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min. (Table 1). All three pairs were discovered within 50 m of one another in a microhabitat consisting of River Bulrush (*Scirpus fluviatilis*) with scattered small willows (*Salix* sp.) imbedded in 4.8 ha of recently burned lowland grassland. This microhabitat was adjacent to a north–south running dike and was a low area (i.e., saturated soils with some standing water) of approximately 0.62 ha. Pair one was copulating when discovered, and remained attached for at least 3 h. Pairs two and three were coiled together, with bodies and tails intertwined, but were not actually copulating at the time of capture.

The findings and conclusions in this note are those of the authors and do not necessarily represent the views of the U.S. Fish and Wildlife Service.

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STORERIA DEKAYI **(Dekay's Brownsnake). COLD TOLERANCE.** *Storeria dekayi* is a small, cold-adapted natricid snake of eastern North America. In the northern portion of the species' range, these snakes must hibernate at sites that are far enough below ground so that long-term exposure to lethal freezing temperatures is avoided. Failure to do so can result in mortality (Bailey 1948. Copeia 1948:215; Pisani 2009. J. Kansas Herpetol. 32:20–36). Most temperate zone reptiles, however, are able to survive brief periods of supercooling to –1 to –2°C (Vitt and Caldwell 2009. Herpetology. 3rd ed. Elsevier, Academic Press, Burlington, Massachusetts. xiv + 697 pp.). Gray (J. N. Amer. Herpetol., *in press*) recorded a surface body temperature (T_{sk}) of –0.2°C from *S. dekayi* at a site in northwestern Pennsylvania, USA, suggesting that they may have the ability to endure short-term exposure to subzero temperatures. Herein, I report further observations of subzero T_{sk} recorded from wild *S. dekayi* that imply this species may utilize supercooling to survive brief exposure to subzero temperatures.

At 0952 h on 1 April 2013 at a site in Erie Co., Pennsylvania, USA (42.09375°N 80.14180°W; datum WGS84), a male *S. dekayi* (SVL = 159 mm, total length = 210 mm; 2.3 g) was found beneath a thin wooden panel. The snake's surface body temperature (T_{sk}) was –0.6°C; air temperature (T_a) was –0.5°C. When initially picked up the snake was stiff and torpid, but managed to flatten its body dorsoventrally while making slow, swaying motions. This same individual was recaptured on 3 April, 4 April, and 6 April 2013 under the same cover object. The snake's T_{sk} on these dates was –4.2°C, –4.8°C, and –0.2°C respectively. When the *S. dekayi* was found on 4 April 2013 the T_a was –4.0°C and the cover object was frozen to the substrate. The snake was stiff and very lethargic when initially handled, but after ca. 1–2 minutes was able to right itself when placed on its back. In addition to the aforementioned snake, two additional male *S. dekayi* (SVL = 150 mm and 163 mm; 2 g and 2.7 g, respectively) were observed under separate cover objects at the site on 6 April. These snakes T_{sk}s were –1.0°C and –0.6°C respectively; T_a at the time was –2.5°C. Two of these *S. dekayi* were observed under the wooden panel on 8 April 2013 and appeared healthy.

The fact that the *S. dekayi* found at below zero temperatures were able to respond by moving when handled suggests that they were supercooled and not frozen, implying that *S. dekayi* may utilize supercooling to survive brief exposure to subzero temperatures. Such exposure may occur, as in this case, during brief overnight frosts in early spring when snakes are active above ground (Storey 1996. Braz. J. Med. Biol. Res. 29:1715–1733). At least one other natricine, *Thamnophis sirtalis* (Common Gartersnake), has been demonstrated to utilize a combination of supercooling and freeze tolerance (Costanzo et al 1988. Cryo-Letters 9:380–385; Storey 2006. Cryobiology 52:1–16), and is able to survive temperatures as low as –3.3°C for a period of 6 h (Churchill and Storey 1992. Can. J. Zool. 70:99–105). The ability to survive exposure to subzero temperatures may allow *S. dekayi* to have an extended annual activity season; however, it does not totally negate the risk of death from freezing or predation while immobile. As noted by Pough et al (2001. Herpetology. 2nd ed. Prentice-Hall, Upper Saddle River, New Jersey. xi + 612 pp.), freezing of a supercooled solution is an unpredictable event, and deaths may occur. For instance, snakes may die when the time of exposure surpasses a few hours, temperature drops much past –2°C, or equilibrium ice content is achieved (Storey, *op. cit.*). Two *S. dekayi* found at the site under the wooden panel on 9 March 2013 likely died as a result of prolonged exposure to freezing temperatures. Both snakes were in a coiled position and lacked any outward signs of predation.

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THAMNOPHIS EQUES MEGALOPS **(Northern Mexican Gartersnake). MATERNAL TRANSMISSION OF ENDOPARASITES.** On 19 June 2009, we captured an adult female *Thamnophis eques megalops* at Bubbling Ponds Fish Hatchery (Yavapai County, Arizona, USA: 34.764946°N, 111.894014°W; datum NAD 83), that gave birth to 38 live young in captivity on 20 June 2009. The female and young were kept together for several hours while the neonates completed their first shed, and were weighed and processed. Nine of the neonates were then kept in captivity continuously for several months, housed communally in a 75-liter aquarium in a separate room at the animal care facility at Northern Arizona University. Water was provided ad libitum and bedding was Carefresh™ recycled cellulose (Absorption Corporation, Ferndale, Washington). On 1 July 2009, we noticed that one of the neonates (male; SVL = 181 mm, 3.8 g at birth) exhibited a small swelling on the right side at mid-body (Fig. 1A). This swelling had increased to 5–7 mm on 7 July, when we noticed a small drain site on the mass. When squeezed, the cranial end of an approximately 15-mm reddish nematode emerged from the hole and was removed intact with forceps (Fig. 1B). The nematode was preserved in 10% formalin and identified as a nematode, i.e. a filarial worm (*Macdonaldius* sp., Nemotoda, Spirurida, Filaroidea).

The neonates were each fed one to two wild-caught *Gambusia affinis* (Mosquitofish) from Bubbling Ponds Fish hatchery, on 2 July and 4 July, in a clean feeding tank separate from their housing quarters. An additional similar-sized *Macdonaldius* sp. nematode was removed from a second neonate *T. eques* (male SVL = 190, 3.8 g at birth) on 14 July 2009. No other snakes were infected, and new cysts did not develop in either previously-infected neonate. Neither neonate showed obvious signs of distress during infection, and both grew at rates comparable with their tankmates over the next few months.

Infection of wild gartersnakes (*Thamnophis* spp.) by helminths has been observed by Jimenez-Ruiz (2002. J. Parasitol.

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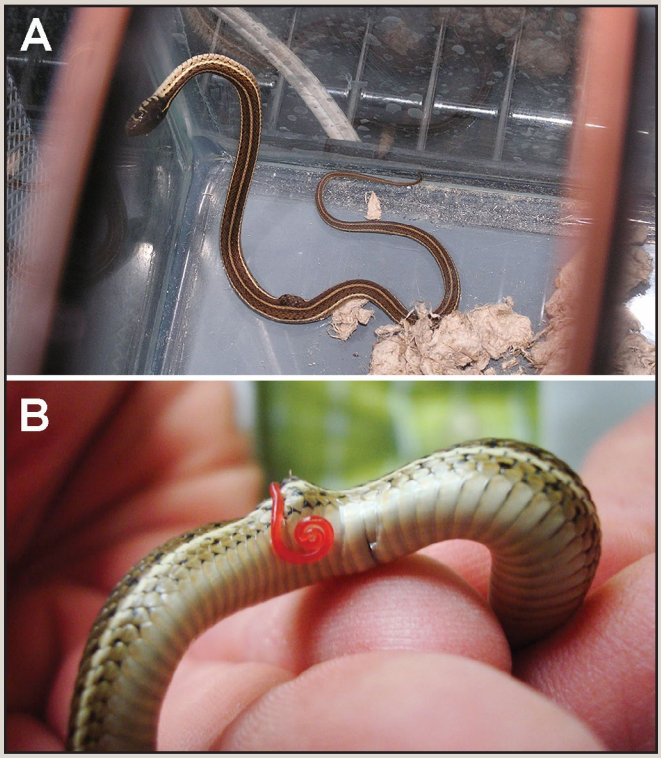

FIG. 1. A) A 10-day old captive-born *Thamnophis eques* with a mass on the mid-body, subsequently documented to contain a nematode (*Macdonaldius* sp.). B) The 15-mm live nematode (*Macdonaldius* sp.) removed from the neonate on 7 July 2009.

88:454–460). Similar lumps have been observed in wild adult *T. eques* at Bubbling Ponds Fish Hatchery and a *Macdonaldius* sp. was removed from an adult specimen in 2009. Neither of the neonates in our study had contact with adult snakes after the initial birthing period, and the first neonate exhibited an infection before being exposed to prey fish. Although it seems evident that the first neonate became infected via maternal transmission, the transmission mechanism remains unknown. Possible explanations include transmission by the mother during the birthing process or in the short time after birth (however, no nematodes were observed during this time, and the dam did not have external swellings characteristic of nematode infection). Alternatively, given that natricines are placental live-bearers (Blackburn and Lorenz 2003. J. Morphol. 256:171–204), it is possible that nematode oocytes could be transferred to developing embryos via the placenta in utero; this mode of infection has been observed in other vertebrates (reviewed by Anderson 1988. J. Parasitol. 74:30–45), including in live-bearing frogs (Rhabditiforms; Gagliardo et al. 2010. Herpetol. Rev. 41:52–58). It is possible that the second neonate became infected after feeding on prey fish.

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***THAMNOPHIS PROXIMUS ORARIUS* (Gulf Coast Ribbonsnake). REPRODUCTION.** *Thamnophis proximus orarius* is an ovoviviparous colubrid that forms mating aggregations and is presumed to mate in the spring. However, there are no detailed observations pertaining to the onset of mating activity in these snakes and we lack data about their reproductive biology (Werler and Dixon 2000. Texas Snakes: Identification, Distribution, and Natural History. Univ. Texas Press, Austin. 437 pp.).

At 1220 h on 20 January 2010, at the Edinburg Scenic Wetlands in Edinburg, Texas, USA (26.291944°N, 98.13507°W; datum WGS84), we observed an aggregation of *T. p. orarius* consisting of two females and four males that were engaged in courtship behavior (Fig. 1). The temperature was 25.5°C. The aggregation was observed on top of a pile of branches and other dry vegetation on the edge of a permanent body of water. Repeated observations of the snakes have been made at this site. Individuals remained at the den for several days and were at times observed retreating or exiting from the cavity formed by the vegetation. Males rubbed their chins along the dorsal side of the females and produced caudocephalic waves and tail searching behavior was also evident; both behaviors are characteristic of courtship in garter snakes (Phase II of courtship) as described by Perry-Richardson et al. (1990. J. Herpetol. 24:76–78). Prior to our observation, no reproductive behavior or mating aggregations for this species were known to have taken place in the winter. This is the earliest record of courtship for this subspecies. To our knowledge this is also the earliest report of courtship for a natricine snake in the USA and Canada. We were unable to determine whether the courtship behavior led to reproduction.

FIG. 1. An aggregation of *Thamnophis proximus orarius* engaged in courting behavior in the winter (20 January 2010) in Eidenburg, Texas, USA.

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