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Variations in Thermal Performance across Populations of two Anuran Species from Different Geographical Regions in Sri Lanka

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Abstract

The thermal performance of an animal is directly linked to its thermal sensitivity. Information on thermal sensitivity would assume special significance in interpreting the vulnerability of amphibian species to climate change. Ectotherm species with narrow temperature tolerance ranges, would be particularly susceptible to predicted changes in ambient temperature. The present study therefore attempts to assess the degree of thermal sensitivity of two anuaran species. It is expected that the study would provide an insight into the ability of the species to adapt to climate change. Two native anurans, *Duttaphrynus melanostictus* (common Asian toad) and *Euphlyctis cyanophlyctis* (Indian skipper frog) were selected as they are widely distributed across the country. Toads and frogs were collected from four locations: Matara-(mean ambient temperature (MAT=30.2° C), Nuwara Eliya (MAT=17.6° C), Colombo (MAT=28.4° C), Polonnaruwa (MAT=34.2° C). The animals were empirically exposed to six test temperatures (between 12° C and 38° C) at field stations in the locations of capture to assess four performance parameters (Jump distance, Righting time, Contact time and Jump force). Thermal Performance Curves (TPCs) were constructed to obtain values for the endpoints-thermal niche breadth (NB), thermal optima (TO) and optimal performance (OP).The TPCs for each species differed considerably across the different populations. Both *D. melanostictus* and *E. cyanophlyctis* in cooler areas performed better at lower temperatures, while those from hotter areas performed better at warmer temperatures. Negative skewedness of TPCs show drastic drops in performance once optima is reached. There was good congruence between thermal optima and the MATs of the capture regions ($F_{3, 20}=26.87$ $p<0.05$). Niche breadth was narrowest in toads and frogs from the coldest region (Nuwara Eliya). The results were consistent across both species. The findings are in agreement with previous observation for disparities in thermal sensitivity across latitudinal and altitudinal gradients in other anuran species. These trends suggest that amphibian populations show a degree of adaptability to specific ambient temperatures to which they are exposed to in their natural environment, enabling them to perform at an optimal level. It was also noted that in the hottest region (Matara) the thermal optima of *E. cyanophlyctis* was slightly below the MAT. This and its narrower thermal niche breadth would make it more susceptible to increases in ambient temperature than *D. melanostictus.*

Keywords: Thermal sensitivity, Climate change, Anurans, Ectotherms