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. 104:61–68) 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 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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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, 111 SW 34th 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).


I thank Jeff Butler for providing the armadillo specimen. LOUIS A. SOMMA, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA; e-mail: somma@ufl.edu.

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 the snake acquired the shrews by deliberately hunting. Shrews are highly asocial and maintain separate territories (Churchfield 1990. This 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, constriction 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 11:28 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 19:20 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 celaeno, 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.