**Wetland Invertebrate assemblages: Biodiversity and Biogeography**

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## Summary

The south-Western Cape region of South Africa is a unique terrestrial biogeographic region different from the rest of the Southern Africa (Werger 1978). The region is of significant international importance as a global biodiversity hotspot and the only area in the sub-Saharan Africa to exhibit the Mediterranean-type climate (Myers *et al.* 2000; Olson and Dinerstein 2002; Thieme *et al.* 2005). Unfortunately, the region is under severe threat from land transformations for agriculture, urban development and alien invasion (Rouget *et al.* 2003). The region is known for its highly diverse and endemic stream communities (Picker and Samways 1996; Wishart and Day 2002). Unfortunately, the same cannot be said about its wetland communities due to our limited knowledge of these ecosystems. This is especially true for invertebrates, although they overwhelmingly dominate animal communities in abundance and diversity. Therefore, this study was aimed at assessing biodiversity patterns of wetlands macroinvertebrates at a regional-wide spatial scale. A total of 140 wetlands were sampled with the objective of describing regional diversity of wetland macroinvertebrates, assess the effects of physico-chemical variables and the relationship between the different taxa. With regards to the first objective, 26 000 individuals representing 119 taxa emanating from 51 families from 73 genera were recorded, this figure is comparable with other Mediterranean-type climate regions. Familial richness was dominated by five families Chironomidae, Dytiscidae, Pomatiopsidae, Culicidae and Baetidae, contributing more than two-thirds combined and individually contributing <10% of overall assemblage abundance. Generic richness, on the other hand was dominated by four genera; *Tomichia*, *Cloeon*, *Culex* and *Sigara* all contributing more than 10 of overall assemblage abundance. Perhaps, that is why temporary wetlands are considered less biodiversed compared to their permanent counterparts considering that the assemblage was dominated by just few taxa. Currently a total of five species new

to science were discovered in this study, three from Hydraenidae (P. D. Perkins *pers. comm*), one from Streptocephalidae (M. Hamer *pers. comm*) and one in the Hydryphantidae (R. Gerecke *pers. comm*). Three of these new species were recorded from the high mountainous Cederberg area (Streptocephalidae: *Streptocephalus* sp. nov, Hydraenidae: *Prosthetops* sp. nov and Hydraenidae: *Mesoceration repandum* Perkins, 2009). However, the observed taxon richness was found to be an under-representation of the "true" taxon richness, as the asympote was not reached. Different taxon richness estimators i.e. 1$^{st}$ & 2$^{nd}$ order Jacknife and Chao 1 & 2, were found to be 20-47 taxa short of the estimated "true" richness. In addition, the prevalence of uniques and singletons even after 140 sites samples suggest that sampling size might not be adequate. However, this I believe this is an artifact of lack of seasonality in the analysis given that this study was carried over one season. Comparison of the different habitat types revealed that open water habitat supported significantly lower invertebrates compared to its vegetated counterpart (e.g. submerged and emergent vegetation). This was expected as it has been well shown in the literature, however, no difference was observed from wetlands with different number of habitat types (i.e. wetlands with single habitat type, 2 or all three habitat types), this was contradictory to other studies.

The second objective was focused on the issue of the effect of physico-chemicals on the assemblage. For this analysis, using Redundancy Analysis (RDA) the model including; pH, Phosphate, Conductivity, Turbidity, Nitrite and Ammonium respectively, was found to be important in explaining significant variation in the assemblage structure. A number of these variables had interesting relationships with individual taxa as captured by the multiple regression analysis, worth mentioning at this juncture is the close relationship observed between Branchiopoda and turbidity. pH and Phosphate appeared to be the major environmental variables conditioning macroinvertebrates, given they each contributed more 20% of the variance. My third objective was to assess the congruence between different taxa; such understanding is crucial for bioassessment techniques development. Very weak relationships were observed

between individual families and higher taxonomic groups (i.e. orders) themselves, this was observed in all three data sets taxon richness, relative abundance and presence-absence data. However, Hemiptera and predators had an encouragingly strong relationship, suggesting that one can be used as a surrogate for the other. Predators also had a strong relationship with overall assemblage, however, since Hemiptera themselves did not have a good relationship with overall assemblages, it was difficult to conclude that Hemiptera were a surrogate for overall assemblage. But the results are quite promising and warrant further research.

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