

Freshwater fishless pools: from the metacommunities to the systematics

Petr Jan Juračka, Ph.D. Thesis, 2016-04-08

ABSTRACT

Despite their small size, freshwater fishless pools often contain complex communities and substantially increase regional invertebrate and macrophyte biodiversity. The main core of this thesis originates from such habitats, which were newly created for the conservation purposes in the Protected Landscape Area Kokořínsko, Czech Republic. This landscape consists of deep valleys separated by steep sandstone ridges and is characteristic for very sparse stream network and low number of large water habitats, which consequents in generally low abundance of waterfowl. We studied microcrustacean metacommunities of 42 selected pools scattered over the area of approximately 220 km². Using variation partitioning of the species composition, analyses of the species richness and colonization experiment in the study area, we identified that spatial distribution of the habitats and number of neighbouring aquatic habitats play a major role in assembly of local communities. This led us to the conclusion that the landscape heterogeneity served as a partial barrier to dispersal of microcrustaceans. Subsequently, we compared this pattern of the microcrustacean metacommunity with other invertebrates of various dispersal modes, from passively dispersing rotifers and aquatic molluscs, to locally common and actively flying insects (true bugs, aquatic beetles and dragonflies). Substantially more variation in species composition variability was explained by the spatial structure than by local conditions in all passively dispersing groups and in aquatic beetles. However, shared fraction of spatial and local variables explained a major part of variation of species composition in dragonflies and true bugs. Therefore, we hypothesize that steep ridges serve as dispersal barriers not only for passive dispersers (whose vectors are waterfowl and large mammals), but also for actively flying insects, which probably follow the local topography in flight. Small and remote habitats may increase a regional diversity also as refugia of rare species, which could be outcompeted in larger or more connected habitats. This might be the case for *Daphnia hrbackeki* Juračka, Kořínek & Petrusek, 2010, a species which we described from our study area. It was very conspicuous by the humped shape of dorsal margin of the carapace, and by retaining neckteeth in adults. However, these specific morphotypes are known only from very limited number of field-collected samples. In laboratory cultures, *D. hrbackeki* loses its specific shape and resemble its closest relative, *D. curvirostris*. We attempted to induce the humped morphotypes experimentally by exposure to predator kairomones. This was not successful but we observed high interclonal variability in formation of neckteeth in both *D. hrbackeki* and *D. curvirostris*. When looking for stable morphological characteristics allowing reliable differentiation of these two species, a large number of specimens were analysed in detail by the Scanning Electron Microscopy (SEM). During this work (and in other projects), we simplified methods for preparation cladocerans, particularly their ephippia and trunk limbs, for SEM analyses. Our workflow allows safe and quick preparation of these body parts that may carry taxonomically valuable structures, and we hope it will be useful also in future projects on cladoceran functional morphology or systematics.