Ecomorphological guilds and diet of exotrophic anuran tadpoles

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ABSTRACT

To test the applicability of anuran tadpole functional ecology with regards to diet as a tool to determine ecosystem function of aquatic habitats, all the presently known southern African anuran species' tadpoles were assigned to ecomorphological guilds. The data set included 106 anuran tadpole species and 84 variables, which included: 23 habitat; 49 morphological; 9 behavioural; and 3 development (time to metamorphosis) related variables. Although the data set for the guild delineation did not include genetic data, a phylogeny (evolutionary approach) was used to obtain a tree where species are grouped together based on shared characteristics, similar to that of a cluster analysis where each cluster or group is a guild. Maximum parsimony was employed with PAUP 4.0b10 to construct consensus trees using heuristic search settings. The phylogenetic/taxonomic affiliation of the species in each ecomorphological guilds' was also observed by constructing a phylogenetic tree. The 12S and 16S mitochondrial gene sequences were retrieved from Genbank, to represent the major lineages documented in the anurans of southern Africa thus far. The ecomorphological guild delineation was further supported by quantify tadpole gut contents to determine their trophic status. Information on the feeding behaviour of four guilds was obtained by analysing a representative anuran tadpole species from each. The IUCN red list of threatened species was consulted to obtain the conservation status of the 106 anuran species used for this study, which made it possible to determine whether there is a link between species found in the same ecomorphological guilds and those species' conservation status. Considering the high diversity of anuran species in the Phongolo region (offering access to a variety of tadpole guilds), and the ability to analyse the diatom communities found in the gut contents of tadpoles. A portion of this study supplemented the assessment of ecosystem functioning and management of aquatic resources of the lower Phongolo River and floodplain, by providing information regarding the health. Diatom bioassessment was applied as a tool for inferring water quality.

The phylogenetic approach proved to be very effective for the guild delineation, permitting the recognition of 10 fully characterised ecomorphological guilds, a number of which corresponded with previously characterized guilds. Terminology had to be produced for three new guilds, based on the guild defining criteria. The phylogeny of the anuran species coincides with guild delineation to some extent in terms of phylogenetic clades. The majority of species within one guild, although belonging to different genera and families belonged to the same phylogenetic clade. The trophic analysis supports the guild delineation, since a clear distinction could be made between the percentage and combination of materials from each trophic category ingested by tadpoles from different ecomorphological guilds.

Even though some similarity can be seen between species, based on the criteria for the endangered status, there was still no true correlation between IUCN status and ecomorphological guild. The fact that the critically endangered, endangered and vulnerable species are distributed over so many guilds further emphasises the extent of amphibian decline. The majority of the diatom species found in the Phongolo River and floodplain favour brackish water, with a moderate to high electrolyte content. Indicating that the Phongolo River and the section of the floodplain considered for this study had a high salinity. This might be due to the water bodies' close proximity to the coast. The diatom index scores indicated the presence of organic pollutants and labelled these water bodies as mesotrophic to eutrophic.

Keywords: Tadpole; Ecomorphological guild, Phylogeny, Conservation status, Diet, Diatom.

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Psalms 124:8 “Our help is in the name of the LORD, who made heaven and earth.” (KJV)

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