

A snake of a different color: physiological color change in Arizona black rattlesnakes

Melissa Amarello* & Jeffrey J. Smith

*School of Life Sciences, Arizona State University

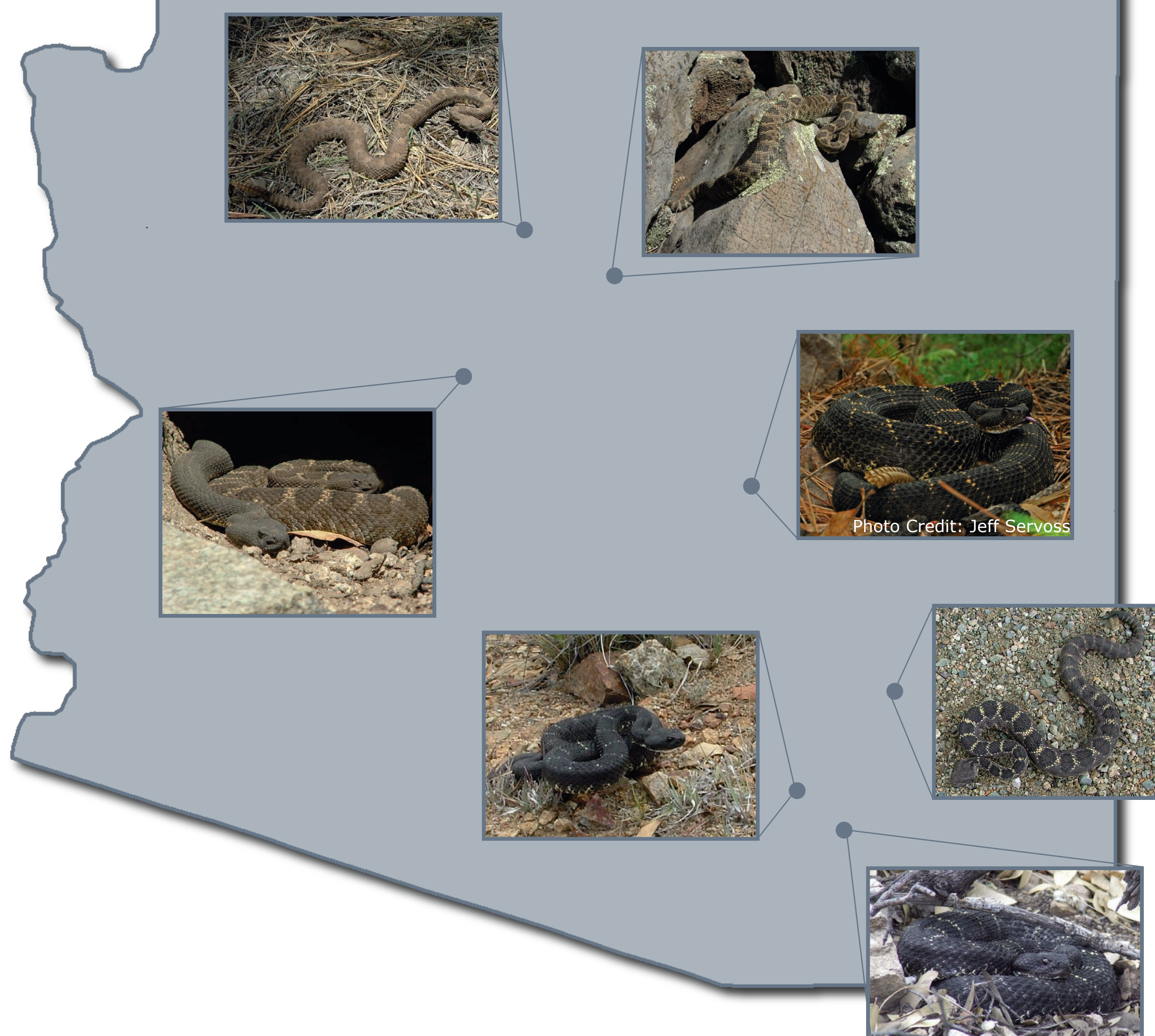
mamarell@asu.edu

eutrophy@gmail.com

A Colorful Snake

Arizona black rattlesnakes (*Crotalus cerberus*) show striking variation in color among populations (geographic variation), within populations, and even within individuals. Adults are less patterned than juveniles (morphological color change) and some adults can rapidly change color (physiological color change).

Geographic Variation in Color



Acknowledgements

We wish to thank R. Repp, J. Slone, M. Feldner, E. Nowak, J. Schofer, G. Schuett, and W. Sherbrooke for sharing their field sites and knowledge of *C. cerberus* ecology. S. Ehret, J. Capps, H-W. Herrmann, C. Loughran, and B. Parker provided field assistance. D. DeNardo, K. McGraw and their students provided lab space and expertise on working with rattlesnakes and measuring color. Permits were issued by Arizona Game and Fish Department and Arizona State University Institutional Animal Care and Use Committees; funding was provided to MA by a National Science Foundation GRFP and Sigma Xi GIAR.

Function of Color^{1,2}

- Camouflage
- Communication
- Thermoregulation
- Protection



1. S. Clusella Trullas, J.H. van Wyk, J.R. Spotila, J. Therm. Biol., 32, 235 (2007).
2. D. Stuart-Fox, A. Moussalli, Phil. Trans. R. Soc. B, 364, 463 (2009).

Why Change Color?^{1,2}

- Variable environment
- Trade-offs among color functions
- Physiological trade-offs

Morphological Color Change²

Gradual change due to changes in number or quality of chromatophores

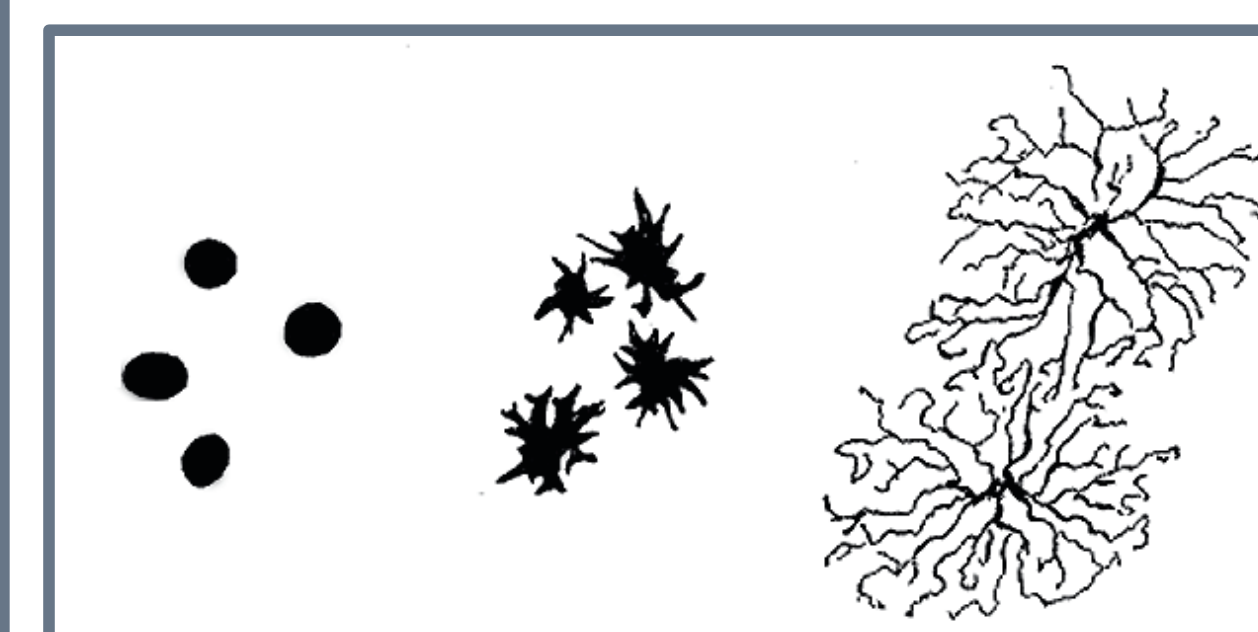


neonate *Crotalus cerberus*



adult *Crotalus cerberus*

Physiological color change due to melanin movement within dermal melanophores.



Left: full aggregation = light color
Center: intermediate
Right: full dispersal = dark color

Physiological Color Change²

Rapid change due to movement of organelles within chromatophores

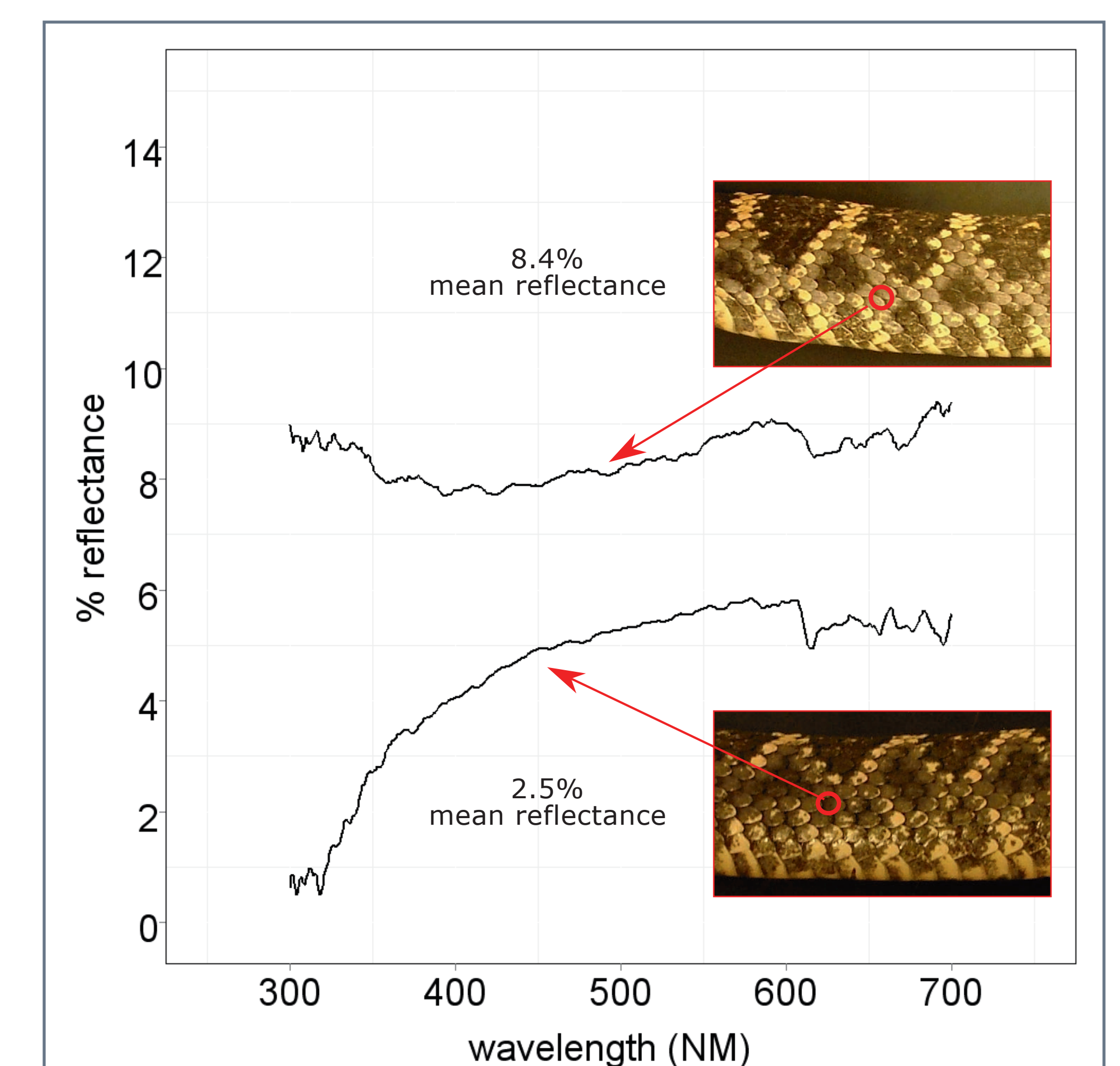
09/17/2008
(right)



09/18/2008
(left)



Crotalus cerberus #205, Santa Catalina Mountains; photos taken ~24 hours apart.



Spectral curves from *Crotalus cerberus* #111 taken approximately 24 hours apart with an Ocean Optics spectrometer.