Green Iguana Proliferation in the Key West National Wildlife Refuge: A Hurricane By-product and a Threat to the Imperiled Miami Blue Butterfly?

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Introduction
A neotropical folivore, the green iguana (Iguana iguana) is exotic to southern Florida, where it has few known predators (Krysko et al. 2007) and limiting factors are poorly understood. At high densities (see Meshaka et al. 2007), this reptile may threaten native wildlife (Smith et al. 2006), including the imperiled Miami blue butterfly (Colias thomasi bethunebakeri) (FFWCC 2010). Gravid female iguanas shun densely shaded areas for nesting and move to more open settings to nest (Bock and Rand 1989). Thus, hurricanes may create or maintain clearings favorable for iguana nesting. Here, I suggest that Hurricane Wilma, the most severe Florida Keys hurricane since 1965 (Kasper 2007), was a catalyst for iguana proliferation. Until my study, the distribution of this reptile and its sympathy with the Miami blue in the Key West National Wildlife Refuge (KWNWR) were unknown.

Methods
• Searched for iguana burrows and tracks on 14 islands, 12 with uplands, in the KWNWR during the iguana nesting season (Feb-March)
• Trapped (42 trap nights) iguanas on 1 island in the Marquesas Keys
• Nezroplised captured females to obtain clutch sizes

Results
• Iguanas present on 12 islands distributed over 28 linear km
• All iguana burrows were in remnants of once-large clearings created by Hurricane Wilma
• Burrow density varied greatly among islands: highest on east Man Key (31 burrows in ~0.2 upland ha), lowest on West Birthplace Key (4 burrows in ~0.4 upland ha)
• Largest number of burrows (n = 62) on Long Beach areas
• Trapped (39 trap nights) iguanas on 1 island in the Marquesas Keys
• Nezroplised captured females to obtain clutch sizes

Discussion
In the KWNWR, Hurricane Wilma transformed what had once been a densely vegetated setting with little suitable iguana nesting habitat (Fig. 5) into an open landscape (Fig. 2) with an abundance of it. More than 5 years after the storm virtually all iguana burrows were found in remnants of clearings known to have been created by Hurricane Wilma (Wilmers pers obs.), suggesting that this hurricane was and continues to be an important

Green Iguanas and the Miami blue butterfly
In the KWNWR, the Miami blue lays eggs only on blackbead (Pithecellobium keyense) leaves and buds (Cannon et al. 2010). In their native range, green iguanas eat a variety of plants but may consume whatever plant is most abundant and common (Rand et al. 1995). Blackbead is the most common woody plant on 6 of the 8 uplands that harbor the Miami blue (Wilmers pers obs.). Whether green iguana eat blackbead leaves is unconfirmed and merits investigation. If it does eat blackbead, Miami blue eggs and larvae would be consumed. Miami blue numbers greatly fluctuate (Cannon et al. 2010) and at low numbers, iguana consumption of the butterfly’s eggs could lead to extirpation on one or more of the 8 islands that harbor the butterfly. The iguana population may increase unchecked in KWNWR until some limiting factor is reached. Of great concern is a future hurricane of Wilma’s magnitude once again killing most of the blackbead, concentrating the butterfly and the reptile in the small patches that remain. The number and severity of hurricanes is expected to increase due to global warming (Webster et al. 2006).

Why Iguana eradication is unlikely an exercise in futility:
• The size and remoteness of the occupied areas
• Iguanas swim well and move between islands
• The largest island in the Marquesas is ~ 8 km long and thus is a reservoir for replenishment of animals removed from smaller islands
• The reptile’s high reproductive rate and lack of native predators
• Trapping constraints: 1. inability to capture most age classes; 2. trap-shyness; 3. state law mandates checking traps every 24 hours but vagaries of weather preclude this; 4. dense, dead vegetation is mixed with live vegetation in the coastal strand; 5. enormous manpower needed even if traps were effective.

No panacea: some imperfect measures:
• Wait for another hurricane of Wilma’s magnitude—live vegetation will be limited and iguana numbers likely greatly reduced, concentrating survivors and increasing the effectiveness of intensive trapping and nest destruction
• Trap nesting females February-March
• Find and destroy nests
• Collect stomach contents from 50 trapped iguanas to determine if blackbead is commonly eaten

Literature Cited

In the KWNWR, the Miami blue (left), one of the rarest butterflies in the world, lays eggs (right) only on blackbead leaves or buds. Iguana consumption of blackbead is unconfirmed but merits investigation.