The present thesis analyses aquatic macroinvertebrates communities in terms of three main purposes: a stream typology for Germany, the possibility to assess hydromorphological degradation of streams and the variability and applicability of a common sampling procedure.
In the first chapter benthic invertebrate samples from near-natural streams in Germany were investigated to distinguish stream types and the necessary taxonomic resolution for typological questions. Non-metric Multidimensional Scaling (NMS) served to define stream type groups. At genus level, streams located in the lowlands differ from streams in lower mountainous areas and the Alps. At species level, streams in the Alps can be distinguished from streams in lower mountainous areas. Catchment size, altitude, geology and slope of the sampling sites formed major gradients for different macroinvertebrate communities. Best discrimination of stream types resulted from complete taxa lists, abundance data and species level resolution.
In the second chapter a new Multimetric Index for stream assessment of mid-sized streams in lower mountainous areas was developed, which focuses on the impact of hydromorphological degradation on the macroinvertebrate fauna. The development process of the assessment system included (1) the generation of a new index ("German Fauna Index"), (2) the selection of faunal metrics, which correlate to hydromorphological degradation and (3) the combination of the selected metrics into a Multimetric Index. The new "German Fauna Index" is based on taxa, which predominantly occur at sites of a certain morphological degradation class.
The last chapter deals with the development and testing of an "electronic subsampling technique" for benthic invertebrate samples. It was investigated how strongly the number of individuals analysed influences the results. For 152 samples ("reference samples") 100 subsamples of the sizes 100, 200, 300, 500 and 700 individuals were generated randomly. In general, the variability of metric results increases with decreasing subsample size. Individual metrics show different sensitivity to decreasing subsample size. More than 40 % of the 100-individuals subsamples are classified into a different quality class compared to the reference samples, but less than 20 % for 700-individual subsamples. A certainty > 20 % is obtained with a subsample size of 300 individuals in lowland streams, whereas 700 individuals are needed to achieve the same level of confidence in mountain streams. Metrics, which rely on absolute abundances or abundance classes show higher sensitivity to a changing number of individuals than metrics, which depend on relative abundances. Thus, the reliability of the metrics is related to subsample size, stream type and metric type.
These three chapters lead to a synthesis from typology of German streams derived from invertebrate studies over the development of an assessment system for mid-sized streams in

the German mountains regions to the statistical testing of the applicability of the proposed sampling and assessment method.