

# What a wonderful fauna of black flies (Diptera: Simuliidae) in the Oriental Region

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## ABSTRACT

Owing to the recent increasing interest and activity in research of black flies, the fauna of black flies in the Oriental Region, which was poorly studied before 1970, and once ranked last among the six zoogeographical regions in number of species, has dramatically emerged as the second largest in the number of the constituent species following that of Palaearctic Region. A yearly progress in taxonomic research of black flies is summarized in an e-article “*World blackflies (Diptera: Simuliidae): A comprehensive revision of the Taxonomic and Geographical Inventory*” annually revised and issued by P. H. Adler & R. W. Crosskey, which is an excellent and significant compilation providing an up-to-date information of the classification of black flies around the world. Based on its latest version (2016), the Oriental fauna of black flies is composed of 524 species (23.8% of the total world number of extant species, 2,204), which are classified in 10 subgenera of the genus *Simulium*, i.e., three endemic subgenera (*Asiosimulium*, *Daviesellum*, and *Wallacellum*), one semi-endemic (*Gomphostilbia*), two cosmopolitan (*Nevermannia* and *Simulium*), and four of a Holarctic distribution (*Byssodon*, *Eusimulium*, *Montisimulium*, and *Wilhelmia*). In the Oriental Region, the subgenus *Simulium* is dominant, having 232 species (44.3%), followed by *Gomphostilbia* with 193 component species (36.8%) and *Nevermannia* with 55 species (10.5%), while seven other subgenera consist of 1–16 species. The Oriental simuliid fauna so far unveiled is characterized by a wealth of diversities in morphological characters (including several novel characters) and phylogenetic lineages (in term of the number of the subgenera and species-groups), which are valued to be equal to or exceed those in other regions. On the other hand, the lack of primitive supraspecific taxa has no equal, and various continental and insular geographical distribution patterns displayed by different lineages, that might have been caused by their different abilities of adaptation to the climatic changes in the cyclic ice ages under the different geological, geographical and

ecological conditions in the Oriental Region, are also striking. In this presentation, highlighted are: 1) Brief introduction of the simuliid fauna of the Oriental Region, compared with those of five other zoogeographical regions; 2) Speciation strategies speculated by morphological changes of pupal gills; 3) geographical dispersals of certain lineages based on a hypothesis that changes occur from plesiomorphic to apomorphic morphological characters. Finally, current taxonomic problems, in particular, over certain old species, are noted, and needs for future black fly studies including species complex, intra- and inter-lineage relationships, origins of endemic and semi-endemic subgenera, biological aspects of each taxon (e.g., biting habits, life history, interactions with environments, natural enemies), roles in the transmission of pathogens and parasites, and roles in the food chain (or energy circulation) of the aquatic ecosystem, and extinction of species, are emphasized.

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