

small black fruits of *Murraya koenigii* (Curry Leaf Tree; Fig. 1B), that measured ca. 4–5 mm in diameter. This lizard was 3 m up in the tree and we watched it feed for 10 min as it ate at least on four fruits.

To our knowledge, this is the first documented record of fruits in the diet of *F. pardalis*. Lizard frugivory is often considered an “insular phenomenon” and has been rarely reported in Chamaeleonidae (Valido and Olesen 2019. *Front. Ecol. Evol.* 7:49). The only other two chameleon species reported to eat fruit that we are aware of are *Chamaeleo chamaeleon* (Meiri 2018. *Global Ecol. Biogeogr.* 27:1168–1172) and *Furcifer oustaleti* (Takahashi 2008. *J. Herpetol.* 42:760–763). It remains unclear how common frugivory is in chameleons and further work is needed.

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HELODERMA SUSPECTUM (Gila Monster). HIBERNATION.

During hibernation, *Heloderma suspectum* remain in their overwintering shelters (commonly crevices in rocky slopes or boulders, or burrows of tortoises or rodents) for several months (Beck 2005. *Biology of Gila Monsters and Beaded Lizards*. University of California Press, Berkeley, California. 211 pp.). The duration of hibernation for *H. suspectum* varies by population, individual, and age class. Beck (2005, *op. cit.*) suggests that individuals remain within shelters for between 75 and 120 d (Beck 2005, *op. cit.*). Gienger (2003. *Natural History of the Gila Monster in Nevada*. M.S. Thesis, University of Nevada, Reno, Reno, Nevada. 55 pp.) reported an average hibernation period for *H. suspectum* in southern Nevada of 130 d, with the longest reported hibernation lasting 154 d. Here, we report on an individual whose hibernation period far exceeded any previously reported case.

During a long-term radio telemetry study at a Mojave Desert site in southern Nevada, USA (near Las Vegas), we observed an individual *H. suspectum* overwinter for 232 d, 78 d longer than the maximum duration previously documented. This individual was tracked to its overwintering shelter (1357 m elev.) on 11 November 2020, where it remained until 1 July 2021. Location was confirmed once per week in the field using radio telemetry from August–March, and then daily during the active season (April–July). On its most recent capture on 10 May 2020 this lizard had an SVL of 266 mm, mass of 315 g, and tail volume of 40 mL and was categorized as a sub-adult of unknown sex based on its size relative to breeding adults in the same population.

This nearly 8-mo residency within the hibernaculum suggests the potential for individual *H. suspectum* to remain inactive for a substantially longer period into the activity season than previously thought. This extended quiescent period corresponded with a 238-d period of exceptional drought at the field site, lasting from 1 December 2020 until 27 July 2021 (www.drought.gov; 1 Sept 2021). For individuals active above-ground, particularly during drought years when prey availability is greatly reduced, the energetic return on foraging activities may not outweigh the energetic costs of leaving an overwintering shelter. This may suggest that some *H. suspectum* following an optimal foraging strategy extend their hibernation period into the active season as a means of energy conservation.

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HOLCOSUS FESTIVUS (Central American Whiptail Lizard).

NUPTIAL GIFT. Signaling the ability to provision limited resources to a mate’s reproductive success should be favored by sexual selection (Andersson 1994. *Sexual Selection*. Princeton University Press, Princeton, New Jersey. 624 pp.; Wedell and Ritchie 2004. *Anim. Behav.* 67:1059–1065). In many taxa, female mate choice is driven by courtship offerings in the form of nutritional items, commonly known as nuptial gifts where males present their partners with feeding gifts before, during, or after courtship and/or copulating (Lewis and South 2012. *Adv. Study Behav.* 44:53–97). Such mating effort has been widely reported across invertebrate species, but it has been less reported among vertebrates, especially reptiles (Lewis and South 2012, *op. cit.*). Here, we report on a novel mating ritual in the lizard *Holcosus festivus* from a tropical lowland rainforest in Costa Rica.

On 22 August 2020, at ca. 1233 h, we observed an adult male *H. festivus* offer a nuptial gift to a female at Veragua Rainforest Preserve, in Las Brisas de Veragua, Limón, Costa Rica (9.9264°N, 83.1876°W; WGS 84; 420 m elev.). The nuptial gift was an adult *Craugastor fitzingeri* (Fitzinger’s Rain Frog), which the male lizard held in its mouth and had already killed. After ca. 1 min, the male approached the receptive female, which was stationary and remained so, before the male positioned its prey in front of her at a distance of ca. 40 cm. Subsequently, the male circled the female once every minute for 4 min while also performing vertical head movements and tail vibrations in front of her at a distance of ca. 50 cm. Afterwards, the male dropped the frog ca. 10 cm from the female, and she picked it up and consumed it vent first. Fifteen seconds after the female started eating the frog, the male positioned himself on top of her in diagonal position, held onto the female’s back, and wrapped his tail under hers, vent-to-vent, and they mated for about 2 min (Fig. 1). Approximately 3 min after

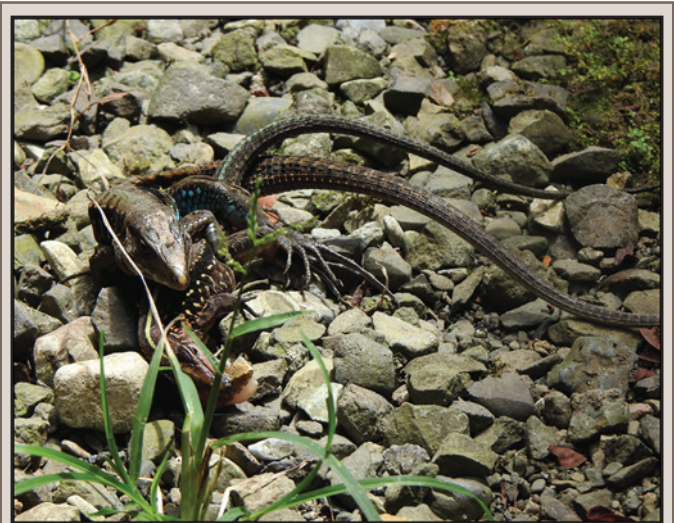


FIG. 1. *Holcosus festivus* breeding in Veragua Rainforest, Costa Rica. Note the female (bottom) eating a frog that was offered by the male (top) as a nuptial gift before copulation.

mating, the female had rearranged the position of its prey and ended up consuming the frog forward towards the mouth.

To our knowledge, this is the first instance of a food nuptial gift exchange in *H. festivus*, or for that matter in any reptile species (Olsson and Madsen 1998. In Birkhead and Moller [eds.], Sperm Competition and Sexual Selection, pp. 503–577. Academic Press, London). This is surprising because this behavior has not been noted before in *H. festivus*, a common and diurnal lizard that is easily observed. It is unclear how often or important nuptial gift giving is for male *H. festivus* mating success, but it does signal good hunting abilities of the male. The present work documents a courtship behavior in the form of nuptial feeding that is largely under-reported in reptiles when competing for mates.

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NAMAZONURUS PUSTULATUS (Herero Girdled Lizard). TAIL-BITING. Some species in the lizard family Cordylidae are known to bite their own tail and “roll into an impenetrable ball, with the spiny tail and legs protecting the soft underparts” as a defense mechanism against predators (Mouton et al. 1999. J. Zool. 249:1–10; Broeckhoven and Mouton 2014. Biol. J. Linn. 111:823–833). For example, this behavior is well documented in *Ouroborus cataphractus* (Peers 1930. S. Afr. J. Nat. Hist. 6:402–411.) and has been observed in three other cordylids: *Cordylus cordylus*, *C. niger*, and *C. oelofseni* (P. Le F. N. Mouton, pers. comm.). This behavior has not been observed in the genus *Namazonurus*, and herein we report on defensive tail-biting in *N. pustulatus* in Namibia.

Namazonurus pustulatus is a secretive, medium-sized (up to 87 mm SVL) lizard, rarely observed outside rock crevices, that is endemic to Namibia. On 31 July 2019, at Farm Lichtenstein West, Khomas, Namibia (22.83322°S, 16.99640°E; WGS 84; 2144 m elev.) we observed a juvenile male *N. pustulatus* exhibiting the tail-biting defensive behavior. We found the lizard (43 mm SVL) in a rock crevice and extracted it to collect measurements and to preserve it as a museum voucher (National Museum of Namibia [NMN], State Museum - Reptile [SMR] 10731). After extraction, and while processing the lizard, it bit the end of its tail and maintained that position for a couple of minutes while in hand and remained in this position after putting it on the ground (Fig. 1A). On 6 August 2019, near Okahandja, Otjozondjupa, Namibia (21.99679°S, 16.93037°E; WGS 84; 1362 m elev.) we observed a second *N. pustulatus*, an adult female (82 mm SVL), exhibiting the tail-biting behavior after being extracted and handled (Fig. 1B). This lizard was released after processing. In both cases the lizards formed a more ovoid shape than the more commonly observed ball shape seen in *O. cataphractus*.

Out of 450 encounters and processing of *N. pustulatus* these are the only two instances of tail-biting and it does not seem common in this species. To our knowledge this is the first time defensive tail-biting has been reported in *Namazonurus*, and is the third genus out the ten cordylid genera to display this behavior (Mouton et al. 1999, *op. cit.*). In our observations the two

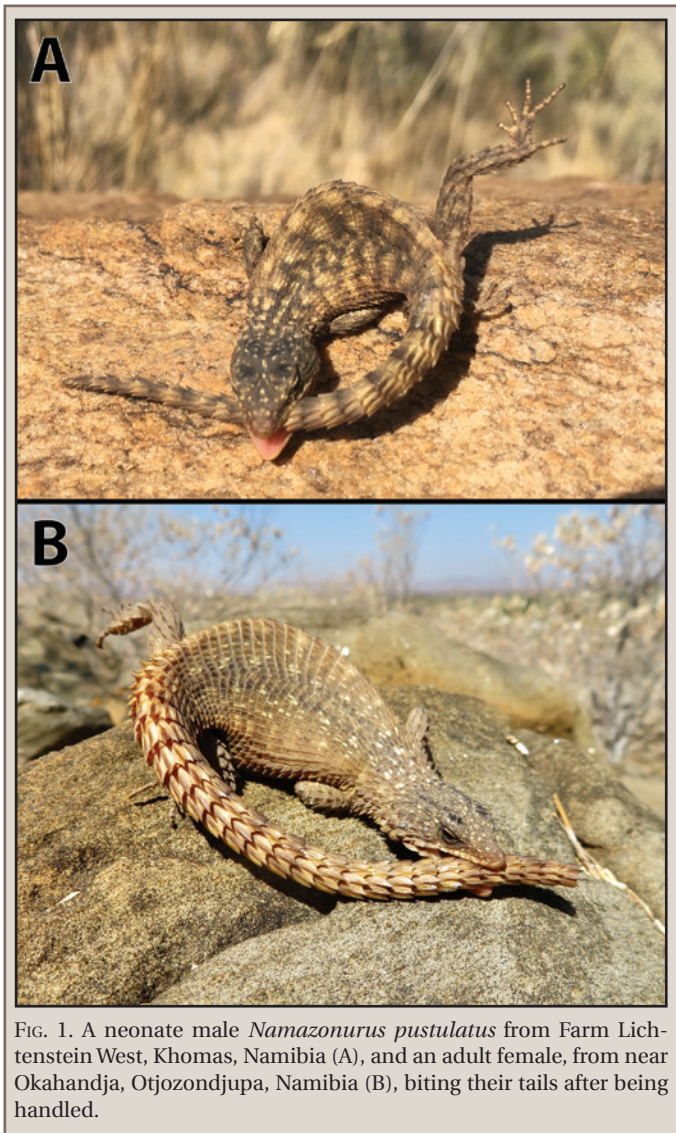


FIG. 1. A neonate male *Namazonurus pustulatus* from Farm Lichtenstein West, Khomas, Namibia (A), and an adult female, from near Okahandja, Otjozondjupa, Namibia (B), biting their tails after being handled.

N. pustulatus bent backwards, where *O. cataphractus* bend forwards to protect their soft belly. As a result, the “ball” shape that protects the lizard, as seen in *O. cataphractus*, was not observed in *N. pustulatus* where its underside appears to be rather exposed (Fig. 1).

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PHELSUMA INEXPECTATA (Manapany Day Gecko). PREDATION. *Phelsuma inexpectata* is a diurnal, arboreal gecko, reaching a maximum size of 62 mm SVL, which is endemic to the coastal areas in the southern region of Manapany-Les-Bains and