

ORIGINAL ARTICLE

Why on the snow? Winter emergence strategies of snow-active Chironomidae (Diptera) in Poland

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Abstract A long-term study of adult non-biting midges (Chironomidae) active in winter on the snow in mountain areas and lowlands in Poland yielded 35 species. The lowland and mountain communities differed significantly in their specific composition. The mountain assemblage was found to be more diverse and abundant, with a substantial contribution from the subfamily Diamesinae, whereas Orthoclaadiinae predominated in the lowlands. *Orthocladus wetterensis* Brundin was the most characteristic and superdominant species in the winter-active chironomid communities in both areas. Only a few specimens and species of snow-active chironomids were recorded in late autumn and early winter. The abundance of chironomids peaked in late February in the mountain and lowland areas with an additional peak in the mountain areas in early April. However, this second peak of activity consisted mainly of Orthoclaadiinae, as Diamesinae emerged earliest in the season. Most snow-active species emerged in mid- and late winter, but their seasonal patterns differed between the 2 regions as a result of the different species composition and the duration of snow cover in these regions. Spearman's rank correlation coefficient tests yielded positive results between each season and the number of chironomid individuals recorded in the mountain area. A positive correlation between air temperature, rising to +3.5 °C, and the number of specimens recorded on the snow in the mountain community was statistically significant. The winter emergence and mate-searching strategies of chironomids are discussed in the light of global warming, and a brief compilation of most important published data on the phenomena studied is provided.

Key words Chironomidae; Diamesinae; Diptera; Orthoclaadiinae; snow activity; weather influence; winter emergence

Introduction

In Poland, where the annual snow cover may last for 3 months or longer, winter-active arthropods are an important part of the fauna. Some characteristic members in this interesting community of poikilothermic animals

are capable of being active on snow surfaces at low temperatures between +8 and -6 °C (Soszyńska-Maj, unpublished data) due to behavioural, morphological and physiological adaptations. This ecological assemblage consists mostly of springtails (Collembola), snow scorpionflies (Mecoptera: Boreidae), spiders (Araneae), as well as flies (Diptera) of several families (Aitchison, 2001; Soszyńska & Durska, 2002; Soszyńska, 2004; Hågvar & Greve, 2004; Hågvar & Aakra, 2006; Hågvar & Krzemińska, 2008; Hågvar, 2010); further members of this community include Coleoptera (particularly Staphylinidae), bugs (Hemiptera), earwigs (Dermaptera), and even moths (Lepidoptera) (Jaskuła & Soszyńska-Maj,

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