

## ARTICLES

### The Appearance of the Exotic Green Iguana as Road-kills in a Restored Urban Florida State Park: The Importance of an 11-Year Dataset

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**Abstract:** We examined 11 years of reptile road-kill data from Cape Florida State Park (CFSP), a vegetatively restored, urban state park in South Florida previously destroyed by Hurricane Andrew in August 1992. We found eight reptile species dead on park roads, three of which were exotic. The native Southern Black Racer and the exotic Green Iguana each comprised 30.4% of the total number of road-killed reptiles. The three exotic reptile species combined accounted for 36.3% of all reptiles recovered in this study. Our findings underscore the threat of shifting exotic species dominance faced by protected lands, such as CFSP, and also the importance of quantifying species abundance in various ways so as to provide the sorts of data necessary to make sound management decisions and evaluate their results.

#### INTRODUCTION

Road-kills of amphibians and reptiles are a major cause of mortality for a wide variety of taxa (Ashley and Robinson 1996, Haxton 2000, Trombulak and Frissell 2000, Hels and Buchwald 2001, Dodd *et al.* 2004, Engeman *et al.* 2004, Aresco 2005, Rossmannith and Smith 2006, Shwiff *et al.* in press). Furthermore, the issue of exotic amphibians and reptiles is a vexing problem in Florida (Meshaka *et al.* 2004a, Meshaka 2006), the United States (Meshaka 2007), and worldwide (Lever 2003).

This paper compares native and exotic reptile mortality due to collisions with vehicles during 1996 - 2006 at Bill Baggs Cape Florida State Park (CFSP), a small, urban park located in Miami-Dade County, Florida, USA, on Key Biscayne approximately seven miles southeast of metropolitan Miami.

#### STUDY SITE AND METHODS

Cape Florida State Park consists of 325 acres (131.5 ha) of uplands and 106 acres (42.9 ha) of tidal and freshwater wetlands for a combined total of 431 acres (174.4 ha) (Smith *et al.* 2007, FDEP 2001). CFSP is completely encapsulated by urban high-rise infrastructure to the North, the Atlantic Ocean to the South and East, and Biscayne Bay to the West. Terrestrial access is only at the Northern interface.

Hurricane Andrew completely devastated CFSP on 24 August 1992. Prior to the storm, the park had been dominated by a near monoculture of Australian-pines (*Casuarina equisetifolia*), a large exotic tree whose canopy rose to more than 30 meters. This forest was

destroyed, and the subsequent clearing of debris left the park almost barren of vegetation. An ecological restoration plan was developed for the park, with the goal of reestablishing, to the extent possible, the native plant communities that once existed on site. This plan was initiated in 1993, and multiple years of replanting followed.

By the time of the conclusion of our road-kill study in 2006, the park securely supported 10 restored natural plant communities in diverse stages of maturity (Smith *et al.* 2007, FDEP 2001). The upland habitat communities principally consisted of 1.2 miles (1.9 km) - 6 acres (2.4 ha) of beach dune, 152 acres (61.5 ha) of coastal strand, 88 acres (35.6 ha) of maritime hammock, and 11 acres (4.4 ha) of coastal grassland (FDEP 2001). Eleven acres (4.4 ha) of ruderal habitat and 54 developed acres (21.8 ha) composed the remaining uplands (Smith *et al.* 2007, FDEP 2001). There also are approximately 10 acres (4.0 ha) of freshwater in five interdunal swale ponds during the wet season which in some years go completely dry (FDEP 2001).

A road-kill survey was opportunistically conducted during 1996 - 2006 at CFSP along ca. 2 km of paved, two-lane road (with variable speed limits of 24.1 - 40.2 km/hr) by Park Rangers and other staff. This survey did not consist of the rigid protocol reported for other Florida state parks (see method reviews in Smith *et al.* 1994, Bard *et al.* 2002, Smith *et al.* 2003, Rossmannith and Smith 2006, Shwiff *et al.* in press) but data were instead opportunistically collected during various staff activities involving transit on park

roadways. Road-killed animals were identified to the species level whenever possible, and data were then compiled by years.

## RESULTS AND DISCUSSION

During 1996 - 2006, 135 road-killed individuals were recovered at CFSP. Five native snake species, two exotic lizard species, and one exotic aquatic turtle were found (Figure 1). Forty-one Southern Black Racers (*Coluber constrictor priapus*) comprised 30.4% of all road-kills, and 22 Corn Snakes (*Elaphe guttata*) comprised 16.3% of all road-kills, and were the most common snakes road-killed. The dominance of the Southern Black Racer among road-killed snakes at our site is typical in rural and urban southeast Florida state parks (HTS pers. obs., Smith *et al.* 2003, Rossmanith and Smith 2006, Shwiff *et al.* in press). Among snakes, the Yellow Rat Snake (*E. obsoleta quadrivittata*), Scarlet Kingsnake (*Lampropeltis triangulum elapsoides*), Southern Ringneck Snake (*Diadophis punctatus punctatus*), and unidentified individuals were killed in lower frequencies (Figure 1). Collectively, the identified native species comprised 60.0% of all roadkills.

Forty-one exotic Green Iguanas (*Iguana iguana*) comprised 30.4% of all road-kills, and together with seven Giant Ameivas (*Ameiva ameiva*), and one Red-eared Slider (*Trachemys scripta elegans*), these three exotic species collectively comprised an astounding 36.3% of all road-kills. The Green Iguana did not appear as a road-kill until 2001 (Figure 2), at which time the Florida Park Service initiated a program to remove this species from the park (Smith *et al.* 2007). Soon thereafter, the Green Iguana became more prevalent in the road-kill survey (Figure 2), and the peak number of road-killed Green Iguanas during 2003 coincided with the highest density of Green Iguanas calculated for the park of 626.6 iguanas/km<sup>2</sup> (Smith *et al.* 2007). The Green Iguana has reached very high densities in CFSP (Meshaka *et al.* 2004b, Smith *et al.* 2007, Meshaka *et al.* in prep.) as it has in several other Florida parks (Townsend *et al.* 2003, Meshaka *et al.* 2004b, Smith *et al.* 2006). We were, therefore, not surprised at the frequency of its occurrence as a road-kill, the values of which are all the more remark-

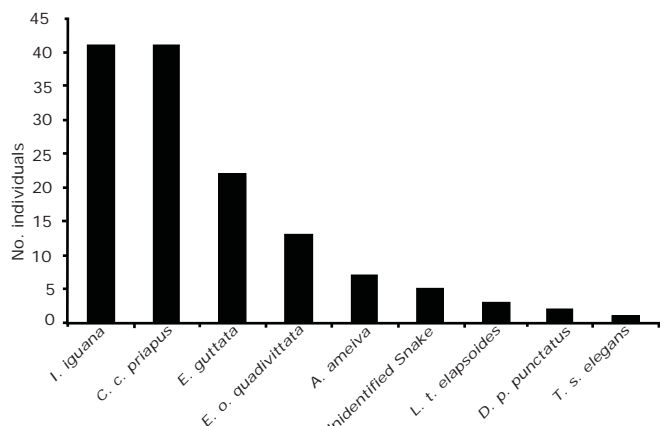


Figure 1. Numbers of reptile species in descending frequency recovered as road-kills during 1996–2006 at Cape Florida State Park, Miami-Dade County, Florida.

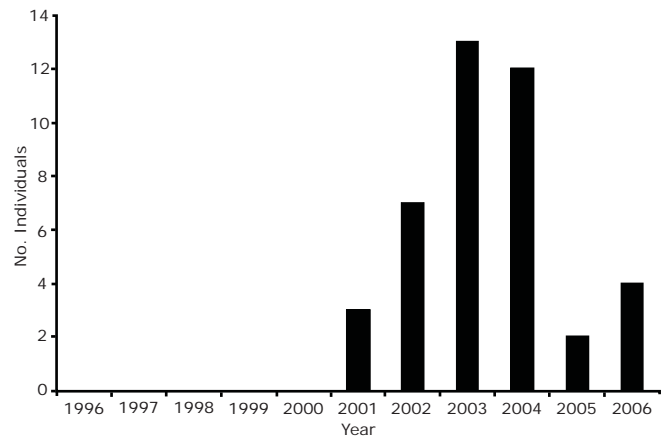


Figure 2. Number of Green Iguanas (*Iguana iguana*) recovered as road-kills during 1996–2006 at Cape Florida State Park, Miami-Dade County, Florida.

able in light of the opportunistic nature of this study. Our results underscore the susceptibility to herpetofaunal community restructuring by exotic species in protected lands such as CFSP. Our results also provide the quantitative data that can prove useful when formulating management plans and measuring results of those plans to bring a system and its various components closer to historical norms as has been the case at CFSP.

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