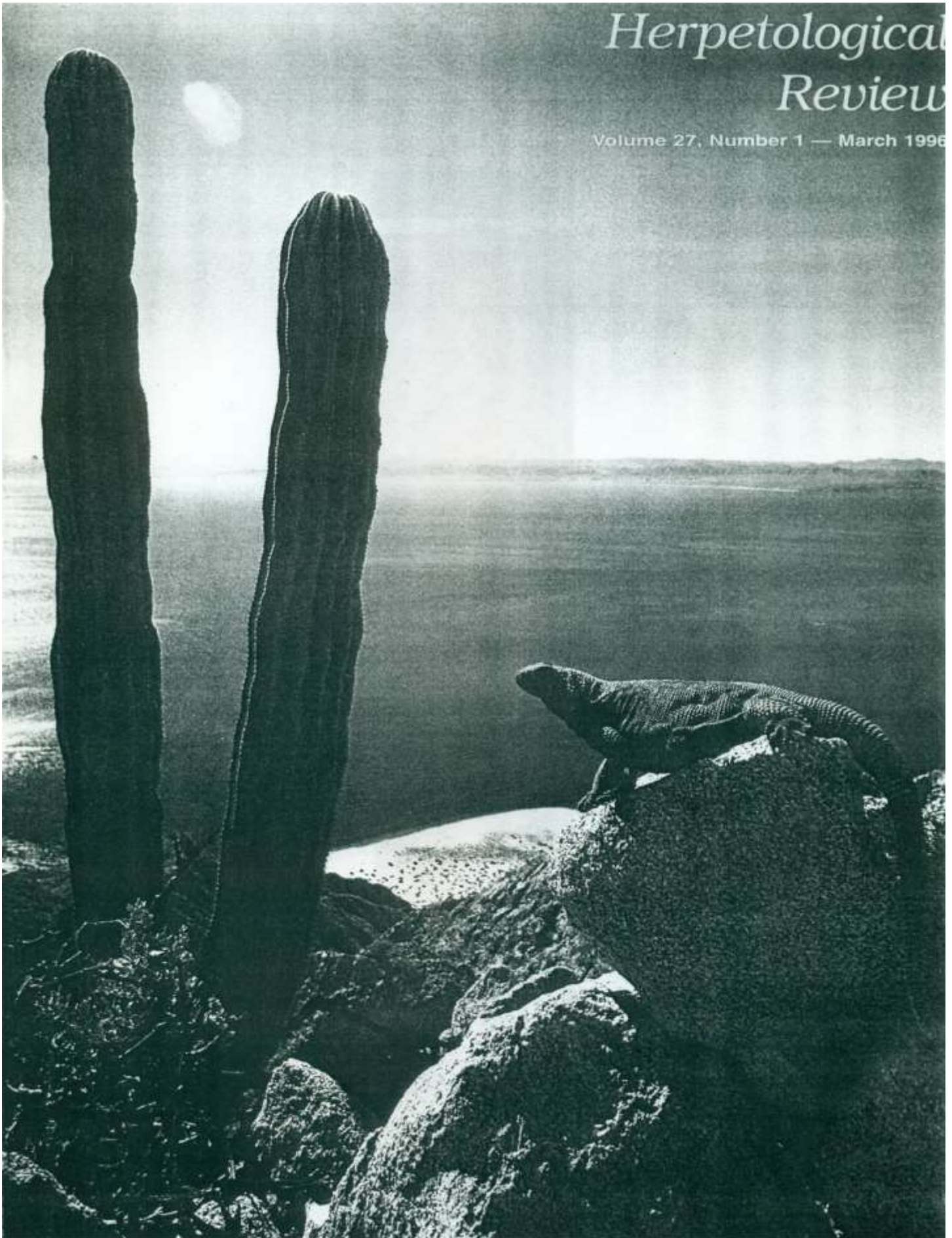


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Pará, eastern Amazonian Brazil. Snakes were found only in juvenile *B. atrox* and comprised 7% of 44 prey items. Observations on snakes feeding under natural conditions are scarce in the literature. Here we describe an observation of a subadult female *B. atrox* eating a colubrid snake in primary forest in Central Amazonia, Brazil.

The observations were made during a radio-tracking study of *B. atrox* begun in December 1993 at Reserva Florestal Adolpho Ducke, a 10,000 ha tract of primary forest under protection situated 26 km north of Manaus, State of Amazonas, Central Amazonia, Brazil. On 2 December 1993, a subadult female (900 mm SVL, 137 mm TL, 230 g) was surgically implanted with a 14 g radio transmitter (SI-2, Holohill Systems Ltd.) and released 21 h following capture. Within several days the snake seemed normal in its behavior and was tracked 2–3 times weekly thereafter. All observations reported here were made at distances of 2–5 m and did not appear to affect behavior even during close approaches by the observer (2 m). Voucher photographs of the predation are in the authors' diapositive files.

On most occasions the tagged snake was found, both during the day and at night, to be tightly coiled on the leaf litter, either exposed or in retreats. However, at 1230 h on 17 April 1994, it was found moving through leaf litter on the forest floor. The snake was not followed at this time, but when relocated 2 h later, it was crawling slowly on the margin of a small stream (ca. 80 cm wide), and stopped upon our approach. One of us (MM) followed it from 1435–1525 h while it moved about 10 m on the stream margin, consistently probing the substrate (fallen leaves, branches, low plants, the bases of tree trunks) with frequent tongue flicks. At 1525 h it began to climb a hill and stopped on a fallen tree trunk (ca. 10 x 60 cm), 1.5 m from the stream. Three minutes later it was observed grasping and pulling an already immobile snake (*Atractus torquatus*, TBL ca. 600 mm) from behind the log (the strike was not witnessed because the snake's head and prey were behind the log). The head and neck of prey were in the ground with three fourths of the body exposed. The *B. atrox* failed to pull the prey from underground and lost its grasp. The prey was grasped again near the cloaca, immediately released, and the pitviper's mouth rubbed on the substrate (an apparent aversion by the predator to cloacal secretions of the prey). The prey was nosed several times in an apparent attempt to locate the head, and at 1535 h the anterior fifth of the body was grasped, pulled from the soil while moving 1.5 m backwards, and released. The body was probed in both directions until the head was seized and swallowing begun at 1539 h. At 1610 h the tip of the prey's tail was hanging from the pitviper's mouth and it had resumed tongue flicking. By 1613 h swallowing was complete and the pitviper remained still for 24 min before moving away.

Based on our records for *A. torquatus*, the prey's mass was 40–60 g and using the initial weight of the *B. atrox*, the prey/predator mass ratio of this event would be 0.17–0.26. The observation described above corroborates our impression (unpubl. data) that although a primarily nocturnal, thermally oriented, sit-and-wait predator, *B. atrox* also forages actively during daytime for ectothermic prey using chemoreception.

The mentors of our study, H. Greene and D. Hardy, Sr., kindly shared their friendship and experience, and provided the equipment. D. Hardy and I. Sazima critically read the manuscript. K. Zamudio assisted with field work. Our work at Reserva Ducke was kindly allowed by the Instituto Nacional de Pesquisas da Amazonia and CNPq provided a grant to MM.

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CROTALUS HORRIDUS (Timber Rattlesnake). **MATING.** Male accompaniment of female rattlesnakes, prior to courtship and mating, has been described by Duvall et al. (1992. *In Biology of the Pitvipers*, Selva Press, Tyler, Texas; pp. 321–326) in *Crotalus v. viridis* and by Macartney and Gregory (1988. *Copeia* 1988:47–57) in *Crotalus v. oreganus*. In both studies, sexual attractiveness and receptivity were correlated with female ecdysis. There are few records of these behaviors in *Crotalus horridus*. In a long-term study in Virginia, Martin (1993. *J. Herpetol.* 27:133–143) observed mating activity five times from 21 August to 18 September in different years. One of these observations was of a male courting a pre-molt female (W. H. Martin, pers. comm.). Brown (J. Herpetol., *in press*) observed male accompaniment of vitellogenic females from 15 July to 25 September over a 12-yr period in New York, noting that such behavior preceded courtship and mating. He noted a correlation between sexual attractiveness and female skin shedding.

There are no records of free-living *C. horridus* mating in North Carolina (W. M. Palmer, pers. comm.). During the period 12–15 August 1994, using radiotelemetry, I observed a sequence of reproductive behaviors in a pair of *C. horridus* which culminated in copulation. These observations occurred in Hanging Rock State Park, Stokes County, North Carolina, USA and are summarized below.

On 12 August at 1745 h, a pre-molt adult female (90 cm total length; containing a transmitter) was found accompanied by an adult male (100 cm TL). The snakes were coiled loosely together, the male in a superior position. On 14 August at 1245 h, the female and the same male (identified by rattle count and body pattern) were located 4 m from their previous location. They were coiled together with the male in an overlying superior position. Both snakes were partially concealed in low vegetation. The female had not shed.

On 15 August at 1345 h, the pair was found copulating. The snakes were aware of, but did not seem concerned about, a human observer nearby. The female was freshly shed, as indicated by her bright appearance and by the addition of a new rattle segment. The snakes were fully extended and facing in opposite directions while coupled. The female's tail was pointed upward and the region immediately anterior to her cloaca was distended. The male was copulating with his left hemipenis, while the right hemipenis was not visible. The male's tail lay to one side, curved back along his body (Fig. 1).

Twenty minutes after my initial observation, the female began a series of forward movements. In response to these movements, the male began a reverse rectilinear locomotion (backing up) to remain coupled with the female. The male was adept at these reverse movements, negotiating obstacles of vegetation, fallen limbs, and other forest debris. At no time did I observe the male being dragged by the female. Forward movements initiated by the female were made at approximately 10-min intervals and averaged about 0.5 m in distance.

Immediately prior to, and continuing throughout each of these movements, the female exhibited a behavior I describe as slow tail lashing. Her tail was curled sharply, left or right of the mid-dorsal line, until her rattle was pointed down (Fig. 1). Once reaching this position, the tail was slowly uncurled until the tail was

fully extended to a vertical position and then was curled down on the opposite side. These slow tail lashes were repeated during each forward movement. Tail movement ceased when forward motion ceased. After 3 h the snakes had moved a distance of 10 m, and the female entered an area of dense cover and coiled loosely. The pair was still coupled and the male was fully extended. At 1830 h I left the snakes while they were once again extended in opposite directions. The next day (16 Aug), I found the female coiled in dense vegetation 55 m away. The male was not found.

I thank the personnel at Hanging Rock State Park for their steadfast support and contribution to this study. Radiotelemetry of *C. horridus* in Hanging Rock State Park is partially funded by the North Carolina Wildlife Resources Commission Nongame and Endangered Wildlife Small Grants Program. I am grateful to W. S. Brown, W. H. Martin, W. M. Palmer, and A. B. Somers for sharing information and advice, and for reviewing the manuscript.



FIG. 1. *Crotalus horridus* copulating fully extended and in opposite directions. The male is on the right, with his tail curved back along his body.

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CROTALUS VIRIDIS VIRIDIS (Prairie Rattlesnake). **BEHAVIOR.** On 18 August 1994 at two locations in Badlands National Park, South Dakota, USA, separate adult prairie rattlesnakes were observed each with a group of young. One snake with young was found in a burrow within a black-tailed prairie dog (*Cynomys ludovicianus*) colony, while the other adult with young was found on the edge of the prairie dog colony nestled within a bed of cactus (*Opuntia* spp.). The adult rattlesnake in the cactus bed was seen with 4–6 young snakes ca. 20 cm in total length. The adult rattlesnake within the prairie dog colony had six young rattlesnakes ca. 20 cm in total length. On 25 August 1994, the young were still present with the adult at the cactus site. The other site was not examined. On 8 September 1994, the cactus site was visited again, and no snakes were seen. Also on this date, recent shed skins of the adult and three of the young were found around the aggregation site. Prior to observing the adult rattlesnake with young at the cactus site, this rattlesnake was observed for approximately one month at this same location. Two weeks before observing this adult with young, no young snakes were present.

The sex of the adult rattlesnakes is unknown, but most likely they were female. Nor do we know the exact date of the birth of the young. However, the young stayed with the adult for at least one week after initial observation, perhaps suggesting parental care and nesting behavior.

We also noted intense rattling by the adult rattlesnake in the cactus bed prior to the presence of young; this animal's rattling was heard well in advance of our arrival. Yet when the snakes were observed on the afternoon of 18 August, the adult rattled only after being disturbed.

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HETERODON PLATIRHINOS (Eastern Hognose Snake). **DEFENSIVE BEHAVIOR.** Platt (1969. Univ. Kansas Publ. Mus. Nat. Hist. 18:253–420) described death feigning by hognose snakes as the terminating stage in a sequence of defensive behaviors and usually is displayed only after experiencing extreme levels of provocation from man. At 1800 h on 20 May 1993, I encountered a pair of copulating hognose snakes both of which had been radiotracked for several weeks. The male (47.5 cm SVL, 111 g) had trailed the female (65.5 cm SVL, 219 g) for three days, traveling at least 600 m. When I physically disturbed the copulating snakes, both immediately turned ventral side up and became limp, feigning death typical of the species. The behavior was not preceded by either the escape or threatening stages or by the extreme writhing and cloacal discharge often seen in death feigning. The remarkable observation is that the pair remained in copulation while feigning death (Fig. 1). Left undisturbed for about 15 min, the female ceased feigning, began moving, and dragged the still feigning smaller male for about 65 m until they separated.



FIG. 1. *Heterodon platirhinos* feigning death while in copulation. The smaller male is underneath the female.

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