Introduced Iguanas in Southern Florida: A History of More Than 35 Years

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All photographs are by the senior author except where noted.

Researchers have been aware of the presence of non-native reptiles and amphibians in Florida for more than 140 years. Cope (1863) reported the small, terrestrial Greenhouse Frog, *Eleutherodactylus planirostris* (Cope), from southern Florida, and the report of *Anolis sagrei* followed about 25 years later (Garman 1887). Since then, numerous papers have detailed the introduced herpetofauna of southern Florida (e.g., Carr 1940, Duellman and Schwartz 1958, King and Krakauer 1966, Wilson and Porras 1983, Butterfield et al. 1997), and more than 40 non-native species are presently reported. These reptiles and amphibians were initially introduced and their populations are supplemented via various routes. Some of these exotics may find their way into the suitable climate of southern Florida as stowaways in shipments of ornamental plants and other commerce, but many recent introductions can be attributed to individ-

Adult female *Ctenosaura similis* on Key Biscayne using an old park bench as a basking site. *Photograph by Joe Burgess.*

Three species of iguanas have become established in southern Florida: *Ctenosaura pectinata*, from near Old Cutler Road (top), southeastern Miami-Dade County, and adult male *Ctenosaura similis* (middle), and *Iguana iguana* from Key Biscayne (bottom).

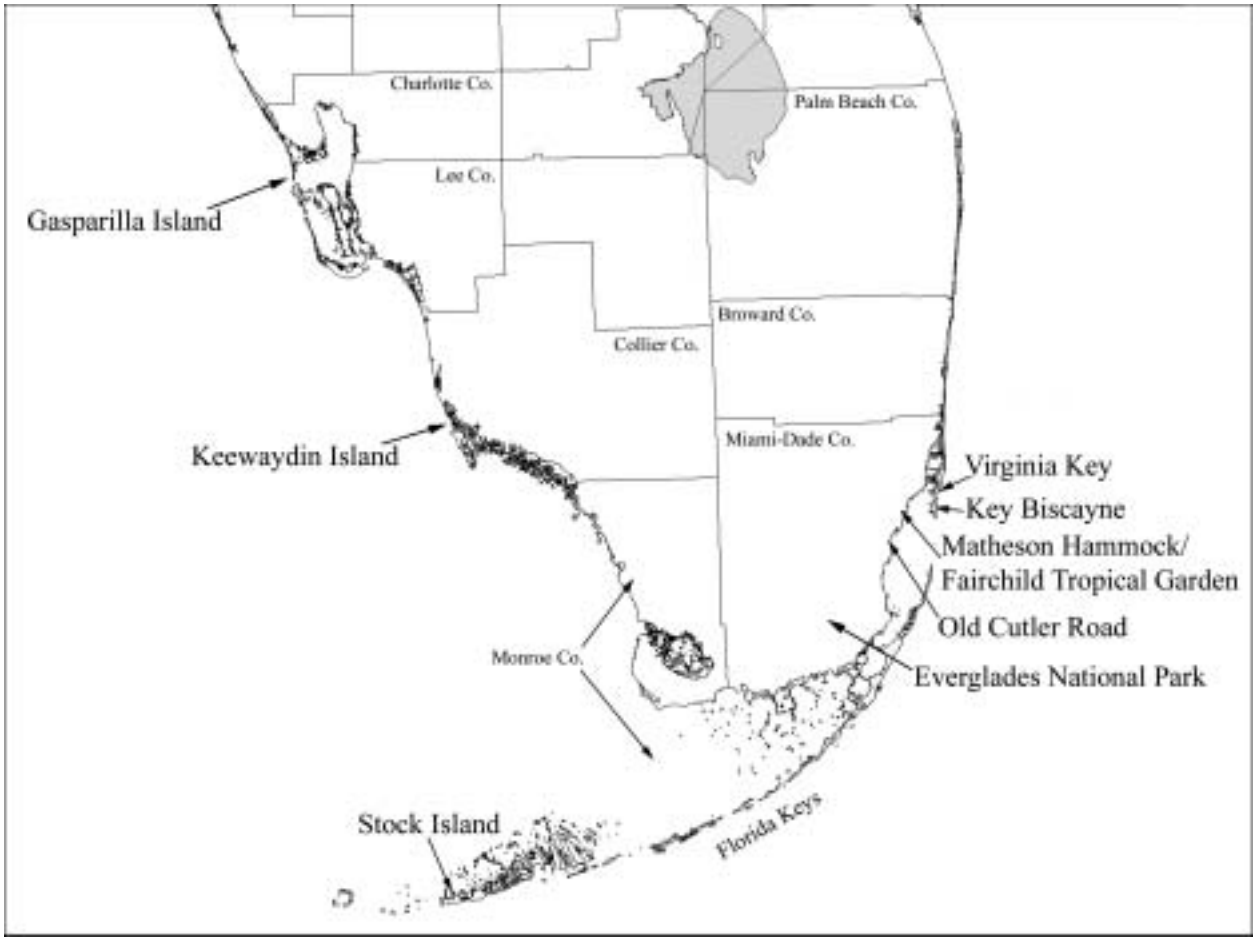
uals being intentionally released by or escaping from reptile dealers or pet owners. As the trade in reptiles and amphibians has increased, so has the number of exotic species that have become established. Some of the more notable, and noticeable, of these species are three large lizards in the family Iguanidae (*sensu* Frost et al. 2001): the Mexican Spiny-tailed Iguana, *Ctenosaura pectinata* (Wiegmann), the Black Spiny-tailed Iguana, *C. similis* (Gray), and the Green or Common Iguana, *Iguana iguana* (Linnaeus).

Lizards in the genus *Ctenosaura* are commonly referred to as Spiny-tailed Iguanas or Ctenosaurs. They are large iguanids that typically have tails ringed with rows of enlarged, spiny scales. Presently, 17 species are recognized. Ctenosaurs are found in southern Baja California, its offshore islands, and on mainland Central America from adjacent parts of Mexico to Panama (Köhler 2002; see also *IGUANA* 10(2):56–57 and 10(3):79–81). Two of these species, *C. pectinata* and *C. similis*, are known to be established in southern Florida.

Ctenosaura pectinata is native to the Pacific versant of southern Mexico. This species was first reported in Florida by Eggert (1978), who described digging up eggs and observing adults near Old Cutler Road in southeastern Miami-Dade County. However, Eggert (1978) erroneously identified this population as *C. similis*, which was later corrected by Wilson and Porras (1983). This case of mistaken identity was the first in a series of misidentifications involving introduced Ctenosaurs in Florida, as *C. pectinata* was subsequently reported from Key Biscayne (Butterfield et al. 1997), Gasparilla Island (Bartlett and Bartlett 1999, McKercher 2001, McCoid 2002), and from "… the streets and trees of metropolitan Miami" (Bartlett and Bartlett 1999).

After examining all Florida specimens of *Ctenosaura* in systematic collections and collecting specimens from all known localities in southern Florida, Townsend et al. (2003) concluded that most populations (including those known from Key Biscayne and Gasparilla Island) are *C. similis*, and the only extant population of *C. pectinata* occurs near the original Old Cutler Road site. We visited the Old Cutler Road site at least six times from 2002–2003 and observed two adult males, six adult females, and one subadult of unknown sex living on and adjacent to a single private property east of Old Cutler Road between SW 168th and SW 184th streets. No other *C. pectinata* was seen, and local residents with whom we talked were unfamiliar with the lizards and unaware of their presence. However, one resident of the Florida Keys related that she had observed Ctenosaurs crossing Old Cutler Road while driving through the area in 2002 and 2003 (H. Kavney, pers. comm.).

Ctenosaura similis is native to Central America, and is found from the Isthmus of Tehuantepec to northeastern Nicaragua and west-



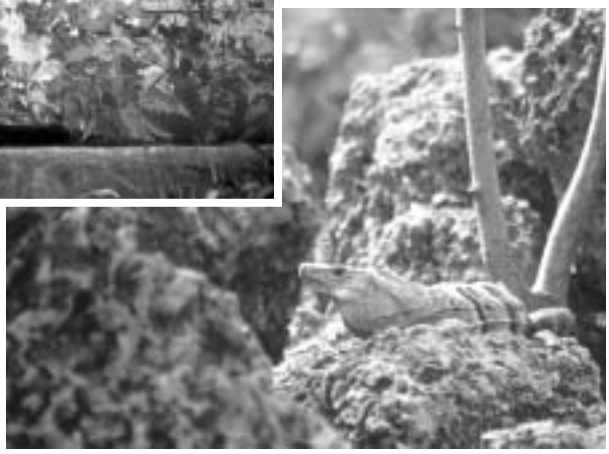
Map of South Florida showing localities mentioned in the article.

ern Panama on the respective Atlantic and Pacific versants. The extent to which *C. similis* has become established in southern Florida is only now becoming clear. One of the earliest known populations of *C. similis* in Florida occurs on Key Biscayne. That population probably has persisted there since at least 1979, when the Crandon Park Zoo was closed and most of the exhibit animals were relocated to the Miami Metrozoo (Townsend et al. 2003). Since its introduction on Key Biscayne, *C. similis* has become well-established in Crandon Park and is being found in increasing numbers in Bill Baggs Cape Florida State Park at the southern end of Key Biscayne (E. Donlan and E. Golden, pers. comm.). This species also was introduced on Gasparilla Island, Charlotte and Lee counties, on Florida's southwestern Gulf Coast during the late 1970s or early 1980s, when an island resident released as few as three individuals brought back from Mexico (Krysko et al. 2003). *Ctenosaura similis* now occurs on Gasparilla Island in large numbers and has expanded its range onto the adjacent mainland and onto Cayo Costa, a small island south of Gasparilla Island. Large populations also occur on Keewaydin and Little Marco islands and within the boundaries of the Rookery Bay Estuarine Research Reserve, Collier County. The latter population was established in 1995, when a Keewaydin resident intentionally (and illegally) released 5–30 *C. similis* on his property (Krysko et al. 2003). The deliberate introduction of nonnative reptiles is illegal according to Florida Statute 372.265, which specifically prohibits the release of exotic wildlife without a permit from the Florida Fish and Wildlife Conservation Commission.

Confusion regarding the identities of southern Florida's Ctenosaurs may be attributed partially to a general similarity in the appearance of the two species. As adults, both *C. pectinata* and *C. similis* are large, dark-colored terrestrial lizards that may

Adult female (right) and an adult male and female (below) *Ctenosaura pectinata* near Old Cutler Road, southeastern Miami-Dade County.

(below) Adult male *Ctenosaura similis*, Key Biscayne.



appear striped or banded. Juveniles of both species are green at the time of hatching, gradually taking on the brown or black adult coloration as they mature. However, these two species may be distinguished easily by using a few morphological characters that were defined by Köhler and Streit (1996) and later applied by Townsend et al. (2003) to Florida Ctenosaurs. Adult *C. similis* usually have a gray or tan ground color with 4–12 well-defined dark dorsal bands that extend nearly to the ventral scales. Male *C. similis* also may take on an orange color around the head and throat during the breeding season. In contrast, mature *C. pectinata* have a black to brown ground color marked with irregular whitish blotches, with additional white coloration usually apparent in the area of the neck and throat. These white markings may give *C. pectinata* a partially banded appearance. Both *C. similis* and *C. pectinata* have tails that are ringed with rows of enlarged spiny scales, or whorls, that are separated by smaller smooth scales, or intercalaries — but differ in the number of intercalaries that separate the whorls. This is most apparent near the base of the tail. *Ctenosaura similis* has whorls separated by two rows of intercalaries and *C. pectinata* has whorls separated by three rows of intercalaries. Florida *C. similis* also tend to have very few (usually zero) small dorsal scales between the posterior end of the dorsal crest and the anterior end of the caudal crest, whereas Florida *C. pectinata* usually has 7 or 8 (range 0–20) dorsal scales between crests (Townsend et al. 2003).

Currently, *C. pectinata* appears to be restricted to a single small area around Old Cutler Road, and occurs in low numbers there despite having been introduced at least 25 years ago. Expansion of this population may have been limited by natural and man-made geographic barriers, including a canal to the north, construction in the early 1980s of a large corporate headquarters to the south,

Biscayne Bay to the east, and Old Cutler Road to the west. A large area directly to the south of the current population was developed since the time it was reported by Wilson and Porras (1983), a process which may have reduced the numbers of *C. pectinata* to the low numbers seen today. In contrast, *C. similis* has been an exceedingly successful invader, becoming well-established and expanding its range in a number of Florida localities. Site fidelity associated with *Ctenosaura* utilization of holes or other refugia may slow the process of range expansion beyond the original site of introduction. Nonetheless, neither species of *Ctenosaura* has been nearly as successful as an invader as their familiar relative, the Green or Common Iguana (*Iguana iguana*).

Iguana iguana is one of the most popular reptiles in the pet trade, with over 1.14 million imported into the United States in 1995 alone, and represents about 45% of all reptilian imports (Hoover 1998). *Iguana iguana* has a wide native range and is found at low elevations on the mainland from Sinaloa, Mexico south to Ecuador on the Pacific versant and Veracruz, Mexico to southern Brazil on the Atlantic versant, as well as on some Central and South American coastal islands

Adult male *Iguana iguana*, Key Biscayne.

Juvenile *Ctenosaura similis*, Key Biscayne.

Three Green Iguanas (*Iguana iguana*) sit at canal's edge, Key Biscayne.

An obviously gravid female *Iguana iguana* pauses while excavating her nest at Key Biscayne. *Photographs by Esther M. Langan.*

and throughout the Lesser Antilles. In the United States, *I. iguana* has been introduced in southern Florida and Hawaii (McKeown 1996). *Iguana iguana* was first reported in southern Florida by King and Krakauer (1966), who indicated that iguanas could be found on Key Biscayne, Hialeah, Coral Gables, and near the Miami International Airport. *Iguana iguana* has since become established at least as far north as Palm Beach County on the Atlantic Coast and Lee County on the Gulf Coast (Bartlett 1980, Bartlett and Bartlett 1999, Townsend et al. 2002, Krysko et al. in press), and as far south as Stock Island in the Florida Keys, Monroe County. In all likelihood, this species is much more abundant in southern Florida than previously reported in the literature. The largest populations of *I. iguana* probably occur in eastern Miami-Dade County on Key Biscayne, in Fairchild Tropical Garden, and Matheson Hammock Park, but these lizards are now found at localities throughout the county and have been sighted numerous times in Everglades National Park (Meshaka et al. 2000).

In Florida, *I. iguana* usually is found near water, often in trees or on embankments bordering canals and lakes, or even basking on lawns or pavement in urban and suburban areas. Juveniles and adults are strictly herbivorous. In Florida, iguanas eat a wide variety of both exotic ornamentals and native plants (see *IGUANA* 10(3):94–95). *Iguana iguana* on Key Biscayne nests in sandy areas, often with multiple females utilizing a single small area. Most hatchlings appear during July and August. Relatively few predators of juveniles occur in the urban and suburban areas of southern Florida, a factor that may lead to rapid growth in any introduced *I. iguana* population that contains multiple reproducing females. Lack of predators and abundance of food are some of the primary explanations for the very high population densities of *I. iguana* found in southern Florida.

Bill Baggs Cape Florida State Park (CFSP) occupies 174 ha at the southern end of Key Biscayne, almost all of it consisting of coastal strand habitat dominated by Saw Palmetto (*Serenoa repens*) or coastal hammock dominated by Buttonwood (*Conocarpus erectus*) and Sea Grape (*Coccoloba uvifera*). In 2003 alone, CFSP staff removed over 500 Green Iguanas (E. Donlan, pers. comm.). However, thousands of iguanas live on Key Biscayne outside of CFSP, and, when an *I. iguana* is removed from the grounds of CFSP, other iguanas from outside the park simply move in and take up available space. Low winter temperatures appear to be a major factor limiting the northern expansion of *I. iguana* in Florida; however, a freeze in Miami-Dade County during the winter of 2002–2003 did little more than tem-

A Buttonwood Tree (*Cornocarpus erectus*) provides food and a place to bask for this Green Iguana (*Iguana iguana*) on Watson Island in Miami. *Photograph by Joe Wasilewski.*

A Green Iguana (*Iguana iguana*) makes itself at home on a Coconut Palm (*Cocos nucifera*) in downtown Miami. *Photograph by Joe Wasilewski.*

porarily reduce numbers (see *IGUANA* 10(3):98). Interestingly, many *I. iguana* have learned to seek shelter in burrows or under buildings, and we have observed *I. iguana* taking refuge under water, exposing only their snouts for breathing, to escape extremely cold temperatures.

Another large iguanid, the Hispaniolan Rhinoceros Iguana or *Cyclura cornuta* (Bonnaterre), was reported in very small numbers in the vicinity of the Miami Seaquarium on Virginia Key and also possibly on Key Biscayne (King and Krakauer 1966). A few individuals of this species escaped from an exhibit at the Seaquarium and are purported to have reproduced in small numbers (Bartlett and Bartlett 1995). However, we have not observed this species in the wild, and no specimens from Florida are known to have been deposited in any systematic collections.

With the ranges and population sizes of *Ctenosaura similis* and *Iguana iguana* continuing to grow and the population of *C. pectinata* persisting for over 25 years, these species obviously have become a permanent part of the dynamic herpetofauna of southern Florida. These three lizard species are only a few of the growing number of introduced reptiles and amphibians that call southern Florida home. This number seems to be increasing as quickly as researchers are able to investigate each new report of a possible introduced species. Without importers and pet owners showing greater responsibility and stricter enforcement of Florida state laws regarding the release of exotic animals, what remains of the native herpetofauna in southern Florida stands a good chance of being displaced by exotic species in the near future.

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A Green Iguana (*Iguana iguana*) shares the shoreline with White Ibises (*Eudocimus albus*) in a Miami park. *Photograph by Joe Burgess.*

Green Iguanas, such as this juvenile, are a common sight in and around the Colobus Monkey exhibit at the Miami Zoo. *Photograph by Carole Saucier.*

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