

(1986. Les Serpents de la Guyane Française. Éditions de l'Orstom XXVII. 165 pp.) found that in French Guiana *P. guianensis* is most active in the late evening and at night. However, our observation suggests that this species may also forage actively during the day.

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**RHABDOPHIS SUBMINIATUS HELLERI (Red-necked Keelback). DEFENSIVE BEHAVIOR.** Snakes in the genus *Rhabdophis*, a widespread Asian genus, possess unique glands in the nape of the neck called nuchal glands (Hutchinson et al. 2007. Proc. Nat. Acad. Sci. 104:2265–2270). Mori and Burghardt (2008. J. Ethol. 26:61–68) examined several defensive behaviors associated with *Rhabdophis* species. Of the 18 behaviors they examined, three seemed to be closely associated with nuchal glands: 1) dorsal-facing posture, in which the dorsal neck region is directed toward the stimulus and elevated above the substrate; 2) neck arch, in which the chin is directed towards the substrate and the neck is bent upward; and 3) neck butt, in which the snake swings the arched neck so that it is butted up against the stimulus. On 4 August 2011, on Lantau Island, Hong Kong, we encountered an adult *R. subminiatus* in a hole on the side of a wall in a water conduit. Upon being extracted from the hole, the snake immediately arched its neck against our glove and began oozing secretions from the nuchal gland region (Fig. 1). This active “transport” of the nuchal fluid is undocumented. In prior observations of nuchal gland secretion in *Rhabdophis*, physical pressure on the nuchal region was required to induce secretion. Our animal did not experience any physical pressure aside from the mid-body capture we made with a glove. During closer approach of the animal for photographs, the nuchal gland fluid was sprayed into the air, apparently towards the approaching photographer. Explanations for the ease with which the animal expressed the nuchal gland fluid may include thin membranes

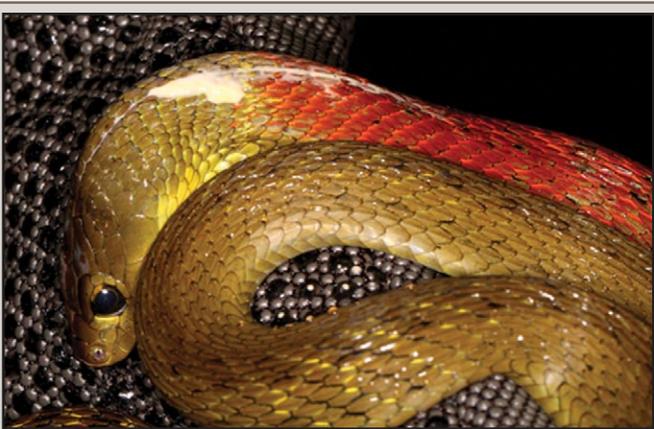


FIG. 1. *Rhabdophis subminiatus* neck arching and expressing nuchal gland toxins.

surrounding the nuchal glands, coupled with flexing of the epaxial muscles during the dorso-lateral flattening of the neck (A. Savitzky, pers. comm.).

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**RAMPHOTYPHLOPS BRAMINUS (Brahminy Blindsnake). PRE-DATION.** *Ramphotyphlops braminus* is a Southeast Asian parthenogenic, typhlopoid snake, probably indigenous to India and Sri Lanka (Wallach 2008. Bull. Chicago Herpetol. Soc. 43:80–82). Because of its small average size (total length = 130 mm), and ability to be anthropogenically transported in soil (especially in potted plants and mulch), *R. braminus* currently has the most widespread, near worldwide, nonindigenous distribution of any snake (Kraus 2009. Alien Reptiles and Amphibians: A Scientific Compendium and Analysis. Springer, New York. 563 pp.). In Florida, USA, *R. braminus* is rapidly expanding its distribution and is established in numerous counties (Krysko et al. 2011. Zootaxa 3028:1–64). Predators of *R. braminus* in Florida include nonindigenous *Rhinella marina* (Cane Toad), nonindigenous *Anolis cristatellus* (Crested Anole), and endemic *Lampropeltis extenuata* (Short-tailed Snake) (Meshaka 2011. Herpetol. Conserv. Biol. 6:1–101).

On 24 March 2011, a *Dasyus novemcinctus* (Nine-banded Armadillo) was killed on the premises of the Division of Plant Industry (DPI), Florida Department of Agriculture & Consumer Services, 1911 SW 34<sup>th</sup> Street, Gainesville, Alachua Co., Florida, USA (29.635175°N, 82.370844°W, datum: WSG84). I examined its stomach contents and discovered an intact adult *R. braminus* (total length = 152 mm, UF 166054) which I deposited in the Herpetology Collection, Florida Museum of Natural History (FLMNH), University of Florida. A population of *R. braminus* previously has been documented on the grounds of this facility (Somma 2007. Herpetol. Rev. 38:355–356) and three additional specimens were collected in March and April 2011 (UF 166055–166057).

*Dasyus novemcinctus*, in Florida, is a nonindigenous, cingulatan mammal that has a primarily insectivorous diet but occasionally preys upon small vertebrates, including reptiles (Carr 1982. Anim. King. 85[5]:40–44; McBee and Baker 1982. Mamm. Species 162:1–9; Nowak 1999. Walker's Mammals of the World. Sixth Ed. Vols. I–II. Johns Hopkins Univ. Press, Baltimore, Maryland. 2015 pp.). In the U.S., *D. novemcinctus* is implicated in zoonotic transmission of the 3I-2-v1 strain of leprosy, *Mycobacterium leporae* (Truman et al. 2011. New England J. Med. 364:1626–1633). This is the first record of *R. braminus* in the diet of *D. novemcinctus*. Whether established populations of *R. braminus* can subsidize populations of *D. novemcinctus*, *R. marina*, *A. cristatellus*, or other nonindigenous predators in Florida remains untested at this time.

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**THAMNOPHIS ELEGANS VAGRANS (Wandering Gartersnake). DIET.** The feeding ecology of *Thamnophis elegans* is highly variable, with some individuals or populations specializing on a narrow range of prey and others exploiting a wide variety of prey



FIG. 1. Three adult shrews (*Sorex* sp.) ingested by a single, pregnant *Thamnophis elegans vagrans* from Mink Creek, Bannock County, Idaho.

(Rossman et al. 1996. *The Garter Snakes: Evolution and Ecology*. Univ. Oklahoma Press, Norman. 332 pp.). Overall, the species has one of the broadest diets of any North American snake, including aquatic leeches, desert lizards, noxious slugs, shrews and other small mammals, and even cooked bits of chicken (Arnold 1977. *Science* 197:676–678; Fitch 1941. *California Fish Game* 27:2–32; Rossman et al., *op. cit.*; Storm and Ferguson 1954. *Herpetologica* 11:48). Here we document an additional case of shrew consumption by *T. elegans*, and suggest that predation on shrews is not incidental but likely represents a significant prey source for some *T. elegans* populations.

On 3 June 2007, along Mink Creek in Caribou National Forest, Bannock Co., Idaho, USA (42.734222°N, 112.407250°W; datum: NAD 1983; elev. 1600 m), CRF observed an adult female *T. elegans vagrans* (SVL = 518 mm) foraging on the bank of the creek. The snake was carefully investigating holes in the soil of the well-vegetated bank ~0.5 m above waterline, probing each hole with its head before moving on to the next. Upon being seized, the snake immediately regurgitated a shrew (*Sorex* sp.), and subsequent palpation produced two additional shrews (Fig. 1). The aggregate mass of the prey (13.5 g) was 27.6% of the mass of the snake (49 g), which was pregnant. Examination of tooth wear patterns on the prey suggests that all three shrews were old adults (but the amount of tooth wear prevented confident species identification).

The apparent foraging behavior of the snake and the age of its three prey items suggest the snake acquired the shrews by deliberately hunting. Shrews are highly asocial and maintain separate territories (Churchfield 1990. *The Natural History of Shrews*. Cornell Univ. Press, Ithaca, New York. 183 pp.), so it seems doubtful that the snake simply chanced upon three old shrews, or a group of shrews. Unlike the great majority of gartersnakes, some populations of *T. elegans* feed substantially on small mammals (Rossman et al. 1996, *op. cit.*) and the species has evolved at least one trait, constricting behavior (Gregory et al. 1980. *Herpetologica* 36:87–93), that is adaptive for feeding on such prey. These characteristics of *T. elegans* make it all the more probable that the observed snake was deliberately hunting for shrews. The *T. elegans* and its contents were deposited in collection of the California Academy of Sciences (CAS 241911).

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**THAMNOPHIS EQUES MEGALOPS** (Northern Mexican Garter-snake). **DIET AND MORTALITY.** *Thamnophis eques megalops* are known to eat amphibians, fish, earthworms, leeches, and occasionally small mammals, lizards, and slugs (Ernst and Ernst

2003. *Snakes of the United States and Canada*. Smithsonian Institution Press, Washington D.C. 668 pp.). As part of a long-term monitoring project for the species at Bubbling Ponds Hatchery (Yavapai County, Arizona, USA), we observed *T. e. megalops* apparently attempting to prey on nonnative Chinese Mystery Snails (*Cipangopaludina chinensis*) on two separate occasions.

On 18 August 2008, at 1128 h, we encountered an adult *T. e. megalops* (SVL = 505 mm) which had been run over by a vehicle along a hatchery road (34.766°N, 111.896°W; datum NAD83) while apparently attempting to eat a *C. chinensis*. Similarly, on 23 June 2011, at 1920 h, we observed an adult female *T. e. megalops* (SVL = 760 mm; 124 g) out of the water attempting to eat a large *C. chinensis* (Fig. 1; 34.766°N, 111.893°W; datum NAD83). The snake's upper jaw was inside the snail's shell, and appeared to be pinned in that position by the snail's closing operculum, prohibiting escape by either individual. We captured the snake and therefore interrupted the predation attempt. Although *T. eques* are known to occasionally consume slugs, they are not known to feed on shelled gastropods (Macias Garcia and Drummond 1988. *J. Herpetol.* 22:129–134; Manjarrez 1998. *J. Herpetol.* 32:464–468). Wood et al. (2005. *Herpetol. Rev.* 36:328–329) reported a similar instance of mortality in *T. validus celsaeno*, in which the snake died of starvation or exhaustion after being unable to extricate its lower mandibles from the shell of the snail *Planorbella subcrenatum*.

We are unsure of why the snakes were attempting to eat the snails, but their lack of experience with this nonnative snail may have been a factor. Bubbling Ponds Hatchery provides a dense and varied *T. e. megalops* prey base of native and nonnative fishes, *Anaxyrus woodhousii*, *Ambystoma mavortium nebulosum*, and nonnative *Lithobates catesbeianus*, so it is unlikely that food is limited. In both cases, the snake's vision was completely obscured while it attempted to access the snail. The ease with which one snake was captured, coupled with the road mortality, suggests that a shift in diet to include this nonnative prey item might be deleterious.

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FIG. 1. Adult female *Thamnophis eques megalops* from Bubbling Ponds Hatchery, Arizona, attempting to eat a nonnative Chinese Mystery Snail, *Cipangopaludina chinensis*.

PHOTO BY MEGAN E. YOUNG