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Temperature-mediated characteristics of the dusky salamander (*Desmognathus fuscus*) of southern Appalachia

Cindy Marcum Moore, Lynnette M. Sievert*

Department of Biological Sciences, Emporia State University, Box 4050, Emporia KS 66801, USA

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Abstract

Thermal preference of the salamander *Desmognathus fuscus* was measured in a linear thermal gradient with floor temperatures ranging from 10 to 30°C. Salamanders were acclimated to 21 ± 1°C and a 12:12 photoperiod with photophase centered at 1200 h for 8 weeks prior to being placed in the gradient. Substrate temperatures were measured under the salamanders' stomachs from 1200 to 2400 h at 2 h intervals immediately after feeding and after seven days fasting. We found no selection for temperature in fasting or postprandial *D. fuscus*. We compared the rate at which *D. fuscus* cooled and heated with that of a control and found no significant difference. We determined the desiccation rate of *D. fuscus* at 16 and 26°C and found a significantly more rapid desiccation at 26°C.

Keywords: Behavioral thermoregulation; Amphibian; Salamander; Desmognathus; Feeding; Thermal selection; Desiccation; Heating rate; Cooling rate

1. Introduction

Temperature and moisture are controlling factors in the environment of amphibians. Water balance is critical in maintaining a moist skin for respiration and temperature determines the rate of chemical reactions that govern physiological processes. Over a broad range of tolerable body temperatures (T_b's), reaction rates of processes like digestion and metabolism increase with increasing T_b (Hutchison and Dupré, 1992 and references therein). Thermoregulation in nocturnal salamanders may allow increased growth and digestive rates as well as increased speed and foraging efficiency (Brattstrom, 1963; Rome et al., 1992).

There is a potential conflict between the moisture requirements and temperature requirements of amphibians. An amphibian that moves out of its moist hiding place to seek warmer temperatures may not be able to return to moisture before it desiccates. This, in part, may be why little behavioral thermoregulation is observed in amphibians (Hutchison and Dupré, 1992).

Presumably, salamanders in the field often accept available T_b's instead of showing temperature preferences (Brattstrom, 1963; Feder and Pough, 1975; Hutchison and Dupré, 1992), although some behavioral observations in the field may be due, in part, to temperature preference (Sievert and Andreadis, in review). When presented with laboratory conditions where thermoregulation is possible, both aquatic and terrestrial salamanders show temperature preferences (Dupré and Petranka, 1985; Hutchison and Hill, 1976; Hutchison and Spriestersbach, 1986; L. Sievert and P. Andreadis, unpublished data). Furthermore, many ectotherms exhibit an endogenous circadian rhythm of preferred temperature (Reynolds et al., 1978; Sievert and Hutchison, 1988; Hutchison and Spriestersbach, 1986; Sievert, 1991). However, in some species of amphibians no circadian cycles of thermoregulation have been observed (Lillywhite, 1971; Sievert, 1991). Few, if any, studies have shown nocturnal salamanders behaviorally

*Corresponding author. Tel.: +1-316-342-0273; fax: +1-316-341-5607.

E-mail address: sievertl@emporia.edu (L.M. Sievert).

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