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Adult male St. Lucian Iguana (*Iguana iguana*) (story on p. 71). *Photograph by Matt Morton, Durrell Wildlife Conservation Trust.*

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# St. Lucian Iguana

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*Photographs by Matt Morton, Durrell Wildlife Conservation Trust.*

INTERNATIONAL IGUANA SOCIETY

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# A Backward Glance at Iguana Exploitation

*Henry S. Fitch[1] and Robert W. Henderson[2]*

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*All photographs by RWH.*

Over a quarter of a century has passed since we first investigated iguana exploitation in Central America. A "friend" recently pointed out to us that we were a couple of "old-timers" when it comes to that particular subject (see also the Profile on p. 86). Prior to collaborating on *Ctenosaura* and *Iguana* research, we independently had done considerable field work with these lizards. Fitch studied *C. similis* in Costa Rica in the late 1960s and Henderson worked with juvenile *I. iguana* and with *C. similis* in Belize in 1970–1. We were both well aware of the human-induced pressure imposed on these lizards, and we were interested in bringing their plight to the attention of our colleagues, conservation organizations, legislative bodies in the countries in which we were working, and to the general public (see the summary in Fitch et al. 1982, full citation at the end of this article).

In the United States, most folks familiar with iguanas associate them with the pet trade or consider them curios, and their importation for these purposes is a minor industry. However, within the iguanas' ranges in tropical America, these lizards are hunted for food and, in some areas, may be the principal game animals. In order to determine the extent of iguana exploitation and learn the methods used to hunt and subdue them, we visited each of the Central American countries, observed iguanas in their natural surroundings and in mercados, and we interviewed hunters and government officials.

Early records revealed that iguanas had been hunted since ancient times by many of the native cultures, but, thanks to their high reproductive potentials, they had been able to maintain their numbers over hundreds of years despite exploitation. However, the widespread use of insecticides to protect crops, habitat destruction resulting in large part from an increase in the number of people, and overhunting inevitably altered ecosystems. The result was that both Green Iguanas and ctenosaurs have experienced rapid reductions in numbers in recent years and have disappeared from many areas where they were formerly abundant.

*Ctenosaura similis* in the Belize City cemetery.

A ctenosaur emerging from a Belize City cemetery grave.

Tethered Green Iguanas at the Chinandega, Nicaragua market (February 1976).

Male and female ctenosaurs with their mouths sewn shut (Nicaragua, February 1976).

Both Green Iguanas and ctenosaurs have been important protein sources for people locally. Each kind is preferred in certain parts of the range. Beyond its actual food value, the flesh is valued for its supposed mystical power, and consumers are prepared to pay much more than they would for a similar amount of beef or chicken. The Catholic Church has ruled that iguana flesh, like fish, is a permissible substitute for "meat" (flesh of mammals or birds) on Fridays and during Lent. Over much of the range, ctenosaur flesh is highly valued as an aphrodisiac. In Belize, however, it is considered unfit for human food. The Belize City cemetery supports a colony of *Ctenosaura similis* and many of the lizards have burrows in the grave mounds. This led to the belief that they feed on human corpses in their graves.

## In the Mercados

From the Isthmus of Tehuantepec along the Pacific Coast to Lake Nicaragua, at least 25 towns have mercados where iguanas were formerly sold. El Salvador was a major importer. Having depleted its own population of iguanas, it received them from Honduras, Guatemala, and Nicaragua by boat and by bus. The neighboring countries passed legislation banning the trade, but pedestrians carrying sacks or baskets full of reptiles in many instances were allowed to cross the border into El Salvador.

Cruel treatment of captured iguanas was routine. In the mercados, buyers often requested that vendors sell them unlaid eggs without the females. The vendors would slit the females' abdomens and rip out the eggs. Many commonly believed that such stripped females would survive and produce more eggs. Females stripped of their eggs and dying from the crude surgery were a common sight where street vendors were plying their trade. Also, because ctenosaurs were liable to bite a handler, their mouths were routinely sewn shut. In addition, pulling off the claw of the fourth (longest) hind toe with pliers and drawing out the tendon was common practice. The exposed tendon was then tied to that of the opposite side so that the animal was immobilized. Iguanas were often stuffed in sacks, several layers deep, and might be kept there for long periods without food or water.

A pile of iguanas: mostly *Ctenosaura similis,* but some Green Iguanas, too (Chinandega, Nicaragua; February 1976).

An iguana vendor at the Chinandega, Nicaragua mercado (February 1976).

Visiting the mercados, we would at times encounter many dozens of iguanas. Approaching the vendors, we requested permission to examine the lizards and to take measurements and can recall being spurned only once; the rest were more than willing to let us handle their merchandise. We would often work for several hours at a stretch, standing in open markets and recording data, while curious onlookers watched. I'm sure our peculiar behavior was attributed to the fact that we were gringos, thereby making it perfectly acceptable. After handling several dozen adult Green Iguanas and, especially, ctenosaurs, our arms would be covered with scratches and cuts, sometimes from the lizards' claws, but more often from their lashing tails.

## Visting the Hunters

The iguana vendors provided us with the names of villages from which the lizards originated. Based on this information, we worked backward from the mercados and were able to track down several hunters in order to learn how they captured their prey. In hunting iguanas for home consumption, a .22 rifle was often used, but some Central American countries banned the use of firearms or even slingshots. Professional hunters for the commercial market in El Salvador captured their iguanas alive and unharmed. This was usually accomplished with a bamboo pole and noose. The hunter slowly approached the basking lizard and extended the pole with noose toward it, with a piece of calf's liver dangling as bait.

Hunters often used trained dogs, and these were especially effective in hunting female Green

A young iguana vendor and her merchandise (Chinandega, Nicaragua; February 1976).

Iguanas during the nesting season. The hunter would move stealthily along a stream, scanning the terrain ahead for signs of nesting activity. Several females might be digging their nesting burrows in a sand bank, and some might have their forequarters in a hole so that they could not see danger approaching. At a signal from the hunter, the dog would race ahead and might catch a female before she could escape from the burrow or outrun her before she could reach the safety of a tree. Females bearing a heavy burden of eggs were relatively slow runners. The dogs were trained not to injure the lizards.

Some hunters used shovels to dig iguanas from their burrows; excavation also could be accomplished with a pointed stick and their hands. Females concentrating on nest excavation were especially vulnerable to capture. Again, a female with her head and forebody in the burrow was less likely to be aware of an approaching hunter than a lizard involved in other activities.

We also became aware that iguanas were sometimes used merely for target practice. They would be shot with a .22 rifle from a vehicle as they sat on roadside boulders or fence posts. If not killed outright, ctenosaurs that were shot often escaped into nearby burrows, whether or not their wounds were mortal. The "hunters" would make no attempt to retrieve the dead or wounded lizards.

## What's Happenend Since?

After our multi-year stint with iguanas, we moved on to new projects or resumed old interests. Fitch continued his studies of *Anolis* lizards and his long-term work with Kansas snake ecology. Henderson moved on to the West Indies and its intriguing snake fauna. We assume that the mercados of Central America no longer sell iguanas in the numbers that we observed in the mid-1970s. Is it because of legislation protecting the tasty lizards, or because population densities have dramatically plummeted? We suspect the latter. The U.S. now harbors denser populations of *Ctenosaura similis* and *Iguana iguana* than do some areas where they occur naturally.

On a brighter note, interest in iguana biology has never been greater, and exciting research is being conducted in many countries and with a diverse cadre of species. The long-term (20+ years) mark-and-recapture study of John Iverson on *Cyclura cychlura inornata* in the Bahamas is especially exciting. Also, efforts to protect species with dramatically declining numbers (e.g., *Ctenosaura bakeri, Cyclura lewisi*) are, on the one hand, disheartening because the numbers are so dangerously low, but, on the other, gratifying that people care enough about the iguanas to do something. Iguanas of all species are fortunate to have the International Iguana Society in their corners.

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# Exploitation of Reptiles in the West Indies: A Long History

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Abundant remains of sea turtles, tortoises, iguanas, and even snakes in archaeological excavations throughout the West Indies testify eloquently to the fact that Amerindians frequently and successfully exploited reptiles. At least some biogeographers have suggested that the first human inhabitants of the region carried with them favored species, such as Red-footed Tortoises (*Geochelone carbonaria*), establishing populations on islands as they migrated north from South America to serve as a ready source of food during subsequent visits[1]. Aboriginal inhabitants have been implicated in the introduction of iguanas on islands in the Gulf of California (see *Iguana Times*, June 2002) and also may have established some West Indian populations. Furthermore, the earliest Americans have been blamed for the extinction or extirpation of

A mongoose (*Herpestes javanicus*) from Savane-à-Mulets, Soufrière, Guadeloupe. These efficient predators have been implicated in the extirpation of populations and even the extinction of diurnally active snakes and ground-dwelling lizards (photograph by Alain Fossé).

[1] Some authorities, noting the abundance of tortoises on oceanic islands, their ability to float, and their resistance to exposure to salt water, disagree and argue that Red-footed Tortoises arrived naturally in the islands by means of overwater dispersal from South America.

Today, the American Crocodile (*Crocodylus acutus*) is endangered, but in the early 20th Century, exploiting the species for hides and meat was widespread and "officically" sanctioned. Here, convicts skin a crocodile in the Dominican Republic in 1922 (photograph by G. K. Noble; courtesy of the Department of Library Services, American Museum of Natural History).

native tortoises and some populations of iguanas (along with a number of large, endemic mammals) that are known only from fossil or archaeological evidence. If true, exploitation of at least some species was not sustainable — and the popular image of Native Americans living in harmony with nature clashes with reality.

The West Indies have been exposed continuously to Europeans longer than any other region of the Western Hemisphere. Columbus spoke of abundant turtles and iguanas, and, beyond any doubt, he, his men, and those that followed considered them resplendent table fare. With the advent of the slave trade, Africans, most of whom were products of cultures that exploited wildlife in their native lands, continued to do so in the New World. Like the Amerindians before them, West Indians of European and African descent are blamed for translocations, extirpations, and extinctions. Although many of the latter are attributable to habitat alteration and destruction or competition with and predation by feral mammals, exploitation levels were undoubtedly high — and often have exceeded sustainable levels into recent decades.

Food undoubtedly has been the primary motivating factor. Most large reptiles, especially those that evolved on islands in the absence of large predators, were at least initially abundant — and are easy to catch, nutritious, and tasty (note the obvious reference in the name *Iguana delicatissima*, for example). Even easier to acquire are the eggs of turtles, iguanas, and crocodilians. In addition, however, turtle shells and bones of many large species were used as tools. Shells and hides were used for the construction of shelters or for decorative purposes, and some animals or their parts became important in ceremonial functions. Snakes still play a significant role, for example, in voodoo rituals. Crocodilian penises and some

In 1922, Iguana hunters on Isla Beata, Dominican Republic, used dogs to catch Hispaniolan Rhinoceros Iguanas (*Cyclura cornuta*) (photographs by G. K. Noble; courtesy of the Department of Library Services, American Museum of Natural History).

A Green Turtle (*Chelonia mydas*) awaits slaughter on the beach of Isla Saona, Dominican Republic (photograph by Robert W. Henderson).

This snake hunter was photographed on St. Lucia in 1888. The snake is *Bothrops caribbaeus* and it may have been killed for a bounty, or merely because it was a snake and potentially dangerous (photograph courtesy of Philip Walwyn).

internal organs were thought to possess aphrodisiacal properties.

Exacerbating the impact of exploitation for useful purposes were efforts at extirpation motivated by fear or dislike. On Martinique and St. Lucia, the only West Indian islands with native populations of pitvipers, these are hunted actively, and bounties have been offered intermittently by the authorities until recent years. On many islands where no species are dangerous to humans, snakes nevertheless are killed whenever encountered. Crocodilians are widely feared and killed, often without any effort to salvage the meat or other useful parts. Even on the few islands on which humans have not traditionally eaten iguanas, they (and other species of large lizards) are frequently persecuted solely because they are perceived as being ugly and strange.

Although presented in a historical context, many of these practices continue largely unabated today, despite the protected status of many species. Shells of sea turtles are piled high in many ports, and freshwater turtles and iguanas show up regularly in small towns or even city markets. Especially people living in rural areas routinely supplement their diets with reptilian meat and eggs. Fear of snakes, large lizards, and crocodilians remains responsible for the deaths of many reptiles throughout the region.

However, in addition to the traditional reasons for exploiting reptiles, one of the most pervasive causes of local extirpations today is unregulated collection for the burgeoning pet trade. Authorities in essentially every island nation can cite example after example of unscrupulous collectors catching, buying, and smuggling enormous numbers of reptiles of all sizes and species — and these commercial collectors are, of course, only those that have been caught. Strangely enough, scientific collectors in the 19th and early 20th centuries initially developed a common practice employed today by these criminals[2]. Offering bounties to locals eager to supplement their meager incomes and often very familiar with the habits of the local species, scientists historically and, now, suppliers to the pet trade harvest huge numbers of animals. The fact that rarities demand the highest prices imposes particularly intense pressure on populations of threatened or endangered species. To their credit, today's scientists have largely abandoned this practice.

What, if anything, is being done? Legislation now protects many of the most vulnerable species and some habitats, but enforcement is lax or nonexistent in many cases. Educational efforts on many islands have had some positive impact, par-

[2] Scientific collecting has not been implicated in any extirpations or extinctions of West Indian reptiles and the knowledge acquired by scientists who take specimens for academic purposes often has been invaluable in developing conservation strategies for specific species or entire biotic communities.

ticularly when coupled with successful efforts at developing ecotourism. Animals become more valuable as means of attracting free-spending tourists than they would be in the market. Unfortunately, education takes time and, in many cases, is directed at children. By the time they are in a position to develop, implement, and enforce enlightened policies, many additional populations and even species of reptiles will have disappeared. Even ecotourism has its drawbacks, since many travelers supposedly enamoured with wildlife buy curios made from exploited reptiles and demand accommodations and amenities that are incompatible with sustaining viable natural habitats.

Hatchling American Crocodiles (*Crocodylus acutus*) offered for sale to tourists in a shop in Santo Domingo, Dominican Republic (photograph by Donald D. Smith).

A roadside vendor selling "Jicotecas" (*Trachemys stejnegeri*) collected in the Laguna de Saladillo, Parque Nacional Montecristi, Dominican Republic (photograph by Robert Powell).

What can any one individual do? One should abide by all legislated efforts to conserve nature, avoid all actions that might in any way encourage the exploitation of wildlife, support educational efforts by governmental agencies and non-governmental organizations, if a pet reptile is to be purchased, select only captive-bred animals from known sources, and travel lightly on the land when in the islands.

## Acknowledgements

Robert Henderson's comments on an early draft improved this article immensely.

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# The St. Lucian Green Iguana — A Special Case?

*John S. Bendon*
*Bath, England*

*"I'm optimistic that the St. Lucian Iguana will be saved, and that we will be able to protect them in such a way that they will be able to expand into new areas. My dream is to see the iguana repopulate a much wider area of the island…"*

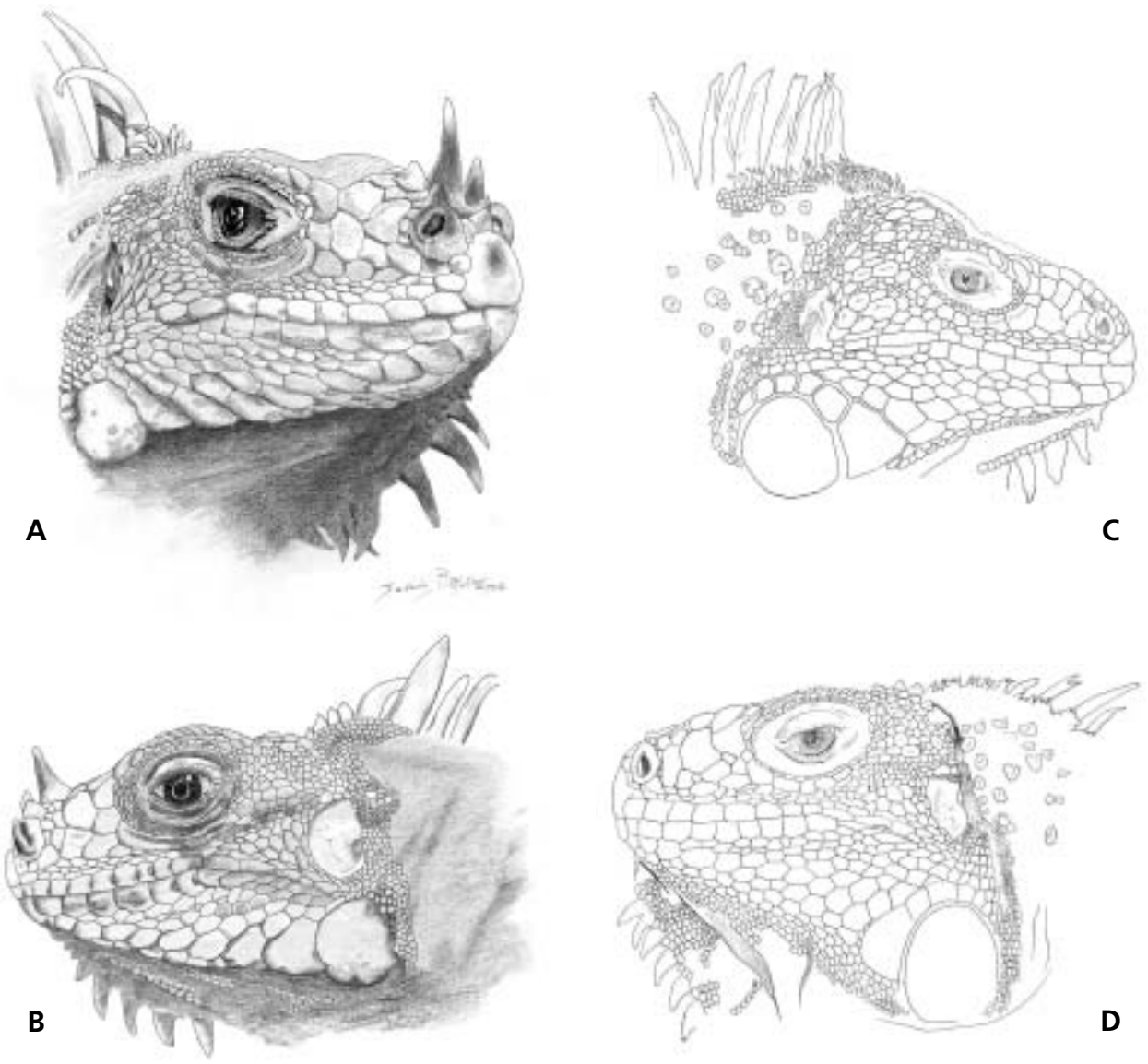
— Donald Anthony,
Wildlife Officer, St. Lucia

St. Lucia is one of the Windward Isles in the Lesser Antillean chain, which extends from just southeast of the Puerto Rico Bank almost to South America. With an area of 610 km$^2$, the island is topographically and biotically diverse. Montane uplands are covered by rainforest, whereas coastal areas are characterized by dry woodlands. Human influence is evident in the abundant agricultural areas and numerous communities.

Green Iguanas (*Iguana iguana*) are widely distributed through Central and much of South America, and have been introduced and become established in many tropical and subtropical areas throughout the world. St. Lucia is the northernmost of the Antilles on which these animals occur naturally.

Introduced Green Iguanas are all too common and indeed, have become pests in parts of Florida (see Newsbriefs, p. 94). On some of the more

Large adult male St. Lucian Green Iguana. Note the pale ground color and the length of the dorsal crest scales.




An adult male St. Lucian Green Iguana (a) and a young adult female St. Lucian Green Iguana (b) compared to male (c) and female (d) Green Iguanas from elsewhere in the species' range. Note the horns and differing shapes of scales on the jaws. *Drawings by the author.*

northerly isles of the Lesser Antilles, they pose a threat to populations of their endangered relative, *Iguana delicatissima*, through competition for food and habitat and by reproducing at a higher rate. In some areas, they also have threatened the integrity of the unique *I. delicatissima* gene pool by hybridizing with the native animals.

Unlike the introduced populations, which have become established only in recent years, St. Lucian Iguanas may have been isolated from other Green Iguana populations for as long as hundreds of thousands of years — and consequently appear to be a bit different. Most obviously, St. Lucian Iguanas have "horns," dramatically enlarged scales that project conspicuously from their snouts. These vary considerably in size and seem to be more prominent in older animals. Although relatively rigid and firm (much more so than the mid-dorsal crest spines, for example), they do "bend" from side to side. They also are thicker in diameter than dorsal crest scales, although, in cross-section, they are somewhat flattened laterally. The coloration and shape of some large scales on the lower jaw also differ from those of other Green

Iguanas. Catherine Malone, Purdue University, has examined the DNA of many iguanids, and recently has been concentrating on St. Lucian Iguanas. Her work is yet to be published, but preliminary results show distinct genetic differences between St. Lucian and other Green Iguana populations.

Although based on a relatively small sample of a few dozen adults and recognizing considerable variation among individuals, St. Lucian Iguanas appear to undergo ontogenetic changes in color and pattern. Hatchlings are bright or yellowish green with cloudy gray or black bands. These bands seem to fade in the first year or two of life, when the iguanas are a very intense green. As the animals continue to age, the green (usually) loses its intensity and the bands appear to darken. In the oldest (or, at least, the largest) individuals, the green fades to a pale gray and the black bands are quite prominent.

Until recently, no research has been conducted on these iguanas. Now, with support from the Durrell Wildlife Conservation Trust, Matthew Morton of Bristol, England and local assistants are implementing a project in cooperation with the Forestry Department (part of the Ministry of Agriculture) of the St. Lucian government. The Forestry Department has provided field assistance and technical expertise, as well as vehicles and office facilities. Head of Department Brian James and Deputy Michael Andrews have taken a keen interest, and Donald Anthony and Alwin Dornelly from the Department's Wildlife section are working closely with Morton. Karen Graham of the Sedgwick County Zoo (Kansas), Bill Toone of the San Diego Zoo, and Catherine Malone also have contributed greatly by assisting with the Union Zoo's (St. Lucia) exhibit, education and community outreach planning, and blood sampling from wild and captive iguanas for DNA analysis. Labor and travel expenses for Graham and Toone were covered by their respective institutions, and Malone received funding through the International Iguana Foundation and the Miami Metro Zoo to cover material costs for improvements to the zoo exhibit and educational posters.

Over 1000 hatchlings were observed on the main nesting beach this year, but survival rate is very low due to predators.

A female iguana in the Limiere area.

The goals of the project are to: (1) determine the population size and distribution of St. Lucian Iguanas, (2) establish the population's taxonomic status, and (3) protect and conserve current populations.

Blood is drawn for DNA analysis and PIT tags (transponders) are inserted in each individual. The latter can be read using a type of barcode reader, and a unique number permanently identifies the animal, even if the tag turns up in the belly of a predator. Some iguanas have been equipped with transmitters and radiotracked.

An adult male St. Lucian Green Iguana that was recaptured on several occasions.

The largest St. Lucian Iguana processed to date weighed over 5 kg and had a snout-vent length of 45 cm. Current estimates of adult population size range in the hundreds, certainly less than 1000. Over 1000 hatchlings have been observed on the main nesting beach, but very few of that number survive to maturity.

St. Lucian Iguanas are restricted to the northeastern part of the island, including the beaches. Several unsubstantiated reports also place at least a few animals in the southeast. Sightings or recent reports of iguanas are absent for the entire interior of the island (moist forest) and the entire western coast. The small number of older reports that are available are difficult to interpret. At least some of these areas should be suitable for iguanas, so why aren't they there? Any number of factors might be responsible.

*"Dogs kill adult iguanas, either in hunts with people (a few people still eat them for food) or, more commonly, it seems, because they are allowed to run around unattended, killing whatever they can. Hunting (by people) was reportedly more common in the past, and many local people attribute perceived declines in iguana numbers at one site in particular to*

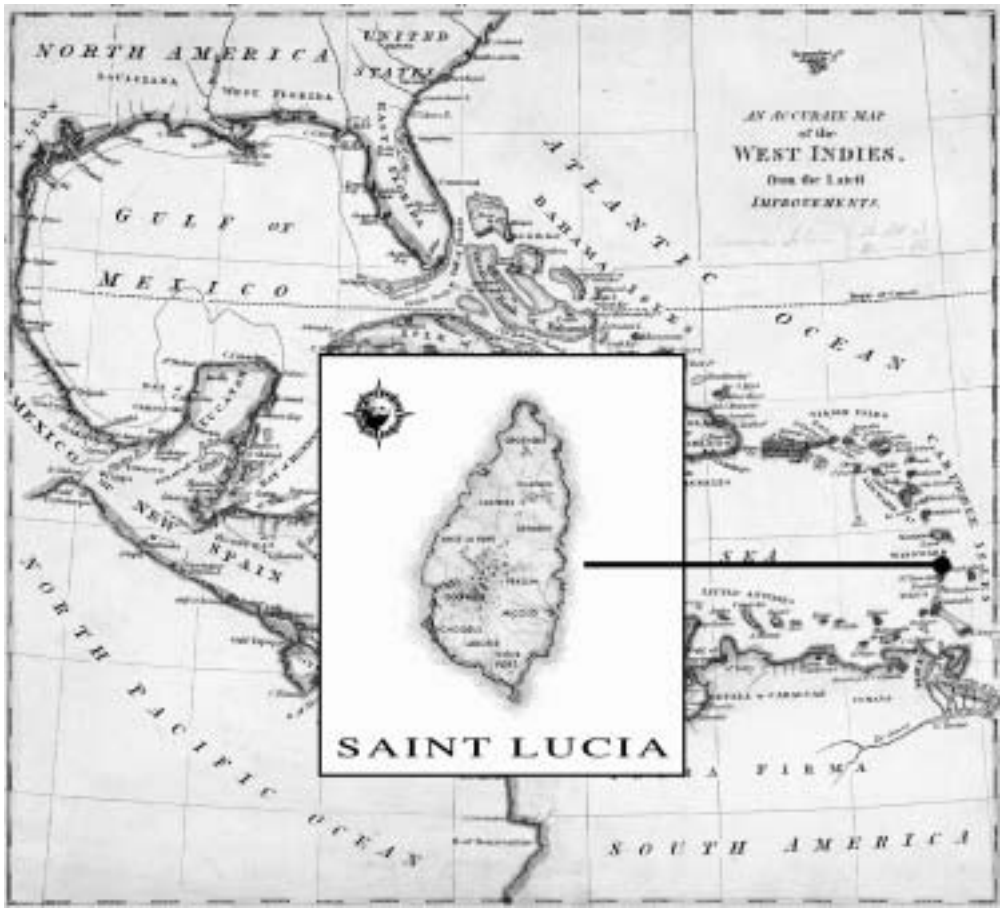



*Illustration by John Binns.*

*over-hunting. The dreaded mongoose takes eggs and hatchlings; this year (unlike last) a cat was found, killing hatchlings, at the main nest site. Natural predators of hatchlings seem to be predominantly various species of herons and the American Kestrel. Manicou (opossums) and rats may theoretically take hatchlings, though there is no direct evidence of this. There is a single observation of a* Boa constrictor *in the act of swallowing an adult, though generally boas are small here and I think this is likely to be uncommon.*

*"Traditionally there has been heavy sand mining at both the beaches where iguanas nest. These sites are also used by Leatherback Turtles and it is known that their nests have been destroyed in this way. So, it seems likely that iguana nests would likewise be at risk, although sand mining is now less intense than in the past at these sites. At one of these beaches 'semi-feral' pigs are reported to open turtle nests, though there is no evidence of the opening of iguana nests as yet.*

*"Clearance of large areas of land for banana growing in the last few decades may have had an effect (during a habitat-use study using radiotracking last year, all nine tracked iguanas 'pointedly' avoided banana plantations)."*

— Matt Morton

*"The main things that are killing iguanas are dogs – especially dogs – cats and people."*

*"When I see them, I'm feeling happy. They see me, they give me a lot of signs – they're shaking their heads [head bobbing]. They're fine with people … Let it be, in the wild, like anyone else."*

— 'Seko', a St. Lucian
field assistant on the project


Sign funded by the International Iguana Foundation and the Durrell Wildlife Conservation Trust; one of many posters made by parents and teachers for pre-school age local children, and an iguana lacing trainer, also made by an adult for children.

The International Iguana Foundation and the Durrell Wildlife Conservation Trust have funded signs asking people to keep dogs on leashes in the main areas occupied by iguanas.

*"Roots Farm is a cooperative farm, run by Rastas in one of the areas on St. Lucia where iguanas are still found. They practice organic farming and grow a wide range of mixed crops, in contrast, for example, to monocultures of bananas, which are commonplace in many areas. What drew our attention to this place is that, unlike most places on the island, this was one where you had a fairly good chance of seeing an iguana. And that's because of the Rastas' gentle and sympathetic attitude toward iguanas and all wildlife. Hunting and unleashed dogs are not tolerated on their land."*

— Matt Morton

*"I think, in this culture people, not knowing too much about wildlife, do not have an understanding of their importance and, as a result, do not appreciate those animals as people who are wildlife-sensitive do. We've had, in the past, to do extensive work in terms of education with the St. Lucia Parrot, and we can see the successes of that. We know that even schoolchildren know some of the basic facts about the parrot and appreciate it. We would like to create that sort of attitude in people toward the iguana, but we know that, right now, some people just look at the iguana as a lizard, that it's not good looking, and it might not be friendly."*

An iguana burrow on St. Lucia.

— Alwin Dornelly,
Wildlife Officer, St. Lucia

Young adult St Lucian Iguana.

Clearly, this mirrors an attitude that unfortunately is common throughout tropical regions of the world. People fail to appreciate their wildlife resources and are likely to dislike, misunderstand, or merely exploit them. The only effective means of changing attitudes is education. Posters designed as part of a local school's activity program and other activities such as games, coloring books, and children's lacing trainers made by parents and teachers are methods that are being used

# Anomalous Hatchlings

*All photographs by Matthew Morton.*

As part of the effort to protect and conserve the current population of St. Lucian Green Iguanas, Matthew Morton of the Durrell Wildlife Conservation Trust has been regularly checking hatchlings on the nesting beach at Louvet. Among this year's hatchlings, Morton observed a number of anomalies.

Hatchling St. Lucian Iguanas: the individual on the left suffers from patches of gray scales that most likely were caused or exacerbated by bacterial or fungal agents, the hatchling on the upper right suffers from possible hydrocephaly or an abscess, whereas the youngster on the bottom right is quite healthy.

Multiple "nest sites" are located at Louvet, at most of which multiple females have nested. Four of the main sites and five of the less heavily patronized ones have been fenced. Thus, certain effects can be described as "per nest-site" and others as "per clutch," and have a higher probability of being due to nesting conditions or to circumstances originating with the parents, respectively. However, causative agents remain in all cases speculative.

Some individuals appeared grubby and unhealthy with patches of gray scales in various locations on their bodies. Some clutches seem to have many individuals with this condition, whereas most have no affected animals. This condition also was observed in a few of last year's hatchlings. This does not appear to be normal shedding and preliminary observations suggest that the affected hatchlings also tend to have hatching weights toward the low end of the scale.

One suggested cause for the grey patches was a bacterial infection acquired in the nest. This would account for some clutches being affected more than others. The mother could pass a bacterial infection to the developing embryos. Bacteria will incubate in the developing eggs and can produce systemic infections in the hatchlings. Secondary opportunistic organisms can localize topically and result in the skin discoloration. Fungal infections also may be responsible, particularly given the damp nesting environment.

A different potential cause is poor nutritional status of the mother. The absence of necessary trace minerals such as selenium or vitamins such as $B_1$ may singly or in combination result in problems such as malabsorbed yolk sacks or too little yolk to support a hatchling in the last hours before hatching and the first days thereafter.

Morton also observed some overt birth defects, mainly tails that were kinked very slightly in the terminal few millimeters and occasionally a more pronounced kink higher up. Again this seemed to affect several individuals in some clutches and none in others. This is most likely attributable to extreme incubation temperatures, although the possibility of inbreeding within a small population exists as well. A single individual displayed what appeared to be hydrocephaly, a condition that, in humans at least,

These hatchling St. Lucian Iguanas emerged from a single nest; the missing portions of their tails probably fell victim to a rat or land crab invading their nest.

can be congenital. However, one observer suggested that this might simply have been an abscess.

Yet another unusual observation was made initially in nine hatchlings, all of which emerged from a single, closely watched nest with various portions of their tails missing. Without a stabilizing tail, these animals were a lot slower and clumsier, fishtailing from side to side as they attempted to run. Consequently, they were much easier to catch (and photograph). The most likely culprit in this instance is a rat or a land crab that burrowed into the nest, a conjecture supported by the fact that more hatchlings with missing tail portions were subsequently observed emerging from other nests.

**Acknowledgments**

Jenny Daltry (FFI), Matthias Goetz (Durrell Wildlife Conservation Trust), Karen Graham (Sedgwick County Zoo), Rick Hudson (Fort Worth Zoo), Jeff Lemm (San Diego Zoo), and Juliann Sweet responded to inquiries regarding the possible causes for the various anomalies.

to get the message to adults and children at the same time.

On some islands people are brought up eating iguana as a delicacy. This is not sustainable.

*"Actually, we've always recognized that the St. Lucian Iguana was in dire straits in terms of its numbers and its chance of survival because we've had a history of hunting iguanas in St. Lucia. Even [though] we had the wildlife laws passed in 1980 with a fine of 5,000 [Eastern Caribbean] dollars for anyone convicted of catching or killing an iguana [St. Lucian law also allows for fines and imprisonment for possession of an iguana], it is very difficult to catch somebody 'in the act,' because the areas are very remote and [representatives of the Forestry Department] are stretched in terms of numbers: we don't have the Forestry Officers to police everywhere. When you go to investigate an area, people are tight-lipped — they won't speak out. It's hard to get any firm evidence. We have been trying to source funding for a long time to get extra help. In the Wildlife Section, I am the only person working there until recently. Now Alwin Dornelly is my assistant. With aid from Durrell Wildlife [and funding grants from the Iguana Specialist Group and the International Iguana Foundation], we're now able to do the things we always wanted to do … doing surveys, finding out where the population is, finding the threats where they are nesting, and other things.*

*"I can say right now that we have a pretty good handle on where the iguanas are located and a pretty good idea as to where they are nesting, and I'm sure that we will get a pretty good idea of the size of the population."*

— Donald Anthony,
Wildlife Officer, St. Lucia

Much work remains. This is only the second year of research and plans are in place to conduct extensive observations of hatchlings on the main nesting beach this year. With time, a much better picture regarding the status of these lizards will emerge.

Species are disappearing at an alarming rate and we now know that we must act immediately when warning signs are seen. The California Giant Condor (*Gymnogyps californianus*) and Spix's Macaw (*Cyanopsitta spixii*) are two high-profile species that have disappeared in the wild. The Grand Cayman Blue Iguana (*Cyclura lewisi*) also is on the brink of extinction.

On St. Lucia, hope prevails. Enough iguanas survive at the moment and the means by which their numbers are being depleted are now well known. The right people are in place to deal with the situation. This beautiful and distinctive Green Iguana is one of the jewels of the Caribbean — and it deserves a future.

## Acknowledgments

I am very grateful to Matthew Morton for providing interviews, valuable information, and photographs. Brian James, Michael Andrew, Donald Anthony, Alwin Dornelly, Catherine Malone, Karen Graham, Bill Toone, and John Hartley have read and commented on various drafts of this article.

# Black Iguanas: Name and Systematics[1]

*Gunther Köhler[1], AJ Gutman[2], and Robert Powell[3]*

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Although few iguanas in the genus *Ctenosaura* are actually black (this occurs only in some individual *C. acanthura* and *C. pectinata*), one of the common names by which they are collectively known is "Black Iguanas." This name is actually misleading when referring to some of the smaller, more colorful species (e.g., *C. alfredschmidti*, *C. defensor*, and *C. flavidorsalis)*. Another common name used in English for species in this genus is "Spiny-tailed Iguanas."

In Central America, Black Iguanas are called "Garrobos" or "Iguanas Negras." Local inhabitants of the Islas de la Bahia (Utila, Roatan, and Guanaja), located off the northern coast of Honduras, call the species that occur there, "Wishiwillies," and, on the Isla de la Providencia, they are known as "Ishillies."

The phylogenetic relationships and taxonomy of iguanas have provoked considerable controversy in recent years. In 1988, eight monophyletic[2] groups were shown to exist within what had been considered the Family Iguanidae. Shortly thereafter, these were elevated to eight distinct families, largely because no evidence could be found for the monophyly of the entire family. This new classification was heavily criticized and eventually reversed on the basis of molecular genetic studies. However, after a very recent revision of the original study, which, among other things, now showed eleven monophyletic groups of iguanian lizards, the controversy continues. Some experts believe that all pleurodont iguanian lizards should be included in a single family (Iguanidae *sensu lato*) and that the monophyletic subgroupings should be treated as subfamilies (e.g., the subfamily Iguaninae). In contrast, other experts think that real relationships are better portrayed by recognizing eleven separate families, one of which includes the "true" iguanas (Iguanidae *sensu stricto*).

Accordingly, lizards in the genus *Ctenosaura* are placed either in the subfamily Iguaninae (in the Family Iguanidae *sensu lato*) or in the Family Iguanidae (*sensu stricto*). Regardless of taxonomic rank, this group also includes the Marine Iguanas (*Amblyrhynchus*), Rock Iguanas (*Cyclura*), Fiji Iguanas (*Brachylophus*), Galapagos Land Iguanas (*Conolophus*), Desert Iguanas (*Dipsosaurus*), Green Iguanas (*Iguana*), and Chuckwallas (*Sauromalus*). The genus *Ctenosaura* is differentiated from the other genera within the family (or subfamily) by the presence of an extremely long subocular scale and whorls of enlarged, spiky scales on the tail. Ctenosaurs are most closely related to lizards in the genera *Iguana* and *Cyclura*.

In recent years, tremendous advances have been made in the systematics of *Ctenosaura*. Seventeen species are currently recognized: *C. acanthura*, *C. alfredschmidti*, *C. bakeri*, *C. clarki*, *C. conspicuosa*, *C. defensor*, *C. flavidorsalis*, *C. hemilopha*, *C. macrolopha*, *C. melanosterna*, *C. nolascensis*, *C. oaxacana*, *C. oedirhina*, *C. palearis*, *C. pectinata*, *C. quinquecarinata*, and *C. similis*. As recently as 1928, 13 species were recognized, but subsequent workers determined that the species *C. brachylopha*, *C. brevirostris*, and *C. parkeri* were actually *C. pectinata*; and, more recently, *C. erythromelas* was subsumed within *C. defensor*, reducing the number to only nine. More recently described species (the most recent in 2001) have elevated the number to the current 17.

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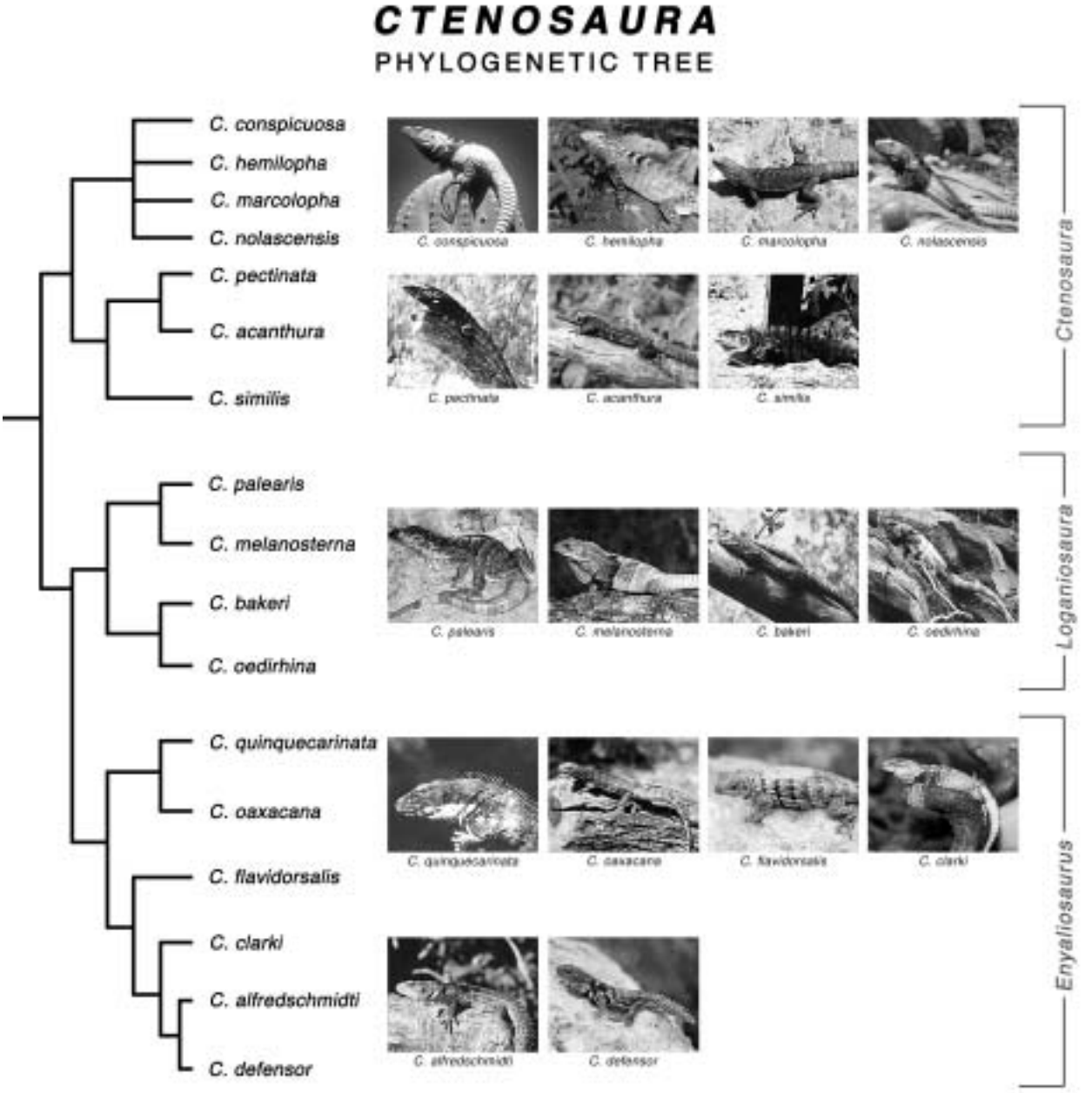
[1] Adapted from Köhler, G. 2002. *Schwarzleguane. Lebensweise, Pflege, Zucht*. Herpeton Verlag Elke Köhler, Offenbach, Germany. Translated from German by AJ Gutman with additional commentary by Robert Powell.

[2] A "monophyletic" group includes an ancestor and all of its descendants.




In the past, some species (*C. bakeri*, *C. palearis*, *C. quinquecarinata*, *C. clarki*, and *C. defensor*) were split off from *Ctenosaura* and placed in a separate genus, *Enyaliosaurus*, but this division is no longer widely recognized. More recent studies, based on genetic and morphological data, have presented an hypothesis of relationships within the genus *Ctenosaura* that recognizes three monophyletic species groups designated as subgenera (*Ctenosaura*, *Enyaliosaurus*, and *Loganiosaura*).

The subgenus *Ctenosaura* includes the larger species, *C. acanthura*, *C. conspicuosa*, *C. hemilopha*, *C. macrolopha*, *C. nolascensis*, *C, pectinata*, and *C. similis*, all of which lack the enlarged, heavily keeled to spiky scales on the dorsal surface of the upper thigh (along with some other characters). The males in these species attain total lengths of over 1 meter. The morphological criteria contained in the initial descriptions of three of these larger species, *C. acanthura*, *C. pectinata*, and *C. similis*, were apparently quite variable and resulted in no definitive morphological characters by which these three taxa could be distinguished from one another. As recently as ten years ago, some authorities suggested that further study of

the status of the *C. similis-acanthura-pectinata* group would reveal that only a single species occurred from southern Sinaloa (Mexico) all the way to Panama. This assumption proved to be incorrect. Morphological and genetic studies have shown that these three species are all valid and can be distinguished by scalation and coloration. Field studies also have provided a more detailed picture of the geographic distribution of the three species in the Isthmus of Tehuantepec, where their ranges approach each other.

The subgenus *Loganiosaura* includes the medium-sized species, C. *bakeri*, *C. melanosterna*, *C. oedirhina*, and *C. palearis*, which attain maximum total lengths of 80 cm. Of these species, *C. bakeri*, *C. melanosterna*, and *C. palearis* possess a well-developed pendulous dewlap, whereas *C. oedirhina* has a transverse gular fold. The species in this subgenus also differ from other ctenosaurs in several skull characters, which reinforces the view that this group is monophyletic.

The subgenus *Enyaliosaurus* includes the small species, *C. alfredschmidti*, *C. clarki*, *C. defensor*, *C. flavidorsalis*, *C. oaxacana*, and *C. quinquecarinata*. These species are characterized, among other things, by a reduction of the number of postmental scales (from four to two) and possession of a relatively short, very spiky tail, which, at its widest point, is broader than it is high. Within this subgenus, *C. alfredschmidti*, *C. clarki*, and *C. defensor* are notable for the reduction of the parietal eye, which is barely distinguishable with the naked eye (this trait is very evident in other species as the distinct spot in the middle of the parietal scale on the top of the head). These three species also have whorls of well-developed, enlarged, spiky scales all the way to the tips of their tails (approximately the distal third of the tail is without whorls in the other species).

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HUSBANDRY

# Iguanas and Artificial Ultraviolet Light: How and How Much Made Simple — Well, Not Exactly Simple…[1]

*Bob MacCargar*
*The Greenhouse in New York*
*All photographs by the author.*

Readers will recognize that, in order to stay healthy, iguanas require UV-B (ultraviolet radiation in the "B" range) as much as they need the complex salads we prepare for them daily. Without UV-B, the all-important mineral, calcium, cannot be effectively absorbed — and calcium is as critical as nutritious food, water, and heat. In responsible husbandry, we must replicate the UV spectrum required for the photochemical process involved in metabolizing vitamin $D_3$ (which mediates calcium absorption) — while never forgetting that this will be of little importance if the diet, heat, etc. are less than optimal. Also remember that this is a discussion on what is best for reptiles, NOT humans.

Since extensive research published in reputable scientific journals has yet to be performed, the recommendations that follow are based on logic, atomic physics, engineering principles, existing knowledge about the natural habitat of iguanas and their biology, and my own personal experience.

Proper placement of bulbs will provide an iguana access to heat and UV light and permit proper thermoregulation by allowing the animal to move toward or away from the heat source.

UV-B is part of the electromagnetic spectrum. This spectrum includes everything from radio waves at one end to gamma rays on the other. Visible light is somewhere in the middle. Wavelengths are read in nanometers from 0.001 nm (x-rays) to 100 billion nm (radio waves). A reptile bulb can be subjected to testing by an ultraviolet radiometer and spectrographs in order to measure precisely the wavelengths that are being produced.

The UV range is from 180–400 nm, the B range specifically from 280–320 nm. However, we are most concerned with readings from 290–300 nm. Why? This is the D-UV range, which triggers the miracle of photo-biosynthesis and is responsible for creating pre-vitamin $D_3$ (cholecalciferol). We think that about 80% of this photochemical reaction is triggered by ultraviolet waves in this range. Ingested vitamin D (7-dehydrocholesterol or 7-DHC) in the reptile's skin absorbs the UV-B protons, which allows the photochemical reaction that converts the 7-DHC to cholecalciferol. The latter is then converted in the liver to 25-hydroxycholecalciferol (25-HDCC). The final step toward becoming biologically active vitamin $D_3$ (1,25- dihydroxycholecalciferol or 1,25 DHCC) takes place in the kidneys through the process of thermal isomerization. Biologically active vitamin $D_3$ is stored in the liver and kidneys and its primary function is to regulate calcium metabolism. This gives you some idea of why reptiles suffering from metabolic bone disease (the lack of sufficient $D_3$ to metabolize calcium) also suffer from forms of liver and kidney disease.

Having mentioned reptilian skin, let's quickly consider the amount of exposure of an animal to

[1] All references to brand names reflect the author's personal experiences and should not be construed as an endorsement by the IIS.

natural sunlight that is necessary for this chemical reaction to take place. The assumption that a few minutes a day is sufficient is based entirely on studies with humans. Keep in mind that the protons from the UV radiation have to penetrate the skin deep enough to reach the capillaries underneath the skin in order to produce this reaction. Anyone with experience around iguanas can appreciate how tough and thick their hide is. Several hours a day of natural sun exposure is much more appropriate for a large reptile.

However, the ultraviolet we need to supply for our animals must be "useable" (in other words, in the D-UV range). How can we measure and be confident that we have supplied our creatures with ample amounts of D-UV? By far the most reliable method is to test specifically for blood levels of 25-HDCC (wild iguanas have levels of 175–275 nmol/L of this form of $D_3$ in their blood). This test can be performed by a qualified veterinarian and is the final say on whether we have provided optimum husbandry for our iguanas. This is much more reliable than using a standard blood panel test (which measures only calcium and phosphorus levels). Even iguanas that have what appear to be good blood panels have been found to be on the low end of the active 25-HDCC level. This helps to explain why iguanas in the wild can drop 20 feet out of a tree and hit the ground running, whereas stories of captive Green Iguanas falling 5 feet and ending up with compound fractures are common.

Just what kind of ultraviolet levels are these creatures exposed to in their natural environment? The standard for measuring intensity of the UV spectrum is read in microwatts per square centimeter ($\mu W/cm^2$). The USDA recently did a study with an Ultraviolet Pyranometer and found readings of UV-B in Florida on June 1st that reached 450 $\mu W/cm^2$ (remember, however, that only a certain percentage of this falls into our "usable" D-UV). Hobbyists have the ability to take their own UV-B readings with a simple hand-held ultraviolet radiometer from Solarmeter (model 6.2). The measurements taken by the USDA are extremely close to the readings that I have been taking for the last two years in a study of reptile lamps and I have used this as a constant for meter calibration.

Although iguanas may not be exposed to as much as 450 $\mu W/cm^2$ on a continuous basis, they will spend several hours a day exposed to relatively high numbers. My studies, as well as those of others, have found that, even in the shade, global UV-B readings reach 30–50 $\mu W/cm^2$. These numbers give us an idea of the minimum and maximum ultraviolet B exposure levels in nature.


The low-cost hand-held ultraviolet radiometer from Solarmeter (model 6.2) provides hobbyists with the ability to take their own UV-B readings.

Interestingly, another study has proven that $D_3$ biosynthesis is a naturally self-limiting process. Without getting too technical, this "safety valve" ensures that toxic levels of vitamin $D_3$ are not created, and that the excess is broken back down into inert ingredients (but please see the references at the end of this article). Basically this means that as long as we do not expose our iguanas to any more UV than that to which they are exposed in their natural environment, we will stay within safe perimeters.

Two styles of reptile UV-B bulbs are available. One is the fluorescent tube and the other is the mercury vapor (MV) reptile lamp. Both style lamps use the heavy metal mercury as a catalyst for producing ultraviolet radiation. An electrical charge passing through liquid mercury excites the molecules until they vaporize (when the mercury cools, it resumes liquid form). In the fluorescent tube, the mercury must combine with high-grade phosphorus to achieve the ultraviolet results.

Over the past two years, I have studied failure and decay rates of mercury vapor lamps and conducted a general study of the major brand fluorescent tube reptile bulbs. I am constantly asked if I have tested a certain fluorescent brand bulb by individuals who have seen them listed inexpensively — in spite of the fact that, for many years, I have been telling people that quality UV is not cheap (unless we're talking about the great and wondrous sun). In a recent conversation with


ZooMed 5.0 fluorescent tubes are built to the most exacting tolerances.

Voltarc Technologies, one of the largest manufacturers of reptile fluorescent bulbs in the nation, the engineers confirmed the fact that money buys UV.

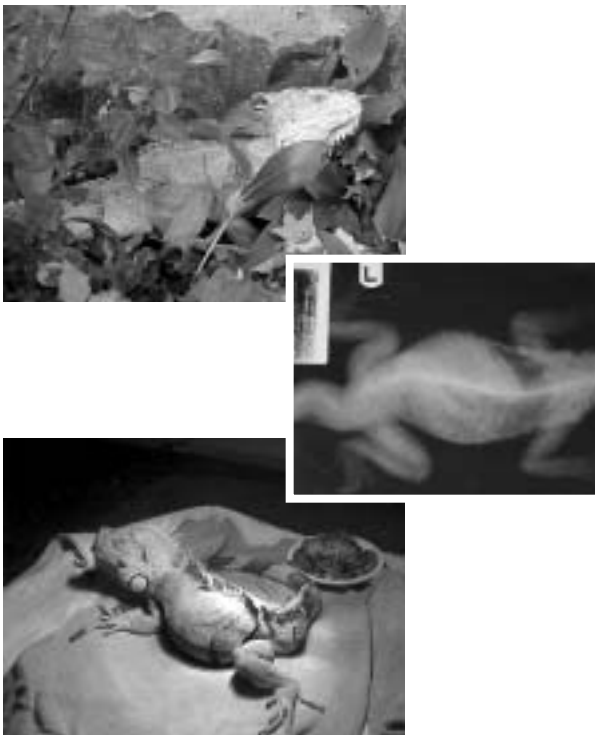
Production costs rise with more exacting specifications (how much UV-B and where precisely it is to be delivered). In order to build a tube that will provide not only high UV-B readings, but one that will generate output in the useable 290–300 nm range, manufacturing tolerances have to be very precise. Two different fluorescent tubes can emit equal amounts of total UV-B, yet one will do a much better job keeping your pet healthy than the other (even though both bulbs might have been manufactured by the same company, but for two different distributors' specifications).

The best fluorescent tubes tested emit 12–15 $\mu W/cm^2$ at 12" after initial burning. A variety of good fluorescents (as well as some absolutely terrible ones) are on the market, but ZooMed 5.0 is built to the most exacting tolerances according to all of the manufacturers with whom I have spoken.

The other choice in artificial UV is the mercury vapor reptile lamp, which comes in a variety of styles and wattages. Anyone who has done rehabilitation work has seen the effects of these bulbs compared to even the best fluorescent tubes. Why is this the case? Do they emit huge amounts of UV? Are they reliable? Is one brand better than another?

Self-ballasted MV lamps suffer from a 50% failure rate over the first six months and a 70% decay rate in total UV-B emitted. The best-selling style MV bulb, the 160 watt FLOOD, emits much less UV-B than stated on their endorsements after decay. These bulbs settle in at about 12 $\mu W/cm^2$ at 12". Why, then, do we see such incredible results with MV lamps when compared to fluorescents? After all, two high-quality fluorescents will produce 25–30 $\mu W/cm^2$ at 12". The answer is simple: MV lamps emit less total UV-B than fluorescents — but more "usable" UV. Studies have shown that MV lamps produce the same percentages of D-UV (and UV-A, which is another subject) as a percent of total energy emitted as the sun.

Self-ballasted SPOT-style lamps produce much higher UV readings than any other reptile bulb on the market. They still are subject to the failure rates of all self-ballasted MV lamps. These lamps settle in at about 100–150 $\mu W/cm^2$ (at 12"), but have a much narrower disbursements of UV-B. These are excellent rehabilitation bulbs for treating animals suffering from severe metabolic bone disease. Regarding concerns that iguanas under this style of lamp will need "goggles" to prevent blindness from "excessive" UV exposure, remember the exposure levels in their natural environment. We have five iguanas that have spent two years exclusively under mercury vapor SPOT lamps with no negative impact on vision. However, the distance from any MV lamp to the basking area must be regulated in order to provide optimum temperatures, regardless of any distances stated by the distributor!



Erving, a rescued Green Iguana, made a remarkable recovery following six months of therapy under UV lamps (top). Note the severe spinal scoliosis (center) and evidence of severe metabolic bone disease (bottom) when he was initially rescued.


The T-Rex UV Heat 100- and 160-Watt lamps are among those recommended.

ZooMed's Powersun 160-Watt lamp is another lamp that performed well when tested.

The Westron Lighting MV in-line ballast lamp requires complementary heat and full-spectrum lighting but outlasts other MV lighting.

At this time I recommend only 100- and 160-watt T-Rex UV Heat, 160-watt ZooMed Powersun, and the Westron Lighting 60-watt in-line ballast MV lamps. Others performed poorly in my tests. A new 60-watt in-line ballasted MV lamp from Westron Lighting produces excellent UV-B after decay, and without the problem of failure (no self-ballast to fail). Its primary drawback is limited heat production, although this could be an asset for keepers of smaller reptiles kept in glass habitats. It also generates poor-quality visible light. According to the manufacturer, these limitations of the current bulb will not apply to models that will soon be available.

So, what is best for iguanas? I recommend 30–50 μW/cm$^2$ at 12" for 8–12 hours per day (comparable to minimal natural exposures in the wild). The best way to realize this number is to use an ultraviolet radiometer (such as the Solar Meter 6.2 hand-held version; see references) to measure the amount of UV-B available to your iguana. The ZooMed 5.0 fluorescent lamps are at the top of the ladder in terms of meeting these specific requirements (i.e., the best "usable" UV-B). Use at least two of these lamps to achieve the desired exposure levels. The 100- or 160-watt T-Rex FLOOD lamps or the 160 watt ZooMed FLOOD lamp also may be used in conjunction with a ZooMed 5.0 fluorescent tube. If you do not have a meter, you should rely on the security provided by the quality of the 5.0 bulbs. Alternately, T-Rex SPOT bulbs (100- and 160-watt) will emit 50–150 μW/cm$^2$ (at 12" after break-in) — as long as they burn. No other supplemental UV-B source is necessary with these lamps. Finally, the Westron Lighting MV in-line ballast lamp can produce 30–50+ μW/cm$^2$ after break-in. This lamp will need additional heat and full-spectrum complements, but should not fail as quickly or frequently as other MV lamps.

## References and Resources
(listed by topic)

25 HDCC blood level study with radiograph (and much more information on ultraviolet bulbs), http://www.myiguana.com

25 HDCC vitamin D Test, University of Michigan, Animal Health Diagnostic Laboratory, PO Box 30076, Lansing, MI 48909 (517-353-0621)

Calcium physiology, Bogoslavsky, B. 2002. Calcium metabolism in iguanas. *Iguana Times* (*Journal of the International Iguana Society*) 9(1&2):32–34.

Electromagnetic spectrum, http://csep10.phys.utk.edu/astr162/lect/light/spectrum.html

Photochemistry and biology, http://www.photobiology.com

Ultraviolet radiometers, www.solarmeter.com

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PROFILE

# Henry S. Fitch: A Legendary Passion for Natural History

*Robert W. Henderson*
*Milwaukee Public Museum, Milwaukee, Wisconsin*

I had not spoken with Henry Fitch in quite some time, and not since his wife, Virginia, had passed away in December 2002 — but Bob Powell had requested that we do something for *Iguana*, and I wanted to say "hello" and to see if he was interested in collaborating on something for that publication.

I called in the morning. Henry answered the phone right away and actually sounded pleased to hear from me. We reminisced briefly, and the subsequent conversation went something like this:

**RWH:** You're 92 now, right?

**HSF** (chuckling)**:** No, 93.

**RWH:** So, how're you feeling?

**HSF:** I'm pretty crippled-up and don't get around much.

**RWH:** Sorry to hear that. I guess you're not getting into the field then?

**HSF:** Well, I'm just starting a radio telemetry project with Timber Rattlesnakes. We put the transmitters in the snakes this morning.

**RWH:** (Silent incredulity).

And that pretty much tells you what Henry Fitch is all about.

———

When I first arrived at the University of Kansas as an incredibly naive undergraduate in 1967, I didn't know Henry Fitch existed, much less that he was doing exactly the kind of research I dreamed of doing myself. The attraction for me at Kansas was Bill Duellman and his amazingly active program of herpetology in the American tropics. But now I had access to a remarkable library (Duellman's), and I somehow found some of

Henry Fitch with a *Boa constrictor* in Chiapas, Mexico (February, 1972). *Photograph by R.W. Henderson.*

Fitch's publications. It was a real epiphany to realize that someone was doing (and had been doing for many years) exactly what I wanted to do. I devoured his classic *Autecology of the Copperhead* (not knowing what "autecology" meant when I started to read it) and anything else snake-related.

Dr. Fitch had been on sabbatical with his family in Costa Rica, and he returned to Kansas in the fall of 1968. I enrolled in his vertebrate natural history course and, although I don't recall the details, I'm sure I forced myself upon him very early on. I became a frequent visitor to the natural history reservation that now bears his name, often arriving unannounced on a weekend afternoon when he was trying to relax and spend time with his family. Often he allowed me to make runs, either with him or on my own, to check the tins under which congregated handfulls of *Diadophis punctatus* (Ringneck Snakes). I think he quickly realized that what I lacked in IQ points I easily compensated for in enthusiasm. He encouraged me to initiate research as an undergrad, and eventually became my advisor when I entered graduate school at Kansas. While still at Kansas, and long after I had moved on to the Milwaukee Public Museum, we spent time in the field. We worked on *Anolis* in Mexico, Great Corn Island off the coast of Nicaragua, and the Dominican Republic, and on iguana (*Ctenosaura* and *Iguana*) ecology, behavior, and conservation in Belize and Nicaragua. We described new species of anoles, presented details on the social behavior of anoles and iguanids, and documented the exploitation of iguanas in Central America (see article on p. 63).

Cumulatively, we've spent months together in the field. One of my most vivid memories was spending six weeks traveling in southern Mexico in his truck and camper. Every dinner for those six weeks consisted of boiled potatoes and fried Spam. I still like Spam, but I cannot stomach a boiled potato. While in Mexico, we ate cold cereal with powdered milk for breakfast each morning. One morning we were out of milk and I suggested we have sandwiches. Dr. Fitch looked incredulous and replied: "For breakfast?" He opted to have his cereal with plain water and admitted that it wasn't very good. Henry is a creature of habit.

Long before I knew him, Henry Fitch was already a living legend. His long-term field studies of snake populations at the University of Kansas field station are data-rich and amazingly thorough. He brought mark and recapture studies of snakes into the forefront of herpetology, and he was a true pioneer in the use of radio-telemetry to study movement ecology and habitat use by a variety of snake species. In 1999, he published his landmark book, *A Kansas Snake Community: Composition and Changes Over 50 Years* (Krieger Publ. Co.).

Henry Fitch and Bob Henderson measuring a Haitian Boa (*Epicrates striatus*) at Paraiso, Barahona, Dominican Republic (March 1985). *Photographs by N.E. Kraucunas.*

The likelihood of another researcher being in a professional situation to conduct a similar study, much less to have the drive, enthusiasm, and good health to do it, are virtually nil.

It wasn't until 1965 at the age of 55 that Dr. Fitch finally made it to the tropics. Once there, however, tropical fieldwork became his passion. He eventually spent a solid year in Costa Rica with his family in order to study the population ecology of a wide variety of lizards. After that, any year (especially during the long Kansas winters) that did not include at least one trip to somewhere (anywhere!) in Central or South America or the West Indies was considered disappointing. He was especially interested in *Anolis* ecology and behavior, and has published on a wide range of topics related to their biology, including taxonomy, behavior, and ecology.

In 1976, we were awarded a small grant to study iguana exploitation in Central America. We worked together in Nicaragua for about six weeks before I returned to the U.S. At about 65 years of age, when other folks are thinking about retirement and taking it easy, Henry set-off on his own to visit markets all over Central America in order to document the extent of exploitation of *Ctenosaura similis* and *Iguana iguana*. By interviewing vendors and hunters, he was able to map a network of iguana black marketeers, with truckloads of the lizards going across borders from one country to another. The next year, we spent several weeks in the Belize City cemetery watching the interactions of a healthy population of *C. similis* (known locally as Wish-willies) using tombstones for basking sites, look-outs for territorial males, and for retreats.

During all of the time I spent with the man, whether on the natural history reservation in Kansas or somewhere in the tropics, I never saw his enthusiasm wane. He was always ready for a new adventure, to collect the next lizard, or record more data. Although I'm 35 years younger than Henry, I would welcome an occasional break in the day to put my feet up and have a cold drink. Dr. Fitch could do that too, but only for about 11 minutes. Then it was: "Bob. Let's go to such and such a place and see what we can find. It's the locality for such and such a critter." — and, of course I would go because I knew that if I didn't I was going to miss seeing something worthwhile and an opportunity to learn something from someone who has forgotten more about lizards and snakes than I'll ever know.

Henry Fitch weighing a *Ctenosaura similis* in Nicaragua (February 1976). *Photograph by R.W. Henderson.*

I'm proud to have been Henry Fitch's student and frequent collaborator, and I can't tell you how much it pleases me that a 93-year-old man who (supposedly) can barely get around is excited about initiating a new project with Timber Rattlesnakes. Decades after it no longer mattered to his professional "status," Dr. Fitch has continued to conduct natural history studies in Kansas and the American tropics and to publish in scientific journals. He continues to do it because his desire to add to our knowledge of squamate ecology has never waned. His life is testimony to passion and doing what you can to satisfy that passion.

HISTORICAL PERSPECTIVE

# Whorl-tailed Iguanas*

*Franz Werner*

The Whorl-tailed Iguanas (*Cyclura* Harl. [translator's note: "Harl." Refers to Richard Harlan, an American paleontologist and comparative anatomist who described many American and "exotic" species of amphibians and reptiles]) are distinguished from Common Iguanas [= *Iguana* spp.] by their dentition, the smaller dewlap, and the more weakly developed gular fold. Pattern and scalation is similar to that of other iguanas, except that the dorsal surface of the tail is distinguished by a ring of enlarged scales following three or four rows of typical scales. Although these enlarged scales are not particularly long, their collective tips form a whorl-like band of erect spikes around the tail. The dorsal crest may be interrupted in the shoulder and hip regions. The teeth, which appear to increase in number with age, are not serrated, but are three-sided, as in Common Iguanas, and those on the pterygoid and sphenoid are small but numerous. Femoral pores are distinct and form a long row on each leg. All species are terrestrial and are found primarily in sandy areas where they live in burrows which they excavate for themselves.

The best-known species is *Cyclura lophoma* Gosse [this "species" is now known to consist of several distinct taxa, including *C. collei*, *C. nubila*, and *C. cychlura*; Philip Gosse was the author of the delightful *A Naturalist's Sojourn in Jamaica*, published in 1851] of Cuba, Jamaica, and the Bahamas. This form may reach a total length of

* excerpted and translated from Franz Werner (1913. Die Lurche und Kriechtiere von Alfred Brehm. Zweiter Band: Kriechtiere (Schuppenkriechtiere). *In* O. z. Strassen (ed.), *Brehms Tierleben*. *Allgemeine Kunde des Tierreichs*. 4th ed. Bibliographisches Institut, Leipzig and Wien. Translated by R. Powell.

Adult male Jamaican Iguana (*Cyclura collei*); at the time Werner wrote this article, the Jamaican species plus populations in Cuba (*C. nubila* ) and the Bahamas (*C. cychlura*) were all known as *C. lophoma*. *Photograph by Jeff Lemm.*

1.2–1.3 m, of which the tail comprises about 70 cm, and is distinctive because of its relatively low dorsal crest, which is composed of linked, somewhat sickle-shaped spines, and which may be continuous at the nape and base of the tail or distinctly separated at one or both places. The snout is covered by three pairs of large, multi-sided, tuberculate plates that are separated from one another by small scales. Plates of variable size, those that are medially located the most prominent, characterize the forehead, and on each side of the lower jaw is a row of large, quadrangular, heavily keeled scales. Overall color of the body and limbs ranges from slate gray to brownish green. A few diagonal lines passing over the shoulder and several broad crossbands that extend from the dorsal crest to the belly are dark olive-brown. The tail is circled by regularly spaced light and dark olive-green bands.

Head of a Rhinoceros Iguana, *Metopocerus cornutus* Daud. *Photograph by L. Medland, F.Z.S. – Finchley, N.*

According to Gosse, Whorl-tailed Iguanas live in only a few places on Jamaica. They were relatively common on the limestone hills that extend from Kingston harbor to the so-called Goat Island and are well known for the large numbers of feral goats, pigs, and chickens that live there. Otherwise, one may find these iguanas with some regularity in the flats that separate the coastal hills from higher mountains of the interior, but only in areas that feature large numbers of old, hollow tree trunks. These lizards appear to have no particular fondness for water, although, like their relatives, they know how to swim rather well. A fortunate circumstance made it possible to learn more about the Whorl-tail than many of its relatives. Two individuals lived in an old Acacia on the estate of a Mr. Minot for 16 months, providing him with the opportunity to observe them for an extended period of time. A friend of the owner had fortuitously discovered the two animals, but a blow with a riding crop frightened them so much that for weeks thereafter they emerged from their lair in only the most surreptitious fashion and immediately sought refuge in the hollow tree when any human approached too closely. Subsequently, Minot forbade any further disturbance of the animals and, over time, they forgot their fright and eventually became so tame that they consented to regular and proximate visits by their landlord. As the day warmed, one of the animals would emerge from its tree hollow and hang from the bark or crawl out on a thin, dry branch to bask in the sun. It would often spend the entire day doing little else, with nary a care for the rest of its environment. Minot never saw it hunting insects and only once did he surprise a lizard while it was eating. This occurred when the sun broke through the dark clouds after a heavy rain and the vegetation had largely dried. One of the Whorl-tails left the tree, covered about 10 m of ground with slow steps, moving only one leg at a time, until it approached a stand of so-called Guinea-grass. Tearing off mouthfuls at a time, it swallowed large masses without any trouble. Startled by the observer whom it suddenly noticed, it rushed back to the tree, not so much running or walking as moving with a rapid series of frog-like hops. Once there, it ducked into its hole and quickly disappeared from sight.

Minot made particular note of the fact that the fleeing Whorl-tail showed no inclination to seek out water, as other iguanas are wont to do under similar circumstances. As a matter of fact, these Jamaican animals showed little interest in water of any kind and seemed to tolerate even the driest conditions without drinking. The two inhabitants of the tree were obviously a pair, since they differed from one another in size and coloration. They also lived harmoniously together, but they were never seen out of the burrow at the same time. Eventually, a good-for-nothing youngster ended the observations, laying near the tree and heartlessly shooting the two

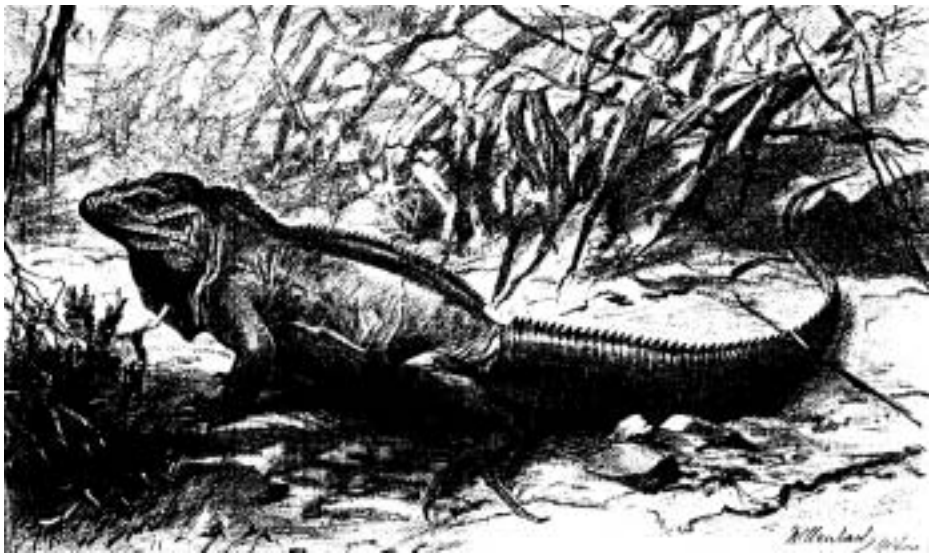
harmless creatures one after the other. Minot opened the carcasses of the shamefully murdered animals and found both stomachs filled with the previously mentioned grass.

Barbour [Thomas Barbour, an American herpetologist who traveled widely throughout the West Indies during the first half of the 20th century] recently noted that the Whorl-tail has been brought to the verge of extinction by the presence of the introduced Mongoose (*Herpestes griseus* [= *Herpestes javanicus*]) and is now found only on Goat Island, which the interloper has yet to reach.

Although generally retiring, preferring to retreat in the face of humans whenever possible, the Whorl-tail is quite brave and quite capable of defending itself in an emergency. The tail is a weapon that should not be underestimated and which can be used with great effect. Easily aroused like all iguanas, the Whorl-tail will respond with considerable wrath when cornered, inflating itself, erecting the dorsal crest, gaping to show its sharp teeth, staring darkly at its antagonist, and readying itself for an attack. If one continues to threaten the beast, it will turn around quickly and deliver a hefty blow with its tail, and then immediately turn the other way in anticipation of delivering another strike from the other side. Hill [an unknown person] had been alerted by natives to the danger posed by this animal and had been clearly warned against a careless approach. The spikes on the powerful tail are sufficiently sharp that the animal can readily inflict a most painful wound. Dogs that approach one carelessly often are severely injured.

Whorl-tails, possibly as a consequence of their diet, have such an unpleasant odor that even ants refuse to touch them — or at least to strip the flesh from a carcass thrown on their colony. These animals appear not to be hunted as eagerly as their relatives in Mexico.

The Rhinoceros Iguana, *Metopocerus cornutus* Daud. [*Metopocerus* is now considered synonymous with *Cyclura*; "Daud." refers to François-Marie Daudin, a French naturalist who wrote *Histoire Naturelle des Quadrupèdes Ovipares* in 1800, in which he formally described the Rhinoceros Iguana], is a mighty beast found in San Domingo [a reference to Hispaniola and, more precisely, to the Dominican Republic]. It resembles the Green Iguana (*Iguana tuberculata* [= *Iguana iguana*]) in having teeth with serrated crowns and the Spiny-tailed Iguanas [= *Ctenosaura* spp.] of Middle America in color, size, build, and lifestyle — but is readily distinguished by the three large, cone-shaped, horn-like scales on the top of the snout of adult males. Old males also are characterized by their bulging jowls and exceedingly large heads and make a considerable impression that is enhanced further by their proud posture and lively eyes. The powerful bite and the strong, spiky tail make the Rhinoceros Iguana a worthy opponent.



Rhinoceros Iguana.

Rhinoceros Iguanas are overwhelmingly terrestrial, consume both vegetable and animal matter, and in captivity can be readily maintained on a diet of fruit, juicy leaves, and strips of raw meat. Ditmars [see the appended biographical sketch] indicated that they even overpower rats and young chickens, shaking larger prey until it is torn into pieces. Given enough space and heat, these lizards

do well in captivity and have become staples in zoos that maintain collections of reptiles. Rhinoceros Iguanas are lively, shy, and careful, and do not become tame in captivity for some time. A male, kept by Werner [the author] in a cage for several years, gaped when approached, exposing its dark purple throat, but did not bite, instead retreated farther into the cage and, only when approached even more closely, did it turn and strike with its tail. When removed from its cage, it exhibited an extraordinary strength, resisted desperately, and flailed its tail violently.

# BIOGRAPHICAL SKETCH:

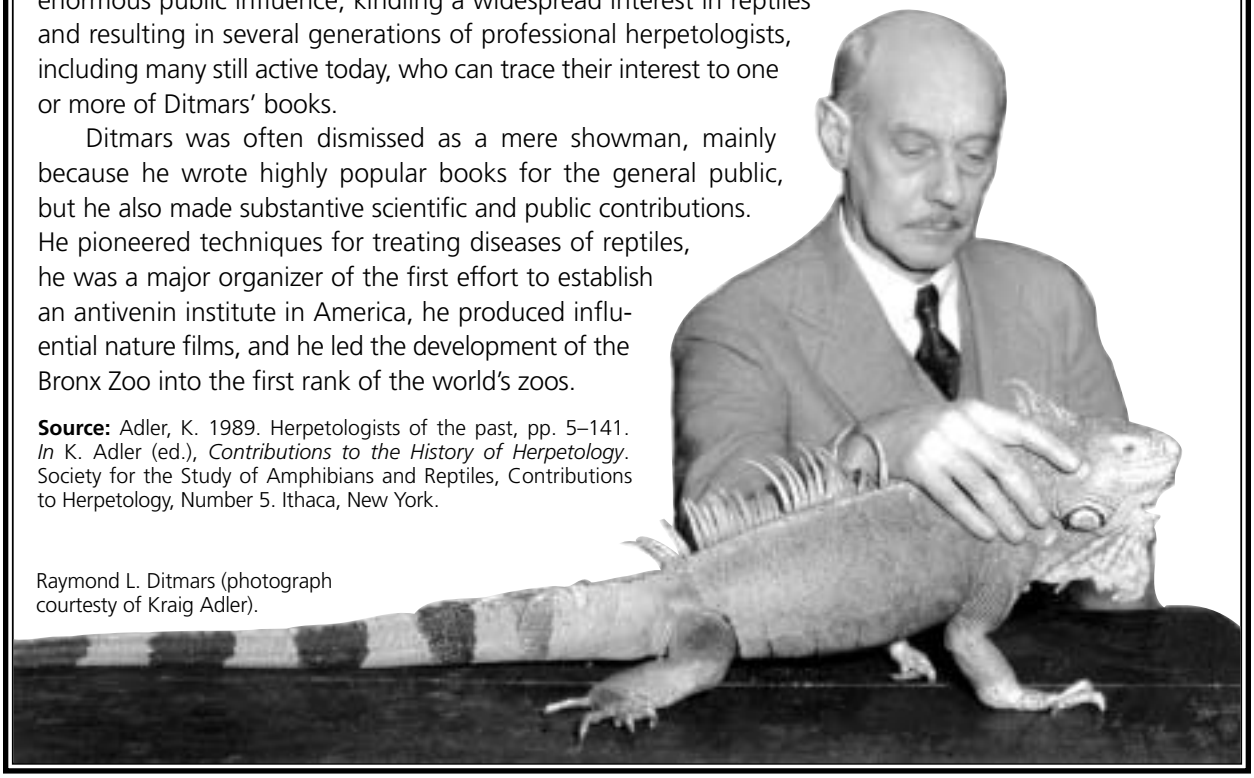
## *Raymond L. Ditmars (1876–1942)*

Raymond Ditmars was America's first great popularizer of reptiles. He was born in Newark, New Jersey and caught his first snakes at age 12 at Gravesend Bay near Brooklyn, New York. In 1893, Ditmars was hired by the entomology department at the American Museum of Natural History, but resigned in 1897 to take higher paying positions unrelated to his interest in animals. In 1898, as a reporter for *The New York Times*, one of his beats was the newly-formed New York Zoological Society. Shortly after the zoo opened, Ditmars, barely 23 years old, was hired as Assistant Curator of Reptiles and his private collection become the nucleus of the zoo's reptile displays.

Ditmars published eight herpetological books, plus a dozen more about other animals or tales of his work or travels. *The Reptile Book*, published in 1907 (an expanded edition was published in 1930) established his reputation. This volume and several others (*Reptiles of the World*, 1910, revised 1933; *Snakes of the World*, 1931; *Reptiles of North America*, 1936; and *Field Book of American Snakes*, 1939) had an enormous public influence, kindling a widespread interest in reptiles and resulting in several generations of professional herpetologists, including many still active today, who can trace their interest to one or more of Ditmars' books.

Ditmars was often dismissed as a mere showman, mainly because he wrote highly popular books for the general public, but he also made substantive scientific and public contributions. He pioneered techniques for treating diseases of reptiles, he was a major organizer of the first effort to establish an antivenin institute in America, he produced influential nature films, and he led the development of the Bronx Zoo into the first rank of the world's zoos.

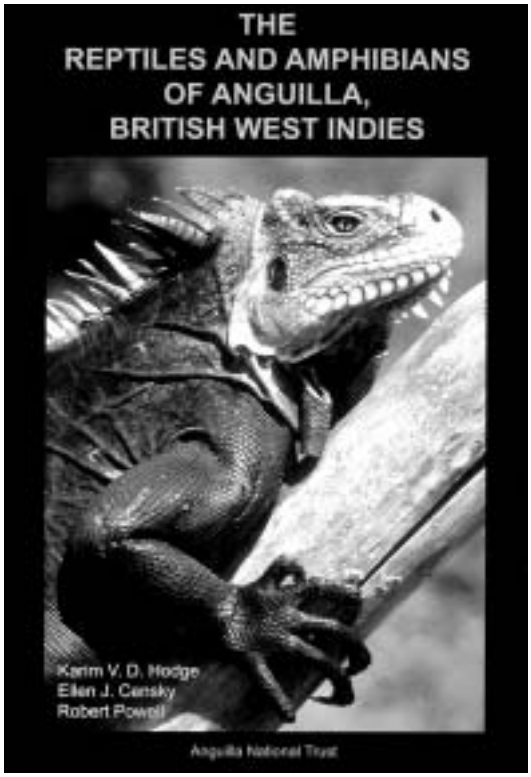
**Source:** Adler, K. 1989. Herpetologists of the past, pp. 5–141. *In* K. Adler (ed.), *Contributions to the History of Herpetology*. Society for the Study of Amphibians and Reptiles, Contributions to Herpetology, Number 5. Ithaca, New York.



Raymond L. Ditmars (photograph courtesty of Kraig Adler).

# BOOK REVIEW

**Hodge, Karim V. D., Ellen J. Censky, and Robert Powell. 2003.** *The Reptiles and Amphibians of Anguilla, British West Indies.* **Anguilla National Trust, The Valley. Softcover, $15. 72 pp., over 90 illustrations, nearly all in color.**




This delightful volume is the second in a series of guides published by the Anguilla National Trust on their native flora and fauna. The nation of Anguilla is composed of one main and several small islands, which collectively form the northern end of the Lesser Antilles (the island chain that extends from the Puerto Rico Bank to South America). Unlike most other Lesser Antillean islands, which are mountainous, much of Anguilla is low-lying and dry. Rather than accumulating on the surface, rainfall tends to seep through the karst limestone from which the islands are formed. Thus the native forest must be both drought and hurricane resistant. What remains, after extensive foraging by the ubiquitous goats, is mostly degraded scrub forest, yet the islands still host over 500 varieties of plants and, surprisingly, over 20 species of reptiles.

The guidebook features species accounts of Anguilla's three frogs or toads (all introduced), four sea turtles, one terrestrial turtle (possibly introduced), three snakes (two introduced), and 13 lizards. The lizard accounts address two iguanas (one native and one introduced), three ameivas (all native and two endemic), two anoles (one native and one introduced), a skink (native), and five geckos (one endemic species has not been formally described and one species is probably introduced). These subjects range in size from massive Leatherback Sea Turtles to tiny Dwarf Geckos. My personal favorite is the Lesser Antillean Iguana, *Iguana delicatissima,* of which an excellent photograph by Glenn Gerber graces the cover. Of particular interest is the conservation status of this animal. Although threatened throughout its range, the Anguillian population is critically endangered. The usual factors (habitat destruction and competition with feral animals) are responsible, but these may be exacerbated by potential competition and hybridization with Green Iguanas, introduced as pets or on a raft of floating debris that arrived on Anguilla shortly after Hurricane Luis in 1995.

This book is an excellent resource for both herp enthusiasts and newcomers. A brief description of the nature of reptiles and amphibians and an excellent glossary of terms provide help for the uninitiated. Each species account includes colorful photographs and illustrations along with notes on the distribution, origin, biology, and conservation status of each animal. I particularly liked the sections on the origins of the various species. Aside from mentioning the usual methods of introduction (e.g., rafting, land bridges, or human mediation), one notation suggested that some geckos may have been "purposely introduced by sorcerers to some islands in order to terrify their subjects."

Most significantly, a section on conservation describes the reasons why many species have become threatened and suggests measures for improving the situation. Among other things, the authors suggest sustainable land use and the conservation and enhancement of animal habitat. Perhaps the most important measure suggested, however, is increasing public awareness, and, in this, the book itself provides an excellent resource. In fact, the Trust intends to utilize it in Anguillian schools to enhance an awareness and appreciation of the nation's natural resources.

Because printing costs were covered by a grant from the United Kingdom's Foreign and Commonwealth Office Environmental Fund for Overseas Territories, all proceeds from the sale of the book will support the efforts of the Anguilla National Trust to preserve that nation's natural and cultural heritage. Copies may be ordered directly from the Trust (Anguilla National Trust, P.O. Box 1234, The Valley, Anguilla, B.W.I.; axanat@anguillanet.com) or from Bibliomania! (http://www.herplit.com/) for US $15 (EC $40) plus shipping and handling.

*AJ Gutman*

# IGUANA NEWSBRIEFS

Twin hybrid *Cyclura lewisi* x *C. nubila caymanensis* emerging from the egg. *Photograph by Roger Lamb.*

## First Breeding of *Cyclura nubila nubila* and *Cyclura n. caymanensis* x *C. lewisi* in the United Kingdom

**Roger Lamb** of Solihull, West Midlands, UK has 18 years experience in keeping and breeding three generations of Green Iguanas (*Iguana iguana*) and one generation of Rhinoceros Iguanas (*Cyclura cornuta*). Since 1997, Lamb also has been working with two pairs of Cuban Iguanas (*C. nubila nubila*) and a pair of hybrid *C. lewisi* × *C. n. caymanensis*.

The Cuban Iguanas produced their first fertile eggs in 2002, with three hatchlings successfully emerging. The female hybrid laid seven eggs, two of which were fertile. Following a 78-day incubation, the hatchlings had pipped the shell and their heads were out. One egg, much to Lamb's surprise, contained twins.

## Evidence of Green Iguana Reproduction in Anguilla

**Karim V. D. Hodge**, Environmental Officer, Government of Anguilla, reported the discovery of a hatchling Green Iguana (*Iguana iguana*) on 30 July at East End Village. This suggests that reproduction of Green Iguanas is occurring in the wild.

The hatchling was found less than a mile from the site where Green Iguanas landed on a raft of floating debris after Hurricane Luis in September 1995. Consequently, the possibility exists that survivors of that event may still live in the area and are reproducing. However, another Anguillian population of Green Iguanas near the southwestern end of the island is known to be the result of escaped (or intentionally released) pets. The fact that this hatchling could be a product of such animals moving or being carried into the area cannot be ruled out.

Hatchling Green Iguana (*Iguana iguana*) found at East End Village, Anguilla. *Photograph by Karim V. D. Hodge.*

Regardless of the source, active reproduction of Green Iguanas in Anguilla poses a potentially serious threat to the native, critically endangered population of Lesser Antillean Iguanas (*Iguana delicatissima*) by means of competition for limited resources or pollution of the native gene pool through hybridization.

Hodge currently is attempting to assess the extent of this new threat by searching for other hatchlings and adults in the area where this individual was found.

## Banner Year for Blue Iguana Hatchlings (*Cyclura lewisi*)

**Fred Burton,** Director of the Blue Iguana Recovery Programme, reported that 82 eggs were collected this year. Burton attributed much of the success to Warden **D. Ebanks**, who closely monitored breeding and nesting sites at the Queen Elizabeth II Botanic Garden on Grand Cayman Island. In addition, Ebanks maintains a vegetable garden designed to meet the dietary needs of iguanas held at the breeding facility in the park. The position was funded with donations from Maples Finance in Cayman and the International Iguana Foundation.

Eggs were exhumed, placed in an incubator, and are being carefully monitored by Burton, who noted that the due date for the first batch of nine eggs is imminent. The success of the captive breeding program emphasizes the need to find a safe and suitable site for the hatchlings to grow up in the wild.

Hatchling Blue Iguana (*Cyclura lewisi*) emerging from an egg at the Blue Iguana Recovery Programme at Queen Elizabeth II Botanic Garden, Grand Cayman. *Photograph by Fred Burton.*

— Caymanian Compass, 6 August 2003

## South Florida is on the Menu for Hungry Iguanas

With few natural predators in South Florida, reptilian immigrants from Mexico and Central and South America are free to romp — and chomp — wherever and whatever they please. South Florida has had a small population of wild iguanas for many years, but only recently have their numbers grown out of control. So far, plant lovers have not found an effective way to stop them.

**Valerie Cassidy**, president of the Gardens at Crandon Park Foundation, estimated that several dozen Spiny-tailed Iguanas (*Ctenosaura* spp.) gobbled up several thousand dollars worth of plants in a 48-hour pig-out in the flower beds at the Crandon Gardens duck pond on Key Biscayne. "They're huge. They're hungry. And they're eating parts of South Florida."

# IGUANA NEWSBRIEFS

At Fairchild Tropical Garden, iguanas feast on the filet mignons and caviars of the plant world — rare and expensive plants sometimes brought from the other side of the world — much to the frustration of the horticulturists. "They like the prettiest and rarest flowers, so they're obviously creatures of some discriminating taste," said **Mike Maunder**, Fairchild's director of horticulture. Park groundskeepers have tried many tactics to drive off the lizards, including spraying the plants with a chemical deer repellent, but the reptiles, who at Crandon happily gobble up toxic Philodendron leaves, were not deterred.

The lizards have only been nibbling on Broward County, with small populations at Flamingo Gardens, Snyder Park, The Bonnet House, and Easterlin Park in Oakland Park. "Right now we're OK," said **Ross Dovey**, director of Easterlin Park. "But it's a potential problem I'm afraid will only get worse."

— Daphne Duret,
Miami Herald,
31 July 2003

## Anegada Iguana Population Assessment 2003

The **IUCN Iguana Specialist Group** (ISG) conducted a population assessment of *Cyclura pinguis* (Stout Iguana) on Anegada Island, British Virgin Islands from 14–29 June (see also *IGUANA* 10(2), June 2003). The **International Iguana Foundation** (IIF), **Institute of Museum and Library Services** (IMLS), and private contributions by **John Binns, Joe Burgess,** and **George Waters** funded the survey.

Anegada is approximately 16 km long and 2–3.5 km wide (about 39 km2). Although not a large island, it presented a significant challenge to the small team's ability to properly survey the island in a limited amount of time. The strategy was to focus on the western half of the island. Any remaining time would be devoted to surveying the area between the central ponds and the southern, developed coast and some areas east of the Settlement. Results of East End surveys conducted by Glenn Gerber, Binns, and others in 2001 would round out the data needed to estimate the total population size.

Each morning, the team members surveyed designated transect areas, battling dense brush and cacti in 100° heat. The habitat shown in this photograph is typical of what team members encountered during the survey. *Left:* Joe Burgess, *center:* Sallie Davis, right: Roberto Maria. *Photograph by John Binns.*

Formal results of the survey will be presented at the annual ISG meeting in the Turks and Caicos Islands this November. However, the status of *C. pinguis* on Anegada remains critical and population numbers appear to be in a continuing decline. The core iguana area, Bone and Windlass bights, contained bulldozed access cuts, which have destroyed a number of known iguana burrows. Citron Bush, the site of Michael Carey's research in 1968, in which he described healthy populations of *C. pinguis,* consisted solely of heavily disturbed habitat, with most of the damage caused by feral cattle and goats. Neither iguanas nor signs thereof were found. Overall, iguana sightings were few, especially disappointing to those team members who had never seen Stout Iguanas and who had traveled far and worked hard for no more than a fleeting glance of a disappearing shadow.

The 2003 survey team: (back row, left to right) George Waters (IIS), Dr. Glenn Gerber (SDZ/CRES/ISG), and John Binns (IRCF/ISG/IIS); (front row) Roberto Maria (ZooDom/ISG), Kelly Bradley (Dallas Zoo/ISG), Tarren Wagener (Ft. Worth Zoo), and Joe Burgess (IIS). Lee Pagni (SDZ/ISG/IIS; not shown) periodically assisted in the survey, but his primary agenda was to interview local residents regarding Stout Iguanas in order to develop public awareness and school educational programs. Lee Vanterpool (National Parks Trust, BVI/Head Head-starting Keeper) and Sallie Davis, a member of an archeological team conducting research on the East End, also assisted the team. *Photograph by Tarren Wagener.*

One of the few photographs of *Cyclura pinguis* taken during the survey. *Photograph by Joe Burgess.*

Current plans call for a limited release of head-started *C. pinguis,* presently held at the Anegada head-starting facility, on Fallen Jerusalem, a small island in the British Virgin Islands. If successful, this would provide a further hedge against the extinction of this species. As a part of that relocation plan, Gerber, Kelly Bradley, and Lee Pagni conducted a habitat survey on Fallen Jerusalem after completing the survey on Anegada. They found no feral mammals and the island appears to be an ideal location for release.

# Editors' Remarks

IGUANA has undergone substantive changes within the past year. The name has changed, the cover went to black and white, new features have been added, and now the color covers are back and the page count increased — yet the message remains the same: iguanas of all kinds are fascinating animals, whether we experience them in their natural habitat or keep them in our homes — and they deserve our attention. Many wild populations are threatened or endangered and nearly all are declining. Our emphasis on conservation remains unchanged and we will continue to focus on populations in need of our assistance, bringing news of setbacks and advances, and profiling projects and persons that endeavor to help these magnificent animals. However, because many of us came to appreciate these reptiles by caring for them in captivity, we also will strive to provide information that will enhance our ability to care for them in the most humane and efficient manner.

In this issue, we present some shocking images of iguanas and other reptiles exploited primarily for food in their native tropical habitats. Although some might argue that this differs little from the exploitation of cattle, swine, or poultry in temperate regions, one major distinction exists: iguanas are wild animals and continued exploitation threatens their very existence. As iguana enthusiasts, regardless of whether we relate best to a pet we have named and with which we share our home or to the fleeting glance of a wild lizard fleeing through the tropical thorn scrub, we must set high standards in our support of conservation efforts and in responsible ownership of even a single animal.

This means following the guidelines set out at the end of the article on the exploitation of reptiles in the West Indies (those "rules" apply everywhere), avoiding impulsive purchases of animals (see the letter from the President), being a responsible pet owner (see, for example, the consequences of escaped iguanas in Newsbriefs), supporting animal rescuers, and, above all, seeking to educate the public and other pet owners by taking every opportunity to inform them of conservation needs and appropriate husbandry concerns.

The IIS did just that at this year's National Reptile Breeder's Expo in Daytona Beach, Florida. Representatives of the Society enjoyed speaking to many current IIS members and welcomed 32 new members! In the course of the weekend, hobbyists, breeders, rescuers, veterinary professionals, and conservationists shared a high level of concern for the well-being of an extraordinary group of animals.

*Bob Powell, AJ Gutman, and John Binns*

The IIS in Daytona (left to right): Joe Wasilewski, John Binns, Liza Greenberg, Sandy Binns, AJ Gutman, and Joe Burgess. Visit our website (www.IguanaSociety.com) for more photos from Daytona. *Photograph by John Binns.*

## Statement of Purpose

The International Iguana Society, Inc. is a not-for-profit corporation dedicated to preserving the biological diversity of iguanas. We believe that the best way to protect iguanas and other native plants and animals is to preserve natural habitats and to encourage development of sustainable economies compatible with the maintenance of biodiversity. To this end, we will: (1) engage in active conservation, initiating, assisting, and funding conservation efforts in cooperation with U.S. and international governmental and private agencies; (2) promote educational efforts related to the preservation of biodiversity; (3) build connections between individuals and the academic, zoo, and conservation communities, providing conduits for education and for involving the general public in efforts to preserve endangered species; and (4) encourage the dissemination and exchange of information on the ecology, population biology, behavior, captive husbandry, taxonomy, and evolution of iguanas.

## Membership Information

*Iguana,* the Journal of The International Iguana Society, is distributed quarterly to members and member organizations. Annual dues:

**Individual U.S. and Canadian Membership** . . . . . $25.00
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(*receives double copies of *Iguana*)

Additional copies are available at a cost of $6.00 including postage.

**JOIN ON-LINE AT: www.IguanaSociety.org**

**Membership questions?** Call AJ at 860-236-8203, or write to: The International Iguana Society, Inc., 133 Steele Road, West Hartford, CT 06119

## Solicitations

Members of the I.I.S. are encouraged to contribute articles, letters to the Editor, news items, and announcements for publication in *Iguana.* General articles can deal with any aspect of iguana biology, including conservation, behavior, ecology, physiology, systematics, or husbandry. Submission of photographs to accompany articles is encouraged.

Manuscripts may be submitted via e-mail (send to ctenosaura@cyclura.com). For any contribution, please include your name, address, phone number, and e-mail address. Authors of one page or more of print are entitled to five copies of the issue in which their article appears.

## Advertising Policy of *Iguana*

We advertise only non-living products (except feeder insects). All products have been examined and been found to be high quality and fairly priced. Contact Sandy Binns, Advertising Director, at sandy@cyclura.com or 3010 Magnum Drive, San Jose, CA 95135.

# We know you are going to love reading Fauna magazine.

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# LETTER FROM THE PRESIDENT

Iguanas make great pets — for those who make a commitment before they purchase one. In fact, a commitment should precede the acquisition of any exotic or domestic pet. Pets are completely dependent on their owners for all of their needs, including food, shelter, and veterinary care. Domestic dogs have a life expectancy of 12–15 years, yet animal shelters take in thousands of dogs daily. Iguanas, on the other hand, if properly maintained, will live into their mid-twenties.

During the mid-1980s, hundreds of thousands of Green Iguanas were imported for the pet industry. Most came from Central and South American iguana "farms," where gravid female iguanas were released into huge enclosures and their eggs were collected. Initially, iguanas sold for $50 or more. Once the market was saturated, however, the price of a baby iguana dropped to the point where some pet shops were offering free iguanas with the purchase of a ten-gallon aquarium. Importers were selling large numbers of iguanas for as little as 75 cents apiece. This only served to cheapen the quality of care these animals received.

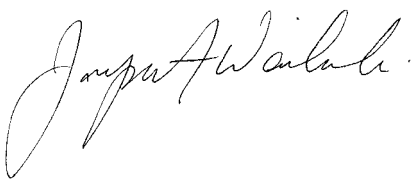
Iguanas belong to a group of animals classified as "impulse" pets. People may visit a pet shop, see an iguana at an inexpensive price, and the next thing they know — they're pet owners. A quick-talking salesperson can outfit a customer with everything needed to raise an iguana. Sadly, the novelty quickly wears off for most people, and the animals suffer from neglect. Few will actually receive proper care and live long, healthy lives. Contrary to popular belief, zoos and animal attractions cannot take those that survive, and they end up in the hands of the few wildlife rehabilitators who are willing to deal with them. Consequently, many are dumped back on the pet shops or released. Depending on the local climate, the latter may or may not thrive.

In South Florida, the climate is well-suited to exotic wildlife, and the Green Iguana population has exploded (see Newsbriefs, p. 94). Healthy populations of Green Iguanas range from Southern Palm Beach into the Florida Keys. They have taken up residence in several tourist attractions, local parks, and botanical gardens. Even southern Florida is a bit too far north for Green Iguanas to occur naturally, because several days throughout the year are too cold. The past five to seven years in Florida have been unusually warm, causing iguana numbers to grow at an alarming rate.

Despite the warm trend, the temperature dipped to under 40° for several nights this past January, and many Floridians thought that many iguanas would perish. On one cold Saturday morning, I visited a local tourist attraction with a healthy population of iguanas. The curator said he had found several dozen iguanas sprawled on the ground and that they had been collected and put into boxes. By the time I arrived, it was near noon, and there I stood, camera in hand, ready to document dozens of iguana carcasses. To my surprise, the staff walked out with several huge boxes and began putting them in my truck. Much scratching came from the boxes, and, upon inspection, I discovered that the iguanas were alive! Cold and slow, but alive. So, when you look at the accompanying photo, note that the only way to pose with 10–15 iguanas is for them to be half-frozen.

*Photograph by Liza Greenberg.*

Remember, the next time you go to a pet shop, beware of impulse purchases.



Joe Wasilewski

INTERNATIONAL
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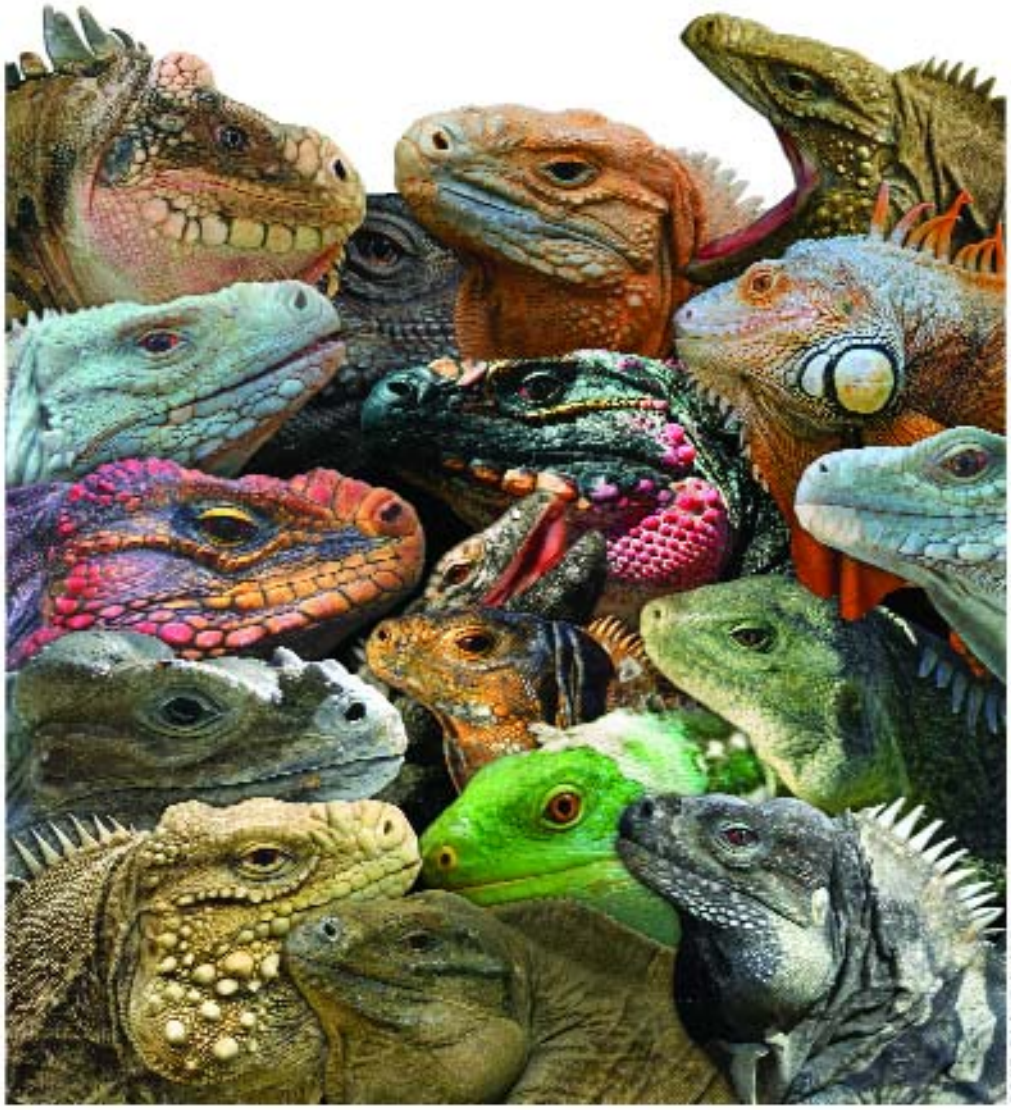

BECOME INVOLVED - HELP SAVE THESE MAGNIFICENT IGUANAS

Adult male Spiny-tailed Iguana (*Ctenosaura similis*) from Utila, Bay Islands, Honduras (stories on pp. 63 & 79). *Photograph by John Binns.*