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Stream habitat fragmentation – a threat to biodiversity

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Biodiversity is undisturbed rhithral streams in central Europe is high, with about 1000 resident metazoan species; over 600 insect species occur in the Fulda river (Germany). Longitudinal downstream shift of dominance from rheobiontic to rheophilous and finally to ubiquituos rheoxenic taxa in the potamal is described. Present downstream importance of ubiquituous species probably results from replacement of original potamal communities, present faunas being surrogates. Species losses through human impact are well documented for fish. The case of Plecoptera (10 potamal species either altogether extinct, extinct in Central Europe or extremely endangered) suggests that potamal invertebrates suffered as severe losses as did fish.

Human impact on major rivers was so severe also because they occur at distances beyond average dispersal capacity of the fauna, i.e. are widely separate ecological islands, with known risk of species losses. In contrast, faunal exchange between adjacent headwater streams in mountains with intact stream nets is easy, certainly for amphibious insects. However, damage to rhithral streams is becoming increasingly frequent. This fragments stream nets, turning also upper parts of drainage systems into ecological islands, with danger of extinctions. Rhithral biodiversity is thought to be much more endangered by human impact than is presently recognized.

Keywords: streams; biodiversity; ecological island; Plecoptera; human impact

Introduction

Streams represent the most widespread type of surface freshwater habitat in Central Europe. They are the central part of the global watercycle, interconnecting all of its compartments, fresh as well as saline. Even though at any given moment in time the amount of water contained in streams may be relatively small, a very large proportion of the available freshwater passes through streams during time. Streams drain and irrigate the landscape, which is largely shaped by the power of flowing water. Conversely, the quality of the landscape also affects streams. Conditions in streams affect both the quantity and quality of our most vital resource, clean fresh water.

A typical stream network resembles a tree, with a large, widely spread-out root-like base eventually leading to a single, major trunk. The stream water body exhibits universal coherence and physical continuity, and naturally there is also regular (Illies, 1961) or even continuous (Vannote *et al.*, 1980) longitudinal change of ecological conditions. However, ecological continuity has in many cases been disrupted by human action. Due to the hierarchical nature of stream networks, discontinuity in any given river continuum fragments the stream network, disconnecting upper subordinate sections of the catchment system and turning them into separate island-like systems. Even outside

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