CROTALUS SCUTULATUS SCUTULATUS (Mojave Rattlesnake). **DEFENSIVE BEHAVIOR/SALTATION AND HEAD HIDING**. Head hiding/coiling defensive behavior has not been previously documented in *Crotalus scutulatus scutulatus*. On 21 April 1994, several unusual behaviors were exhibited by an adult male *C. s. scutulatus* ca. 850–900 mm SVL (snout–vent length) in Fenner Valley, San Bernardino County, California, USA. At 0840 h (air temperature 27°C), a resting, fully coiled, slightly buried, adult male was observed in a gravelly wash, partially shaded by a large shrub (Fig.1A). After I took numerous photos from different compass directions, the snake remained motionless until it struck at me without rattling or moving into an aggressive striking position, and became airborne. The snake struck directly at me from the position facing 90° to my left (Fig.1A), a distance greater than its full body length. As the snake struck, it came completely off the ground (at least 15–20 cm) and propelled itself forward landing between my feet. A similar type of saltation behavior was

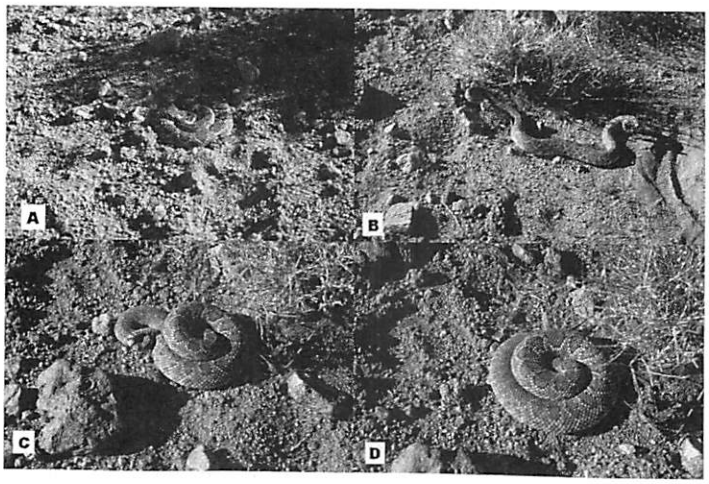

FIG. 1. Male Mojave Rattlesnake (*Crotalus s. scutulatus*) behavioral sequence of head-hiding: A) resting coil; B) saltation and aggressive behavior; C) head hidden and coiling; D) coiling completed, rattle extended upward but not vibrating.

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described by Bartholomew and Nohavec (1995. Great Basin Nat. 55:282–283) in reference to flight behavior of a *C. s. scutulatus* from Mohave County, Arizona. Additionally, this type of saltation behavior has been observed in *C. scutulatus salvini* (Armstrong and Murphy 1979. The Natural History of Mexican Rattlesnakes. Univ. Kansas Mus, Nat. Hist., Spec. Publ. No. 5. 88 pp.): "This rattlesnake is one of the most aggressive species we encountered. Several struck so violently that their entire body appeared to be momentarily air borne." The present observation parallels that of Armstrong and Murphy (1979, *op. cit.*). In my observations of hundreds of active rattlesnakes, the distance they could strike is about 2/3 of its body length; B. H. Brattstrom (pers. comm.) corroborated this estimate as well. Klauber (1982. Rattlesnakes. Their Habits, Life Histories, and Influence on Mankind. Abridged edition, p. 93. University of California Press, Berkeley, California) stated: "A rattler can strike only a short distance from its resting coil—only the distance involved in straightening the S-shaped section of the neck;" and Klauber (*op. cit.*) p. 96. "From my own experience I should say that a rattler will rarely strike more than half its length, measured from the front of the anchor coil, and almost never beyond three-quarters of that length." Mattison (1996. Rattler! A Natural History of Rattlesnakes. Sterling Publ. Co. Inc., New York. 144 pp.) notes "A rattler's strike is rapid—about 2–3 m (6–10 ft) per second—and can reach a distance of about half its body length. The strike is sometimes so violent that its whole body slides forward and, under exceptional circumstances, it may completely leave the ground." This particular male Mojave Rattlesnake did not follow the distance axioms estimated above.

Following the active saltation display, the snake became agitated and began body bridging, looping coils, rattling violently, and repeatedly striking in any direction as I tried to lift it with a stick to move it to a safe location. Most rattlesnakes are easily picked up near midbody with a stick and balance themselves well so they can safely be moved. This particular snake would not stay balanced on the stick and repeatedly fell off and continued to act aggressively, striking and rattling violently (Fig. 1B). This aggressive behavior continued for several minutes, with each attempt to pick up the snake eliciting continued striking, thrashing, and falling to the ground. On my final attempt to pick up the rattlesnake it began to display an unusual coiling behavior, placing its head on the ground and initiating a clockwise coiling motion on top of its head (Figs. 1D, 1E). In this position the snake's head was on the ground and completely buried under the center of its coils with the rattle erect and not vibrating. The snake stayed motionless in this position for approximately 5 minutes. Then I reached out with the stick to pick the snake up and attempt to move it again, this time the snake became docile while I moved it to a nearby wash 100 m west and released it next to a rodent burrow, into which it rapidly crawled.

A second head-hiding observation was made on 18 May 1999 of a smaller *C. s. scutulatus* (female ca. 650–700 mm SVL) in Piute Valley, Clark County, Nevada, USA. I attempted to move this snake from where I had set up some equipment. The snake repeatedly fell off the stick with which I had attempted to move it and was not striking violently as described earlier. After a number of attempts to move this snake it behaved similarly to the male specimen and hid its head (Fig. 2A), attempted to coil its body over the head, though not quite concealing it as well as the male specimen described earlier (Fig. 2B).

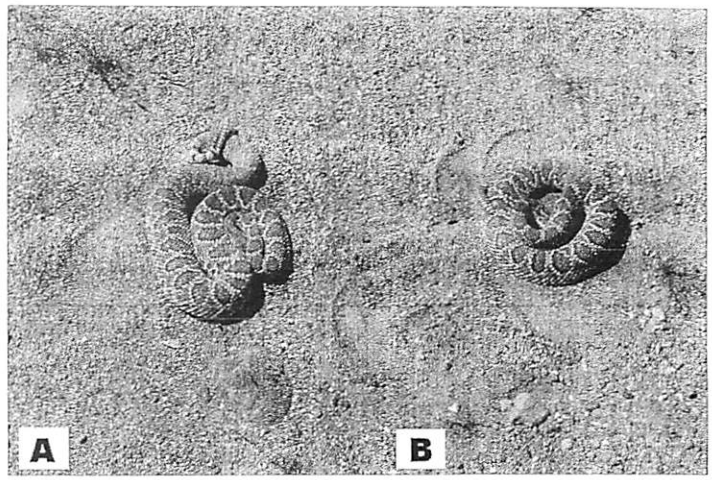

FIG. 2. Female Mojave Rattlesnake (*Crotalus s. scutulatus*) behavioral sequence of head-hiding: A) initiating head-hiding behavior; B) coiling completed, rattle silent.

Head hiding in rattlesnakes is apparently uncommon and was not documented in Carpenter and Ferguson (1977. *In* C. Gans and D. W. Tinkle [ed.], Biology of the Reptilia Vol. 7. pp. 335–554. Academic Press, New York). Subsequently, several instances of head hiding have been recorded as a result of human or predator interaction with rattlesnakes. An account of intimidation of a Western Diamondback Rattlesnake (*Crotalus atrox*) was reported (Cowles 1977. Desert Journal: A Naturalist Reflects on Arid California. Univ. California Press, Berkeley. 263 pp.) where several snakes were individually intimidated by placing a flattened hand into the face making the snake lower its head and hiding it under a coil. This behavior apparently is an attempt to avoid an attacker by escaping and to protect its head from imminent danger. A slightly different posture of head hiding behavior has been documented in *C. atrox* as an escape from predation after being confronted by a Roadrunner (*Geococcyx californianus*). After the snake struck numerous times at a Roadrunner and became exhausted, it protected its head by tucking it under its coils (Cornett 2001. The Roadrunner. Nature Trails Press, Palm Springs, California. 64 pp.; Meinzer 1993. The Roadrunner. Texas Tech Univ. Press, Lubbock, Texas. 104 pp.; Sherbrooke and Westphal 2006. Southwest Nat. 51:41–47). Head-hiding behavior has also been documented in the Prairie Rattlesnake (*Crotalus viridis viridis*) in response to human interaction (Duval et al. 1985. Nat. Geogr. Res. 1:80–111; Alcock 1998. Animal Behavior: an Evolutionary Approach. Sinauer Associates, Inc. Sunderland, Massachusetts. 640 pp.); and in the Red Diamond Rattlesnake (*Crotalus ruber*) by Rubio 1998. Rattlesnake: Portrait of a Predator. Smithsonian Institution Press, Washington, D.C. 240 pp.). Head-hiding behavior in conjunction with defensive tail displays is widespread in snakes (Greene 1973. J. Herpetol. 7:143–161). The significance of head hiding behavior in rattlesnakes and lack of rattle vibration appear to simply be a defensive measure to protect the snake and its head from human intimidation and/or possible predation.

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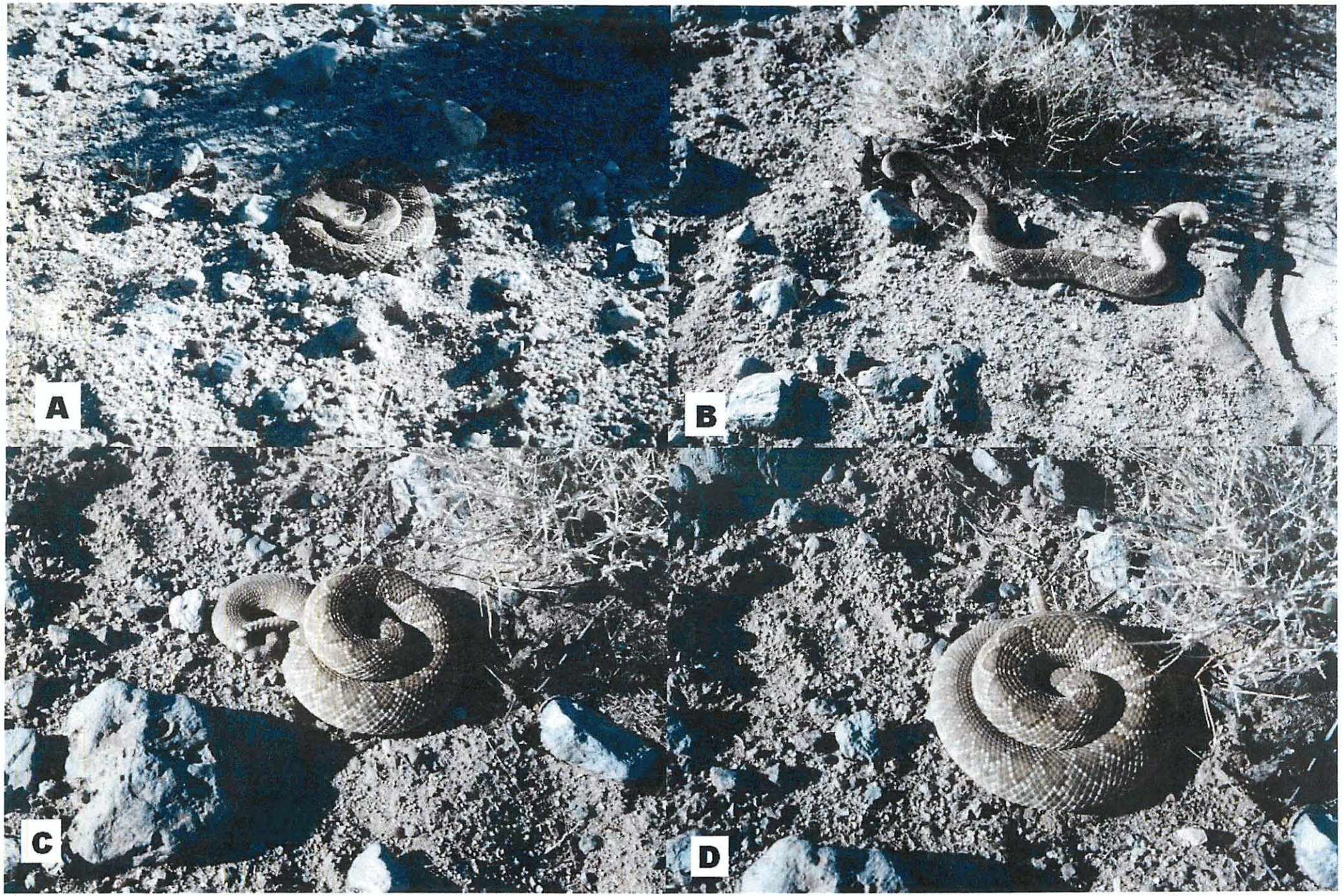
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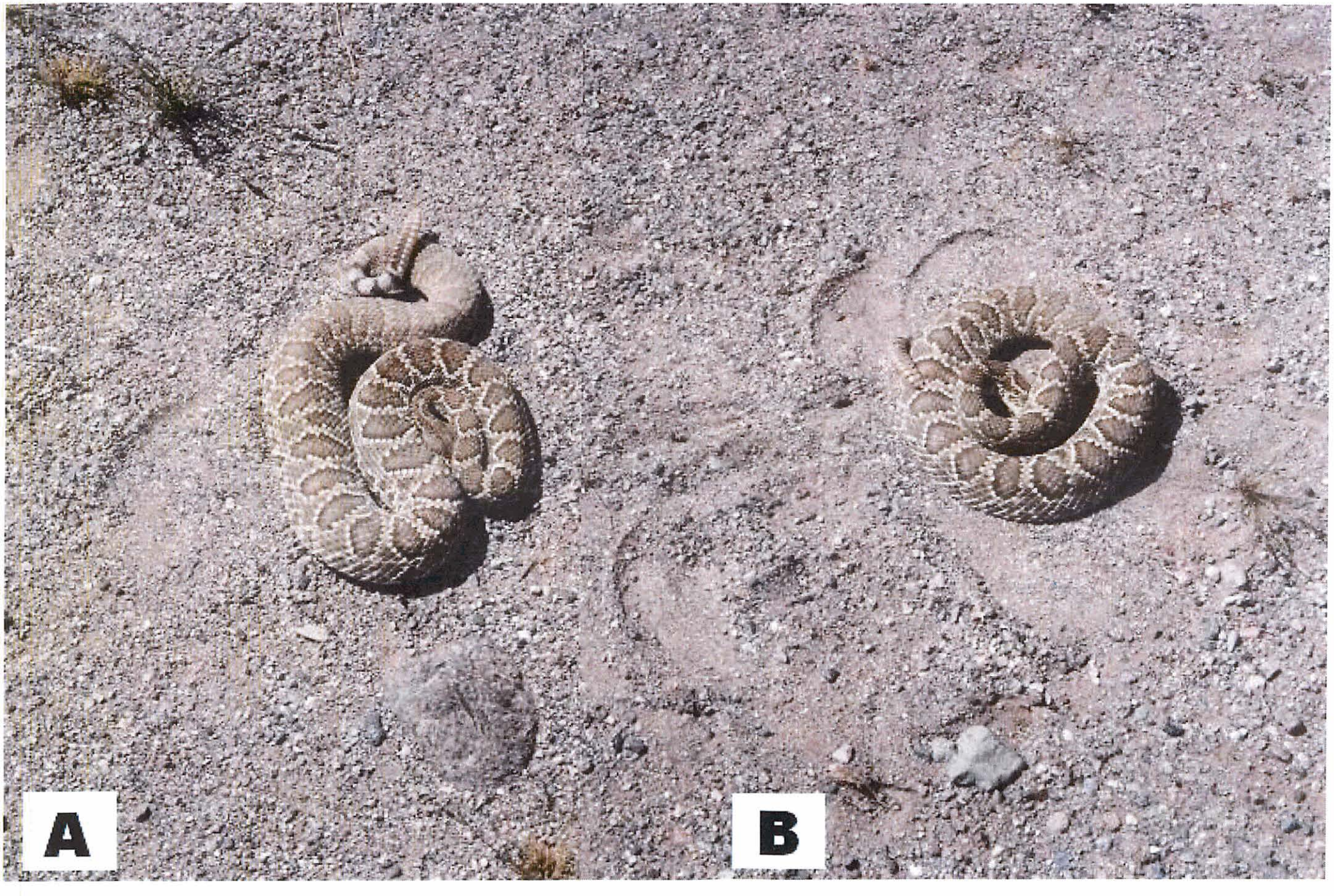
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