



Predation on a Prairie Kingsnake (*Lampropeltis calligaster*) by a Virginia Opossum (*Didelphis virginiana*) in Oklahoma, USA, with Notes on Opossum-Snake Interactions

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Opossums (Marsupialia: Didelphidae) are a New World radiation of approximately 116 species distributed across the Americas and occupying a diversity of niches (Voss and Jansa 2021). The Virginia Opossum (*Didelphis virginiana*) is a nocturnal mesopredator widely distributed from southern Canada throughout most of the United States and Mexico and southward to northwestern Costa Rica (Gardner and Sunquist 2003). This species is ubiquitous in ecological communities within its range and occupies a variety of habitats, including deciduous forests, wetlands, and urban and suburban landscapes (Gardner and Sunquist 2003; Kanda et al. 2006; Beatty et al. 2014). Classified as a type A generalist, *D. virginiana* consumes a diversity of foods, including but not limited to plant material, invertebrates, vertebrates, and anthropogenic resources such as garbage (Hopkins and Forbes 1980; Bearhop et al. 2004). Despite its broad distribution and high abundance where it occurs, our understanding of the trophic ecology of *D. virginiana* remains incomplete.

Didelphis virginiana is an important predator of snakes, with snakes comprising ca. 19% of prey items taken by adult opossums in a population in New York, USA (Hamilton 1950). Although many reported prey species are non-venomous (Hamilton 1950; Hopkins and Forbes 1980), Virginia Opossums are known to consume venomous snakes. For example, Copperheads (*Agkistrodon contortrix*) comprised ca. 6% of prey items taken by opossums in Texas, USA (Wood 1954).

At 2129 h on 21 March 2025, after conducting frog-call surveys near a pond in the Fort Gibson Wildlife Management Area, Wagoner County, Oklahoma, USA, the first author heard rustling noises in a patch of tall, dried grass. Upon investigation, he observed and recorded video footage (<https://doi.org/10.6084/m9.figshare.28718690.v1>) of an

adult *D. virginiana* tugging on the posterior body of a live adult Prairie Kingsnake (*Lampropeltis calligaster*). For about 20 min, the opossum chewed and tugged on the posterior end of the snake, frequently repositioning its grip along various parts of the snake’s body as the snake attempted to escape (Fig. 1). The first author left the area, leaving the animals uninterrupted, and upon returning to the location about 70 min later; neither the *D. virginiana* nor *L. calligaster* could be relocated.

Documented snake prey species of *D. virginiana* include the non-venomous Western Wormsnake (*Carphophis vermis*) (Reynolds 1945; Sandidge 1953), North American Racer (*Coluber constrictor*) (Stieglitz and Klimstra 1962), Ring-necked Snake (*Diadophis punctatus*) (Reynolds 1945; Hamilton 1950), Milk Snake (*Lampropeltis triangulum*) (Hamilton 1950), Northern Watersnake (*Nerodia sipedon*) (Hamilton 1950), Dekay’s Brownsnake (*Storeria dekayi*) (Hamilton 1950), Red-bellied Snake (*Storeria occipitomaculata*) (Hamilton 1950), Common Gartersnake (*Thamnophis sirtalis*) (Hamilton 1950), and the venomous Copperhead (*Agkistrodon contortrix*) (Wood 1954; Fitch 1960) and Cottonmouth (*Agkistrodon piscivorus*) (Palis 2022). To our knowledge, this observation is the first record of predation by *D. virginiana* on *L. calligaster*.

The trophic ecology of opossum-snake interactions (reviewed in Voss and Jansa 2012) warrants further discussion, particularly considering the observation described herein. Prey handling by predators is generally expected to be efficient, and selection for careful handling may be heightened when prey items are chemically defended by toxins (Aiyer et al. 2022). Selection on predators of venomous snakes would be expected to promote rapid immobilization and/or incapacitation of prey. Some snake predators lack resistance to the



Figure 1. A Virginia Opossum (*Didelphis virginiana*) attacking an adult Prairie Kingsnake (*Lampropeltis calligaster*) at Fort Gibson Wildlife Management Area, Oklahoma, USA. Photographs by Owen M. Edwards.

venoms of their prey (e.g., Balchan et al. 2025) and are sensitive to the lethal effects of those venoms (Siegrist et al. 2022). Other snake predators are resistant to venoms (Voss and Jansa 2012; van Thiel et al. 2022), and various mammals possess endogenous mechanisms to detoxify venoms (e.g., Bdolah et al. 1997; Drabek et al. 2015; Balchan et al. 2024). Despite the diversity of species capable of detoxifying snake venoms, the mechanisms responsible remain poorly characterized, although venom inhibitor proteins and modified target proteins are typical mechanisms conferring resistance (Holding et al. 2016).

Unlike most mammals, opossums are both predators (Voss and Jansa 2012) and prey (Voss 2013) of snakes and thus interact with venoms in both contexts. Venom resistance in opossums is conferred by adaptive modifications in a venom-targeted protein (von Willebrand Factor; Jansa and Voss 2011), which renders co-occurring pitviper venoms

effectively non-toxic. This adaptation can result in a hundredfold increase in resistance compared to a non-resistant mammal (Werner and Vick 1977). Consequently, opossums might be released from the strong selective pressures imposed by snake venoms, and this could minimize constraints associated with careful prey handling that are driven by toxic prey. The ability of mammals to differentiate between non-venomous and venomous snakes varies and might be poor (Owings et al. 2001, Glaudas et al. 2025), especially in low-visibility or fast-paced interactions, and thus handling both non-venomous and venomous snake prey with similar caution to limit risk of envenomation is a reasonable expectation.

In the observation described herein, we noted that the opossum focused its attention on the posterior body of the snake. Other predators are known to incapacitate snakes quickly, generally focusing attacks on the head (Farallo and Forstner 2012), presumably to render the snake defenseless

and safer to handle. Little is known about prey-handling behaviors of *D. virginiana*, but the observed lack of urgency in subduing this snake might reflect relaxed selection due to resistance against venoms of locally relevant pitvipers. Handling of snake prey by a congener (*D. marsupialis*) apparently is context-dependent, and opossums may feed on venomous snakes with or without incapacitating the animal first, depending on the behavioral response of the prey (Almeida-Santos et al. 2000). Future work is needed to determine if the prey-handling observed herein is typical, if opossums are capable of distinguishing venomous from non-venomous snakes, and if *D. virginiana* handles venomous and non-venomous snake prey differently.

Acknowledgements

We thank Robert S. Voss for providing comments that improved the quality of this note.

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