

Conduction of a freshwater trophic magnification study based on a comprehensive literature evaluation

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To assess chemicals for their environmental risk, one characteristic evaluated is the potential to bioaccumulate in organisms. Laboratory derived endpoints have been representing the gold standard. In the light of the 3R principle for animal studies (Reduce, Replace, Refine) and a need for more holistic consideration of bioaccumulation alternative methods are being investigated right now. One of these metrics is the trophic magnification factor (TMF). This endpoint integrates enrichment processes over a food web and is derived from field samples. TMF values are also applied in the context of the Water Framework directive to normalise chemical monitoring results to a common trophic level. The derivation of environmental quality standards for the 'secondary poisoning of predators' goal is another aspect TMF values are important for. Recent reviews show that manifold factors could influence the TMF, accordingly research should be conducted to evaluate the respective impacts.

A comprehensive literature evaluation was conducted to identify the requirements for the performance of TMF studies, focusing on freshwater habitats. A sampling campaign which considered many of the findings was successfully performed at lake Templin, Potsdam, Germany. Passive sampling covering the entire sampling period was conducted and plankton samples of different fraction sizes and sampling dates were retrieved. Mussels were collected as representatives of primary consumers (2nd trophic level). Since larger invertebrates are absent in the pelagic food web of lake Templin, fish samples of small and juvenile specimens representing intermediate trophic levels were included. Considerably larger and older fish were collected to provide insight into the upper trophic levels. These fish were divided into filet and carcass samples to allow analyses of both, accumulation and tissue distribution. Furthermore, blank samples of plankton, mussels and fish (filet) were taken. Preparation was performed following ESB cryomilling and storage standards. Enough sample material for the different trophic classes could be obtained allowing the analyses of the food web interactions. However, the sampling campaign also showed that not all requirements specified for TMF studies in the literature can be applied to any environment. In how far these or other aspects could potentially impact the TMF determination is part of ongoing questions that are currently under investigation using the retrieved samples.