present it has been deemed best to keep the same genera so far described and accepted and to add just as few to our list as possible. In only one case has a new genus been erected, namely, *Eumyiolepta*, type *Myiolepta strigilata*. In this case the color of the face made it impossible to conveniently include it under *Myiolepta* in the table, and the structure of the pile of the body is so distinct it is easy to recognize the form as a separate genus. The European genus *Doros* has been included to contain our species *Xanthogramma aequalis*. *Cynorrhina*, formerly considered a subgenus, is here considered of generic rank.

Several tropical genera included in Williston's *Manual*, but of which there is no material at hand, have not been included, as it is impossible to place them in their respective subfamilies. These are listed at the end of the table of genera. *Senogaster* (= *Acrochordonodes*) is of tropical distribution and of very doubtful occurrence in our fauna, hence is not included.

Several more or less radical changes have been made in the status of the subfamilies, but it is believed that they are more clearly defined than before, and an attempt has been made to take care of all aberrant forms. With the subfamilies "circumscribed" on their present basis, it is hoped that other workers will be able to choose a group to greater advantage and will work up the genera in more detail, placing them, thereby, on a more nearly equal rank, and at the same time improve the classification of the species. It is also hoped that structural characters will be used in place of color, for such do exist. Structural characters are more obscure than color differences, but we of the present day, through the aid of the binocular microscope, enjoy a great advantage over Williston and his contemporaries. With our modern means we are enabled to discover many characters that could not have been seen with the olden hand lens that Williston and his colleagues were forced to use.

SYRPHINAE.

The characters of the bare humeral calli; abdomen of both sexes consisting of five visible segments exclusive of genitalia (*Eupeodes volucris* O. S. illustrates this character best); the loca-

tion of the spiracle of the third abdominal sternite (being located in the middle of the membranous parts on the sides of the sternites, whereas in the other groups it is placed in or near the anterior corners), all serve to very definitely separate this subfamily from the others. In addition, it contains all of the aphidophagous forms, except those of *Pipiza*, a biological character of considerable importance. The hitherto aberrant-considered genus, *Chrysotoxum*, undoubtedly belongs here.

The above characters seem to indicate that the *Syrphidae* have split into two main groups: the Syrphinae, and all of the other groups considered collectively; and that the Syrphinae are specializing in structure from the cephalic aspect and the remainder of the family from the caudal aspect. Nausigasterinae are an exception to both of these groups, as they appear to be specializing from both aspects.

The genera of the Syrphinae have not yet been defined satisfactorily. Many of them have been based on weak characters and frequently there are neither distinct nor, sometimes, natural divisions. The Melanostomini are not sharply defined from the Syrphini; several species in *Syrphus* are doubtfully retained there. The generic limits in the Melanostomini are very weak, being based mostly on male characters. *Rhysops* and *Xanthandrus* are not separated in the table from *Melanostoma*.

A number of the present genera of Syrphini are in reality merely aberrant species of the genus *Syrphus*; and in the case of *Didea*, *D. laxa* should, according to the present concepts, be placed in a genus of its own, or more preferably be considered congeneric with *Syrphus*; it shows more relationship with species of *Syrphus* than with *D. fuscipes*.

Likewise the genus *Xanthogramma* is a heterogenous one; *X. flavipes* is a typical *Xanthogramma*. The remaining species have very little of the habitus of *flavipes* and evidently are more or less unrelated species of *Syrphus* with yellow lateral mesonotum margins. The European genus *Doros* is here included for *Xanthogramma aequalis* Lw.

Ocyptamus (*Baccha*) *jactator* Lw. clearly connects the *Bacchini* with *Syrphus*.

(Continued in December number)



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