Quaternary assemblages of aquatic invertebrate mandibles and other sclerotized remains

Colin Courtney-Mustaphi¹, Enrica Steiner¹, Stefanie von Fumetti¹, Oliver Heiri¹

¹ Geoecology, Department of Environmental Sciences, University of Basel, Klingelbergstrasse 27, 4056 Basel, Switzerland (colin.courtney-mustaphi@unibas.ch)

Chitinous remains can persist for years to hundreds of thousands of years as subfossils or fossils in sediments. Remains of aquatic invertebrates found in lacustrine sediments are useful palaeoenvironmental indicators to reconstruct environmental changes (Frey, 1964; Smol et al., 2001) that include variations to lake depth, nutrient availability, trophic status, salinity, and climate (for example, Verschuren and Marnell, 1997; Korhola et al., 2000; Heiri et al., 2011; Vondrák et al., 2019). Strongly scleroticized chitinous body parts from the exoskeleton of invertebrates are often the most resistant to degradation during syn- and post-depositional processes. Some identification guides, catalogues and atlases are available for the identification of remains for several invertebrate groups, such as chironomids, cladocerans, and ostracods, among others (Uutala, 1990; Brooks et al., 2007; Szeroczyńska and Sarmaja-Korjonen, 2007). Mandibles, claw-like remains, and pygopodia observed in sieved Quaternary lacustrine, palustrine, and deltaic sediments sediments, are infrequently recognised, reported and interpreted. Aquatic invertebrate remains of several ecologically important taxonomic invertebrate groups continue to be underused in paleoenvironmental studies, in part, because there are few summarising visual keys or accessible documentation sources.

We present an overview over a project to i) document the aquatic invertebrate remains, ii) create reference microscope slides, iii) plans to further develop the catalogue, iv) discuss the potential for its application to paleoenvironmental studies, and v) present example studies that apply the catalogue to understand past environmental changes in lakes. The study has assembled >150 digital photomicrographs of pre-identified aquatic invertebrate specimens collected from streams and lakes that have been chemically cleared to resemble remains found in sieved lake sediment samples, commonly in the >100 μm size fraction. The photograph keys document an overview of mandibles, mouthparts, head remains, and claw-like appendages from several of the key taxonomic groups sensitive to aquatic environmental changes. We present taxa that include Crustacea (Amphipoda, Isopoda, Ostracoda, and Notostraca) and Insecta (Coleoptera, Diptera, Ephemeroptera, Hemiptera, Odonata, Lepidoptera, Megaloptera, Plecoptera, and Trichoptera). We present lake sediment records that show how these invertebrate remain assemblages can be used to reconstruct past environmental changes and anthropogenic influences (Tóth et al., 2019; Ursenbacher et al., 2020). The compilation of aquatic invertebrates observed in European lake sediments is a companion tool for the analysis of assemblages of invertebrate remains for paleoecologists interested in the late Quaternary and recent lake sediment deposits (Courtney-Mustaphi et al., in press).
REFERENCES


