Unravelling a hotchpotch

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1 General introduction

Hoverfly diversity and its taxonomic exploration: a geographical paradox

Hoverflies or flower flies are well-known insects to anyone with even a slight interest for nature. Their ability to hover (hence the first name) and their predilection for flowers (hence the other) make them easy to spot, especially on sunny days. Another conspicuous aspect of their lifestyle is their resemblance to stinging insects like (bumble)bees and wasps. This so-called mimicry has a deterring effect on potential predators: a hungry bird will think twice before eating a fly when it looks like a wasp.

Worldwide, approximately 6000 species of hoverflies (Diptera: Syrphidae) have been described (Thompson & Rotheray 1998). As with most other animals, the hoverfly fauna of the temperate regions is relatively well known. Especially the European species receive much attention from biologists, both professionals and amateurs. In the tropics this is different. Diversity in the tropics is large but underexplored, and many species are undescribed. For instance, an approximate number of 1600 species of hoverflies are described from South America, whereas an almost equal number is known from the Palaearctic region (Europe and the temperate parts of Asia). However, it is estimated that the actual number of hoverfly species in South America probably well exceeds 3000 (Thompson 1999), so more than half of this continent's diversity is currently undescribed.

In general, the larger the number of hoverfly species occurring in a region, the smaller the proportion of described species. This is certainly true for the group of species forming the subject of this PhD thesis: the hoverflies of the subfamily Microdontinae. In terms of species numbers, this is mainly a tropical group of flies. For instance, around 150 species are known from South America, whereas only around five occur in Europe. As a consequence, the Microdontinae are the least known of all three currently recognized subfamilies of hoverflies. This is unfortunate, considering its aberrant lifestyle and the astounding array of morphological characters in the adult stage.

The Microdontinae as a taxonomic hotchpotch

Williston (1886: xiii) experienced considerable difficulties in his attempts to classify the Syrphidae: "The richness in species, the many intermediate forms, the absence of marked plastic variations, all tend to make the family in its subdivision an exceedingly difficult one to define with clearness." Several decades later, important progress had been made in the classification of Syrphidae (e.g. Sack 1928-1932, Shiraki 1930). Despite this, similar statements were made by Bezzi (1915), Shannon (1927) and Curran (1941), but now addressed specifically at the subfamily Microdontinae alone: "There are numerous structural differences in the group, seemingly well fitted for generic uses (...). The characters, however, do not lend themselves to this purpose as they do not include natural groups and frequently they appear to be of only specific importance, or are shared in common only by a few closely allied species" (Shannon 1927: 17).

Since Shannon (1927) and Curran (1941), there have been few attempts to define morphological groups within the Microdontinae. Hull (1949) presented the first comprehensive treatment of the subfamily, defining previously described genus groups and introducing some new ones. More than half a century later Cheng & Thompson (2008) published a second overview, which makes clear that the number of genus group names has obviously increased since the days of Williston (1886): 59 genus group names are available (misspellings excluded), 37 of which they consider valid. Nevertheless, still more than 300 out of over 500 available species names are classified in the single genus *Microdon* Meigen, despite large morphological differences between the species. This 'dustbin-approach' of grouping such a large variety of species into one genus merely illustrates the fact that the group constitutes one of the great challenges in syrphid taxonomy. More details on the history of the classification of this group will be given in Chapter 5.

Objects and outline of this thesis

Because of their large morphological diversity, highly specialized biology and worldwide distribution, Microdontinae offer a wealth of possibilities for research on speciation, evolution of host specialization and historical biogeography. However, the fundamental framework for such research, a phylogenetic classification of supraspecific taxa, is currently unavailable. In addition, species identification in tropical areas is almost impossible due to the lack of revisionary work. The present thesis constitutes an attempt to change this situation, by providing a taxonomic framework that can serve to improve the knowledge on Microdontinae.

The three main objectives of this thesis are:

- To develop a phylogenetic hypothesis of Microdontinae, based on both molecular and morphological characters (Chapters 3 and 4).
- To propose a generic classification of Microdontinae, based on the phylogenetic results and detailed comparisons of morphology (Chapter 5).
- To classify all species-group names into (sub)genera (Chapter 5).

Additional aims are:

- To construct an identification key to all genera and species groups (Chapter 5).
- To prepare a revision of the stingless bee-mimicking species of Microdontinae formerly grouped under *Ubristes* s.l. (Chapter 6).
- To assemble published and non-published information about associations of Microdontinae with ants, in order to learn more about the evolution of host-association (Chapter 7).
- To describe the biogeography of the subfamily (Chapter 8).

References

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Few insects have occasioned more perplexity in the minds of entomologists than the species of Microdon (...).

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