

THE STATUS OF THE TAXONOMY OF THE MAYFLY (EPHEMEROPTERA) FAUNA OF SOUTH AMERICA

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ABSTRACT

A total of 375 nominal species representing 91 genera in 13 families are presently known in South America. The family Leptophlebiidae is presently the most diverse group representing 38 % of the mayfly genera and 30 % of the species in the region. Brazil and Argentina have the highest number of mayfly taxa known followed distantly by Peru and Chile. Approximately 60 % of the South American genera and 80 % of the species are endemic to the region. A high percentage of taxa that are known from only one life stage, disparity of the fauna known from different countries, and lack of communication and information exchange among mayfly workers are some of the problems with mayfly taxonomic studies of the region.

INTRODUCTION

It has been roughly two centuries since Weber (1801) described the first South American mayfly species, *Ephemera atrostoma*. This first species has an interesting taxonomic history. Pictet (1843) transferred it to *Palingenia* without any explanation, but Eaton (1871) thought that the species belonged to the genus *Hexagenia* Walsh. However, Eaton later (1883) transferred the species back to *Palingenia*. Lestage (1931) referred to this species as enigmatic because *Palingenia* does not occur in South America and nobody has seen the type specimen of the species. Today it is considered a *nomen dubium*.

Knowledge of the mayfly fauna of South America has been slow in coming. It took almost a century after Weber's first description of *Ephemera atrostoma* before a considerable number of taxonomic studies of South American mayflies began to appear in various publi-

cations. Figure 1 shows a remarkable increase in the number of taxonomic papers on mayflies from 1901 to 1975. The majority of the taxonomic papers that were published during this period included those of Demoulin, Edmunds, Lestage, Mayo, Navás, Traver, and Ulmer. An even more dramatic increase in taxonomic studies of the mayfly fauna in the region started in the mid 1970's because of the efforts of a newer generation of Ephemeropterists (Domínguez, Flowers, Hubbard, Lugo-Ortiz, McCafferty, Pescador, Peters, and Savage, whose works account for about one third of the over 253 taxonomic papers on mayflies of the region (see Hubbard 1982, Hubbard and Peters 1977, 1981).

TAXON RICHNESS OF THE MAYFLY FAUNA IN THE REGION

We are just beginning to recognize the diversity of the South American mayfly fauna. Following McCafferty's (1991) recent higher classification of the Ephemeroptera in which 24 extant families are recognized worldwide, 13 families are presently represented in South America including the enigmatic monotypic genus *Melanemerella*, whose familial placement, however, remains unresolved, as some consider it an ephemerellid while others think it is a leptophlebiid. Of the approximately 2 500 mayfly species known worldwide, 375 species are presently known to occur in South America, almost half of the number of species known from America north of Mexico (~700 species). The South American mayfly fauna is presently represented by 91 described genera, roughly 23% of the 330 genera known worldwide. Approximately sixty and eighty percent of the South American mayfly genera and species, respectively, are endemic to the region.

MAYFLY FAUNA OF THE VARIOUS SOUTH AMERICAN COUNTRIES

Comparing the currently known mayfly taxa of the various countries in South America, Brazil and Argentina have the highest number of genera (59% and 38% respectively), distantly followed by Peru and Chile with 28% and 23% of the total number of currently known genera, respectively (Fig. 2). A similar pattern occurs in species richness; Brazil and Argentina again have the highest number (38% and 30% respectively) of species in the region (Fig. 3). We believe that the enormous gap in faunal composition reflects more the history of collecting in certain countries rather than the actual taxon richness in these countries. It is hard to imagine Chile, for instance, a small country, and with comparatively less diverse habitats, having more mayfly taxa than the other countries in the region except for Argentina, Brazil, and Peru. Based on the number of recently published taxonomic studies on mayflies, it is obvious there have been more concerted collecting efforts in Argentina, Brazil and especially Chile than in the other countries of South America.

GENERIC AND SPECIES DIVERSITY OF MAYFLY FAMILIES IN THE REGION

The generic composition of the different mayfly families in the region ranges from monogeneric [Coloburiscidae (*Murphyella*), Ephemeridae (*Hexagenia*), Metamoniidae (*Metamonius*), Oniscigastridae (*Siphonella*), and Ephemerellidae (*Melanemerella*)] to as many as 25 and 35 genera in the Baetidae and Leptophlebiidae, respectively (Fig. 4). Based on the number of genera and species (35 and 118, respectively), the family Leptophlebiidae is the largest mayfly group representing 38% and 30% of the 91 genera and 375 species of mayflies in the region (Figs. 4 and 5). The taxonomy of this family is also comparatively well known. The leptophlebiid fauna of southern South America (Chile and Andean region of Argentina including the Magallanes Islands) is very much identifiable to species, and a good number of species in the area have the nymph and adults associated. Indeed, there is a good possibility that the leptophlebiids could very well be the most diverse mayfly group in

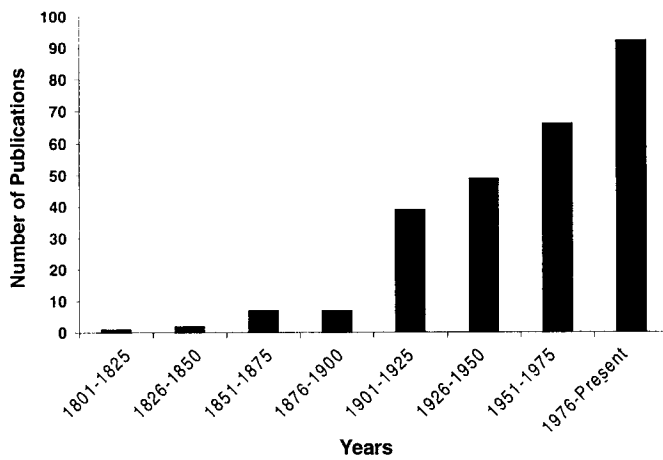


Fig. 1. Publications dealing with South American mayflies from 1801 to present (total N° of publications: 263).

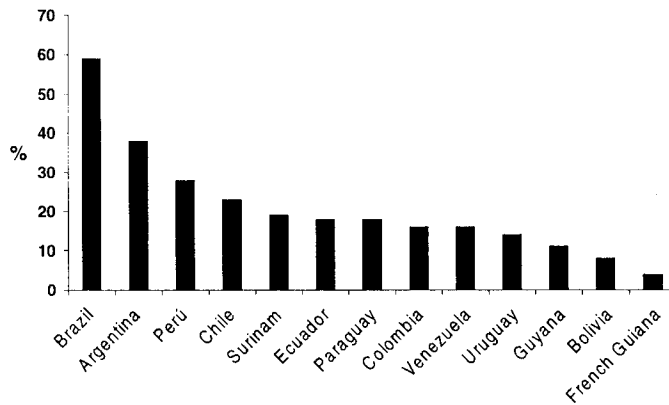


Fig. 2. Percentage of mayfly genera in each country of South America (total N° of genera: 91).

South America but human factors should not be ignored. For example, Savage in his recent taxonomic works on the Leptophlebiidae from Brazil, Domínguez and Pescador in Argentina, and Pescador and Peters in Chile have contributed considerably to the tremendous increase of described leptophlebiid taxa in the region. The family Baetidae represents the second largest mayfly group with approximately 92 species currently known representing 25 genera. Recent papers by Flowers, McCafferty, Lugo-Ortíz, and Waltz on the baetid fauna in the region are significant additions to the earlier works of Traver and Edmunds.

The family Leptohyphidae and Oligoneuriidae each have seven genera and are represented by 53 and 15 species, respectively. The speciose *Leptohyphes* has thirty-four of the 53 known leptohyphid species in the region. The families Euthyplociidae and Polymitarcyidae each have three genera and are represented by 6 and 52 species, respectively. Interestingly, approximately 81% of the 52 known polymitarcyid species in the region belong to the genus *Campsurus*.

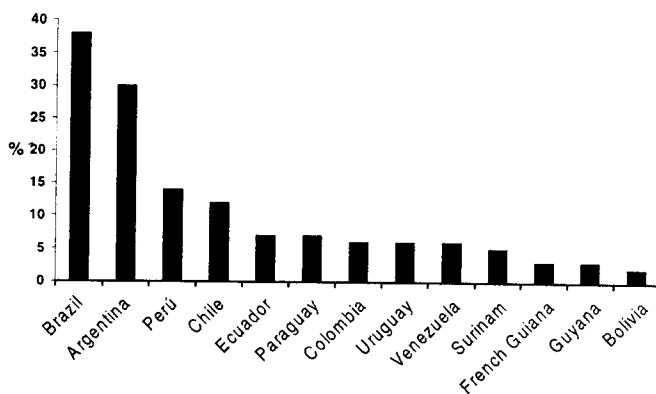


Fig. 3. Percentage of mayfly species in each country of South America (total N° of species: 375).

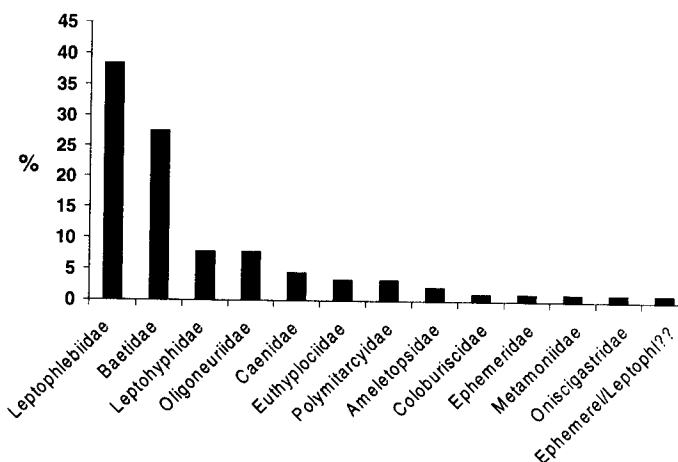


Fig. 4. Generic composition of the mayfly fauna of South America.

In addition to the genus *Brasilocaenis* that is endemic to Brazil, the family Caenidae is represented in the region by three other geographically widespread genera (*Brachycercus*, *Caenis*, *Cercobrachys*). The four caenid genera occurring in the region contain 25 species, approximately 7% of the mayfly species in the region (Fig. 5).

PROBLEMS ASSOCIATED WITH TAXONOMIC STUDIES OF THE REGION

A high percentage of taxa are known or described from only one life stage. Approximately 53% of the species in the region are known from the alate forms while only 11 % are known from both the adults and nymph. Most species of leptohyphids and baetids are known only from the nymphal stage. Conversely, all species of *Campsurus* (Polymitarcyidae) are known from adults; some of the descriptions are based only on females and a number of subimagos.

Disparity in the portion of the fauna known from various countries in South America. Present data appear to be more a reflection of collecting effort than anything else. More

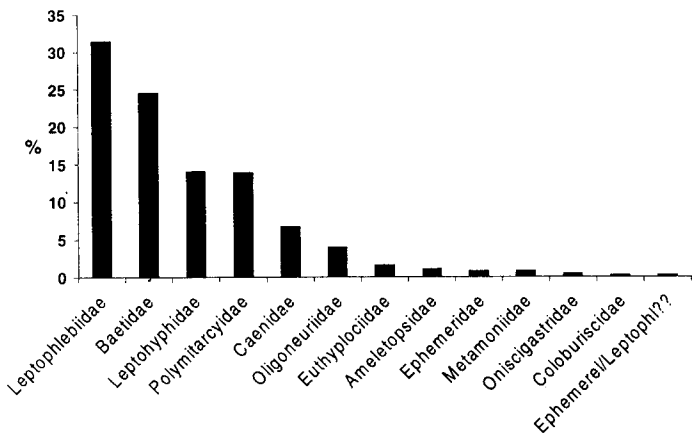


Fig. 5. Species composition of the mayfly fauna of South America.

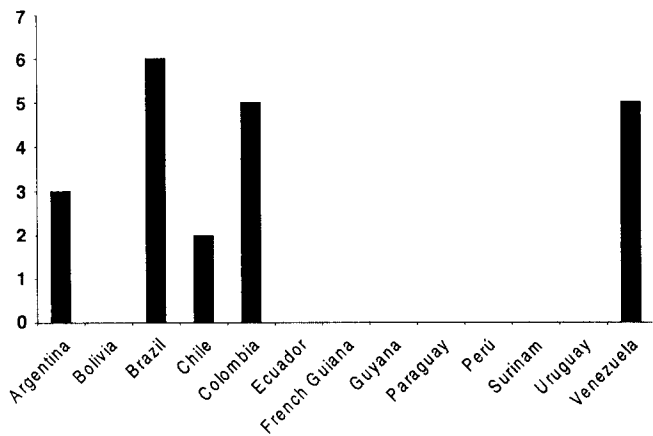


Fig. 6. Estimate of number of mayfly taxonomists.

collection and study must be done in countries where the mayfly fauna is virtually unknown. Figure 6 lists the approximate number of workers in the various countries of South America presently engaged in taxonomic activities with mayflies. It is obvious that the paucity of endemic workers contributes to the lack of knowledge of various faunas.

Lack of knowledge of the location where many type specimens are deposited. This is a particular problem with the species of Navás. Additionally, difficulties involved in borrowing type specimens and lack of financial support to visit museums and examine types contribute to taxonomic difficulties in South America.

Lack of communication and information exchange. There appears to be less than ideal communication among mayfly workers in the region and exchange of publications is often limited. Workshops, seminars, conferences, and visitations are all excellent methods of enhancing communication.

CONCLUDING REMARKS

Our knowledge of the South American mayflies though still fairly inadequate, is steadily improving. The quality of taxonomic papers which have been published recently is also steadily improving and many have included the descriptions of eggs, nymphs, and adults of some taxa. Additionally, interpretations of the phylogenetic relationships and zoogeography of some taxonomic groups have also been included in many of the mayfly papers dealing with the region.

We must, however, accelerate our efforts to collect the fauna in many areas of the region before the undescribed taxa become eliminated by environmental perturbations (e.g., deforestation, urbanization, industrialization, and agricultural activities). We, as systematists, must find a way to educate funding agencies of the importance of systematic research in the region and convince them to support our research efforts.

REFERENCES

(Selected references; a complete list of references to the South American fauna is beyond the space limitations of this paper)

- Eaton, A. E. 1871. A monograph on the Ephemeridae. Trans. ent. Soc. London 1871: 1-164, pl. 1-6.
- Eaton, A. E. 1883-1888. A revisional monograph of recent Ephemeridae or mayflies. Trans. Linn. Soc. Lond., Zool., 3: 1-352, pl. 1-65.
- Hubbard, M. D. 1982. Catálogo abreviado de Ephemeroptera da América do Sul. Pap. Avul. de Zool. 34: 257-282.
- Hubbard, M. D. and W. L. Peters. 1977. Ephemeroptera, pp. 165-169. In: S. H. Hurlbert (ed.). Biota acuática de Sudamérica austral. San Diego State University, San Diego, California.
- Hubbard, M. D. and W. L. Peters. 1981. Ephemeroptera, pp. 55-63 In: S.H. Hurlbert, G. Rodríguez and N. D. Santos (eds.). Aquatic biota of tropical South America, Part 1: Arthropoda. San Diego State University, San Diego, California.
- Lestage, J. A. 1931. Contribution à l'étude des larves des Ephéméroptères. VII. Le groupe Potamanthidien. Mém. Soc. ent. Belg. 23: 73-146.
- McCafferty, W. P. 1991. Toward a phylogenetic classification of the Ephemeroptera (Insecta): A commentary on systematics. Ann. ent. Soc. Amer. 84: 343-360.
- Pictet, F. J. 1843-1845. Histoire naturelle générale et particulière des insectes néuroptères. Famille des éphémérines. Chez J. Kessmann et Ab. Cherbuliz, Geneva. 300 pp., xix + 47 pl.
- Weber, F. 1801. Observations entomologicae, pp. 99-100.