
Dietary habits of the Burmese python, *Python molurus bivittatus*, in Everglades National Park, Florida

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THE Burmese python (*Python molurus bivittatus*), a subspecies of the Indian python (*Python molurus*), is one of the largest snakes in the world, attaining lengths of up to six meters and over 90 kg in weight (Ernst & Zug, 1996; Minton & Minton, 1973). Native throughout southeast Asia, *P. molurus* is known to consume a wide variety of prey items including various mammal, amphibian, lizard, snake, bird and fish species (Bhupathy & Vijayan, 1989; Ernst & Zug, 1996; Minton & Minton, 1973). A formidable predator, large *P. molurus* have been reported to even prey upon adult leopards, jackals, deer, and boar (Ernst & Zug, 1996; Minton & Minton, 1973; Wall, 1921). However, information specific to *P. m. bivittatus* in the wild is scant and limited to data available for *P. molurus*.

Instances of pet release have lead to *P. m. bivittatus* becoming established within Everglades National Park (ENP), Florida (Snow, 2006). The number of individuals captured or sighted in ENP has increased dramatically since large specimens were first reported in the 1980s (Meshaka *et al.*, 2000) (see Figure 1). From 1995 through 2005, *P. m. bivittatus* have been observed and removed along Main park road, Long Pine Key, Shark Valley, Tamiami trail, and along the eastern park boundary (Snow, 2006). The majority of sightings have been along roads and canal levees. More troubling is that pythons have been observed in remote areas such as the mangrove backcountry and recovered along the 18 mile stretch leading to the Florida Keys (Snow, 2006). This suggests a far broader invasion than initially thought and one that appears to be expanding. Given the ability of *P. molurus* to

consume large and varied prey, *P. m. bivittatus* poses a serious threat to the majority of native fauna in ENP and surrounding areas. Determining which native species may be most at risk is of particular concern. In an effort to understand the potential ecological impact of this invasive species, we investigated the diet of sub-adult and adult *P. m. bivittatus* through analyses of stomach and lower intestines of captured specimens.

Fifty-six *P. m. bivittatus* recovered in or adjacent to ENP between January 2003 and March 2006 were examined for prey. These individuals were located along elevated roads and canal levee corridors associated with habitat including coastal prairie, mangrove, freshwater marl prairie, cypress, pinelands, hardwood hammocks, freshwater slough, and farmland (both active and former). Sex, snout-vent length (tip of snout to posterior of anal plate), weight and total length were recorded where possible. Stomach and lower gastro-intestinal tracts were then examined stereoscopically for feathers, hair, teeth, bone fragments, claws and scales. An attempt was made to identify mammal, bird and reptile remains to species level, however, most were identifiable only to genus, with others to order.

Fifty (89.3%) of the 56 *P. m. bivittatus* examined (mean total length 265.14 ± 10.90 cm, range 69.5–427 cm) contained prey remains from twelve species of mammal and five species of birds. This included two bird species listed by the Florida Game and Freshwater Fish Commission as species of special concern (Table 1). Eighty six percent (43 out of 50) of these pythons had prey items in an advanced stage of digestion and found

Prey	No. of records	% of sample
Mammals	38	70.37
<i>Sylvilagus</i> (Cottontail rabbit)	9	16.67
Rodentia (species uncertain)	6	11.11
<i>Sigmodon</i> (Cotton rat)	5	9.26
<i>Peromyscus gossypinus</i> (Cotton mouse)	3	5.56
<i>Sciurus</i> (Tree squirrel)	3	5.56
<i>Felis</i> (Cat)	2	3.70
<i>Procyon</i> (Raccoon)	2	3.70
<i>Rattus</i> (Old World rats)	2	3.70
Unidentifiable remains	2	3.70
<i>Didelphis</i> (Large American opossums)	1	1.85
<i>Felis rufus</i> (Bobcat)	1	1.85
<i>Neofiber</i> (Round tailed musk rat)	1	1.85
<i>Oryzomys</i> (Rice rat)	1	1.85
Birds	15	27.78
Aves (uncertain identity)	9	16.67
<i>Podilymbus podiceps</i> (Pied-billed grebe)	2	3.70
<i>Aramus guarauna</i> (Limpkin)*	1	1.85
<i>Eudocimus albus</i> (White ibis)*	1	1.85
<i>Fulica americana</i> (Coot)	1	1.85
<i>Troglodytes aedon</i> (House wren)	1	1.85
Reptiles	1	1.85
<i>Alligator mississippiensis</i> (Alligator)* ¹	1	1.85

Table 1. Prey ingested by 56 *Python molurus bivittatus* recovered in or adjacent to Everglades National Park, Florida, between January 2003 and March 2006. ¹ This python (386 cm total length) died consuming an *A. mississippiensis*. * Indicates species listed by Florida Game and Freshwater Fish Commission as special concern species.

in the lower intestine. The ratio of male *P. m. bivittatus* to females was almost 1:1, with 27 identified males and 29 females. Males were a mean total length of 253.35 ± 13.37 cm and mean mass of 8301.35 ± 1234.54 g, while females were a mean total length of 277.50 ± 17.16 cm and mean mass of 12116.12 ± 2126.73 g. Eight of the 56 *P. m. bivittatus* were under 200 cm, with the majority of individuals (85.71%) considered either sub adult or adults given that sexual maturity is around 260 cm (Lederer, 1956; Wall, 1921).

In addition, one female *P. m. bivittatus* (378 cm total length) consumed a subadult Bobcat (*Felis rufus*), and a male (386 cm total length) attempted to consume an American alligator (*Alligator mississippiensis*) (210 cm approx. total length) but died in the process.

The presence of *F. rufus* and *A. mississippiensis* in two large *P. m. bivittatus* indicates that almost any native species within ENP is vulnerable to predation. Native threatened and endangered species such as the Florida panther (*Puma concolor coryi*), Wood stork (*Mycteria Americana*), Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) and Mangrove fox squirrel (*Sciurus niger avicennia*) have not been observed as prey to date but are of special concern. The distribution of *P. m. bivittatus* within ENP overlaps with all four of these species with a large number of sightings or captures occurring in close proximity to birding hot spots, including Wood stork rookeries (Snow, 2006).

Another concern is the many federally listed endangered mammals that inhabit the Florida Keys (Reed, 2005). This includes the Key Largo woodrat (*Neotoma floridana smalli*) and Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*). To date there have been in excess of 14 pythons recovered along the 18 mile stretch leading to the Keys (R.W. Snow, pers. comm.)

Our observations agree with the information available for *P. molurus* in its native range, suggesting a broad diversity of diet and the ability to prey upon other large predators (Bhupathy & Vijayan, 1989; Ernst & Zug, 1996; Minton & Minton, 1973). While studies such as Bhatt & Choudhury (1993) found birds constituted the main prey item of *P. molurus*, Ernst & Zug (1996) have noted mammals as the dominant prey type. This variation can be expected given different prey species associate with specific habitat types, and seasonal fluctuations in abundance are common among migrating birds and especially many rodent species (Madsen & Shine, 1999; Smith & Vrieze, 1979).

The broad dietary and habitat diversity, ability to consume large prey, long lived nature, and high reproductive output (up to 100 eggs in a single



Figure 1. A 3.14 m (total length) female *Python molurus bivittatus* located on a tree island a few kilometres south of Pa-hay-o-kee Lookout, ENP. The snake was subsequently removed. © Jemeema Carrigan (University of Florida).

clutch) of *P. m. bivittatus* (Ernst & Zug, 1996; Minton & Minton, 1973) have the potential to create a huge ecological problem in ENP. It is essential that initiatives are developed specifically to manage and mitigate python impacts and to protect and monitor native fauna, especially endangered species.

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