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AN ATTEMPT AT THE SUBFAMILY CLASSIFICATION OF THE GOMPHIDAE, BASED ON SOME NEW INTERPRETATIONS OF WING VENATION (ANISOPTERA)

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In order to obtain a more natural classification, the currently adopted subfamily groupings are defined on venational characters partly different from those used by FRASER (1957, *A reclassification of the order Odonata.* R. zool. Soc. N.S.W., Sydney).

INTRODUCTION

A reconsideration of FRASER's (1957) classification of the order has revealed that a number of genera of the Gomphidae are controversially placed in some subfamilies. Besides, advance in our knowledge of the Gomphidae learns that many of the diagnostic characters hitherto used for the definition of the subfamily groupings have become invalid due to "aberrant" species. Consequently, Fraser's key appears inaccurate for a number of genera. In order to meet these objections, a key has been constructed with partly other venational characters than used by FRASER (1957).

CONSIDERATIONS ON THE CLASSIFICATION

The cross-veins of the subtriangles, supratriangles and discoidal triangles disappear in this order in the diverse genera. The last degree of reduction in the number of traversing veins in the fore wing subtriangle is only found in the Epigomphinae. Gomphinae and Hageninae. Genera pertaining to these subfamilies have these subtriangles uncrossed without exception. The condition, "crossed/uncrossed", is used here as a character in the grouping of the genera.

WILLIAMSON (1920) already stated that "uncrossed discoidal triangles"

is not an infallible character of the *Gomphus* series, on the basis of features found in *Davidius*. But uncrossed supratriangles is not an infallible character of the *Gomphus* series either, since *Davidius nanus* has the supratriangle occasionally crossed (cf. WILLIAMSON, 1907). Thus *Davidius* is peculiar by the reduced and specialized antefurcial cross-veins between M1-3 and M4, and by the symmetrical forking of M1-2 and M3. However, the symmetry of the fork M1-2 and M3 is not an infallible character of the *Gomphus* series as clearly appears from the wings of *Trigomphus* (cf. ASAHINA & WATSON, 1960). Apparently the occurrence of highly specialized antefurcial cross-veins between M1-3 and M4 is essential for the *Gomphus* series i.e. the Gomphinae. The last degree of reduction in the number of antefurcial cross-veins between M1-3 and M4 (intermedian cross-veins) is found in the hind wings of gomphine genera only. This character is here employed as a criterion for subfamily classification purposes. Species pertaining to gomphine genera may possess individuals having more than the minimum number of intermedian cross-veins in the hind wings (cf. LIEFTINCK, 1939) but these species are forming a natural group with the congeners showing that minimum i.e. one intermedian cross-vein. Thus gomphine genera are peculiar in containing species at least some individuals of which possess a single intermedian cross-vein in the hind wings or in one of the hind wings.

Uncrossed discoidal triangles and supratriangles are also not an infallible character of the *Epigomphus* series i.e. the Epigomphinae. CALVERT (1920) already stated that *Epigomphus* has crossed discoidal triangles and supratriangles in a small percentage of cases. ST. QUENTIN (1973) placed on record a male of *Cyanogomphus uncatus* which has a crossed discoidal triangle in both hind wings. Further, in my collection there is a male of *Agriogomphus ericae* with a crossed discoidal triangle in one of the hind wings while another male of the same species has a crossed discoidal triangle in the right hind wing and a crossed supratriangle in the left hind wing.

The Hageninae have crossed discoidal triangles and occasionally also crossed supratriangles (cf. SELYS & HAGEN, 1858: pl. 23, fig. 6). The Hageninae are distinguished from the Epigomphinae by the presence of a distinct trigonal supplement.

The occurrence of crossed fore wing subtriangles is restricted to the Gomphoidinae and Ictinogomphinae. A unique character of the Ictinogomphinae, namely the presence of a strongly developed sector of Rs (cf. WILLIAMSON, 1920), is used here for separating these two subfamilies.

Uncrossed fore wing subtriangles occur in individuals of gomphoidine species but these examples are again forming a natural group with congeners in which these are crossed.

WILLIAMSON (1920) placed *Diaphlebia* in the *Progomphus* series but the subtriangles are never crossed in the former genus (the discoidal triangles

are generally crossed and the supratriangles only occasionally). Also in *Zonophora* the subtriangles are never crossed (the discoidal triangles are crossed and the supratriangles sometimes; cf. BELLE, 1963). Both genera are therefore transferred into the Epigomphinae.

Summarizing the above, the classification of the family is constructed as shown in the following scheme:

(1) In all gomphoidine genera, although in some species of them not in all individuals, the fore wing subtriangles are crossed.
(2) In the Ictinogomphinae such subtriangles also occur, but the subfamily is peculiar by the presence of a forked radial sector.
(3) In the fore wing subtriangles of the Epigomphinae, Gomphinae and Hageninae the cross-veins are lacking without exception. The three subfamilies can be characterized as follows:
   (a) Epigomphinae and Hageninae possess two or more intermedian cross-veins in the hind wings; the latter subfamily is characterized by the presence of a trigonal supplement which is lacking in the former.
   (b) In the Gomphinae hind wings the reduction has gone a step further, and within the genus a single intermedian cross-vein occurs.

KEY TO THE SUBFAMILIES OF THE GOMPHIDAE

1	Fore wing subtriangles with cross-vein(s) in most specimens	2
—	Fore wing subtriangles without cross-vein	3
2	Radial sector forked	Ictinogomphinae
—	Radial sector not forked	Gomphoidinae
3	In hind wings a single intermedian cross-vein may occur	Gomphinae
—	In hind wings never less than two intermedian cross veins	4
4	Trigonal supplement present	Hageninae
—	Trigonal supplement lacking	Epigomphinae

CLASSIFICATION OF THE GENERA OF THE GOMPHIDAE

Ictinogomphinae: *Austrictinogomphus* Fraser, *Cacoides* Cowley, *Diastatomma* Selys, *Gomphidia* Selys, *Ictinogomphus* Cowley, *Indictinogomphus* Fraser, *Lindenia* Selys, *Sinictinogomphus* Fraser.

Gomphoidinae: *Aphylla* Selys, *Gomphoides* Selys, *Phyllocycla* Calvert, *Phyllogomphoides* Belle, *Progomphus* Selys.

Epigomphinae: *Africogomphus* Laidlaw, *Agriogomphus* Selys, *Archaeogomphus* Williamson, *Austroepigomphus* Fraser, *Cyanogomphus* Selys, *Diaphlebia* Selys (*Desmogomphus* Williamson, *Perigomphus* Belle),

Eogomphus Needham, *Epigomphus* Selys (*Eugomphus* Kennedy), *Fukienogomphus* Chao, *Heliogomphus* Laidlaw, *Hemigomphus* Selys, *Leptogomphus* Selys, *Macrogomphus* Selys, *Microgomphus* Selys, *Mitragomphus* Needham, *Nepogomphoides* Fraser, *Perissogomphus* Laidlaw, *Peruviogomphus* Klots, *Phaenandrogomphus* Lieftinck, *Tragogomphus* Sjöstedt, *Zonophora* Selys.

Hageninae: *Hagenius* Selys, *Sieboldius* Selys.

Gomphinae: *Acrogomphus* Fraser, *Amphigomphus* Chao, *Anisogomphus* Selys, *Anormogomphus* Selys, *Antipodogomphus* Fraser, *Arigomphus* Needham, *Austrogomphus* Selys, *Burmagomphus* Williamson, *Ceratogomphus* Selys, *Crenigomphus* Selys, *Cyclogomphus* Selys, *Davidioides* Fraser, *Davidius* Selys, *Dromogomphus* Selys, *Erpetogomphus* Selys, *Gastrogomphus* Needham, *Gomphus* Leach (*Gomphurus* Needham, *Hylogomphus* Needham, *Stylurus* Needham), *Allogomphus* Needham, *Isomma* Selys, *Labrogomphus* Needham, *Lamelligomphus* Fraser, *Lanthus* Needham, *Lestinogomphus* Martin, *Megalogomphus* Campion, *Merogomphus* Laidlaw, *Neogomphus* Selys, *Nepogomphus* Fraser, *Neurogomphus* Karsch, *Nihonogomphus* Oguma, *Notogomphus* Karsch, *Octogomphus* Selys, *Ophiogomphus* Selys, *Onychogomphus* Selys, *Paragomphus* Cowley, *Phyllogomphus* Selys, *Platygomphus* Selys, *Sinogomphus* May, *Stylogomphus* Fraser, *Temnogomphus* Laidlaw, *Trigomphus* Bartenef.

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