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USE OF SHADE BY UPLAND SANDPIPERS (*Bartramia longicauda*) DURING FALL MIGRATION: AN EXAMPLE OF THERMAL REFUGIA IN A GRASSLANDS SPECIES?

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Abstract – Minimal data exists on metabolism and temperature regulation in Upland Sandpipers (*Bartramia longicauda*). The extent to which they use shade as thermal refugia during diurnal activities has not been reported in the literature. Herewith, we report the use of shade produced by large round hay bales during fall migration.

INTRODUCTION

The use of thermal refugia by animals has been reported as a mechanism to conserve water by preventing water loss during hot, arid environmental conditions, especially in deserts (Louw and Seely 1992). Use of burrows as thermal refugia by birds has been reported (Wolf *et al.* 1996, Williams *et al.* 1999). However, the extent to which birds select specific microsites during diurnal activity and the resulting thermal consequences is not well understood (Wolf *et al.* 1996). Foraging and social behavior, reproduction, and avoidance of predators could be affected by diurnal mircosite selection due to thermal constraints (Wolf *et al.* 1996).

Lack of thermal temperature regulation can severely affect metabolic processes that could lead to poor physiologic conditions that could result in death. The effects of air temperature on birds are well known (Calder and King 1974, Wolf and Walsberg 1996) but have not been studied in the Upland Sandpiper, *Bartramia longicauda* (Houston and Bowen 2001). The use of thermal refugia has obvious physiological benefits, e.g. preserving water. Mountain Plovers (*Charadrius montanus*), another obligate grassland species, have been reported actively seeking shade beneath green vegetation during the breeding season (Shackford 1996). Thermal microclimates may have major influences on time, water, and energy budgets, especially for smaller animals (Wolf and Walsberg 1996). Therefore, the use of refugia (ex. shade) may provide suitable environmental conditions that help control physiological mechanisms and maintain homeostasis (Walsberg 1985, 1993).

Data is limited or lacking on metabolism and temperature regulation, or physiological limits for the Upland Sandpiper (Houston and Bowen 2001). Herewith, we report on Upland Sandpiper use of shade produced by large round hay bales in Kansas during fall migration.

OBSERVATIONS

On 4 August 2005, we observed about 50 Upland Sandpipers northwest of Quivira National Wildlife Refuge, Stafford County, Kansas (38°14.216 N, 98°33.308 W), in a hay field. Observations lasted from 1315 hrs to 1335 hrs (CDST). Weather conditions consisted of partly cloudy skies (15%), winds ENE at 8-24 kph, and the air temperature was 36.7°C. The site is located in rolling sandhill prairie habitat that exists within the Arkansas River Lowlands physiographic province (Thompson and Ely 1989).

There were numerous round hay bales (native prairie and alfalfa) located throughout a 1/4 section of land (approximately 64.8 hectares). The sun was slightly toward the southern sky, typical for this time of year as the Earth moves toward the winter solstice in the Northern Hemisphere. This position of the sun resulted in small patches of shade along the north side of the hay bales during the mid-day. These shaded areas contained several groups of two to three sandpipers; two contained a group of four; and there was at least one group of five individuals. Within several of the groups individuals were huddled, sitting adjacent to each other, with their bills open and actively panting. Only six to eight individuals were actively foraging in the open, sun lit field.

A cold front moved through the area during the evening and a subsequent visit to the site the following day (5 August) yielded no birds. Apparently, the birds migrated with the passage of the front and favorable northerly winds.

DISCUSSION

The Upland Sandpiper is an obligate grassland species which is frequently exposed to hot, dry environmental conditions especially during the breeding season and during fall migration which typically occurs in late-July and August. Presumably, they obtain all of their water requirements via their diet (Houston and Bowen 2001), which means that water loss could be problematic during migration if the cessation of migration causes a "fall out" in an area with limited food supply.

Both Mountain Plovers and Upland Sandpipers have been observed using fence posts for shade during the breeding season and migration (Rob Penner and Sebastian Patti pers. comm.). However, the use of artificial refugia during migration raises some intriguing questions, especially for a grassland specialist like the Upland Sandpiper. Some possible explanations for such behavior by an obligate grassland species are discussed below.

During fall migration the use of refugia may be important since short vegetative habitats used for foraging are often associated with moderately to heavily grazed pastures, hay meadows, or crop fields. These hayed fields may have less food availability after haying (Swengel 2001, Stoner and Joern 2004). Birds that stop over in such habitats may

be less physiological fit to continue typical migration patterns. Furthermore, the average daily temperatures during the peak of fall migration (August) can be high, well above 32.3°C, with low humidity, placing additional stress on water balance processes. The use of thermal refugia under such conditions may be an adaptation to overcome these potential physiological restraints, or just a chance encounter and taking advantage of human alterations.

Lastly, the use of pesticides like organophosphates and carbamates, which act by inhibiting cholinesterase enzymes, could affect the endocrine system of birds (Mitchell and White 1982, Fair et al. 1995, Iko et al. 2003, Strum et al. 2010). It is conceivable that sublethal exposure to pesticides may cause physiological constraints that would encourage the use of thermal refugia. The use of pesticides in hay meadows or on crops which are hayed may also reduce invertebrate abundance, thus decreasing a food supply for migrating sandpipers that use such habitats. Water-balance might be more difficult to maintain under physiological stress due to pesticide accumulation, or during the utilization of poor habitat, especially after a long migratory flight. Such conditions could reduce physiological health, ultimately reducing survival rates.

Future studies on the physiological aspects of Upland Sandpipers are needed to help address some of these possible explanations as are activities associated with the use of natural versus artificial shade. Such behavior by a grassland species that should be able to cope with hot, arid conditions, even during migration, needs further study.

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