

between years, provide a better understanding of the range of responses in the life history traits of this species. We believe that our study might have implications for the assessment of future demographic trends and potential habitat management for the ubiquitous Eastern Garter Snake. Furthermore, given the current and widespread biodiversity crisis, additional long-term studies focused on life history traits and the systematics of northeastern ophidians are necessary to confirm or complement our current findings.

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Homosexual Reproductive Behavior in the African Brown House Snake (*Lamprophis fuliginosus*)

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The occurrence of homosexual behavior in male snakes is complicated by the presence of female-like reproductive pheromones in at least one species, *Thamnophis sirtalis*. The production of female-like pheromones by male *T. s. sirtalis* was first described by Noble (1937) in the “homosexuality” section of his paper. Noble (1937) suggested that males may have evolved female odors to confuse other males or that perhaps the courting males were conditioned to court by exposure to attractive females. Mason and Crews (2005) studied the occurrence and function of female-like reproductive pheromones in male *T. s. parietalis* from Manitoba, Canada, and concluded that the production of female-like pheromones by males (termed she-males) was a reproductive strategy that enhanced the mating frequency of males producing these pheromones.

Although males produce female-like pheromones, copulation between males is rare. Pfrender et al. (2001) observed a copulatory plug in the cloaca of a male *T. s. parietalis* that was being courted by several other males and postulated that this male, because it was courted by several males, was a she-male. They added that because of its moribund condition, this male might have been unable to resist copulation by the courting males. We do not consider male courtship of she-males an example of true homosexual behavior.

For species in which males are not known to produce female-like pheromones, male-male courtship or copulation has been observed only in captivity. Hardy (1998) described male-male copulation in *Crotalus scutulatus*. He suggested that the copulation might have resulted from the presence of female pheromones from the male’s body or from the cage floor. Shaw

(1951) described male-male courtship in captive *Pituophis melanoleucus* and postulated that this could have been due to the failure of chemical discrimination. Smith (1968) suggested that homosexual mating in snakes



Male African Brown House Snake (*Lamprophis fuliginosus*) courting another male. Note that the bodies are parallel, the head of the courting male is along the dorso-lateral surface of the target male and Male 1 is performing a tail search of the target male. A freshly shed skin of the courted male is present.

is a captivity-dependent behavior that occurs because the male's sexual discriminatory powers, which are largely olfactory and chemosensory, are dull and confused. The purpose of this paper is to describe true homosexual behavior in a snake.

The Aldridge lab has conducted over 300 trials designed to study the biology of sex pheromones in the African Brown House Snake (*Lamprophis fuliginosus*; Aldridge et al. 2005). The snakes were implanted with PIT tags (Trovan) for identification. The typical experimental design consisted of acclimating two males in an aquarium for about 10 min, then introducing a female. The snakes were then observed for a minimum of 30 min (in early experiments) to an hour or more in later experiments. The reproductive behaviors (modified from Gillingham 1979) were categorized as: (1) Tongue-flicking of the attractive snake; (2) chin-rubbing along the dorsolateral surface of the attractive snake; (3) writhing, the movement of the male's body when parallel with the attractive snake; (4) tail-searching on the attractive snake; and (5) copulation. The time of each specific behavior and the individuals involved was recorded. In all observations, male behavior was focused on the female. Any male behavior involving the other male in the aquarium appeared incidental.

Male 1, the subject of this note, was hatched in 1997. At the time of testing, the snout-vent length (SVL = 565 mm) and mass (94 g) of this male were within the normal range (SVL 590 ± 659 mm; mass 91.5 ± 24 g) of adult males in the colony. Male 1 was used in 42 trials in 2006 and 2007. In no instance did we observe behaviors aimed at the other male in the test arena. In January of 2008, Male 1 was observed courting and attempting to mate with another male (Male 2, SVL 580 mm, mass 134 g). The behaviors Male 1 displayed towards Male 2 were identical to courtship displays males typically displayed toward females. Male 1 chin-rubbed the dorsolateral section of the body of Male 2, and tail-searched and everted his hemipenis several times while courting Male 2. Later in January, Male 1 focused his attention on another male (Male 3), tail-searching and biting Male 3 on the neck. In a third trial, Male 1 primarily courted the other male in the aquarium, but mated with the female. The mating of Male 1 with this female may be the result of Male 1 attempting to mate with the male. A female mating with two males simultaneously is relatively rare in our trials (2 of 61 matings).

We assumed that the unusual behavior exhibited by Male 1 was due either to the presence of female sex pheromone residue on the skin of the courted males from previous trials or to the production of female pheromones by these males similar to those found in "she-male" *T. s. parietalis* (Mason and Crews 2005). To test these hypotheses, we tested the snakes courted by Male 1 with other male snakes. The protocol was similar to previous experiments, but instead of introducing a female, we introduced one of the courted males in each trial. In all of these trials ($n = 6$), neither of the males courted by Male 1 were attractive to other males. We concluded that the courtship of the males by Male 1 was not due to contamination of the male's skin with female pheromones or the presence of female-like pheromones in these males.

Male 1 was tested again with a male and an attractive female. Male 1 courted the male and not the female, and at 16 min into the trial, released uric acid while chin-rubbing the male, which is typical of males courting attractive females (Aldridge et al. 2005). At 65 min into the trial, both males were mating simultaneously with the female.

Male 1 was tested again in January 2009. In trial one, two males were acclimated for 10 min in the aquarium. These males ignored one another. After 10 min, Male 1 was added. Six minutes later, one of the males began to shed and completed the shed within 4 min. During and following the shed, Male 1 courted this male intensely. The other male was ignored. At 31 min, Male 1 excreted uric acid and continued to court the shed male for an additional 10 min when the trial was terminated. Within an hour, the shed male was then tested with two additional males to determine attractiveness. Neither of these males courted the shed male. A female was added to the aquarium at 30 min to determine if the males would court a female. All



Two male African Brown House Snakes (*Lamprophis fuliginosus*) simultaneously mating with a female.

three males courted the female, and two of these males released uric acid, suggesting that these males were sexually attracted to the female. In trial three, Male 1 and another male were acclimated to the aquarium for 10 min before the introduction of the same recently shed male. Male 1 again courted only the recently shed male. Thirty minutes into this trial, a female was added to determine if these males would court the female. All of the males, including Male 1, courted the female; however, only Male 1 also courted the recently shed male.

We conclude from these experiments and observations that the behavior of Male 1 represents an aberrant and rare reproductive behavior. This behavior was not due to the contamination of female pheromones on other males nor associated with production of female sex pheromones by these males. The behavior was not congenital because Male 1 only courted females during the latter two years of trials. The stimulus that triggered the reproductive behavior of Male 1 appeared to be pheromones on the dorsolateral surfaces of other males — and male sex-specific pheromones have been identified in *T. sirtalis* (Mason et al. 1989). However, additional test males did not find these male pheromones attractive. The courted males made no efforts to dislodge or escape from the courting male, perhaps indicating that homosexual behavior is so rare that mechanisms to discourage it have not yet evolved.

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