Green Iguanas (*Iguana iguana*) have become a common sight in the human-altered habitats of southern Florida. *Photograph by Joe Wasilewski.*

A young Green Iguana from Miami, Miami-Dade County.

The southern Florida Peninsula. *Illustration by John Binns.*

Colonization Success by Green Iguanas in Florida

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Photographs by Richard D. Bartlett unless otherwise indicated.

If the business of biology is detective work, then answering the following questions is an attractive endeavor: Why is the Green Iguana (*Iguana iguana*) suddenly so ubiquitous in southern Florida? What can we expect of it in the future? Why? From an academic perspective, the Green Iguana and its relatives, the Spiny-tailed Iguanas (*Ctenosaura* spp., see IGUANA 10:111–118), are the only exclusively herbivorous components of Florida's exotic terrestrial herpetofauna. As a matter of aesthetics, the sight of an adult Green Iguana is an eyestopper. Also, these lizards are popular pets that can grow to large size, are behaviorally complicated, can be docile, and are attractive. Not surprisingly, pet trade-related releases and escapes are responsible for the mostly spotty geographic distribution of Green Iguanas in southern mainland Florida and the Florida Keys. First reported from several sites during the 1960s, breeding populations were not confirmed until sometime later.

Where are Green Iguanas Now?

Presently, Green Iguanas are a largely coastal species in southern Florida. They occur somewhat continuously along the coast of

An adult Green Iguana basking on a palm with the Miami suburbs in the background. *Photograph by Joe Wasilewski.*

An adult male Green Iguana at Crandon Park, Miami-Dade County.

Palm Beach, Broward, and Miami-Dade counties and on Key Largo in Monroe County. Populations also are established on the lower Florida Keys. To the west, Green Iguanas are established in parts of Collier County and have been reported from Lee County. With some regularity, the species is seen in Vero Beach (Indian River County) and Tampa Bay (Hillsborough County). Although not part of breeding populations in the much colder interior of Florida, an individual was reported from Alachua County and another was seen in Highlands County. Apart from those in southern Florida, adults and hatchlings are known to occur in Cameron County in southern Texas.

Green Iguana populations reach their highest densities along the warm coast, where frost-free conditions prevail through most of Palm Beach County. Almost without exception, these lizards are associated with water, such as bays, canals, ponds, and ditches — and they are especially attracted to areas with trees that extend over water and where tender edible vegetation is abundant.

Population densities can be high. For example, annual reports from the Florida Department of Environmental Protection revealed that, at Cape Florida in Miami-Dade County, an astonishing 397 individuals were removed during the five-year period 1 July 1998–30 June 2003 (0, 0, 1, 12, and 384, respectively). During this same period, 27 individuals (5, 0, 0, 18, and 4, respectively) were removed from Hugh Taylor Birch State Park in Broward County.

At Oleta River State Park in North Miami (Miami-Dade County), Park Service Specialist Laura L. Kruger began seeing iguanas within a few years of her arrival at the park in 1998 and

An adult Green Iguana basking at the Kampong, Miami-Dade County.

An adult Green Iguana very comfortable in brush in Broward County.

has noticed a sizeable increase in population numbers. In the past three years, she has personally captured 16 individuals. She usually sees lizards in areas surrounded by saltwater habitat and in the park's mangrove stands.

At Fairchild Tropical Garden, also in Miami-Dade County, population densities are such that Skip Snow, National Park Service, has indicated that the Hibiscus garden can no longer be maintained. Although not sampled in similar fashion, these examples and our own combined observations at these sites and at others over time corroborate the notion of sharply increasing iguana population sizes at the few sites where anyone is monitoring the situation.

Temporal and Spatial Colonization Patterns

Why have Green Iguanas so suddenly become ubiquitous in an otherwise unremarkable Florida range? Efforts to separate the phenomena of increased interest in finding the species and increased dispersal rates (natural or otherwise) complicate the matter of dating newer populations. Acquiring a full accounting of which colonies are actually new and which were simply overlooked for some period verges on the impossible. If one examines the literature concerning this species in Florida, verifiable populations tend to be found far more frequently in a few southernmost counties than in new counties. With the exception of Palm Beach County, much of what Green Iguanas appear to be doing is filling gaps in their current distribution. What can be said with certainty, however, is that population growth in previously known sites dramatically increases the opportunities for natural dispersal, especially along the seemingly innumerable waterways that crisscross the state.

Why, however, do increases in population sizes continue and how can one explain the sudden and seemingly endless supply of Green Iguanas from sites that had never supported large numbers during the 10 or so years during which we have been conducting searches? More directly and ironically, how has this species become so numerous that these former discards from the pet trade are now collected from south-Florida populations for sale by pet dealers?

The answers to these questions potentially can serve to predict the nature of future trends. Green Iguanas, like many other colonizing species, often occupy a few localized sites for very long periods while slowly building up population sizes or until conditions are ripe for an explosion of numbers, with the latter scenario ranging from nearly instantaneous to a period of many years.

Why populations persist initially requires a favorable combination of characteristics, all of which are present in southern Florida (in no particular order): (1) Amenable climate exists. (2) Disturbances in association with water are common in Florida, occur in many forms, and are often accompanied by prolific growth of ornamental or native edible foliage. Perhaps these habitat characteristics mimic the secondary growth along rivers so favored by Green Iguanas in native ranges throughout the Neotropics? (3) Competitors for food, except other Green Iguanas, are largely absent. (4) Adults are safe from most predators, and potential predators of hatchlings and juveniles are uncommon in human-disturbed situations. (5) Green Iguanas

A young Green Iguana from Miami, Miami-Dade County.

are either protected by humans who like them or are hard to detect by residents who do not. (6) These lizards can persist for long periods until conditions are favorable for recruitment; although attaining maturity may take three to four years, females then can produce large clutches for many years.

To illustrate the resilience of iguanas, in 1999, one of us received an adult female that had been collected in downtown Austin, Texas. According to the collector, she had been living for at least three years in a burrow (possibly of her own construction) in an extensive area of rubble from a demolished building and highway construction. Low, weedy shrubs of unknown species grew thickly around the perimeter. On many occasions, this iguana had been seen eating foliage and blossoms from the shrubs. When crews began removing the rubble, they decided to catch the iguana. Except for having her elongated vertebral scales worn completely off, this 3-foot long iguana was in excellent condition and acclimated immediately to captive conditions. Today, five years after being captured, her vertebral scales have regrown only moderately.

Back to Florida, on Virginia Key, Biscayne Key, Cutler Bay, and in Hugh Taylor Birch State Park, Green Iguanas were not nearly as abundant before Hurricane Andrew in 1992. With the exception of Hugh Taylor Birch, they had been present for many years at these sites — but in no appreciable numbers. Within a decade subsequent to Hurricane Andrew, the Green Iguana bucket, so to speak, began to overflow. Common to these sites (with the exception of Hugh Taylor Birch) was aggressive replanting with a smorgasbord of plants, shrubs, and trees bearing edible and apparently delectable parts. Abundant resources in a rich habitat resulted in successful reproduction and a large crop of now 8+ year old adult females that are in turn producing large numbers of hatchlings each year. This surplus is now large enough to disperse actively to previously vacant areas that also were heavily planted after the storm. However startling the population densities, as both herbivores and ectotherms (which require far less energy for maintenance and reproduction than endothermic birds or mammals), large body size is no barrier to

A sick Green Iguana on a lawn in Miami, Miami-Dade County. Although no cause is known for the condition of this individual, feral iguanas may be vulnerable to toxins used to control pests or weeds.

enormous population densities, despite what might superficially seem like a mediocre food supply.

Further accelerating geographic expansion attributable to explosions in population sizes is the ever-increasing potential for pet escapes or releases. Within the past decade, farming of iguanas for import into this country from several Latin American countries, especially Colombia and Belize, has reached levels such that tens of thousands of baby Green Iguanas are introduced via the pet trade each year — and continuously rather than seasonally as in the past. This has resulted in close to single-digit retail prices. With this explosion in availability has come a concurrent spike in orphan iguanas, enhancing opportunities for escapes or deliberate releases of unwanted pets that have become too large, too aggressive, or too sick to keep.

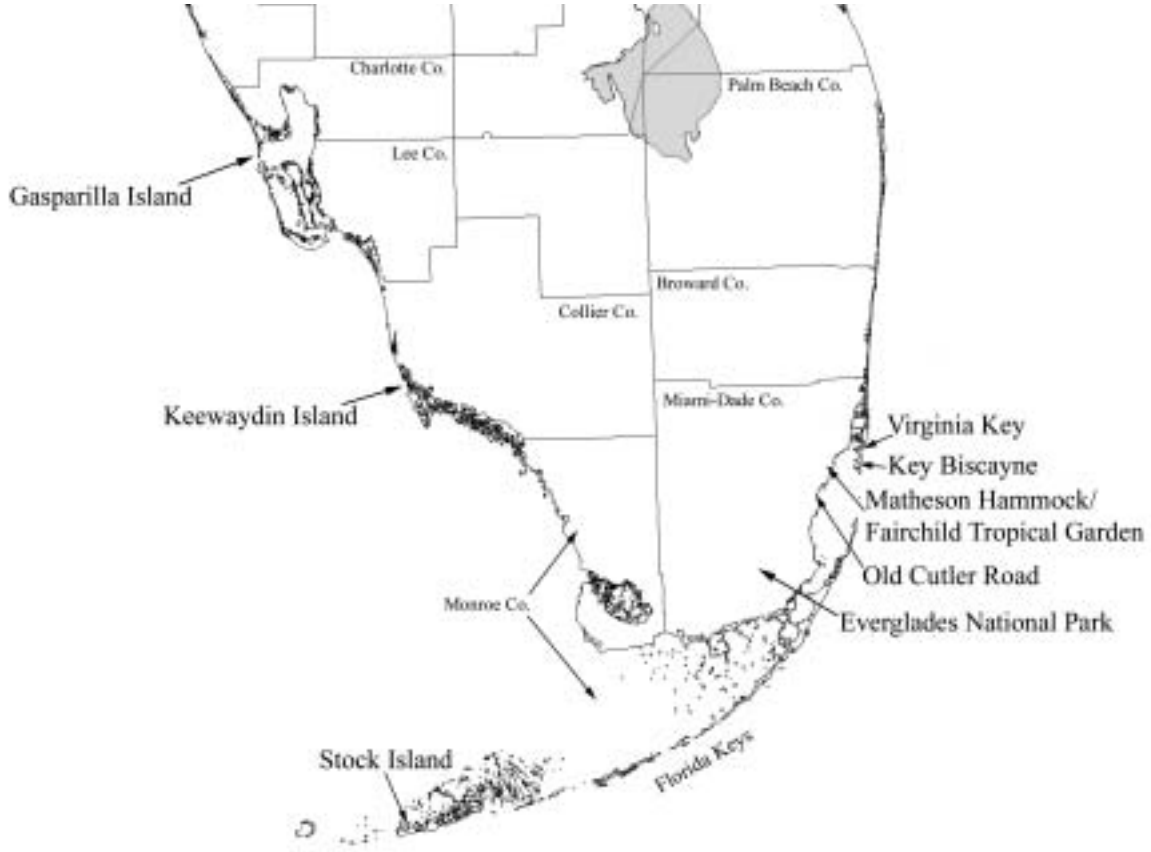
The Test

So, Green Iguanas are thriving in their disturbed southern Florida range. Yet, the exception tests the rule. Everglades National Park, a large expanse of relatively natural wetland and upland communities, provides the test. The Park also was damaged by Hurricane Andrew, but was then left to revegetate on its own. Since 1970, the Park has reported only 20 sightings of Green Iguanas, with observations occurring in 1970–1977 (N = 11) and again in 1995–2004 (N = 9). Reports occurred on or very near heavily traversed trails, along canals, or in campgrounds. In all cases, animals were near or very near water. Mean estimated total length of these individuals was 94.3 ± 19.4 cm (61.0–121.9 cm, N = 16), with size estimates not available in four instances.

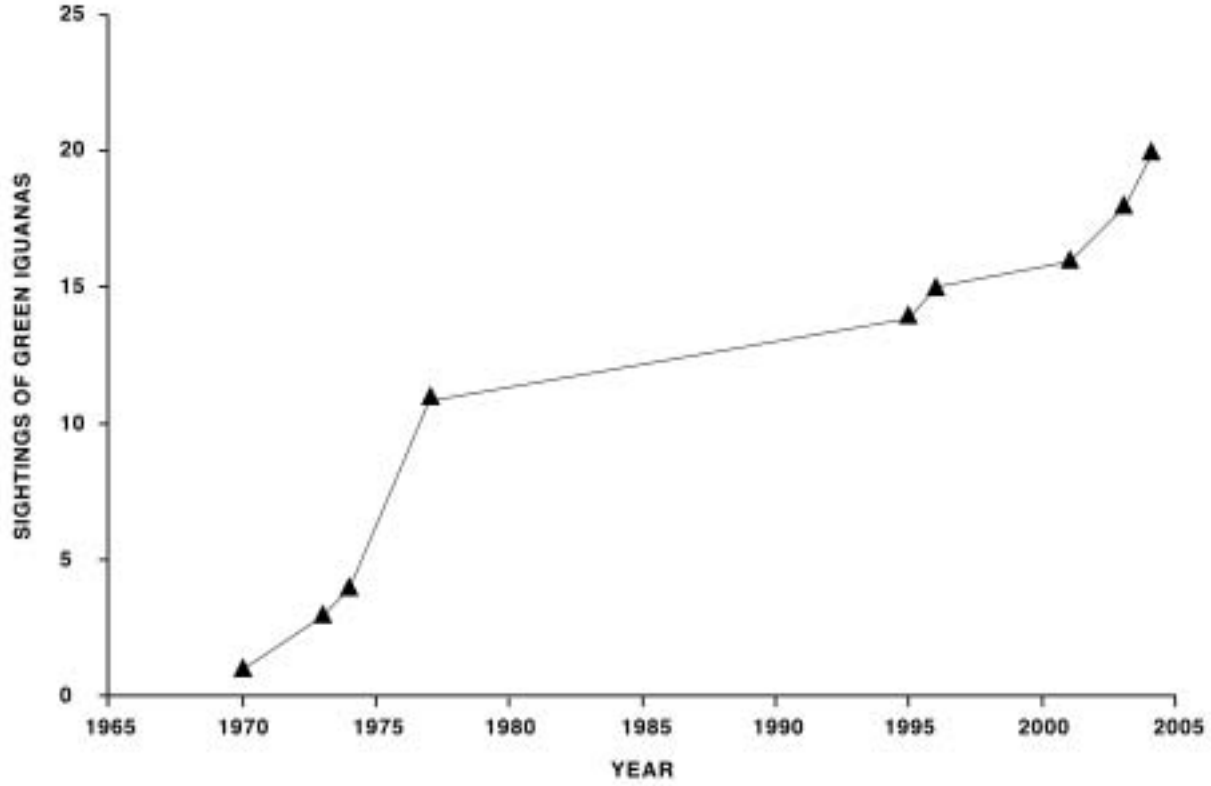
Could the second wave of reports corroborate the notion of a human-mediated boom in the Green Iguana population after Hurricane Andrew, now spilling into the Park? Of the nine reports during 1995–2004, all but two came from the north end of the Park or in association with adjoining canals. The exceptions were a single individual found along the road just north of the West Lake boat ramp and boardwalk and a single individual found in the Flamingo campground; both likely locations for vehicle-related dispersal from other locations. Reasons for the first pulse of sightings in the 1970s and the subsequent hiatus in the 1980s are unknown, but the opportunity for Green Iguanas to disperse into the Park appears to have increased since the nearly 20 year hiatus in sightings. This phenomenon is most easily explained by connections to the Park via canals that pass through Florida City and Homestead, both of which most certainly sustain populations, and by the post-Hurricane Andrew boom in quality habitat. Yet, despite the increased opportunities for dispersal into the Park, both pulses of sightings represent failed colonization attempts with no evidence of successful reproduction. We suggest that the reason for this failure is because the Park is, in many ways, what urban and suburban southern Florida is not — namely natural habitat occupied by a suite of well-adapted native predators and potential competitors.

In sharp contrast to the nearly ideal conditions experienced by Green Iguanas in the developed areas of Miami-Dade County, the Park has an abundance of predators (including the American Crocodile, a known predator of iguanas), a dearth of suitable fully-insolated nesting sites in areas of open-canopy and well-drained soils, and a food supply that is less than ideal for iguanas, which prefer the more palatable ornamentals so beloved by South Floridians. As long as human intervention with the Park's watershed does not alter any of these three factors in any substantive

South Floridians often encounter feral Green Iguanas basking in open areas. *Photograph by Joe Wasilewski.*



Geographic distribution of Green Iguanas (*Iguana iguana*) in Florida. Only those counties with established colonies are indicated; Highlands and Alachua counties are not shaded because those records appear to represent waifs.



An accumulation curve of sightings of Green Iguanas in Everglades National Park from 1970–2004.

Green Iguanas using arboreal perches may be difficult to see, explaining why few area citizens are aware of their growing numbers, especially in urban and suburban yards and parks. *Photograph by Joe Wasilewski.*

fashion, the southern Everglades should continue to resist colonization by iguanas.

The Future?

Urban and suburban areas of southern Florida effectively provide a glimpse of the not-too-distant future, when continued growth of the human population and the inevitable alterations of the few remaining natural areas will assure that Green Iguanas will mimic the exceedingly successful Brown Basilisk (*Basiliscus vittatus*), which has already become an ubiquitous inhabitant of waterside properties, but is held in check solely by penetrating frosts in regions to the north. For Green Iguanas, this translates into a secure coastal existence north to Martin County along the eastern coast and to near Sarasota, Sarasota County, on the west. Why? Because human-mediated changes will increase opportunities for lizards to disperse, the number of wayward pets will increase. Also, the climate is largely amenable and further habitat modifications to their liking are likely. Iguanas are innately highly fecund, and, with few exceptions, human attitudes regarding their presence range largely from indifference to enjoyment. Only in the ever-shrinking natural areas of the state does the Green Iguana seem ill-suited.

As for every other of the 40 exotic species of amphibians and reptiles that are successfully reproducing in Florida, humans are the cause of the Green Iguana's very existence in Florida and their subsequent success. The evident prosperity of this large herbivore effectively underscores the huge role humans can, even if inadvertently, play in the good life enjoyed by so many exotic species in the hospitable climes of southern Florida.

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