

Effects of water temperature and diet on the element composition of European eel (*Anguilla anguilla*) otoliths

The inner ear bones (otoliths) of bony fish are mainly composed of aragonite. They function as an equilibrium and hearing organ and grow continuously during the entire lifetime of a fish. As the element incorporation into otoliths is mainly driven by physicochemical properties of the surrounding water the determination of their elemental composition is widely used to reconstruct individual life history of fish. Especially Sr is used to trace the migratory behaviour and habitat choice of diadromous fish species like the European eel (*Anguilla anguilla*), as otolith Sr contents reflect ambient water salinities. It was reported that factors like water temperature, growth, food or metamorphosis might affect the element incorporation into otoliths of some fish species as well. We therefore experimentally determined the influence of diet and water temperature on the microchemical composition of *A. anguilla* otoliths to examine if (1) these factors might impair the interpretation of migration studies and if (2) potential candidate elements appear that store information about individual temperature history or feeding behaviour. In a first experimental set-up 8 different diets, including 7 natural prey types and 1 artificial diet, were fed during 8 weeks and a second experiment tested the effect of 3 different temperatures (14°C, 19°C and 24°C) during 14 weeks. Concentrations of 15 elements (Li, Na, Mg, Mn, Cu, Zn, Rb, Sr, Y, Zr, Nb, Cd, Ba, Pb, U) were analysed in aragonite formed during the experiments using LA-ICPMS. Results show for the first time that food has no influence on the incorporation of elements into European eel otoliths. However it could be shown that Na, Sr, Mg, Mn, Ba and Y incorporation is significantly influenced by water temperature. We conclude temperature not to disturb *A. anguilla* migration studies, because detected differences between temperature treatments were far below those used to detect eel movements between waters of different salinities. ANOSIM containing Sr, Mg, Mn and Ba concentrations showed highly significant differences between temperature groups and a multidimensional scaling plot and cluster analysis resulted in clearly separated groups according to temperature treatments. We therefore conclude these elements to possibly store experienced water temperatures in European eel otoliths in freshwater.