



Spatial organization of macroinvertebrate assemblages in the Lower Mekong Basin



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ABSTRACT

In this study, we investigated patterns of spatial variation in macroinvertebrate assemblages in the Lower Mekong Basin (LMB) and examined their relationship with environmental factors. Cluster analysis was used to group macroinvertebrate samples and Linear Discriminant Analysis was performed to discriminate the major factors associated with the macroinvertebrate assemblages. Four clusters could be distinguished based on the dissimilarity between macroinvertebrate assemblages. The assemblages related to the tributaries and the upstream parts (cluster II) were characterized by a lower richness, abundance, diversity and a lower number of indicator taxa compared to the assemblage found downstream in the Mekong delta (cluster I). Aquatic insects and their indicator taxa (e.g. *Caenodes* sp., *Dipseudopsis* sp. and Gomphidae sp.), preferring a high-altitude environment with a high dissolved oxygen concentration and a high density of wood/shrub and evergreen forests, were the most predominant group in the assemblages occupying the tributaries and the upstream parts (cluster IIa). The assemblage found in the delta, consisting largely of molluscs and a moderate richness and abundance of worms, crustaceans and dipteran insects, was mainly represented by *Corbicula leviuscula* and *C. moreletiana* (molluscs), *Namalycastis longicirris* and *Chaetogaster langi* (worms), *Corophium minutum* and *Grandidierella lignorum* (crustaceans), and *Cricotopus* sp. and *Clinotanytus* sp. (dipteran insects). This assemblage was associated with a large watershed surface area, deep and wide rivers and a high water temperature. The intermediate assemblage (cluster IIb1) in-between could be discriminated based on land cover types including inundated, wetland and agricultural land, and was represented most by molluscs. Strikingly, the assemblage occupying the upstream parts (cluster IIa), which is related to intensified agriculture and a moderate conductivity, was characterized by a higher macroinvertebrate diversity compared to the mountainous and less impacted tributaries. This could mean that the natural stress is high in these systems for some taxa, leading to a lower overall taxonomic richness and abundance. Nevertheless, the number of taxa and the diversity of macroinvertebrates remained relatively high across the basin, especially in the delta assemblage. Therefore, the LMB deserves a particular attention for conservation.

1. Introduction

Tropical regions are remarkably rich in biodiversity (Sodhi et al., 2004), with 16 out of the 25 terrestrial biodiversity hotspots of the world being located in the tropical zone (Myers et al., 2000). Southeast Asia has a unique geological history (Sodhi et al., 2004), and can be separated into four biodiversity hotspot regions: The Philippines, Sundaland, Wallacea and Indo-Burma (Mittermeier et al., 1999). Through Indo-Burma, the Mekong River, which is the longest river in Southeast Asia, flows from its source in the Tibetan plateau to the South China Sea (Zalinger et al., 2003). This river harbours diverse biotic

communities and is the breeding area of numerous endemic, threatened and endangered species. The aquatic and terrestrial communities of the Mekong form a biologically important food web that supports a high biodiversity (Sodhi et al., 2004). Moreover, it is an economically important region, since aquatic fauna such as fish (~1200 species, Rainboth, 1996), molluscs, crustaceans and insects, are all highly dependent on this basin as a breeding ground (Davidson et al., 2006; Zalinger and Thuok, 1998).

Macroinvertebrates are a key component of freshwater ecosystems (Bogan, 2008; Palmer et al., 1997). In river systems, macroinvertebrate communities are differently organized and structured along environ-

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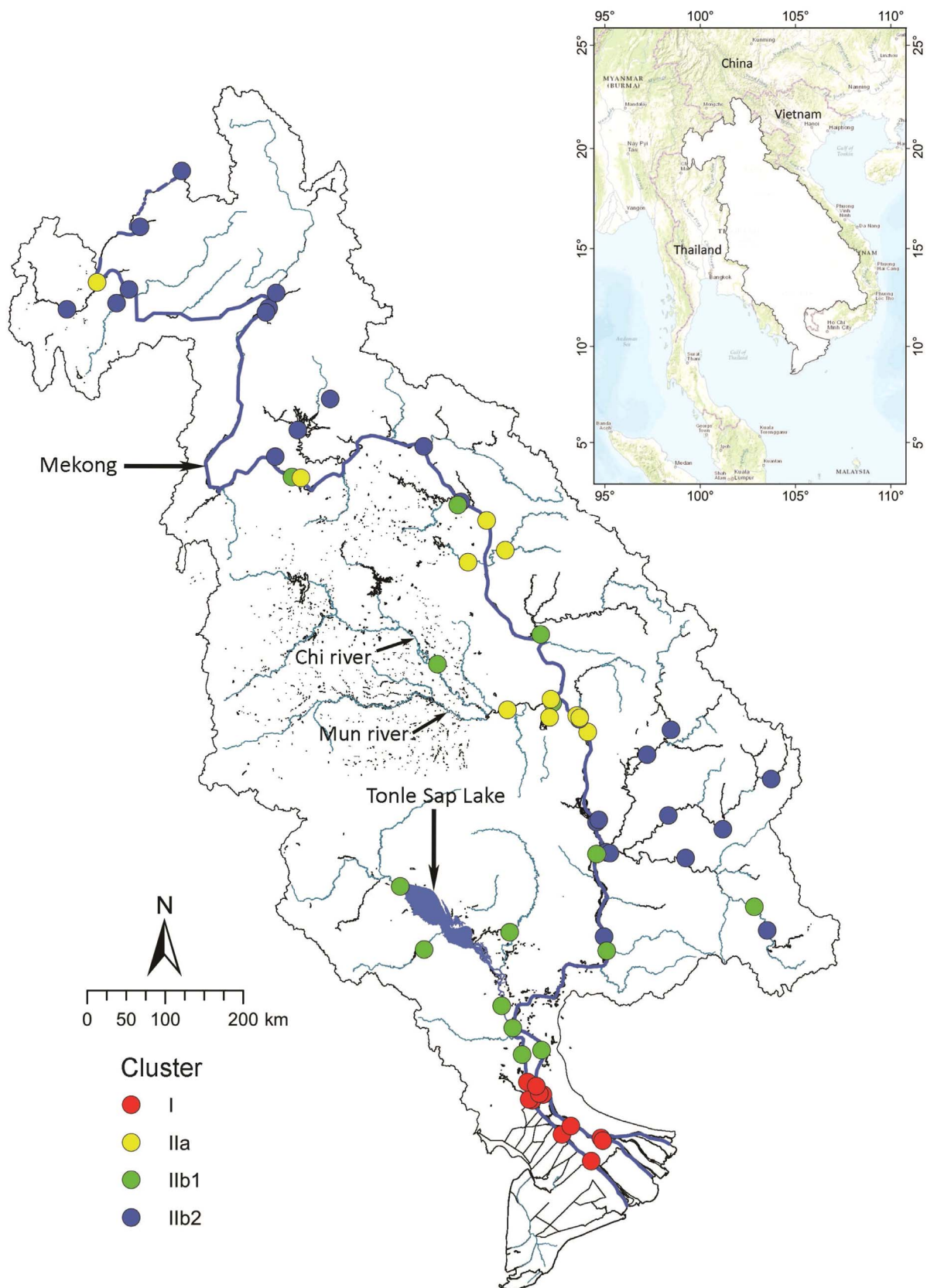


Fig. 1. Sampling sites and the four clusters, representing four macroinvertebrate assemblages, based on the cluster analysis.

mental gradients. Many studies have shown that in the upstream regions, the invertebrate communities are mainly characterized by a high abundance of insects (e.g. Ephemeroptera, Odonata and Trichop-

tera) (Arab et al., 2009; Collier and Lill, 2008; Jiang et al., 2013), whereas the downstream communities are characterized by a high abundance of molluscs, crustaceans and worms (Arscott et al., 2005;

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