IGUANA TIMES

LOST WORLD

THE HELLSHIRE HILLS

IN SEARCH OF THE JAMAICAN IGUANA

R. EHRIG

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IN SEARCH OF THE JAMAICAN ROCK IGUANA

ROBERT W. EHRIG

In the Spring of 1990, a good friend recounted his trip to the Hellshire Hills in southern Jamaica. He was there to collect seed and propagate plants on behalf of a West Indian botanical garden in Manalapan, Florida. Prior to his journey, I asked him to pay close attention for any signs of the Jamaican Rock Iguana, *Cyclura collei*, a rare, or possibly extinct, species. He saw none, but his detailed description of the rugged terrain and vegetation gave me hope that this iguana still survived.

The Hellshire Hills is a 44 square mile, uninhabited area that juts out from the south Jamaican coast. It is the driest region on one of the Caribbean's wettest islands. Rainfall varies from 45 inches annually in the northwest part of the hills, to near 20 inches in the southeast. Located a mere 15 miles west of Kingston, the island's capitol and largest city (population 750,000), the Hellshire Hills have remained unpopulated due to the lack of fresh water.

The vegetation of the Hellshire Hills is West Indian Dry Hardwood Forest. With the possible exception of areas in the Dominican Republic, this is the most diverse dry forest in the Caribbean (see Table 1). The forest canopy, on the average, is 30 feet high and relatively open. Huge Kapok trees, *Ceiba pentandra*, tower over the surrounding vegetation. Semaphore cactus, *Opuntia spinosissima*, grow tree-like to heights of 10-15 feet. Many have bird nests in their crowns. Giant columnar cacti, *Cephalocereus swartzii*, grow saguaro-like up to 25 feet, some adorned with purple orchids, *Broughtonia sanguinea*, blooming on their trunks. Jamaican fan palms, *Coccothrinax jamaicensis*, grow throughout the forest and up the sides of cliffs, reaching dramatic heights of 35 feet. The Thatch palm, *Thrinax parviflora*, grows in the lower areas and near the sea. The red-barked, Gumbo Limbo tree, *Bursera simaruba*, is common throughout the area. An exotic member of the flora is the Calabash or Gourd tree, *Crescentia cujete*, whose dried fruit are used to make maracas.

The Hellshire Hills is the supreme example of West Indian Karst Limestone formation and, without doubt, one of the roughest spots in the West Indies. The rock is sharp and pitted, and can render even the best boot soles to shreds in a matter of hours. The Cubans descriptively refer to Karst formation as "diente del perro", which translates to "dog's teeth"! The landscape is grayish and tortured, with an abundance of plant life bursting from cracks in its surface. Although the highest elevation is only 740 feet, elevations change drastically over short distances, making a hike very difficult. There is a maze of abrupt limestone ridges with holes 20 to 30 feet deep appearing in unexpected places, so foot travel is a dangerous experience. Furthermore, day-time temperatures can reach 94°F, and a good supply of drinking water is mandatory to avoid heat exhaustion.

On August 2, 1990 (a few days after papers were filed to incorporate I.I.S.), I received word that a specimen of Jamaican Rock Iguana had been captured by a hog hunter in the Hellshire Hills. Unfortunately, the animal had been injured and it died on August 13 at Hope Zoo in Kingston where it had been taken. I flew to Jamaica on August 17, with the idea of searching the area where the iguana had been captured. With few preconceived plans, I provisioned for the long trek.

Early on the morning of August 19, 1990, I.I.S. member Dan Byrd, a Jamaican guide, and I began the long hike into the Hellshire Hills along a burro trail. The intense heat and weight

of our supply packs and water bags took their toll. The first three hours were spent walking uphill on a very rocky track. When we reached the top of a particularly steep stretch, I pulled off my sweat-soaked shirt and wrung it out. Our guide politely protested, "No..... that good water, mon"! At that point, I knew we were in for an interesting, as well as demanding, trip. After the better part of the first day was gone, we had managed to make only three miles, but the discovery of an iguana dropping pulled us out of our exhaustion. After a meal of nuts, crackers, and Gatorade, we searched the area carefully, and found mostly pig scats, and one more iguana dropping. It was characteristically shaped, of appropriate size, and contained seeds of the Jamaican caper. We also found droppings of the Jamaican hutia or coney, a small, native, guinea pig-like rodent. The rugged beauty of the hills faded as the sun dropped rapidly behind the ridge in front of us. I sat and momentarily contemplated what tomorrow would bring.

We spent the next morning in a thorough but fruitless search for iguanas or their droppings. Many cliff faces were climbed and holes and crevices searched. I became convinced that iguanas were certainly not numerous. Shortly before 11:00 a.m., fresh iguana tail drags were discovered in a patch of loose, red soil. They were unmistakable and indicated the presence of two different individuals. The excitement momentarily revived our spirits and we considered spending more time in the vicinity, but we decided it was time to return to our supplies. On the way to our provisions, at 12:10 p.m. on August 20, 1990, a large, dark-colored, Jamaican Rock Iguana dashed across our path and up a steep cliff face to our left. Climbing slowly and cautiously some 70 feet up the cliff face, I got one brief look at the animal before it disappeared into a deep cave in the cliff rocks. This was the first sighting of *Cyclura collei* in the wild by a non-hunting group in nearly forty years. The remainder of the trip was almost anticlimactic.

During my short stay in Jamaica, I learned that Dr. Peter Vogel of the University of the West Indies was planning a five-week survey of the Hellshire Hills for iguanas. In the weeks that followed, I received word that his survey team had recorded 24 sightings of *Cyclura collei,* and these probably represented at least eight different animals.

Stimulated by the news, I returned to Jamaica on October 12, accompanied by society member Curtis Kruer, a veteran field biologist and researcher. This second trip was only marred by a massive hatching of mosquitos, making our four days rougher than I could have imagined. Sleep was elusive. Our only new find on this second trip was the discovery of iguana eggshells on the surface of an apparent nesting area. The eggs were a bit smaller than other *Cyclura* eggs with which I'm familiar. Did this mean a small female, or does *Cyclura collei* produce smaller hatchlings? We at least knew there was one female still laying eggs, increasing our optimism that the population, as a whole, was still viable. Egg shells on the surface, however, indicated to us that the nest may have been dug up by a predator, or that a female had excavated an old nest site.

We know very little about *Cyclura collei* at this time. Although the number of museum specimens in U.S. collections is small, it seems to have its closest affinities to the Rhinoceros Iguana, *Cyclura cornuta*, of Hispaniola. In scale counts, it is closer to *C. cornuta* than to *C. cychlura* or *C. nubila*. *Cyclura collei* has enlarged frontal and pre-frontal scales, but they are not developed into horns as in the Rhino Iguana. The dorsal crest is pronounced (as in male Cuban Iguanas), but it does not seem that sexual dimorphism is great in this species, a trait also shared with *C. cornuta*. Geographically, it is closest to *C. cornuta* since it is known only from southern Jamaica.

Cyclura collei is Jamaica's largest native land vertebrate, with the possible exception of large specimens of the Yellow Boa, *Epicrates subflavus*. Like all *Cyclura, C. collei* is herbivorous and diurnal, preferring rocky limestone terrain with many crevices for dens and temporary retreats.

The Jamaican Rock Iguana was common throughout dry southeastern Jamaica until about 1820. It occurred on the Liguanea Plain (Ligany to Jamaicans today) where Kingston is now located. Initially, hunting was the primary factor for its decline, but it had been hunted since pre-Columbian times by Arawak Indians who used it for food. Introduction of the Indian Mongoose, *Herpestes auropunctatus*, to Jamaica in 1872 undoubtedly contributed greatly to the mortality of hatchling and young iguanas. Also, predation by dogs and cats, nest predation by hogs, and competition from livestock all contributed to the downward spiral of the iguana population. By 1910, *Cyclura collei* was limited to the rough interior of the Hellshire Hills and the Goat Islands. Iguanas on the Goat Islands were used for target practice by U.S. Naval personnel during World War II. Their extirpation from the Goat Islands was hastened by collection of 22 iguanas for a breeding program that was to later fail (J.D. Woodley, pers. comm. to R. Montanucci). In recent years, *Cyclura collei* has been generally conceded to be extinct.

C. Collei male Peter Vogel

If the Jamaican Iguana, and the Hellshire Hills as an ecosystem, are to survive into the next century, some difficult problems will have to be solved quickly. Today, feral hogs, lean animals weighing up to 120 lbs., roam the Hellshire Hills by the hundreds. They have been kept in check over the years by about a dozen hog hunters, but their presence continues to threaten the iguana's future, as well as that of other reptiles. Until very recently, hog hunters have been the only people to see iguanas, usually after one of their dogs had killed one. The Indian Mongoose occurs in the hills but apparently it is somewhat limited by the aridity of the area. The Jamaican Yellow boa, one of the most beautiful *Epicrates, is* undoubtedly much rarer than it would be due to the presence of these exotic predators. Likewise, the Galliwasp, *Diploglossus crusculus*, and Woodslave, *Mabuya spilonotus*, are present but much rarer than these interesting lizards should be.

The perimeters of the Hellshire Hills are being rapidly deforested. In Jamaica, the main cooking fuel is charcoal, and the demand for this fuel is increasing, as is its price, with the threat of war in the Middle East. The forest trees are cut, stacked in piles, and burned to make charcoal which is then bagged and hauled away on the backs of donkeys. The process that so effectively destroyed Haiti's ecology is being repeated in Jamaica. In less than two months, the deforestation has advanced to within half a mile of where iguanas have been sighted.

Jamaica is an exciting island nation with a rich, vibrant culture. It is amazing that this small Caribbean country has had such a tremendous musical-cultural influence worldwide. Although endowed richly with natural resources, its unique and varied ecosystems are in danger as never before. Part of the solution to Jamaica's problems may lie in its fledgling national park system. Expanding the nation's economy through eco-tourism would seem to be the best hope for bolstering its people's standard of living and at the same time, protecting their unique natural heritage. Already, the Montego Bay Marine Park and Blue Mountain National Park are both in the process of being established. Blue Mountain, located 25-30 miles northeast of Kingston, will protect a large part of the Caribbean's wettest ecosystem and become Jamaica's latest tourist drawing card. The perfect complement to this park would be to protect the unique dry forest ecosystem southwest of Kingston as the "Hellshire Hills National Park." The development of eco-tourism and other sustainable economies will hopefully become Jamaica's future endeavor. The Hope Zoo is now expanding to promote its public education programs, which will help Jamaican children learn about and appreciate their natural world.

The urgent tasks ahead include the rehabilitation of Jamaican Rock Iguana population, as well as other species of reptiles and birds in jeopardy. This can best be accomplished by a systematic program of removal of feral predators and competitors. Simultaneously, an alternative, sustainable economy is needed to replace the destructive process of charcoal production.

It is amazing that one of the premiere West Indian wilderness areas lies less than 20 miles from one of the most densely populated urban areas in the Caribbean. The Hellshire Hills invokes a feeling of total isolation from the rest of the bustling world. I came away from the Hellshire enriched by the few days I had spent there and by the fleeting glimpse I had caught of a creature that now has only a toe-hold on survival. Will we lose this strange and hostile, yet beautiful part of the Caribbean? I hope not.

Acknowledgments -- Special thanks go to Dr. Peter Vogel, Director of the Iguana project and survey team and to Ms. Rhema Kerr, Director of the Hope Zoo, for assistance in various ways. Thanks also go to Gordon, our driver and assistant. Also, I acknowledge the invaluable aid of Edwin Duffas, our friend, guide, re-discoverer of *Cyclura collei*, and, I hope, first warden of the "Hellshire Hills National Park".

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Note: Hawksbill Turtle, Eretmochelys imbricata, has important nesting areas on the beaches of Hellshire. Southwestern Hellshire has large salt pond and mangrove swamp areas which serve as a Jamaican stronghold of the American Crocodile, Crocodylus acutus. Birdlife is phenomenal.

Table 1. Trees and shrubs of the Hellshire Hills, Jamaica

SCIENTIFIC NAME	COMMON NAME	FAMILY
Acacia macracantha		Fabaceae
Acacia pinetorum		
Acacia tortuosa		
Agave sobolifera	Century plant	Agavaceae
Amyris elemifera	Torchwood	Rutaceae
Ateramnus lucidus	Crabwood	Euphorbiaceae
Bourreria baccata	Strongbark	Boraginaceae
Bourreria venosa		
Broughtonia sanguinea	Orchid	Orchidaceae
Bumelia americana		Sapotaceae
Bumelia nigra		
Bumelia rotundifolia		
Bumelia salicifolia	Bustic	
Bursera simaruba	Red Birch	Burseraceae
Bursera simplicifolia		
Calliandra pilosa		Fabaceae
Calliandra portoricensis		
Calyptranthes pallens	Spicewood	Myrtaceae
Calyptranthes zuzygium		
Canella winterana	Cinnamonbark	Canellaceae
Capparis cynophallophora	Jamaica caper	Capparaceae
Capparis flexuosa		
Capparis ferruginea		
Cassia chapmanii		Fabaceae
Cassia emarginata		
Celtis iguanaea		Ulmaceae
Ceiba pentandra	Silk tree	Bombacaceae
Cephalocereus swartzii	Columnar cactus	Cactaceae
Cereus pentagonus		
Chloris petraea		Poaceae
Cissus sicyoides		Vitaceae
Clusia flava	Autograph tree	Clusiaceae
Coccoloba diversifolia	Pigeon plum	Polygonaceae
Coccoloba krugii		
Coccoloba tenuifolia		
Coccoloba uvifera	Seagrape	
Coccothrinax jamaicense	Fan palm	Arecaceae
Cordia brownei		Boraginaceae
Cordia bullata		
Cordia gerascanthus		
Cordia globosa		

Table 1. (continued)

Cordia sebestena		
Crescentia cujete	Calabash	Bignoniaceae
Crossopetalum rhacoma		Celastraceae
Croton (5 spp.)		Euphorbiaceae
Dalbergia ecastaphyllum		Fabaceae
Drypetes lateriflora	Guiana plum	Euphorbiaceae
Erithalis fruticosa	Black torch	Rubiaceae
Eugenia axillaris	White stopper	Myrtaceae
Eugenia biflora		
Eugenia foetida	Spanish stopper	
Eugenia rhombea	Red stopper	
Exostema caribaeum	Princewood	Rubiaceae
Ficus citrifolia	Fig tree	Moraceae
Forestiera segregata	Privet	Oleaceae
Galactia (4 spp.)		Fabaceae
Guaiacum officinale	Lignum vitae	Zygophyllaceae
Guapira discolor	Blolly	Nyctaginaceae
Guapira fragrans		
Guapira obtusata		
Guettarda elliptica	Velvet seed	Rubiaceae
Hibiscus clypeatus		Malvaceae
Hibiscus tiliaceus		
Hippomane mancinella	Manchineel	Euphorbiaceae
Hylocereus triangularis	Night blooming cereus	Cactaceae
Hypelate trifoliata	White ironwood	Sapindaceae
Jacquinia arborea		Theophrastaceae
Jacquinia keyensis	Joewood	
Jatropha gossypiifolia		Euphorbiaceae
Krugiodendron ferreum	Black ironwood	Rhamnaceae
Lantana involucrata	Lantana	Verbenaceae
Lasiacis divaricata	Wild bamboo	Poaceae
Manilkara bahamensis	Wild dilly	Sapotaceae
Maytenus jamaicensis		Celastraceae
Melocactus communis	Turk's cap	Cactaceae
Metopium toxiferum	Hog doctor	Anacardiaceae
Morinda royoc	Cheese plant	Rubiaceae
Myrsine floridana	Myrsine	Myrsinaceae
Nectandra coriacea	Lancewood	Lauraceae
Opuntia spinosissima	Semaphore cactus	Cactaceae
Passiflora perfoliata		Passifloraceae
Peltophorum linnaei		
Piscidia piscipula	Dogwood	Fabaceae

Table 1. (continued)

Pithecellobium guadalupense	Blackbead	Fabaceae
Plumeria obtusa	Frangipani	Apocynaceae
Randia aculeata		Rubiaceae
Reynosia septentrionalis	Darling plum	Rhamnaceae
Salicornia perennis		Chenopodiaceae
Scaevola pulmeri		Goodeniaceae
Selenicereus grandiflorus	Worm cactus	Cactaceae
Stenocereus hystrix		Cactaceae
Suriana maritima	Bay cedar	Surianaceae
Tabebuia riparia	White cedar	Bignoniaceae
Tillandsia (6 spp.)	Air plant	Bromeliaceae
Thrinax parviflora	Thatch palm	Arecaceae
Ximenia americana	Hog plum	Olacaceae
Zanthoxylum flavum		Rutaceae
Ziziphus sarcomphalus		Rhamnaceae

Many of the plants in Hellshire are found throughout large areas of the West Indies. Others are endemic to Jamaica. The majority of plants native to Hellshire are known to be utilized as food by iguana. In some plant species only the fruit or flowers are eaten. In others, leaves are also ingested. Probably more than 80% of the flora is used at least seasonally. The various habitats present in Hellshire are a virtual supermarket for the Jamaican Iguana.

The International Iguana Society,Inc. is an international membership non-profit organization dedicated to the preservation of the biological diversity of the Iguanas through habitat preservation, active conservation, research, and the dissemination of information. Iguana Times, the newsletter of the Society is distributed quarterly to members and member organizations. Additional copies are available at a cost of $4.00 including postage.

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IGUANA NEWSBRIEFS

Good Hatch

On September 10, 1990, Finca Cyclura successfully hatched twin Cuban Iguanas (*Cyclura nubila*) in a clutch of seven eggs. Twin iguanas share a single yolk sac as well as the space within the egg. Thus, they are typically smaller than their siblings, but in time, they may achieve the same size. The twins at Finca Cyclura will be raised to maturity on site. Fifteen Rhinoceros Iguanas (*Cyclura cornuta*) were also hatched from one clutch on September 20 -24, 1990, at Finca Cyclura. In September 1988, Life Fellowship Bird Sanctuary hatched twins of the Grand Cayman Blue Iguana (*Cyclura nubila lewisi*), and the twins still reside there.

DNA Studies Underway

Texas members, Ed Lewis and Denise Garcia, of Texas A&M University, have been working for several years on a DNA study of Galapagos tortoises based on blood samples collected from various individuals. This year Ed and Denise have started working on Cycluran iguanas and they have developed procedures which will distinguish among different populations. To date, they have data for *Cyclura n. nubila, C. n. lewisi, C. n. caymanensis*, and *C. c. cornuta*. The techniques may prove invaluable for establishing subspecific identities of captive individuals and resolving questions pertaining to parentage and degrees of relatedness. This information will be of vital importance in helping to maintain out-bred captive populations. We wish them the best of luck on their interesting and important work.

Blue Iguanas Hatched in California

David Blair of the Cyclura Research Center reports the successful reproduction in October of this year of the Grand Cayman Blue Iguana, *Cyclura nubila lewisi*. This is believed to be only the third institution to breed this subspecies in captivity, and it is the first time the Blue iguana has been bred in the U.S. outside of Florida. A total of five second-generation hatchlings were produced from two captive-hatched females. The eggs hatched in 74 - 77 days after being incubated at 30 C in damp vermiculite. All five hatchlings appear to be completely normal and are thriving. The Grand Cayman Blue Iguana is considered to be one of the rarest lizards on Earth, with as few as several dozen animals existing in the wild on Grand Cayman Island, British West Indies.

San Salvador Island Visited

Society Vice President, David Blair, toured the small, satellite cays of San Salvador Island in the Bahamas collecting data on the status of the San Salvador Rock Iguana (*Cyclura rileyi*). Eight days were spent on the island and vicinity searching for iguanas in the scrub and interviewing locals about the iguanas. *Cyclura r. rileyi* is a beautiful, mottled iguanid that is smaller than many other *Cyclura* species. It also has a limited distribution and is, therefore, in a rather precarious state. The next issue of the Newsletter will carry a complete report of Dave's findings.

C. Nubila September 1990 Laurel Canty

THE IMPACT OF FERAL CATS AND DOGS ON POPULATIONS OF THE WEST INDIAN ROCK IGUANA, *CYCLURA CARINATA*

JOHN B. IVERSON

Abstract

A population of rock iguanas, *Cyclura carinata*, inhabiting Pine Cay in the Caicos Islands was nearly extirpated during the three years following construction of a hotel and tourist facility. The decline, from an estimated adult lizard population of nearly 5500, was due primarily to predation by domestic dogs and cats introduced to the island simultaneously with hotel construction. Population declines on other nearby islands were also attributed to predation by these feral mammals.

Introduction

Among the most rapidly declining of the world's reptile species are the rock or ground iguanas of the genus *Cyclura*. These primarily herbivorous lizards are endemic to the West Indies, and their populations are steadily dwindling in the face of man's intervention.
The decline of populations of the rock iguanas, as well as those of the marine and land iguanas (*Amblyrhynchus* and *Conolophus*) in the Galapagos, is usually blamed on predation by, or competition with, introduced feral mammals such as rats, dogs, cats, goats, pigs and mongooses (Lewis, 1944; Dowling, 1964; Carey, 1975; and review in Wiewandt, 1977). However, the direct effects of the introduction of these animals on undisturbed, relatively natural populations of iguanas have been poorly documented. This paper relates the systematic extirpation of an island population of the Turks and Caicos Islands iguana, *Cyclura carinata*, following the introduction of cats and dogs.

Materials and Methods

The natural history and social behavior of *Cyclura carinata* were studied on Pine Cay and adjacent islands in the Caicos Islands, British West Indies, between September 1973 and June 1976. The results of the behavior and ecology study, as well as locations and complete descriptions of the study islands, appear in Iverson (1977).

Pine Cay (350 ha) was chosen as the principal study island in 1973 not only because of the obvious abundance of lizards, but also because construction of a large hotel and clubhouse complex had just begun on the island. This offered the opportunity to record the effects of increased human occupation on a heretofore relatively undisturbed iguana population.

A flush transect method similar to the "King strip census" (see Giles, 1971), for discussion) was utilized for lizard density and population size estimates. Flush transect data were used to compute adult lizard densities by four methods. The first (Method A) was a modification of the Frye strip census method as used by Overton (1953) for quail. The second method (Method B) utilized only the number of lizards flushed within 10 m of the transect, and assumed that all lizards within this boundary could be seen or heard. The density was expressed in the formula:

$$\text{Density} = \frac{\text{Number}}{\text{Area}} = \frac{N}{dL}$$

where N = number of lizards flushed within 10 m, L = length of transect, d = width of transect (in this case, 20 m).

Method C was a variation of the King strip census method as discussed by Hayne (1949) and expanded by Giles (1971). The final method (D) was that of Gates *et al.* (1968). Calculations, application, and acceptability of each of these methods to the lizard data are discussed in Iverson (1977). Only those data from transects yielding maximum density values are reported here.

Results and Discussion

Sector A of the transect route, because of its proximity to human activity, supported extremely low densities of lizards even at the beginning of the study. Data from that sector were therefore excluded from the initial mean density calculation. That value, obtained by averaging all density estimates obtained for sectors B through F by all four methods in June and July 1974, was 26.88/ha. This compares well with the value of 31.1/ha based on known adult inhabitants of optimum habitat at the SW Blind study area at that time. Based on area and density values for primary habitats on Pine Cay at that same time (early summer, 1974) the adult *Cyclura* population was estimated at nearly 5500 (Iverson, 1977).

Both the maximum number of iguanas encountered on flush transects and the densities computed from those transects decreased steadily during the study period. These data also clearly indicate the effects of proximity to human settlement: lizards in those sectors nearest to human activity showed the earliest declines and disappeared first. Since lizards were not disturbed or removed from the transect route in the course of my studies, their disappearance was presumed to be entirely the result of other human-related interferences.

The entire iguana population on Pine Cay, estimated to exceed 15,000 individuals in June and July 1974 (Iverson, 1977), was almost completely extirpated during the following two years. Not a single iguana was flushed during five transects, and evidence (by spoor) of only five iguanas (4 large males and 1 young adult) was found on the entire island during a week of investigation in June 1976. *Cyclura carinata* had thus been nearly extirpated from Pine Cay. A similar decline also occurred on Water Cay, connected by a narrow isthmus to Pine Cay. However, no such declines were noted on Little Water Cay or Fort George Cay (at least until 1976), both of which had received very little human interference in recent history (but see later). The relationship of the observed population decreases to human occupation cannot be denied.

Of all the ramifications of human exploitation, those which most affect the survival of *Cyclura carinata* are habitat destruction and direct predation by man and animals introduced by him. Iguanas are clearly rare or absent from the larger islands of the Turks and Caicos banks, i.e. those most populated with humans and feral mammals. However, as is the case for many of the world's wildlife species (Denney, 1974), domestic dogs (*Canis familiaris*) and cats (*Felis domesticus*) apparently represent the greatest threat to *Cyclura carinata* populations, and have been the most significant contributors to the demise of iguanas on at least Pine and Water Cays. This determination was based on direct observations as well as circumstantial evidence.

Cats -- Prior to the construction of the hotel on Pine Cay in 1973, only a few cats lived on the island. There was, moreover, little evidence that these feral cats were affecting the dense iguana population. I believe this can be attributed to their very low numbers and the presence

of a more easily available food source: rats thrived on Pine Cay in high densities in the 1950s and 1960s (Webb & Hayden, 1957; Liam Maguire and George Nipanich, pers. comm.).

When hotel construction began in September 1973 there was a sudden influx of staff and workmen, many of whom brought cats and dogs. Many of these free-ranging pets became feral, mother cats repeatedly removing litters born in residences to the "bush" (personal observation). Initially, rats may have provided a ready food resource. The once dense rat populations soon virtually disappeared, with only small populations remaining around older buildings (Liam Maguire, pers. comm.; and personal observation). At this point, the cats apparently preyed upon a higher proportion of lizards, crabs, and birds, suggested by observations of their feeding behavior and examination of fecal pellets.

The cats on Pine Cay employed at least three foraging strategies to obtain lizards, depending on the time of day. During early morning hours, before lizard emergence, they excavated shallow burrows inhabited by curly-tail lizards (*Leiocephalus*) and juvenile *Cyclura*. This was presumably also the case in later afternoon following submergence, although this was not documented. I saw cats with freshly caught lizards in their mouths as early as 15 to 20 minutes before sunrise, and up to 2 hours before typical iguana emergence times. As lizard burrows have a distinct odor, detectable at their entrances by even the human nose, I believe that cats are capable of following the odor gradient to its greatest concentration at the burrow. Support for this comes from observations made when captive juvenile *Cyclura* placed in plastic bags were occasionally brought into my quarters for measurement. Within minutes, cats were scratching at the door to gain entry. If allowed to enter they would always find the lizards within 30 seconds, even when the plastic bags were hidden under cloth bags on top of an overhead shelf. Such capabilities greatly decrease search times and increase prey capture success.

CONTINUED IN NEXT ISSUE

Articles and Letters Solicited

Members of the I.I.S. are encouraged to contribute articles for publication in the Newsletter, following a format like that shown in this first issue of the Newsletter. The articles can deal with any aspect of iguana biology, ecology, behavior, husbandry, systematics, etc. Members can also submit letters to the Editor for publication in a Letters section of the Newsletter. The Editor.

Letters to the Editor

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