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Neotropical and Afrotropical freshwater copepods: recent advances

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I present new perspectives and advances on the knowledge of free-living copepods in large tropical river basins. Currently, the greatest copepod diversity is known from the Palearctic region, with a surface about twice or thrice that of the Neotropical and Afrotropical areas, respectively. Interestingly, biological diversity estimators suggest a much higher and largely unexplored diversity in the two latter regions, potentially reaching or exceeding that of the Palearctic. I show trends for both regions, focused on Brazil and Congo Basins. Brazil comprises almost 40 % of the Neotropical region surface, including four rivers among the 20 largest in the world. Based on the literature review, there are 190 free-living copepod species in the country. Among the 12 hydrographic regions in Brazil, the richest are the Amazon and the Paraná basins, with the largest surface. Taxonomical studies on Brazilian copepods were predominant until 1979, yet, between 1980 and 1989 ecologically-oriented works were developed and became a main trend after 1990, representing over 80% of copepod studies after 2000. Molecular diversity and functional ecology are still poorly studied. Ecological studies with molecular-based diversity parameters, functional attributes or comprehensive spatial-temporal data of copepod species behavior and environmental variables have been used to detect effects of environmental changes both at population and community levels. Cyclopoid copepods composition and abundance changes according to the trophic level, but calanoids appear to be influenced by conductivity. The presence of cyanobacteria and phytoplankton of lower nutritional value can cause a bottom-up effect on the copepods, resulting in low functional diversity and increase of functional uniformity. Large filtering copepods can be replaced by small cyclopoids at increasing eutrophicated conditions. The Afrotropical region comprises four of the largest rivers worldwide. The most studied environments have been the great lakes of the rift valley (e.g. Tanganyika, Victoria, Kivu), the Nile River, and several places in South Africa. The Congo River, the second largest in the world, is almost entirely unknown in terms of copepod composition and ecology. Herein, I show initial data revealing the lack of knowledge of the l extant Congo copepod diversity, with a high potential for new species. Two expeditions made in 2013 and 2015 along the Congo and the Kasai River revealed 15 copepod species, but rarefaction and extrapolation diversity curves suggest the presence of at least double of this number. There are four large groups of copepods species in the Congo Basin, being the two largest separated by differences in primary productivity (white waters rivers) or microbial food web (black waters rivers). Copepods within the main channel of the Congo River seem to be less dissimilar than tributaries, thus reinforcing the effect of upstream basins, a trend observed in other large tropical river basins. Each large river has different copepod species especially for diaptomid calanoids and also for some Cyclopoida species, but just the last have shared species between Afrotropical and Neotropical regions. The river continuum and the flood pulse concepts were applied in these large tropical rivers, but both were disrupted by reservoirs. The large rivers of these tropical regions appear seem proportionally equal in copepod diversity according to this surface, and linked to their historical biogeography.