NATURAL HISTORY NOTE

Apparent Rain Harvesting by a Colorado Desert Sidewinder (*Crotalus cerastes laterorepens*)

Jim Rorabaugh
U.S. Fish and Wildlife Service, Tucson, Arizona, USA.
Jim_Rorabaugh@fws.gov

The Yuma Desert is the hottest and driest portion of the Sonoran Desert in Arizona. Mean annual precipitation is about 70 mm (2.8 in) at Yuma and a scant 55 mm (2.2 in) at San Luis Río Colorado in the very northwestern corner of Sonora, Mexico (Holcombe et al., 1997; Felger, 2000). Temperatures frequently exceed 43° C (109.4° F) on summer days. These conditions are harsh for reptiles, but the situation is exacerbated by the fine, silica sand substrates that characterize the area. These fine sands quickly absorb any precipitation. As a result, there is no pooling of water, no arroyos that collect surface flows, and no xero-riparian corridors. Instead, there are just miles and miles of sandy flats and occasional dunes vegetated primarily by sparse associations of creosote, white bursage, and galleta grass. These conditions make it very challenging for reptiles or other animals to obtain free water for drinking.

Figure 1. Colorado Desert Sidewinder (*Crotalus cerastes laterorepens*) apparently drinking water from its skin. Yuma Desert, Arizona. Photo by Jim Rorabaugh.

Drinking of water in this way has not previously been documented in *Crotalus cerastes.*

During 16-17 April 2007, I participated in transect work in the Yuma Desert to quantify levels and types of human disturbance. From 1230-1402 h on 16 April, I walked a transect located just north of the international boundary and about 20.5 kms (12.7 mi) southeast of the Colorado River at San Luis, Arizona. At 1345 h I encountered a Colorado Desert Sidewinder (*Crotalus cerastes laterorepens*) in a loose coil that was markedly flattened out against the sand. The air and surface temperatures were 15° C (59° F), and a light rain was falling. No annual plants were present, indicating that the winter of 2006-2007 had been relatively dry. I was surprised to see a snake in the cool, wet weather, and its flattened posture was curious as well. Although individuals can sometimes be found cratered in the sand on cool days, suitable surface temperatures for sidewinder activity are typically >20° C (68° F; Secor, 1994). I stopped and took off my pack to extricate my camera and document this behavior, but the snake quickly disappeared into a nearby burrow before I could take a picture. About 10 minutes later I encountered a second *C. cerastes*. This individual was smaller (roughly 25 cm [9.8 in] total length), but was also in a loose coil and flattened against the sand. I was able to take several pictures (see Fig. 1). Although I did not see this animal actually drinking (moving its jaws), I believe it was likely drinking water from its skin. Its snout was directed into the inside of a coil of its body that would be an efficient place to collect rainwater accumulating and running off its skin. The flattening of its body, clearly visible in Figure 1, would also facilitate water collection.

Drinking of water in this way has not previously been documented in *Crotalus cerastes*; however, it is not unprecedented for snakes or reptiles in general. On page 32 of Harry Greene's 1997 "Snakes, the Evolution of Mystery in Nature" a Horned Adder (*Bitus caudalis*), an evolutionary equivalent to the sidewinder from southern Africa, is pictured drinking water from its skin in a pose very similar to the sidewinder in Figure 1. Peringuey's Adder (*Bitus*

peringueyi), another African sidewinder equivalent, flattens its neck to condense coastal desert fog for drinking (Greene, 1997). Drinking from skin has also been documented in the Great Basin Rattlesnake (*Crotalus oreganus lutosus*; Aird and Aird, 1990), and Lasiewski and Bartholomew (1969) suggested Desert Night Lizards (*Xantusia vigilis*) and Western Banded Geckos (*Coleonyx variegatus*) may do the same. The Texas Horned Lizard (*Phrynosoma cornutum*) has been observed to arch its back during storms to allow rainwater to flow towards its mouth (Sherbrooke, 1990); Johnson and Spicer (1985) reported the same behavior in a captive Flat-tailed Horned Lizard (*Phrynosoma mcallii*) that was misted with water.
In the Yuma Desert where free water is in scarce supply, sidewinders likely obtain much of their water metabolically from the foods they eat; however, rain harvesting during infrequent precipitation events may be important for maintenance of homeostasis in the very arid environment that is their home.

Literature Cited

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CURRENT RESEARCH SUMMARY

Movements of Sonora Mud Turtles

The authors of this 18-year study quantified movements, spacing, and activity of Sonora Mud Turtles (*Kinosternon sonoriense*) in interrupted mountain streams within the Santa Catalina Mountains of southern Arizona. The majority of movements by turtles were within a single pool or complex, with occasional movements between complexes, and only rare movements between drainages. Movement and activity patterns of turtles depended on water availability and varied by their sex and size. Although considered almost entirely aquatic in Arizona, mud turtles estivated terrestrially during periods of extreme drought. After the onset of summer rains, turtles increased the frequency with which they moved between pools and to nesting sites.

Movements of all turtles were shorter during drought years than non-drought years. Adult male turtles made longer movements (93 m [305 ft] on average) and had longer home-range lengths (206 m [676 ft]) than did adult females (38 m [125 ft]; home range = 40 m [131 ft]). Younger adult females made longer movements (52 m [171 ft]) and had longer home ranges (80 m [262 ft]) than did older females (38 m [125 ft]; home range = 26 m [85 ft]). Males made movements >500 m (1640 ft) more frequently (8%) than females (2%) and moved as far as 7.2 km (4.5 mi) as measured along drainage bottoms. Home range sizes observed in this study are among the largest reported for the family Kinosternidae. Large turtles used pools exclusively, only rarely sharing pools with other large individuals of the same sex, and pool fidelity was particularly strong for large females. Movements of large females away from home pools occurred only to abandon a drying pool or to move to an estivation or nesting site.

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Historically, perennial streams and wetland complexes linked what are now isolated pools in mountain canyons and almost certainly supported the vast majority of turtles and other aquatic species in the region. However, wetlands that Arizona turtles inhabit have diminished to 10% of their former size, mainly from activities associated with urbanization and agriculture, thus reducing the potential for long-distance movements of turtles among disjunct, remnant populations. Large-scale conservation strategies for mud turtles and other aquatic species must address restoration of perennial, lowland wetland complexes, which provide a source of colonizers after local extinctions and facilitate movements among populations.

Hall, D.H., and R.J. Steidl. 2007. Movements, activity, and spacing of Sonoran Mud Turtles (*Kinosternon sonoriense*) in interrupted mountain streams. Copeia 2007:403-412.