NATURAL HISTORY NOTE

An observation of multiple idiopathic kyphoscoliosis in a free-roaming California glossy snake (*Arizona elegans occidentalis*) in northwestern Baja California, México

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Several species of reptiles have been reported with physical anomalies, such as bicephaly, dwarfism, scoliosis, kyphosis, tail bifurcations, and other malformations (Mcallister and Wallach 2006, Mitchell and Johnson 2013, Sant'Anna et al. 2014, Hildago-Licona et al. 2016, Alvarez et al. 2020, Heyborn 2021). These conditions have been variously reported as congenital, environmental, or idiopathic in origin (Gray et al. 2003, Wallach 2007, Sant'Anna et al. 2014). Spinal anomalies such as kyphosis and scoliosis (also: kyphoscoliosis—a combination of the two conditions) appear to be most common in lizards under captive conditions (Divers and Mader 2005). Valdez-Villavicencio et al. (2016) reported a wild-caught *Sceloporus vandenburgianus* (Southern Sagebrush Lizard) with kyphosis and scoliosis and noted three other wild-caught congeners with the same condition. Franklin (2021) recently reported kyphosis in a wild *Graptemys versa* (Texas Map Turtle) and summarized the condition in other congeners of the map turtle. Although snakes with kyphosis, scoliosis, or kyphoscoliosis, have been reported, it appears to be uncommon or rare (Sant'Anna et al. 2014). Currently there are very few reports of scoliosis and kyphosis among colubrid snakes and there is a paucity of published information on malformations or other physical/anatomical anomalies for *Arizona elegans* in either wild, or captive, populations. Herein we report an observation of an adult *A. elegans* that was found in the wild with multiple kyphoscoliosis.

Arizona elegans is a wide-ranging colubrid snake that is distributed through Texas and Kansas to central California, and south through Baja California and mainland-México (Conant and Collins 1991, Grismer 2002, Stebbins 2003). The species is divided into 8 subspecies that are recognized by body pattern, tail length, and range (Klauber 1946, Powell et al. 2016, McGinnis and Stebbins 2018). In the state of Baja California there are two subspecies: *A. e. eburnata* (Desert Glossy Snake) on the eastern half, and *A. e. occidentalis* (California Glossy Snake) on the western half, and are known to be nocturnally active (McPeak 2000, Grismer 2002).

We attended an educational workshop for field biologists in early August 2021 at the Meling Ranch in northwestern Baja California (120 km southeast of Ensenada). The site lay at approximately 650 m elevation among an expansive chaparral plant community. On 04 August 2021 we were conducting night-time visual encounter surveys for snakes. At approximately 2215 hrs, we encountered a free-roaming *A. elegans* that lay motionless on an open patch of bare ground (30.972050° N, 115.750025° W). The snake was temporarily collected for species identification, photographs, and measurements.

Upon close examination and physical palpation, the adult female *A. elegans* appeared to have multiple kyphoscoliosis on the posterior quarter of the body (Figure 1). We measured and weighed the snake (84.4 cm snout-vent length, 94.3 cm total length, 175 g) and more closely examined the body malformations. Under close inspection we counted 13 dorsoventral bends that were in fixed locations, indicating kyphosis, and three that were laterally fixed, indicating scoliosis (Frye 1991, Rothschild et al. 2012). Our general examination included a visual assessment of body condition and a gross examination for other atypical body conditions. This examination allowed us to conclude that the individual was otherwise healthy; it appeared to be a reasonable weight for its length; and showed no signs of emaciation or physical anomalies that would preclude successful foraging. The *A. elegans* was retained for additional photographs and subsequently released at the site of capture the following evening.

The specimen we observed appeared mobile, showed no sign of malnutrition, and was of an adult size (following Aldridge 1979). We speculated that the malformations were congenital, and the specimen grew to adult size with, or in spite of, these physical anomalies. Although *A. elegans* is a constrictor, it is also known to swallow prey directly (Ernst and Ernst 2003). This level of behavioral plasticity may have aided this individual in feeding while appearing physically atypical. Based on body condition, this malformation apparently had little to no effect on movement and foraging. It was unclear whether the multiple kyphoscoliosis impaired reproduction for this adult female snake.

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Fig. 1. An *Arizona elegans* with multiple idiopathic kyphosis and scoliosis, Meling Ranch, Baja California. Photo by Jorge H. Valdez-Villavicencio.

Fig. 2. An *Arizona elegans* showing specific (red arrows) idiopathic kyphosis and scoliosis, Meling Ranch, Baja California. Photo by J. Álvarez.

We believe that this is the first report of kyphosis or scoliosis in *A. elegans*. Although the origin of kyphoscoliosis may be the result of either genetic or environmental conditions, this individual existed in a natural environment with little influence from environmental contaminants, heavy-dose fertilizers, waste dump sites, or similar. We suspect the condition was congenital, but this would require further investigation. Also, the frequency of kyphosis or scoliosis in the vicinity—in any vertebrates—should be recorded and reported.

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