FOLLOWING OF CONSPECIFIC AND AVOIDANCE OF PREDATOR CHEMICAL CUES BY PINE SNAKES
(Pituophis melanoleucus)

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Abstract—The ability of hatchling pine snakes (Pituophis melanoleucus) to follow or avoid the chemical trails of conspecifics and a king snake (Lampropeltis getulus) on paper substrates was investigated in Y-maze experiments. Hatchlings entered the arm with the adult conspecific trail and avoided the arm containing the king snake trail at a frequency much greater than that due to chance. The data support the hypotheses that pine snakes follow the chemical trails of adult conspecifics and avoid the chemical trails of a predator.

Key Words—Chemical cues, predator avoidance, pine snake, Pituophis melanoleucus, odor trails.

INTRODUCTION

Trailing of conspecifics or prey by chemical means has been demonstrated in controlled laboratory experiments for snakes (Brown and Maclean, 1983; Chiszar et al., 1986; Ford, 1982; Ford and O'Brieness, 1986; Ford and Schofield, 1984; Gehlbach et al., 1971; Heller and Halpern, 1981) and for lizards (Cooper and Vitt, 1986a). Further, reptiles often respond to odors or those on applicators by increased tongue flicks (Cooper and Vitt, 1984, 1986b; Cooper et al., 1986). In some cases pheromonal communication is suspected because adult male skinks follow the trails of adult conspecific females, but not those of other males (e.g., Eumeces laticeps; Cooper and Vitt, 1986c). For reviews of the role of chemoreception in reptiles, see Burghardt (1980), Simon (1983), and Von Achen and Rakestraw (1984).
Earlier studies have shown the use of chemical abilities in several important contexts, including recognition of prey (Burghardt, 1973; Chiszar et al., 1986), detection of conspecifics (Cooper and Vitt, 1984), discrimination of male from female conspecifics (Cooper and Vitt, 1984), discrimination of conspecific and closely related syntopic congeners (Cooper and Vitt, 1986c), trailing conspecifics to find hibernacula (Brown and Maclean, 1983) or mates (Ford and O’Bleness, 1986), and differentiation of ophiophagous from nonophiophagous snakes (Weldon and Burghardt, 1979; Weldon, 1982). However, Weldon’s (1982) studies dealt with changes in tongue-flick frequency. There has been no clear demonstration in snakes of discrimination of ophiophagous from nonophiophagous snakes. Snakes can distinguish conspecific from heterospecific odor trails (Ford and O’Bleness, 1986). Because some snakes are predators on other snakes, it would be advantageous for prey species to be able to detect the chemical trails of potential predators and avoid them. This would be particularly true for hatchlings that are more vulnerable to predators because of their small size. In this article I report experiments designed to examine choice discrimination by hatchling pine snakes (*Pituophis m. melanoleucus*) of the odor trail of conspecifics and of a heterospecific predator of pine snakes, the king snake (*Lampropeltis getulus*).

**METHODS AND MATERIALS**

Under appropriate state permits, pine snake eggs were collected from the Pine Barrens of southern New Jersey (Ocean, Cumberland, and Monmouth counties), and 200 hatchlings were hatched and maintained in the laboratory in 1986. Date of hatching was noted, so the exact age of each snake at testing was known. Snakes were maintained individually in plastic (30 x 15 x 9 cm) cages containing paper for shelter. Snakes were given the opportunity to drink water daily and to eat young laboratory mice once a week. Not all snakes had eaten, but there were no significant differences in behavior as a function of this variable. Snakes were sexed by hemipenis eversion, a reliable rapid procedure for young snakes (Schaefer, 1934; Fitch, 1960; Gregory, 1983; Gutzke et al., 1985).

To determine whether pine snakes could make directional responses to chemical trails, *Y*-maze experiments were conducted. The base arm of the *Y* maze was 1 m long and 15 cm wide, with 15-cm-high wooden sides. At the end of the base arm, two side arms (experimental arms, 45° angle from the base arm) were the same dimensions as the base arm. The floor of the maze was covered with paper that was changed after each trial. Plexiglas was placed over the maze to prevent the snakes from escaping from the center, choice point of