

Implications of tradeoffs between crypsis and thermoregulation for the evolution of coloration in lizards

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Background

Patterns of covariation between the coloration of animals and their environments are some of the most striking examples of adaptation in nature. For ectotherms, such patterns likely result from a tradeoff between thermoregulation and crypsis. That is, coloration will influence both the amount of radiation that is absorbed by an individual from the environment as well as determine how conspicuous an individual appears in its environment.

An evolutionary tradeoff may occur when coloration that is optimal for thermoregulation causes an individual to be more easily detected by predators.

Study System

One system that shows striking patterns of color matching between individuals and their environment is the lizard community of the Tularosa Basin in New Mexico, USA (Fig. 1).

Coloration of lizards ranges from melanistic in the Carrizozo lava field to blanded in the White Sands dune system (Fig. 2).

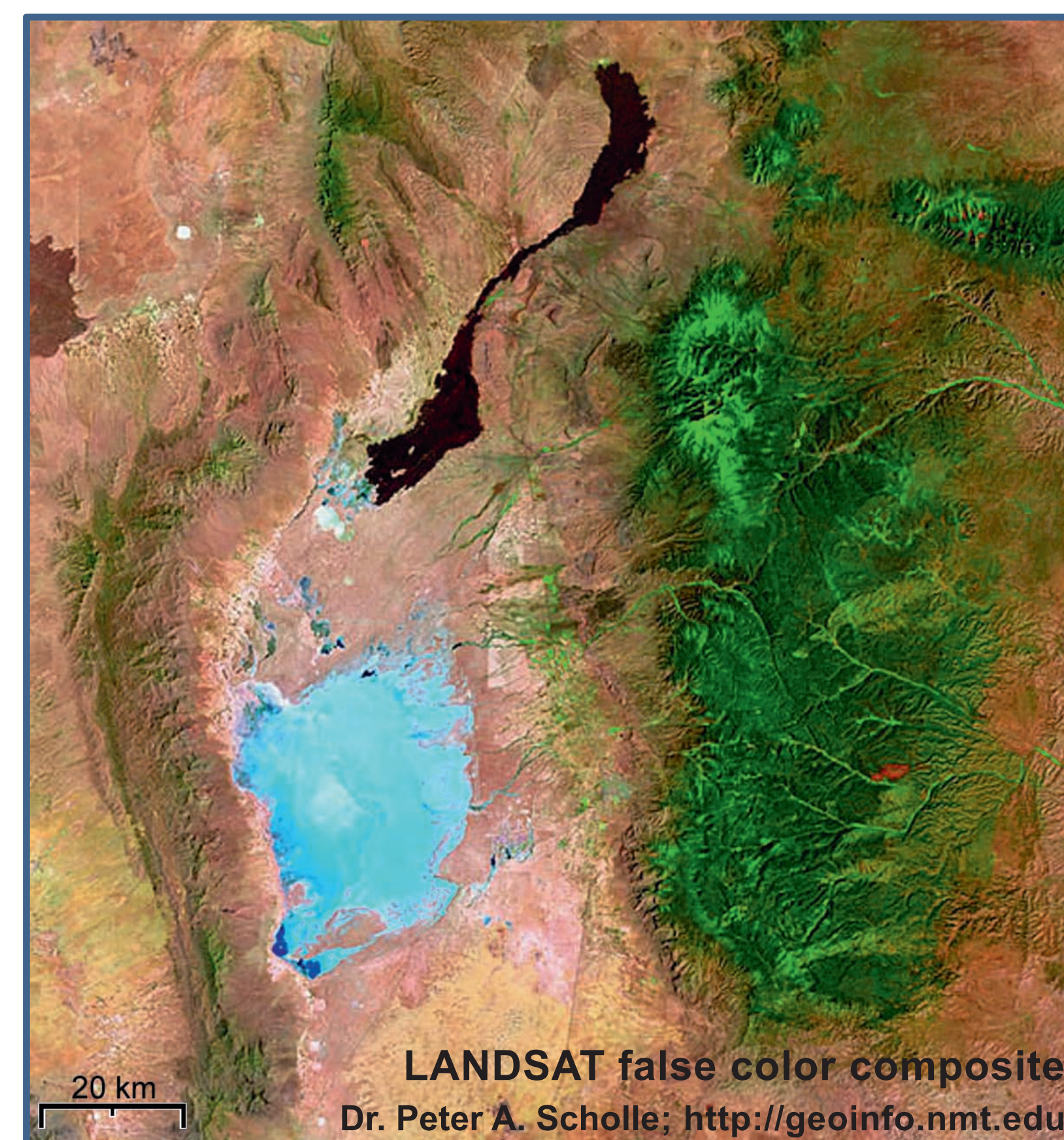
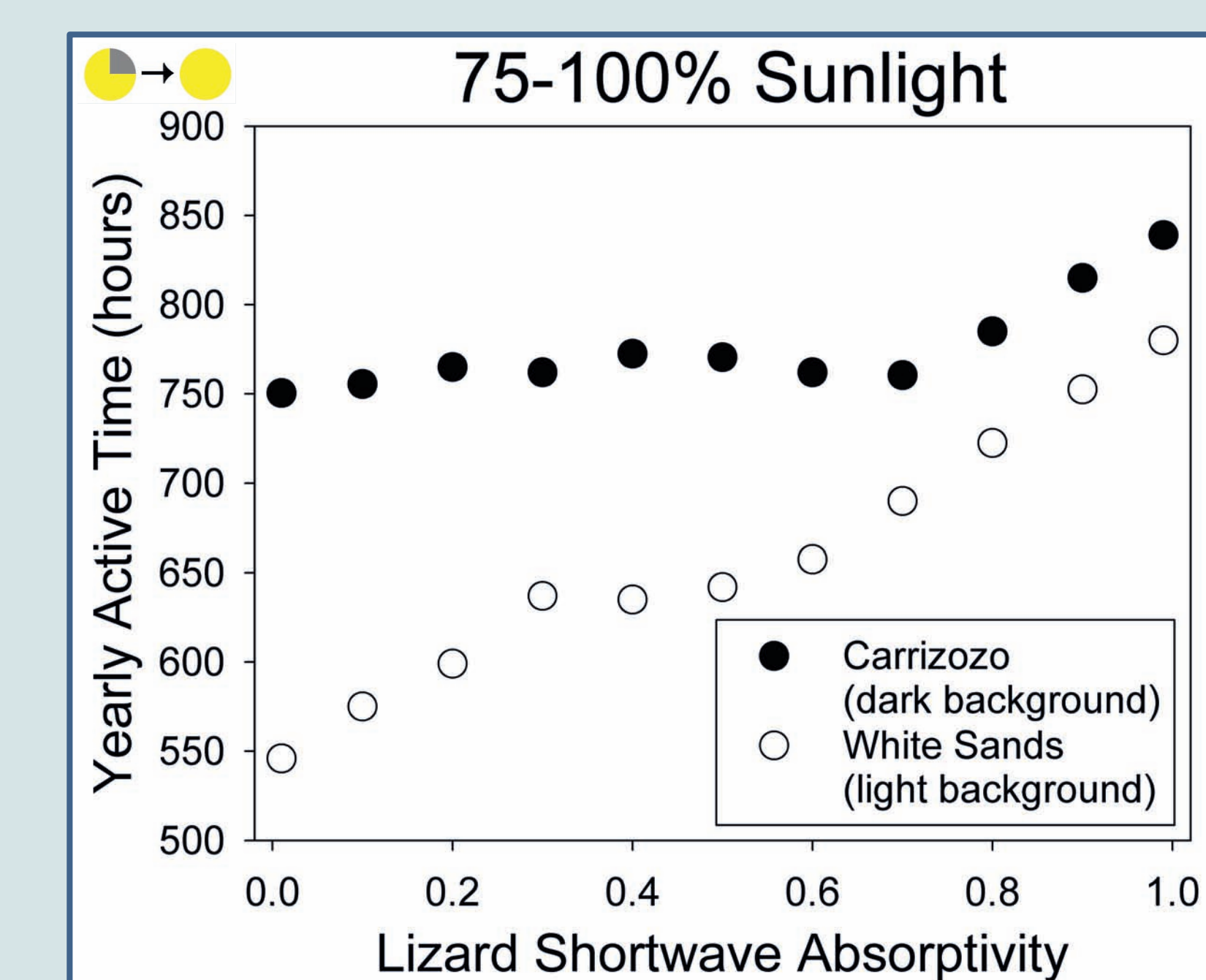
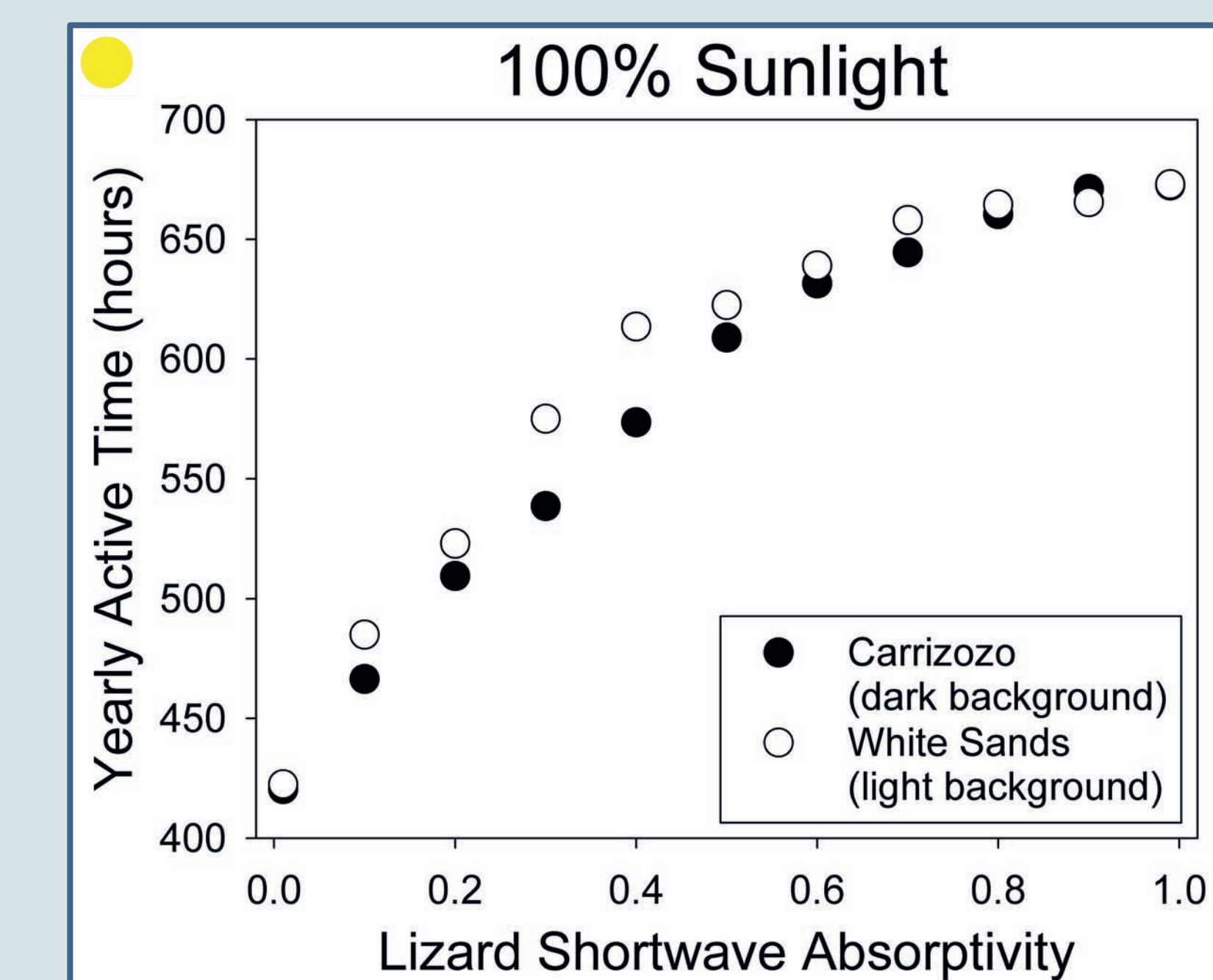


Fig. 1: Clockwise from above: Tularosa Basin (Carrizozo in the north and White Sands in the south); Carrizozo lava flow; White Sands dune system.



Fig. 2: Melanistic & blanded *Sceloporus undulatus*

Figure 4: Active time by absorptivity



Results

Melanistic lizards have a thermoregulatory advantage (more potential hours of activity per year) over blanded lizards in the Carrizozo lava fields and White Sands dune system (Fig. 3, 4). However, melanistic lizards may be at a greater risk of predation at White Sands, due to their decreased ability to match their background (crypsis). We propose that tradeoffs between thermoregulation and predation likely have given rise to patterns of coloration for lizards in the Tularosa Basin.



Future Directions: how cryptic is this lizard?

Methods

We used biophysical models that incorporated morphological and spectral traits of lizards along with the physical characteristics of the background environment to examine the consequences of color matching on activity and energy budgets of lizards in the Tularosa Basin. Further, we conducted virtual transplants to examine the thermal consequences of patterns of animal coloration that contrast with their environment.

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Figure 3: Daily activity throughout the year for melanistic and blanded *Sceloporus undulatus* at White Sands and Carrizozo

