

BROWN TREE SNAKE (*BOIGA IRREGULARIS*) CANNIBALISM

Richard M. ENGEMAN¹⁾, Gordon H. RODDA²⁾, Daniel V. RODRIGUEZ³⁾
and Michael A. LINNELL³⁾

1) Denver Wildlife Research Center, P.O. Box 25266, Denver, CO 80225-0266, USA

2) National Biological Service, 4512 McMurry Ave., Fort Collins, CO 80525-3400, USA

3) USDA/APHIS/ADC, 1060 Route 16, Suite 103-C, Barrigada Heights, GU 96921, USA

Abstract: Three incidents of cannibalism among brown tree snakes on Guam are described. The potential effects from cannibalism on brown tree snake populations on Guam are discussed and appear minimal. One observation yielded no evidence that brown tree snakes are susceptible to their own venom.

Key words: Diet, Envenomation effects, Forage, Gut sample.

Low levels of cannibalism can have a profound demographic effect on populations of low-fecundity organisms. For example, Rootes and Chabreck (1993) estimated that cannibalism provided large American alligators with an average of only 2.13 prey items per year, a rate too low to be detected with most gut samples. Yet, this small amount of predation accounted for 63.7% of all mortality among alligators of age 11 mo. or older. Comparable dietary and demographic data do not appear to exist for any snake species, but the population effects could be equally important.

Few cannibalistic events have been observed directly in snakes in nature, but a review of the literature (Polis and Myers, 1985) tabulated potentially significant levels of cannibalism in one non-venomous (1.6% of *Coluber constrictor* prey items; Jackson, 1971) and several venomous snakes (0.6% of *Crotalus cerastes* prey items, Funk, 1965; 2.3% of *Austrelaps superbis* (22.6% of food mass) and 2.2% of *Suta gouldii*, Shine, 1977). Although many cannibalistic snakes are venomous, other venomous snakes are not cannibalistic (e.g., Shine, 1977). It is not known if the availability of venom is

important in promoting the practice of cannibalism.

For both venomous and non-venomous snakes, eating conspecifics is less risky if the prey is dead when first encountered. Although carrion eating is not believed to be a general practice among snakes, it occurs, at least among energetically-stressed snakes (Chiszar et al., 1983). Gillingham and Baker (1981) argue that carrion may be the modal food for many rattlesnakes. The literature records do not explicitly distinguish between conspecific gut contents that were alive when first contacted by the predator, and items that may have been scavenged.

We have observed several incidents of cannibalism in the brown tree snake. In this paper we wish to report those incidents, and evaluate them in a demographic framework with reference to published and unpublished studies of gut contents. These data will address the questions: What is the incidence of cannibalism in brown tree snakes? Are the prey alive when eaten? Are brown tree snakes vulnerable to their own venom?

At 2058 on 25 Sept. 1990, on a unused but mowed grassy road atop the cliffline

above Falcona Beach, Guam, two brown tree snakes were found grappling. The longer (1.4 m total length) but skinnier and possibly emaciated snake had begun swallowing the shorter (1.3 m) and underweight but heavier snake. At the time of first sighting, the quadrate regions at the rear of the jaw were still visible on the snake being swallowed. The swallowing snake was ineffectually attempting to constrict the other, and both were pulling away while anchoring their bodies and prehensile tails to any herbs within reach. The snake being swallowed was vigorously attempting to withdraw, while the other snake was attempting to overtake and engulf the retreating head. As a result, the pair was progressing rapidly through the vegetation. By fourteen minutes after initial observation, the pair was on the verge of disappearing from view, so they were captured to determine if a mutually-seized food item was responsible for initiating the apparent cannibalism, as happens from time to time in captivity. During our observations, the swallowing snake had bitten the other snake 50–100 times (as counted by mandibular protractions), but had succeeded in ingesting only the anterior 10 cm of its prey. The swallower regurgitated immediately upon capture, and palpation indicated that neither snake had eaten recently. The two snakes were retained for 24 h to determine if either gave any evidence of the effects of envenomation or swallowing. There was no evidence of illness, lethargy, or motor impairment.

On 17 July 1995 we discovered a brown tree snake (approximately 1.2 m total length) dead along a trail in the Conventional Weapons Storage Area at Andersen Air Force Base, Gua. Its body was grossly distended, and examination of stomach contents revealed another,

slightly larger (approximately 1.35 m) brown tree snake (the onset of decomposition in the warm climate allowed for only a superficial examination). The tail portion of the swallowed snake was about 18 cm posterior to the mouth while the bulk of the body was folded into the central portion of the snake.

On the same day another, but possibly artificially induced, example of cannibalism was discovered in the same area. In this case, a brown tree snake was found hanging dead, suspended from the trap door of a snake trap in a tree (the trap was a minnow trap entered through flap doors). Approximately 20 cm of the anterior portion of the snake was inside the trap. Protruding from its mouth was about 10 cm of the tail of a partially swallowed, dead brown tree snake. Both snakes were about 1.25 m in total length.

In two of the above observations of cannibalism, both snakes involved were found dead, possibly rendering them easier to detect during daylight (when the nocturnal brown tree snake is usually concealed). Nonetheless, the observation of multiple incidents of cannibalism suggest that it may be important in the brown tree snake on Guam. Or, does the number of anecdotes simply reflect the detection of extraordinary events by the large number of people (approximately 20 at present) searching for brown tree snakes on a daily basis?

Perhaps cannibalism results from large populations of brown tree snakes depleting their normal prey base. Brown tree snakes on Guam have demonstrated foraging versatility relative to their trophic adaptations as they forage for skinks on the ground in areas where arboreal lizards and birds have already been removed (Rodda 1992). Rodda and Fritts (1992) document radical reductions in nocturnal lizard species on

Guam with more equivocal effects on diurnal lizards (skinks). High brown tree snake populations nearby the locations of cannibalism observations were recently demonstrated when 4 days of operational trapping at the end of August 1995 resulted in the capture of over 250 brown tree snakes from 3 plots totalling less than 16 ha in size. Thus, in some areas of Guam circumstances may increase the likelihood for cannibalism to occur.

Do gut samples of brown tree snakes show evidence of cannibalism? Savidge (1988) found no evidence of cannibalism in 683 brown tree snakes necropsied. Similar negative evidence comes from 59 snakes sampled by Greene (1989), 64 by Shine (1991) approximately 300 by M. J. McCoid (pers. comm.), 168 by B. Smith and T. H. Fritts (pers. comm.), 167 by E. W. Campbell, III (pers. comm.), and 89 by E. P. Collins (pers. comm.). In aggregate, this sample of more than 1500 gut samples strongly suggests that cannibalism has been so rare that it has not likely been of demographic significance in *B. irregularis*.

In two cases, the cannibalism was apparently fatal to both participants (although, the decayed condition of the ingested snakes makes it impossible to unequivocally rule out scavenging). If the cannibal loses its life, one would not expect cannibalism to evolve in this species. The reason for the deaths is unclear. As indicated by the first case, brown tree snakes do not appear to be highly vulnerable to their own venom. Captive brown tree snakes often regurgitate (pers. obs.), suggesting that the cannibals should not have died from consuming an excessively large prey item. The cause of the fatalities is unresolved.

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