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OBSERVATONS ON THE FORAGING ECOLOGY OF THE WESTERN COACHWHIP SNAKE, *MASTICOPHIS FLAGELLUM TESTACEUS*

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Masticophis flagellum is locally abundant within the southern United States (Wilson, 1973; Tennant, 1984; Ernst and Barbour, 1989); yet very little is known of its natural history (Ernst and Barbour, 1989). Much of the ecological literature on this species consists of anecdotal reports (see references below), with the exception of Jones and Whitford (1989).

Coachwhips are active diurnal foragers, which also employ a "sit-and-wait" strategy (Jones and Whitford, 1989). This species is euryphagic, preying on lizards (Tinkle et al., 1962; McKinney and Ballinger, 1966), bats and rodents (Collins, 1982), birds and their eggs (Finch, 1981; Ward and Clark, 1988), turtles (Ortenburger, 1928; Hamilton and Pollack, 1956), snakes (Mueller and Whiting, 1989), frogs (Conant and Collins, 1991), and insects (Hamilton and Pollack, 1956; Carpenter, 1958). Dead prey items may also be scavenged (Cowles, 1946; Minton, 1959). The purpose of this paper is to describe field observations of coachwhip foraging, and to report previously undocumented food items.

In the first instance we observed an adult male *M. f. testaceus* (SVL=1,295 mm, TL=1681mm, mass=541.5 g), prey on an adult female Texas horned lizard, *Phrynosoma cornutum* (SVL=96 mm, TL=128 mm, mass=35.5 g). The incident took place at Lake Spence, Coke County, ca. 7.6 km west of Robert Lee, Texas, on 10 July 1991. At 1002 hr we encountered the coachwhip with the head of the horned lizard in its mouth. The lizard was still alive, and had inflated its body and elevated its head, a characteristic defense posture used by horned lizards (Sherbrooke, 1981; pers. obs.). The ingestion process was observed over a period of four hours and ten minutes, during which the snake continually restrained the lizard under its coils. The snake pushed the lizard against its own body, the ground, and a variety of immobile objects to facilitate ingestion. Horned lizards have dorsally compressed bodies, which when inflated serve to inhibit ingestion by a predator, particularly snakes. The lizard's morphology undoubtedly constrained ingestion, until finally the coachwhip climbed a mesquite tree (*Prosopis glandulosa*), and used a small branch to force the lizard down its esophagus (Fig. 1). The coachwhip was then captured, and the lizard palpated out. Grasshopper (Orthoptera: Acrididae) remains, were also recovered

Fig. 1. *Masticophis flagellum* using a small branch to force a Texas horned lizard (*Phrynosoma cornutum*) down its esophagus.

Fig. 2. *Masticophis flagellum* with a partially ingested jack rabbit (*Lepus californicus*).

from the snake's stomach. Because the spines located on the head of horned lizards have been known to be fatal to predators (Sherbrooke, 1981), the coachwhip was sacrificed and its alimentary canal examined for abrasion or perforation caused by the horns; none were found.

A road-killed *M. f. testaceus* (male, SVL=805mm, TL=1082mm, mass=134 g) containing a *P. cornutum*, was recovered 1.8 km north of Paint Rock on HWY 83, Concho County, Texas, on 18 May 1990. This was a much smaller lizard (SVL=45 mm, TL=60 mm, mass=4.4 g). Grasshoppers (Orthoptera: Acrididae) were also found in the stomach.

Horned lizards have been previously reported as food items of *M. flagellum* (Ortenburger, 1928; Thyler, 1977; Sherbrooke, 1981). However, only Tyler (1977) provided predator/prey measurements and the horned lizard, a juvenile (SVL=63 mm) was ingested by a large coachwhip (SVL=1,600 mm, mass 637 g) in under 5 minutes.

Although *M. flagellum* has been reported to feed on small mammals (eg. Stebbins, 1985), an extensive literature search provided no record of lagomorphs in the diet of coachwhips. On 13 April 1991, ca. 35 km southwest of Llano, Llano County, Texas, at 1830 hr, an *M. f. testaceus* (SVL=1,222 mm, TL=1596 mm) was found ingesting a young jack rabbit, *Lepus californicus* (total length=185 mm). The rabbit was almost half-way ingested when the snake was captured (Fig. 2). The snake was subsequently released. The identities of both animals were confirmed by J.R. Dixon (Curator of Amphibians and Reptiles, Texas Cooperative Wildlife Collection).

In a separate incident we obtained a dead male coachwhip (SVL=1,264 mm, TL=1594 mm, 860 g) containing five nestling cottontail rabbits (*Sylvilagus* sp.). Measurements (mm; $\bar{x}\pm SD$) for four of the rabbits were obtained and are as follows: ear length, $\bar{x}=15.75\pm0.96$; hindfoot length, $\bar{x}=26.75\pm1.26$; and total length, $\bar{x}=103.75\pm4.65$. The snake was collected near HWY 864, 4.8 km south of the junction of HWY 190, Menard County, Texas, on 19 June 1991. Cottontails nest in slanting holes averaging 125 mm in length (Schmidly, 1983). The nest was apparently encountered by this snake and the young consumed. Additionally, we observed an adult coachwhip actively pursuing a juvenile cottontail (*Sylvilagus* sp.), near Paint Rock, Concho Co., Texas, summer

1990. Initially we observed the rabbit run diagonally across a dirt road for about 20 m, stopping at the road margin. The snake followed with its head raised in a characteristic foraging posture (Ruben, 1977). The coachwhip continued crawling to where the rabbit had stopped, gradually lowering its head to ground level and reducing pursuit speed as the proximity to the prey decreased. The rabbit remained motionless as the snake approached to within several centimeters, and oriented its head perpendicularly towards the prey. The snake then seized the rabbit along the anterior third of the body, pinning it to the ground. As we approached to attempt closer observations the snake released the rabbit and fled.

Our observations confirm that *M. f. testaceus* is an opportunistic forager, feeding on a variety of prey types. This species apparently exhibits little prey size discrimination, occasionally ingesting very large or many prey items. Additionally, coachwhips may expend large amounts of time capturing and ingesting prey (see also Mueller and Whiting, 1990). Although most accounts of coachwhip foraging behavior indicate visual detection and pursuit of prey (Jones and Whitford, 1989), the consumption of nestling rabbits suggests that chemosensory cues may also be used to locate hidden prey.

All specimens were deposited in the Texas Cooperative Wildlife Collection (TCWC), with the exception of the *Lepus californicus*, for which a voucher specimen does not exist. The catalog numbers that follow are in the order of appearance in the text: *M. f. testaceus* (TCWC 69, 153), *P. cornutum* (TCWC 69, 152), *M. f. testaceus* (TCWC 69, 155), *P. cornutum* (TCWC 69, 154), *M. f. testaceus* (TCWC 69,201), and *Sylvilagus* (TCWC 52, 311–52, 315).

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セイブレッドレーサー *Masticophis flagellum testaceus* の索餌行動の観察

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セイブレッドレーサーの捕食例をいくつか観察した．1つはテキサスツノトカゲ *Phrynosoma cornutum* を捕食していたもので，トカゲの頭の上のとげが呑み込むのを妨げていたが，木の枝を使ってトカゲを口の奥に押し込むのに成功した．路上死体の1つからも，小さいテキサスツノトカゲが見つかった．別の例では，全長1.2m の個体がジャックウサギの若い個体を呑み込みつつあった．また，路上死体でワタオウサギの幼体を5頭呑んでいるものも見つかったが，ウサギ目は本種の餌としては初めての記録である．

テキサス農工大