

Multiple Predations of Wild Birds by Brown Treesnakes (*Boiga irregularis*) on Guam

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The brown treesnake (*Boiga irregularis*; BTS) was accidentally introduced to Guam via cargo shipments during the late 1940's or early 1950's. Over time, the snake population irrupted island wide, reaching densities of up to 40 individuals per hectare (2.54 ac) of forest habitat (Fritts 1988). The super-abundant snake is responsible for the demise of most of the island's native avifauna and herpetofauna (Savidge 1987, Engbring & Fritts 1988, Wiles et al. 2003), frequent power outages (Fritts & Chizar 1999), and numerous human bites (Fritts 1988). The high densities of snakes on Guam, coupled with the tendency of the BTS to seek day-time refuge in cargo, creates a significant threat to the biodiversity and economic security of the tropical Pacific (Fritts 1988, Fritts et al. 1999, Vice et al. 2003).

To reduce the likelihood of BTS dispersal from Guam, large-scale population reduction is implemented in and around the island's ports of exit (Vice & Pitzler 2002). Trapping, using modified minnow traps, is the primary means of removing BTS from both urban and forested port habitat throughout the island (Vice & Pitzler 2002, Vice et al. in press). Traps are also the primary component of BTS control efforts in support of native species recovery on Guam. While BTS will occasionally enter an unbaited trap, an attractant, usually a live mouse, greatly increases trap captures (Rodda et al. 1999). Observations from live trapping on Guam suggest BTS will enter a trap baited with a live mouse despite the recent ingestion of a large meal. Although captive BTS will often ingest several large prey items (e.g. mice or birds) in rapid succession, the only documented multiple prey ingestions by wild BTS on Guam have involved lizards as prey (M.J. McCoid, pers. comm.) or wild snakes entering a cage holding captive birds (Savidge 1987).

We are reporting three incidents of multiple wild bird predations by BTS on Guam. On 15 May 1997, a female BTS (145 g total weight, 960 mm snout-vent length) was hand collected, live, on the Naval Activities facility on the southern end of Guam. A stomach content analysis revealed 3 adult Eurasian tree sparrows (*Passer montanus*), each at different stages of digestion (Figure 1). On 17 December 1997, an unknown sex BTS (760 mm snout-vent length, weight unknown) was hand collected live in Maite, Guam. A stomach content analysis revealed 2 pre-fledging Eurasian tree sparrows, at similar stages of digestion. On 28 March 2005, an unknown sex BTS (950 mm snout-vent length, weight unknown) was hand collected live in the Munitions Storage Area on Andersen Air Force Base. The gut of the snake contained three black francolin (*Francolinus francolinus*) eggs.

Known digestion rates from BTS indicate the sparrows recovered from the first specimen were ingested 12-36 hours apart (Jackson & Perry 2000). This suggests the snake discovered sparrow roost sites on consecutive nights or made repeated visits to the same roost. Research on the nightly movements of BTS has confirmed the snakes often return to the same area over several nights (Tobin et al. 1998). The sparrows removed from the second specimen were likely taken from the same nest, as both juvenile birds were at similar stages of digestion. The francolin eggs were also likely taken from the same nest, as all three eggs were intact upon collection.

Eurasian tree sparrows are common introduced residents on Guam, generally located in commensal settings. Sparrows roost communally, perching on fences or tree tops during nighttime; such behavior may facilitate enhanced predation opportunities for BTS. As a consequence, sparrow populations primarily exist around human development on Guam, where BTS populations are substantially lower than in forested habitat. In non-commensal forested areas, BTS predation on adults, chicks, and eggs likely limits sparrow populations (Wiles et al. 2003).

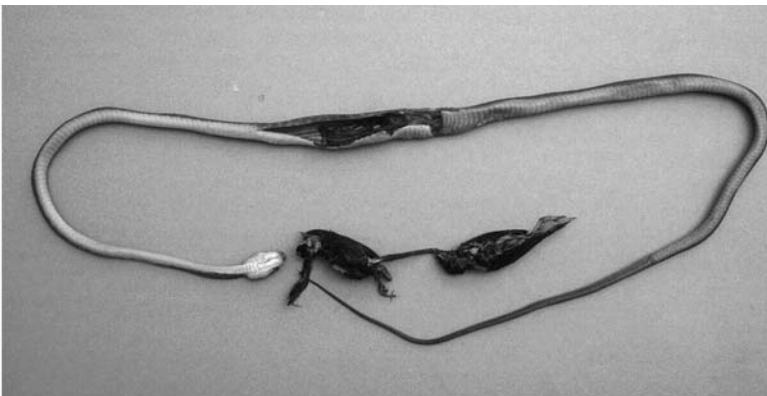


Figure 1. Adult brown treesnake, partially dissected to reveal three adult Eurasian tree sparrows; two have been removed from the snake and the third remains visible in the digestive tract.

Similar to Eurasian tree sparrows, the bridled white-eye (*Zosterops c. conspicillatus*), a subspecies endemic to Guam, communally roosted during nighttime. Savidge (1987) documented group roosting by captive white-eyes; although the birds often slept shoulder-to-shoulder, they could be removed from a cage one at a time without the other birds fleeing. On one occasion, a single small BTS entered a cage holding birds for research and consumed 3 white-eyes and killed a fourth over the course of one night (Savidge 1987). The smallest forest birds on Guam, such as white-eyes and the Guam flycatcher (*Myiagra freycineti*) disappeared first from the island, as BTS rapidly exploited adults, eggs, and chicks (Jenkins 1983, Engbring & Fritts 1988, Wiles et al. 2003). Larger birds, such as the Guam rail (*Gallirallus owstoni*) and the Mariana crow (*Corvus kubaryi*) persisted longer in the wild, as most BTS on Guam were too small to readily kill and consume adult birds (Wiles et al. 2003).

Black francolins are common introduced residents in savannah and forest edge environments throughout Guam. Francolins (and their eggs) are approximately the same size as the Guam rail and Mariana crow. Their size, coupled with reproductive strategies such as frequent re-nesting and rapid flight capability for chicks, has facilitated francolin population expansion despite high BTS densities. However, BTS likely have some impact on francolin recruitment, as evidenced by intensive BTS predation on other introduced Guam birds (Conry 1988, Wiles et al. 2003).

These observations provide evidence that Guam's native forest birds were extremely vulnerable while nesting and roosting. This vulnerability led to high rates of exploitation by an abundant and efficient nighttime predator and subsequently, the rapid demise of the island's native avifauna.

The first BTS specimen is archived in the U. S. National Museum of Natural History, tag number BSFS22239. The other specimens were not archived.

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