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NOTES

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**MINERAL-LICK USE BY *CHOLOEPUS HOFFMANNI* (PILOSA:
MEGALONYCHIDAE) AT LAS CRUCES BIOLOGICAL STATION,
COTO BRUS, COSTA RICA**

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ABSTRACT—To date, only one record of mineral licking exists for sloths (i.e., *Choloepus didactylus*) from Ecuador. Here we present the first record of mineral licking for *C. hoffmanni* from a tropical rainforest in Costa Rica. This behavior has been mainly associated with detoxification in herbivores, but no evidence exists for such needs in sloths.

RESUMEN—Hasta la fecha, sólo existe un registro del consumo de minerales en perezosos (i.e., *Choloepus didactylus*) en Ecuador. Aquí presentamos el primer registro del consumo mineral para *C. hoffmanni* en una selva tropical en Costa Rica. Este comportamiento se ha asociado principalmente con procesos de desintoxicación en herbívoros, pero no existe evidencia de tales necesidades en perezosos.

Mineral licks are commonly used by mammals and birds, especially in the tropics (Kreulen, 1985; Klaus and Schmidg, 1998; Matsubayashi et al., 2006; Blake et al., 2011). Animals lick rocks and soil (i.e., geophagy) and material weathering to clay to get minerals (e.g., sodium, calcium, magnesium; Emmons and Stark, 1979; Klaus and Schmidg, 1998). These mineral-rich materials are used possibly for detoxification of plant secondary compounds (Kreulen, 1985; Molina et al., 2014). Mineral licking has been reported in most herbivorous mammal taxa, but is especially common in ungulates and primates (Klaus and Schmidg, 1998; Blake et al., 2011).

Within the Order Pilosa, observations of mineral lick use in the wild are rare (Blake et al., 2011), although the diet of captive animals is generally supplemented with vitamins and minerals (Meritt, 1985). The two-toed sloth, *Choloepus hoffmanni*, is a strict herbivore, feeding primarily on fresh leaves, inflorescences, and fruits (Esberard, 2001; Vaughan et al., 2007; Hayssen, 2011). Mineral licking for *C. didactylus* (misidentified as *C. hoffmanni*; J. Guerra, pers. comm.) has been reported to our knowledge only once from a camera trap in *terra firme* forest at Tiputini

Biodiversity Station, Ecuador (Blake et al., 2011). In Peru, the same species has been recorded consuming human feces and urine from the latrines in Quebrada Blanco Biological Station, presumably seeking mineral resources (Heymann et al., 2011). The use of mineral licks by sloths may be an uncommon behavior that provides individuals with essential nutrients that are only needed in small amounts or at specific times. To better understand the importance of such rare events, it is necessary to document them. Here we provide the first published account of mineral-lick use by *C. hoffmanni* from Costa Rica.

The observation occurred on 20 June 2016, at 2030 h, where we observed an adult *C. hoffmanni* female licking a mineral-covered rock, adjacent to a culvert stream, tributary of the Java river, in a tropical rainforest at Las Cruces Biological Station (08°47'1.13"N, 82°57'39.38"W; 1,170 m), Coto Brus, Costa Rica. The individual was found near the stream, hanging at ~1 m height between rocks, vegetation, and an abandoned aqueduct infrastructure (Fig. 1a). The individual was actively licking the surface of the rock (Fig. 1b) and did not show any stress



FIG. 1—Mineral lick used by *Choloepus hoffmanni* at Las Cruces Biological Station, Costa Rica, on 20 June 2016: a) mineral-covered rock and position of the sloth; b) detail of the sloth actively licking.

signs or seem disturbed by our presence or the intermittent use of flashlights for photographic recording. After 1 h of observation, the individual hid in a concavity of the wall where it kept licking rocks. We stopped our observations to avoid disturbing the animal. Two hours later we returned to the site and the individual was still licking rocks. However, on this occasion in the presence of observers, the animal started to climb the tree closest to the rocks it was licking and escaped. According to local guides and staff at Las Cruces, this behavior has never been recorded in the area.

The few previous records available of this behavior for sloths have already stated the rarity of such events (Blake et al., 2011; Heymann et al., 2011), which together with the rarity of our observation, can reflect the low frequency of mineral-lick use for sloths at ground level. This can be because of at least three not mutually exclusive explanations: 1) exposure to predators, 2) salt-licks not being the only mineral source, and 3) low relative importance of minerals in sloth diet. Minerals are used by other herbivores mainly for detoxification of compounds in the diet (Kreulen, 1985; Molina et al., 2014). The low basal metabolic rates in *Choloepus* (McNab, 2002) together with a large multichambered stomach may reduce the amount of supplemental minerals needed in their diet (Gilmore et al., 2001; Heymann et al., 2011). It is noteworthy that also, as in previous records, the individual observed was a female, which could be associated with special mineral needs of pregnant or lactating females (Blake et al., 2011; Heymann et al., 2011).

The hypotheses presented assume the use of the mineral lick by sloths is providing an important resource that is needed by the individual. More data will need to be gathered about individuals found engaging in this behavior, and the nature of the mineral content of the lick, before we can begin to understand the underlying reasons for such phenomena.

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OBSERVATIONS ON REPRODUCTION IN THE WESTERN CHICKEN TURTLE, *DEIROCHELYS RETICULARIA MIARIA*, IN LOUISIANA

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ABSTRACT—We collected reproductive data from six female *Deirochelys reticularia miaria* in northeastern Louisiana that were collected in January 1999, June 2001, and May of both 2002 and 2003. One female collected in late January was dissected and found to contain two size classes of enlarged ovarian follicles. Five additional females collected on land in May or June were all gravid; three of them were caught while digging a nest. Mean clutch size was 10.6 and mean egg size was 37.68 × 22.88 mm, with a mass of 11.69 g. The mean incubation period for 32 eggs was 84 days, and hatchling measurements were mean carapace length of 31.67 mm and mass of 8.32 g.

RESUMEN—Colectamos datos reproductivos de seis hembras de *Deirochelys reticularia miaria* en el noreste de Luisiana colectados durante los años 1999 (enero), 2001 (junio), 2002 (mayo) y 2003 (mayo). Una hembra colectada a finales de enero fue disectada y se encontraron dos clases de tamaño de folículos ováricos agrandados. Cinco más hembras colectadas en tierra durante mayo o junio estuvieron grávidas; tres de ellas fueron atrapadas mientras excavaban el nido. El promedio de la puesta fue de 10.6 huevos y el promedio de las medidas de los huevos fue de 37.68 × 22.88 mm, con la masa de 11.69 g. El período de incubación promedio para 32 huevos fue de 84 días y la longitud media del carapacho de las crías fue de 31.67 mm y la masa de 8.32 g.

The chicken turtle (*Deirochelys reticularia*) was revised taxonomically and divided into three nominal taxa by Schwartz (1956)—the western chicken turtle (*Deirochelys reticularia miaria*), Florida chicken turtle (*Deirochelys reticularia chrysea*), and eastern chicken turtle (*Deirochelys reticularia reticularia*). More recently, mitochondrial DNA variation was assessed among the three subspecies (Walker and Avise, 1998), with little divergence between the two subspecies found east of the Mississippi River, the eastern chicken turtle and the Florida chicken turtle. Although their geographic sampling was limited west of the Mississippi River, the western chicken turtle stood out as having a distinctive mitochondrial haplotype, and there was a significant amount of genetic differentiation from the two subspecies east of the river. The possible taxonomic significance of this genetic differentiation within *D. reticularia* awaits additional study. In the state of knowledge assessment for North American turtles performed by Lovich and Ennen (2013), *D. reticularia* was

ranked near the middle (28/58) in their examination of the published literature by species. When one looks at the details of their literature compilation, which was based on Ernst and Lovich (2009), approximately 90% of the *D. reticularia* literature concerns the eastern or Florida chicken turtles. This leaves the western chicken turtle as one of the lesser known turtle taxa in the United States.

The western chicken turtle (*D. r. miaria*) was proposed for listing on the International Union for Conservation of Nature and Natural Resources (IUCN) Red List as Near Threatened in 2011 (Turtle Taxonomy Working Group, 2014). This taxon is currently “Under Review” by the United States Fish and Wildlife Service (http://ecos.fws.gov/tess_public/profile/speciesProfile;jsessionid=3F96320206510C9E9ED122E1EAEAA374?spcode=C07U#status) in response to a petition to list 404 species of southeastern aquatic species under the Endangered Species Act (Center for Biological Diversity, 2010). In Louisiana, the distribution of the western