

BEHAVIORAL ECOLOGY / EVOLUTION II

Abstracts

AN INTERACTION BETWEEN THE DIEL BIORHYTHMIC ACTIVITY PATTERN OF GREEN FROG (*Rana clamitans*) TADPOLES AND TEMPORAL VARIANCE IN PREDATION RISK ON TADPOLE GROWTH RATES

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Prey trade off foraging gains and predation vulnerability in choosing an activity level, but many prey also have biorhythmic activity patterns. Biorhythmic activity patterns may interact with temporally variable predation risk to change the cost of this trade-off to prey growth rates. To this end, I recorded the diel activity patterns and growth rates of three size classes of green frog (*Rana clamitans*) tadpoles when living in predator-free well water and when exposed to predator chemical cues from caged larval dragonflies (*Anax* spp.) for 12 hours during the day or 12 hours during the night. Separately, I also recorded the activity and foraging rates of *Anax* during the day and night. Tadpoles of all size classes living in well water were more active and foraged more during the night, with very low foraging levels during the day. *Anax* were also more active and foraged more during the night, although they also foraged during the day. Tadpoles of all size classes exposed to cue during the day or during the night strongly reduced activity during cue exposure. When not exposed to cue, these tadpoles followed the pattern of the well water treatments after one- to four-hour post-exposure lags in activity levels. Growth rates were significantly slower in the cue-during-night treatments compared to the cue-during-day treatments in all size classes, and growth rates in both cue treatments were significantly less than in well water treatments in all size classes. These results suggest that instinctual behavior can interact with plastic anti-predator responses to affect the strength of a predator's non-lethal effect on its prey.

Keywords: *predation, biorhythm, growth, anuran*

COMPARATIVE THERMAL ECOLOGY AND HABITAT USE OF RATSNAKES AND RACERS IN ILLINOIS

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Because body temperatures of ectotherms are determined almost entirely by their environment, the fitness of ectothermic animals is affected directly by the temperature of their environment, and their success at exploiting thermal opportunities within that environment. In fact, thermoregulation may be the single most important factor affecting timing of activity and habitat selection of terrestrial reptiles. The cost-benefit model of reptile thermoregulation proposed by Huey and Slatkin (1976) predicts that reptiles should thermoregulate carefully only when the

benefits outweigh the costs. Thus far, strong tests of the current model have not been possible. I compare the behavior and habitat use of two ecologically similar species at the same study site to test important predictions of the cost-benefit model. Thermal specialists should thermoregulate more carefully than thermal generalists. If the benefits of thermoregulation vary with species, then thermoregulatory behavior should differ between species at the same location. And if thermoregulatory behavior differs between species, then habitat use patterns should also differ. We used temperature-sensitive radio-telemetry and habitat analyses on a sample of adult free-ranging ratsnakes and racers over the course of two and a half active seasons. The results indicate clear differences in the thermal strategies of the two snake species. It does appear habitat use is linked to these differences, as expected. Therefore, the predictions made by the cost-benefit model are supported by this study.

Keywords: *Thermoregulation, Snake, Habitat, Radio-telemetry*

A TEST OF THE HIERARCHICAL MODEL OF HABITAT SELECTION USING EASTERN MASSASAUGA RATTLESNAKES (*SISTRURUS C. CATATENATUS*)

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Understanding how animals select habitat, rather than just documenting the habitat they use, should improve the ability to predict how the animals use habitat in other locations, or how they will respond to changes in habitat. It is often assumed that habitats are selected hierarchically, where animals preferentially use specific macrohabitats at a landscape scale, and specific microhabitats within the preferred macrohabitats. We used four years of telemetry data from 34 individuals to test this hierarchical model of habitat selection with eastern massasauga rattlesnakes (*Sistrurus c. catenatus*) in Ontario. Contrary to predictions of the model, massasauga rattlesnakes used habitats in similar proportion to their availability at a landscape scale. Snakes were selective at the microhabitat scale, however, preferentially using locations with closer retreat sites, more ground structure, and less canopy cover than random. Habitat use varied by reproductive condition, month, and study site. Gravid females were most selective, using sites that were rockier and with less canopy cover than sites used by males and non-gravid females. In contrast to foraging and gestation sites, hibernation sites were almost always in forested areas, presumably reflecting subterranean features available in forests. The failure of the hierarchical model of habitat selection appears to be a consequence of fine-grained differences between habitats at a landscape scale that allow massasauga rattlesnakes to find suitable microhabitats in all available macrohabitats. In terms of conservation, landscape-scale modeling will be ineffective at identifying rattlesnake habitat at our study site, although the generality of this problem remains to be determined.

Keywords: *eastern massasauga, rattlesnake, Bruce Peninsula Ontario, hierarchical habitat selection*

MICROHABITAT USE IN *ANOLIS* LIZARDS: THE IMPORTANCE OF PERCH CHOICE

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Habitat use is a function of two components: 1) the microhabitats available within the habitat, and 2) the preference of an organism for particular microhabitats. If an organism has no preference for particular microhabitat characteristics, its use of that microhabitat should reflect the extent to which it is randomly available within its range. In contrast, if an organism prefers certain microhabitats, it should occur in a non-random subset of the available habitat. To examine the influence of microhabitat preference in two species of *Anolis* lizards (*A. gundlachi* and *A. krugi*), we measured both microhabitat use and availability in five different forest types in Puerto Rico. To determine if lizards of these species consistently occur in certain microhabitats, we measured the height, diameter, angle of inclination, and visibility of male lizard perches in each of the forest types. To determine if available perches in the five forest types differ in the above characteristics, we measured potential lizard perches along a 30-50m transect in each forest type. Using multivariate analyses of variance (MANOVA), we found that although the five forest types differ in available perch characteristics, both species of lizards perch in a similar microhabitat regardless of forest type. These results indicate that *A. gundlachi* and *A. krugi* use a non-random subset of available microhabitats and suggest that perch choice is an important component of habitat use in *Anolis* lizards.

Keywords: *Anolis lizards, microhabitat, perch choice, availability*

INFLUENCE OF MICROHABITAT ON TERRITORIAL BEHAVIOR IN THREE PUERTO RICAN LIZARDS

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Variations in microhabitat have been shown to affect territoriality in some animal species. In this study, we examined the relationship between microhabitat characteristics and territorial behaviors using three Puerto Rican *Anolis* lizards (i.e., anoles): *Anolis gundlachi*, *A. cristatellus*, and *A. krugi*. *Anolis gundlachi* and *A. cristatellus* are trunk-ground habitat specialists that typically perch on the trunks of trees a few meters from the ground, while *A. krugi* is a grass-bush specialist. These *Anolis* species are known to defend territories using visual displays: dewlap extensions, pushups, head bobs, and tail movements. We predicted that the territorial behaviors of the trunk-ground species would be more similar to each other than to those of the grass-bush species. We established a study plot for each species and individually marked all adults in the plot. We determined individuals' microhabitat characteristics (perch heights and perch diameters) and performed 20 minute focal observations, timing total displays and counting all territorial behaviors. The microhabitat data indicated that the two trunk-ground species perched on significantly higher and broader perches than the grass-bush species. Behavioral data also indicated that male *A. gundlachi* and *A. cristatellus* perform significantly more displays than *A. krugi*, particularly dewlap and pushup displays. Additionally, although females across all species perform fewer displays than males, female *A. gundlachi* and *A. cristatellus* display more frequently than *A. krugi*. Our analyses lend support to the hypothesis that the trunk-ground species (*A. gundlachi* and *A. cristatellus*) have territorial behaviors more similar to each other than to the grass-bush species (*A. krugi*).

Keywords: *Anolis lizards, territoriality, microhabitat, display behavior*