Joannea Geol. Paläont. 11: 113-115 (2011)

Scientific Collaboration On Past Speciation Conditions in Ohrid (SCOPSCO): Recent and fossil Ostracods from Lake Ohrid as indicators of past environments: A coupled ecological and molecular genetic approach with deep-time perspective

Julia Lorenschat, Burkhard Scharf, Trajan Petkovski, Finn Viehberg & Antje Schwalb

Introduction

Ancient Lake Ohrid, with a maximum water depth of 289 m, is located in a tectonically active graben system and is characterized by a high degree in endemism and an unresolved geological history. Ostracods are preserved in adequate abundances in at least two interglacial sediment sequences and thus provide a unique record to test the aquatic ecosystem response to environmental changes. Because knowledge of ecological dependences is insufficient to interpret fossil assemblages from sediment cores, we (1) perform autecological and taxonomic analyses of recent ostracods and environmental parameters to characterize habitats, (2) unravel the response of the lake system and the ostracod assemblages during Eemian and Holocene, and (3) determine the degree of extinction due to anthropogenic pressure. Recent ostracods are also used to (4) establish phylogeny and (5) date speciation events using genetic techniques. This will allow to verify ostracod taxonomy and the degree of diversity. The coupling of taxonomic and autecological analyses with genetic techniques and results from fossil assemblages will be used to narrow down age and causes of speciation events, and the origin of Lake Ohrid.

Autecology and taxonomy of recent ostracods

Because it is essential to understand the ecology of individual ostracod species and species assemblages when working with fossil assemblages, we carried out four seasonal field campaigns to unravel the ecology of ostracods in Lake Ohrid as well as in its catchment by characterizing sediment and water characteristics. Initial results from our survey of living ostracods provided 34 species belonging to 13 genera (*Candona*, *Fabaeformiscandona*, *Candonopsis*, *Cypria*, *Cyclocypris*, *Ilyocypris*, *Eucypris*, *Prionocypris*, *Dolerocypris*, *Leptocythere*, *Paralimnocythere*, *Cytherissa* and *Darwinula*). The most prominent species is *Cypria lacustris* that occurred in all water depths. The most common group are the Candonidae representing about 52 % of all species.

Even in 280 m water depth living ostracods were found. In the catchment of Lake Ohrid 21 species were discovered of which 14 also occurred in the lake itself.

Eemian and Holocene ostracod assemblages

A preliminary set of 34 samples from core CO1202, spanning the past approximately 136 ka, shows that ostracode valves are present in all interglacial samples of Eemian and Holocene age and only sporadically in glacial sediments (carbonate contents < 10 %). So far we identified 21 ostracod species out of which five species were not yet found in our recent sediment samples. In contrast, Belmecheri et al. (2009) reported only a total of 12 species from a sediment core spanning the past approx. 140 ka. The presence of *Leptocythere*, a genus that typically occurs in sea- and brackwater, in this core and in our surface sediment samples may provide evidence for a marine origin of Lake Ohrid. Diversity during the Eemian is lower than during the Holocene. This also contradicts results by Belmecheri et al. (2009) who suggest that there is no significant change in species diversity between these two interglacial periods. These discrepancies also underline the need for accurate taxonomy.

Anthropogenic impact on species assemblages

To reach this goal we have taken short cores in Lake Ohrid from polluted sites (ST09 and OH09) and pristine site (SV09), and we identified a total of 27 ostracod species (17 in ST09, 25 in OH09, and 14 in SV09) out of which ten species were not yet found in our recent sediment samples. Dominant species in ST09 and SV09 was *Candona trapeziformis* and in OH09 *Candona hadzistei*. Higher ostracod diversity and abundances occurred near the cities of Struga and Ohrid than near Sveti Naum.

DNA analysis

In a pilot study we isolated the mitochondrial cytochrome oxidase I (COI) gene from five ethanol-preserved ostracod species (*Candona hadzistei*, *Candona ovalis*, *Cypria obliqua*, *Leptocythere karamani*, and *Paralimnocythere karamani*) utilizing the protocol of Winnepenninckx et al. (1993). In the next series of analysis we will screen the 16S, 18S and 28S region. These are slow evolving genes that may be more suited for our purposes, the reconstruction of long evolutionary histories (Schön & Martens 2003). Another reason for this choice was that Schön & Martens (2003) have successfully used 16S on ostracods.

References

Belmecheri, S., Namiotko, T., Robert, C., Von Grafenstein, U. & Danielopol, D.L. (2009): Climate controlled ostracod preservation in Lake Ohrid (Albania, Macedonia). – Palaeogeography, Palaeoclimatology, Palaeoecology, 277: 236-245, Amsterdam.

Schön, I. & Martens, K. (2003): Phylogenetic reconstructions of ostracodes - a molecular approach. – In: Park, L.E. & Smith, A.J. (eds.): Bridging the Gap, Trends in the Ostracode Biological and Geological Sciences. – The Paleontological Society Papers, 9: 71-88, Pittsburgh.

Winnepenninckx, B., Backeljau, T. & De Wachter, R. (1993): Extraction of high molecular weight DNA from molluscs. – Trends in Genetics, 9: 407, Cambridge.

Authors addresses:
Julia Lorenschat, Burkhard Scharf & Antje Schwalb
Institut für Umweltgeologie, Technische Universität Braunschweig, Langer Kamp 19 c, 38106 Braunschweig, Germany
j.lorenschat@tu-bs.de

Trajan Petkovski
Macedonian Museum of Natural History, Boulevard Ilinden 86, MK-1000 Skopje, Macedonia

Finn Viehberg
Institut für Geologie und Mineralogie, Universität zu Köln, Zülpicherstraße 49 a/b, 50674 Köln, Germany