



# First insights into the diversity and ecology of non-biting midges (Diptera: Chironomidae) of the unique ancient Skadar Lake basin (Montenegro/Albania)



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## ABSTRACT

In the present study, based on faunistic information collected during 2014 and 2015, in association with physical–chemical conditions of the collection sites, the environmental factors influencing the composition and distribution of chironomid assemblages were investigated. In total, 164 Chironomidae taxa reported in this study extended the existing checklist with 152 taxa newly found in the Skadar Lake basin. The comparison based on the list of species from the six large, well-studied European lakes showed that Lake Constance (Switzerland/Germany/Austria) is the most species-rich waterbody with 174 taxa, followed by Lake Skadar with 164 taxa. For pupal exuviae, the most species-rich site was situated in the centre of the small lake (north-western part of the Skadar Lake). A Canonical Correspondence Analysis (CCA) revealed that shallow coastal parts of the lake are much richer in species than the open, deeper parts of the lake. This first investigation since 1979 of non-biting midge species (including imagines) diversity will help to monitor biodiversity of the basin and to understand how protection programs influence biodiversity within the lake basin.

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## Introduction

Chironomidae (non-biting midges), with more than 6000 valid species described worldwide, grouped into 550 genera, is one of the largest and most diverse dipteran families (Ashe and O'Connor, 2009, 2012; Pape et al., 2011). Chironomidae represents a flagship taxon in freshwater ecology and due to large populations, even in heavily eutrophic waters, chironomids play a prominent role in energy flow in various aquatic ecosystems (Armitage et al., 1995). At larval stages, chironomids inhabit various freshwater ecosystems such as streams, rivers, ponds, lakes, dam reservoirs

and, to a much lesser extent, brackish waters and soil. They are found from 5600 m asl on glaciers in Nepal down to depths of over 1000 m in Lake Baikal (Coffman and Ferrington, 1996; Armitage et al., 1995; Cranston et al., 1983; Wiens et al., 1975). Exceptional physiological and behavioural adaptations, such as the evolution of an effective heat shock protein system and haemoglobin as oxygen carrier, enable chironomids to colonise extreme environments such as waters with high temperatures or highly polluted. These adaptations led chironomids to become of relevant interest in basic/fundamental research. Also, due to the fast response of larvae to environmental changes, chironomid communities have been considered to be among the most promising biological indicators of water and sediment quality (Lindegaard, 1995), both in lakes (Free et al., 2009) and in running waters (Skoulikidis et al., 2009).

The pupal stage lives from a few hours to several days. When the developing adult matures, pupae free themselves from silken

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