

Iguana Times

THE JOURNAL OF THE INTERNATIONAL IGUANA SOCIETY
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VOLUME 8, NUMBER 3
FALL 2000
\$6.00



Andros iguana, *Cyclura cyclura cyclura*, on South Bight, Andros Islands, Bahamas. Photograph by John Bendon.

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UPDATE

North Andros Island Report

Robert W. Ehrig

Finca Cyclura Reserve, Big Pine Key, FL

There is no place where I have felt at home as quickly as North Andros Island in the Bahamas. It is perhaps because it looks so similar to my own home, Big Pine Key, 200 miles to the west. Andros is the largest landmass in the Bahamas, with an area of 5,959 km². It is 100 miles long and 20–40 miles wide, and is actually not one single island, but several large islands separated by bights. Most of Andros is uninhabited; its human population of 9,000 is found in settlements along the east coast. Nicollstown in the north is the largest. Red Bays is the only settlement on the west coast of Andros and it is also home to some of the last iguana hunters on North Andros. The west coast of

Andros is a maze of saltwater creeks, sand bars, mangrove swamp, and salt marsh. This region is called “Swash” and is known for being very inhospitable. The interior of North Andros is a mix of pine forest, fresh water wetlands, and West Indian hardwood forest, locally called coppice.

Along the east coast of Andros runs an impressive coastal ridge covered alternately with coppice or pine yards. This ridge is the best *Cyclura* habitat on the island and, for the most part, is presently empty of iguanas. The ridge and the land between it and the sea are also the preferred habitat of the human inhabitants of Andros. Off the shore of the east coast is the third largest barrier coral reef formation in the world.



Andros iguana, *Cyclura cyclura cyclura*, May 2000. Middle Bight. Photograph: John Bendon



R.W. Ehrig holds Andros Island Rock Iguana, *Cyclura cyclura cyclura*, 16 June 1991. Twin Lakes, North Andros.
 Photograph: Timothy G. Haack.

The largest native terrestrial vertebrate of Andros is the largest iguana species of the Bahamas, *Cyclura cyclura cyclura*, the Andros Island rock iguana. On 13 September 2000, I returned to North Andros after a nine-year absence. Accompanied by I.I.S. president, Joe Wasilewski, I planned on a survey of the most distant logging roads on North Andros. We landed at the small airport at Fresh Creek, where Bill Davis, the Director of Forfar Field Station at Stafford Creek met us.

I had conducted two previous surveys of North Andros for rock iguanas in 1991 with Forfar as my base. The surveys consisted of driving a general pattern in the network of old logging roads. They cover an area from the northwest, south to Fresh Creek, and south and west of Fresh Creek (Ehrig, 1991). Historically, the iguanas were found throughout all uplands of North Andros (Auffenberg, 1976). Auffenberg found iguanas in most of the areas I visited in 1991 (Auffenberg,

1991, pers. com.). The drive would cover 65 to 125 miles of logging roads and walking 2 to 6 miles in areas where iguanas were sighted. The surveys were conducted between 700 and 1700 hours in June and August 1991 and September 2000. Days were sunny at least 50% of the time and rain was encountered twice. The logging in North Andros ceased in 1976. It had been logged of pine, *Pinus caribaea* var. *bahamiensis*. In the more distant past, Andros yielded mahogany, *Sweitenia mahogoni*, cedar, *Juniperus barbadensis* and other valuable woods. Feral European hogs have been present on North Andros for a long time. Iguanas have survived in spite of these negative impacts on the habitats of North Andros.

Road surveys are not an accurate census method for detailed population studies, but they are useful for confirming the existence of iguanas in particular areas. North Andros is massive. Its eastern coastline is over 50 miles long. It is 10 to 15 miles wide in the north, 42 miles wide at its



Andros iguana, *Cyclura cyclura cyclura*, May 2000. Middle Bight. Photograph: John Bendon

center, and 25 miles wide at the south end of the northern bight. Surveying the island completely would take years. By covering the logging roads, the coastlines and the banks of the major creeks, a rough estimate of the iguanas' range can be established. There are many areas where transects can be run off the logging roads, but this could be dangerous. Even the most hardy field worker would find it challenging not to get lost 30 miles into the bush on North Andros.

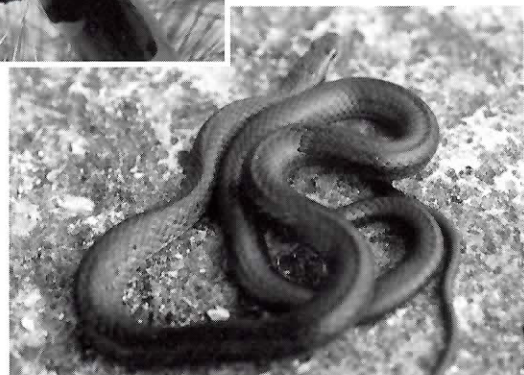
North Andros has had substantial construction in the last nine years but has still maintained its laid back and isolated atmosphere. We left Forfar early in the morning on September 14, proceeding west then south on the main logging road in the center of North Andros. We traveled directly to the areas where I had spotted a number of iguanas in 1991. The edges of the roads had become substantially overgrown in the intervening years. Australian pine, *Casuarina equisetifolia* had also become more common. A number of white crown pigeons and bobwhite quail were observed.

On 16 June 1991, we spotted and caught our first Andros Island iguana at 845 hours, while it was basking on the road. By 1400 hours we had spotted four *Cyclura* and six hogs. On two day-long surveys in August 1991 we had spotted six *Cyclura* and five hogs and four *Cyclura* and six hogs respectively. All the iguanas were 3.1 ft (1 m) or less in total length (Ehrig, unpublished data). Six of the *Cyclura* sightings occurred while I was walking in areas that we considered likely to harbor iguanas. Most sightings occurred before noon. All animals were young (less than 20 years). Four iguanas were under ten years of age. It is hard to draw any conclusions from such small data, but we did know *Cyclura* were breeding and that hogs were a large factor in the iguana population

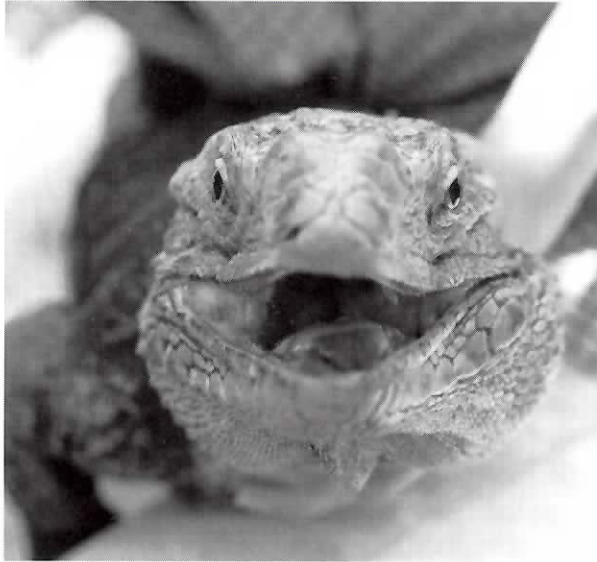
Below: A pair of Black-billed tree ducks, along with their offspring inhabiting a swampy area on one of our survey roads. Right: A Great Lizard Cuckoo, *Saurothera merlini*, displays to another cuckoo. This bird has spectacular displays. As its name implies, this species may feed on hatchling iguanas. Photographs: Joe Wasilewski



Below: A species of racer, *Alsophis vudii*, one of the more commonly seen snakes on Andros Island. Also found on the island are species of island boas from the genus *Tropodophis* and *Epicrates*. Photograph: Joe Wasilewski



dynamic. Most hogs were spotted near areas with iguanas, but several hogs were observed more than 15 miles from any iguana sightings.



Andros iguana, *Cyclura cyclura cyclura*, May 2000. Middle Bight. Photograph: John Bendon

Feral hogs are known predators of young iguanas and their nests. On Andros, *Cyclura cyclura* are known to lay eggs in termite mounds, although they will undoubtedly nest in a more traditional manner when conditions permit. Hunters are present on North Andros and are apparently becoming more numerous. Most hunting appears directed toward hogs. Ducks and pigeons are also hunted. Iguana hunting is illegal, but there is no enforcement. It is more rare these days, primarily because the iguanas are becoming very rare. Every local inhabitant both now and in 1991 made mention of the fact that iguanas are not as common as they were in the past.

On our September 2000 survey, we encountered hunters deep in the interior of Andros. There were two hunters in a truck, one driving and one standing in the bed. The shooter was well armed with a modern looking 12-gauge shotgun. They were friendly to us but they had no idea what we were doing so far out in the bush. When I asked them if they were hunting hogs, they replied, "yes." They seemed too well armed for iguana hunting but I regretted later that I had not ques-



Young male Andros Island Rock Iguana, *Cyclura cyclura cyclura*, North Andros. Photograph from I.T. Vol. 1, No. 3: Timothy G. Haack.

tioned them further. They were recreational hunters and did not appear dependent on making a kill to eat. On this 8½ hour survey we saw no iguanas at all. We were disappointed. We had seen four hogs, slightly fewer than the 1991 surveys but still enough to indicate an ample population was present. Was it just a bad day or were there fewer iguanas than nine years earlier? Only additional surveys will answer the question for sure.



Above: The bromeliad, *Catopsis* sp. uses a *Bucidia spenosa* bush as an anchor. There is an abundance of beautiful bromeliads, along with orchids throughout Andros Island. Photograph: Joe Wasilewski

The Blanket Sound Iguana

In 1991, three different local residents told us the story of a very large iguana that would periodically be sighted at the edge of the Queen's Highway at the turnoff for the settlement of Blanket Sound. This very large male would stand near the road displaying and standing his ground. If approached too closely he would retreat into the thick coppice on the ridge behind him. If not confronted he would sit as long as twenty five minutes before walking back into his forest. This male is apparently still occupying the same habitat nine years later. We once again heard the story of the same iguana from a different trio of local residents. An employee of the Andros Town Airport related seeing this giant while with his young daughter and seemed very pleased with his encounter. We were happy to hear that this iguana is apparently still alive and well.

At Forfar Field Station a dog killed a yearling iguana in August 2000. The specimen is preserved in the library. We talked to employees of the station who had periodically seen young animals right on the station grounds. We also spoke with a local resident in Stafford Creek who had seen an adult animal two miles up the creek about two months earlier. We surveyed up the creek on our last morning for about an hour. As Joe lay in the boat (a victim of jungle fever of the previous evening), I saw some beautiful *Cyclura* habitat on the high



Andros iguana, *Cyclura cyclura cyclura*. Photograph: John Bendon



Andros iguana, *Cyclura cyclura cyclura*, May 2000. Middle Bight. Photograph: John Bendon

banks but unfortunately no animals. Students sometimes see iguanas about six miles up the creek.

The residents of North Andros are enthusiastically embracing an economy of sport fishing and ecotourism. All seem genuinely proud of their island and the Andros iguana. The iguana is not easy to hunt since it is now rare. No one is dependent on iguana hunting. Everyone seems to accept the fact that hunting is one of the main reasons that the iguana is likely to disappear. Many young people have never eaten iguana and have no desire to start. The impact of the population of feral hogs on the iguanas is not known but it is presumed to be substantial. Hunting is known to be very detrimental to the iguana populations. Feral dogs and cats are present but do not seem to be numerous. Feral dogs would presumably have short life spans due to the legendary mosquito populations of Andros and their transmission of heartworm. Some residents are aware of the potential tourism benefits of populations of Andros iguanas. Most people seem to accept the idea of protecting the iguanas. Even the iguana hunters with whom I have spoken have admitted they would not hunt if it was illegal and they knew that the law would be enforced. The people of North Andros are also unique in that they have approached the Government of the Bahamas asking that large



Andros iguana, *Cyclura cyclura cyclura*. Middle Bight. Photograph: John Bendon

areas of North Andros be preserved in a National Park. The time is ripe for the Bahamas to begin to enforce the existing laws and to protect the Andros rock iguana. Sport hunting is increasing on Andros. If hunters are not informed that hunting iguana is illegal and that hunters will be prosecuted if they break the law, the *Cyclura* of Andros will become so rare that most residents will not see one again.

In 1991, the most alarming observation I made was the presence of the Brazilian pepper tree, *Schinus terebinthifolia* on North Andros. This non-native, very fast-growing tree is the worst ecological invader in the state of Florida. Nine years ago, a small population was observed at the San Andros Airport. This population has expanded tremendously and now poses a serious threat to the habitats of Andros. Two other very invasive exotic plants are present on North Andros, Australian pine (*Casuarina equisetifolia* and *Melaleuca* sp.). Without a control program for these species, they will spread and cause tremendous damage to the Bahamas last great wilderness.



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Care of Iguana Eggs

Carl and Janet Fuhri
Bonita Springs, FL

This iguana breeding season we have had numerous inquiries as to the proper care of iguana eggs. It would seem that many more people are trying to successfully hatch their iguana eggs and meeting with mixed success. The information in this article has been compiled from our twelve years of practical experience in breeding, *Iguana iguana*, *Cyclura cornuta* and *Cyclura nubila nubila*.

The first and most crucial step in producing live hatchlings is to make sure that you produce good fertile eggs. This obviously means that you must have a male and female of a particular species. The adult animals must be in top physical condition. They will have been on a nutrient rich vegetarian diet. They will have either been exposed to 3 to 6 hours of natural sunlight daily or 12 hours of artificial UV A & B. They will have had access to a good calcium supplement for at least three or four months prior to egg production. Since green

iguanas generally start their breeding activities in December, calcium supplements should start in September. Adult males need less calcium than the females. Caribbean rock iguanas usually start their breeding activities in March through May depending on species, so it makes sense to supplement with calcium from December to March. At that time, your adults should become more colorful, look robust, have nice fat tails and be reasonably active during their normal feeding times. If they do not show these traits your chances of getting eggs with good potential will be greatly diminished.

Once your female has been successfully bred, she will lay her eggs in roughly 45–60 days. As the time to lay approaches you should notice several things. A couple of weeks before laying she will probably refuse even her favorite foods and you should observe a decrease in the girth of her tail and pelvis as she lives off her stored fat. There is literally no room in her body for digestive contents



Hatching green iguana newly pipped through. Photograph: Carl Fuhri

to pass through due to the volume of the egg mass in her abdomen. It is critical, however, to provide fresh drinking water during this period. Several days before she actually lays her eggs, she will become very restless and pace the bottom of her cage or enclosure. She is looking for a nest site that is acceptable to her. You must provide a site for her, or you will stand a good chance of losing the eggs and possibly the female. Some females will retain their eggs to the point of becoming egg-bound if they cannot find an acceptable site. If she does lay her eggs without a proper nest site and you don't find the eggs immediately, some of the eggs may be lost.

A nest site attractive to a female iguana would be a box full of damp soil or sand. Personally, we prefer to provide our females with clean washed sand. The material should be damp to the touch but not soaking wet. If possible, provide the medium in a plastic container with easy access for the animal. We sometimes place a new mother in the container several times. It is desirable to have the container in the cage several weeks before egg laying so that the female is familiar with it. To mimic a natural entrance to the box or tub, place

the end of a piece of pipe that is about three feet long and wide enough for the gravid female to pass through, into the side of the box. In the wild, these animals would normally dig a burrow a couple of feet to several yards long depending on the geographical make up of the territory. Make sure you have access to the nest chamber through a lid so you do not have to move the nest box to get to the eggs. Once she lays her eggs and back fills the opening, she will look thin and will be extremely thirsty. To help her through the physical stress of the occasion, provide her with a large dish of clean water and an assortment of fresh vegetables. You will also want to supplement her food with calcium for a month or two.

You should prepare enough containers ahead of time to hold the possible number of expected eggs. We use clear plastic airtight containers that are deep enough to hold about 1½ inches of perlite and 1½ inches of free air space. Over the years we have used both vermiculite and perlite for incubating the eggs. We now use perlite exclusively for two reasons. One of the most bothersome things you will deal with is fungus on the eggs. Perlite will hold the moisture needed for proper egg



Nest box in Rhino pen as described above. *Photograph: Carl Fuhri*

Right: Green iguana after laying 59 eggs. Note normal emaciation.
Below: Home made incubator. Heating element by Hovabator, Fan from old computer.
Photographs: Carl Fuhri



growth without keeping the moisture in direct contact with the egg, therefore eliminating much of the problem. Secondly, when the eggs hatch and the young animals emerge they are naturally damp. Vermiculite sticks to the babies and covers them for days. Perlite does not bind to the skin, leaving cleaner resting hatchlings.

Preparation of the containers consists of thoroughly cleaning and disinfecting the containers with a mixture of 25% bleach to 75% water. In the past we have placed the perlite in baking pans and heated it in our oven at 200+ degrees for an hour.

We have also used the perlite right out of the bag with equally successful results. We then prepare the medium by mixing it with water. Some people like distilled water; we have a well and use the water straight from the tap. If you are using chlorinated or treated water let it stand for at least 24 hours in a separate container. Most articles suggest a mixture of medium and water at 50/50 by weight. Some breeders advocate even a little more water than 50%. Personally we have found that we eliminated most fungus problems by mixing light on the water, closer to 45% water and 55% medium. Some breeders have had success with even less water. If you use less, keep an eye on the eggs to make sure they are growing properly. Within a few days of being placed in the container, they should have absorbed enough water to completely fill the egg which should feel firm to the touch. The combination of a little less water and the perlite keep the egg's surface dry but the atmosphere within the container moist so that the eggs can expand normally.

As soon as you have noticed that the female has laid her eggs, it is time to remove them from the nesting site. The female will probably be standing by the box protecting it. Gently push her aside and carefully begin to dig through the moist sand. You will most likely find the eggs in one of the two bottom corners farthest from the entrance of the box. Once you have found the eggs, carefully pick them up one at a time without turning them. If you have been watchful and gotten to the eggs



Left and below:
Newly hatching baby
iguana. Note some perlite
adhering to skin.

Photographs: Carl Fuhri

within a few hours of them being laid, they should separate easily. Place them into your incubation container. Make a depression for each egg in the medium, so that the egg will not roll around when you handle the container in the coming months. Do not bury the egg completely. Try to get it about half way into the



medium. When you place it into the container, make sure the egg does not touch its neighbors and that there is room for expansion. Occasionally you will find two or more eggs that stick together. Pulling them apart could damage the surface of one or both eggs. We recommend that you place these eggs into the medium together, and then keep an eye on them over the incubation period. Chances are both will develop normally. If a problem does arise and you lose one of the eggs, you can carefully separate the bad one from the good one even if you have to use a pair of scissors to cut the bad egg off. This is one of the times when you can see nature at its finest, the qualities of the egg shell protecting the embryo from harm.

The incubation period for iguana eggs varies quite a bit based on temperature. The warmer the

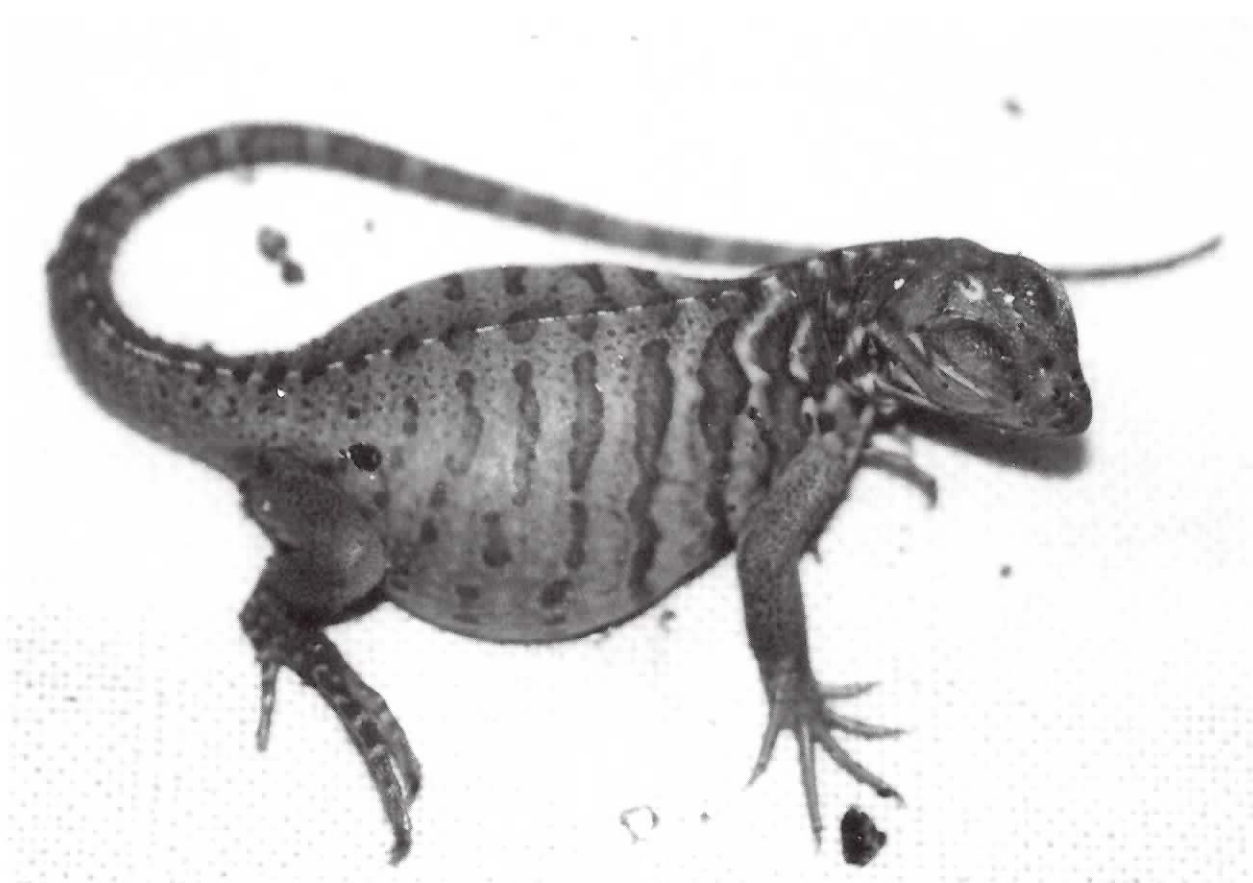
eggs are, within the safe range of 82-89 °F, the shorter the incubation period. During this period we have experimented with opening the containers occasionally to allow for a change of air. As new breeders, we had heard that the containers should be opened once a week during the process and then every three days for the last couple of weeks. Other breeders have told me that they open their containers daily and then twice a day in the last few weeks. As long as you are careful not to jostle the eggs or leave the containers open too long, there should not be a problem. My only caution is that if the containers are opened too long and too often, you will change the moisture content of the medium and not know how much new water to add without causing fungus problems. If fungus is observed we immediately apply Lotrimin foot

powder to the surface of the egg with a cotton swab. If the problem persists we remove the egg from the container and discard it. It is far better to lose one egg, than to lose a clutch trying to save one egg. On rare occasions we have had eggs begin to decay quickly and the container, even though sealed, fill with little gnat-like flies and then tiny maggots. If this happens, immediately prepare a new container. Remove all of the good eggs, checking to be sure that they are visibly clean and unbroken, with no tiny holes. Place them in the new container.

We have been asked if we take any particular precautions in handling the eggs. We do make sure our hands are clean but we do not wear rubber gloves. Approximately two weeks before the eggs are due to hatch, you will notice that condensation begins to form on the sides of the container and on the underside of the lid. The shell has made a transformation allowing this one way passage of moisture. If the egg retained all of the liquid until hatching, the possibility of the embryo drowning in the liquid would be greatly increased. At the

same time, the eggs, which over the incubation period have increased in size by approximately 50%, will begin to collapse. This is normal and to be expected. The embryos, which until this point have been completely suspended in liquid, are getting ready to hatch.

To hatch, the baby cuts several slits in the top of the egg and partially sticks its head through the slit to begin breathing air. Once the baby has cut the egg and gotten its head out, it will stay that way for 24 to 48 hours. During this time the young iguana is absorbing the yolk sack which until this point has been on the outside of the abdomen. This is a critical time for the babies. If they are overly disturbed they will try to get out of their egg prior to absorbing all of the yolk. They will reflexively start running around in the container. Depending on the stage of absorption of the yolk, this can be life threatening. Under normal conditions once the baby has absorbed the egg sack it will appear quite fat, and with young *Cyclura*, so fat that they have difficulty walking. If the yolk sack detaches in the late stages of absorp-



Newly hatched Rhino, abdomen distended with yolk. Photograph: Janet Fuhri

*Right: Clutch of day-old Rhinos.
Photograph: Janet Fuhri*

*Below: Hatching Rhino. Note umbilical
scar on ventral side of iguana.
Photograph: Carl Fuhri*




tion it is not too critical. However, when this happens before the baby can absorb most of the yolk it will lack its first food source and may not survive, or will surely be behind in its development.

One of the things we have found over the years is that reptiles have amazing recuperative capabilities and good immunity to infection. We do not worry about the babies getting infections from laying through hatching. Occasional handling of the egg does not create a problem providing we and the environment are clean. This is another reason we choose perlite over vermiculite. We do not know that a baby would be in any more danger dragging its yolk sack around on vermiculite as opposed to on perlite, but the sack can

become quite encumbered by adhering vermiculite.

The sex of the babies is determined by the temperature during incubation. We are not scientists and have not researched temperature controlled sex determination. We do observe however, that the cooler the temperature, the greater the ratio of males to females. At Dragon's Glade the incubator is set at 86 °F. At that temperature we get roughly an equal number of males and females. The incubation period for iguanas at that temperature is constant at between 86 and 92 days. We give a range of days because it naturally takes 3 to 4 days for all of the eggs to hatch.

The hatching process is quite exciting to observe. This is one of the reasons we use the clear plastic containers. You can see what is going on without disturbing the hatchlings. During this process we do open the lid slightly, everyday, for a few seconds to allow fresh air into the container. Again this must be done with caution and if it appears that it causes too much activity by first-to-hatch babies, try doing it in a low light situation. Remember that in the wild, the eggs would be buried. The air space left by the female when sealing the nest would be quite small and it would take the young lizards several days to dig out.

We hope that this article will help those of you who are just starting out or those that may have had problems in the past. The best teacher is experience, we hope you benefit from ours and enjoy your own. We wish you luck and success born of good common sense. 

Ctenosaurs of West Hartford

AJ Gutman
West Hartford, CT

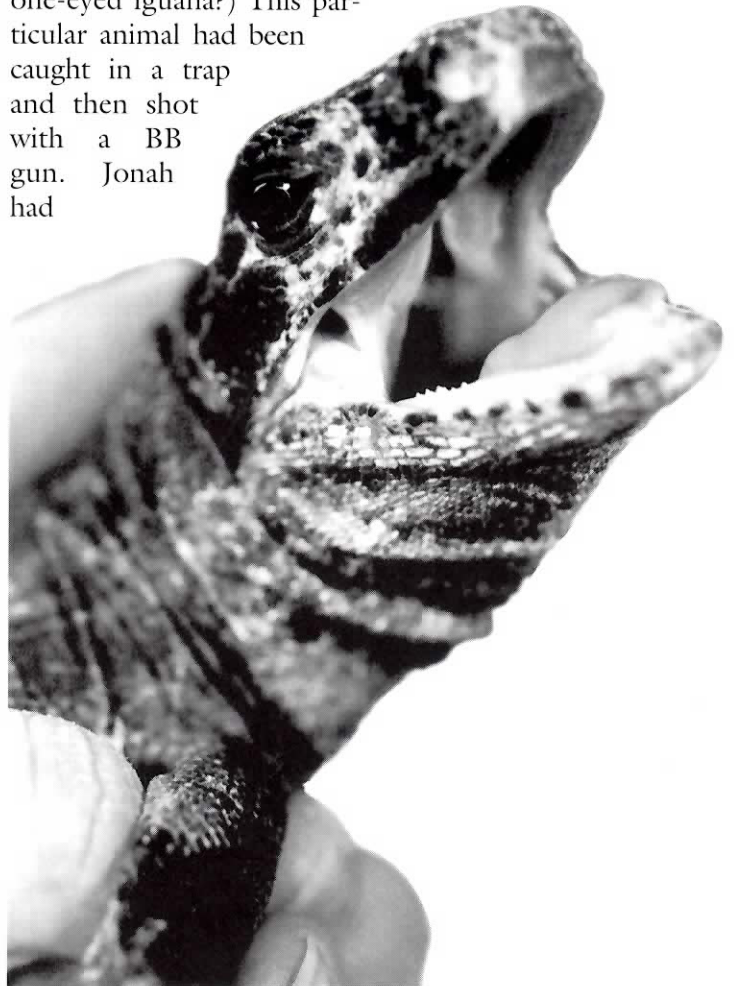
The past two issues of the *Iguana Times* have contained items in the Newsbriefs column about the spiny-tailed iguanas, *Ctenosaura pectinata*, on Gasparilla Island off the west coast of Florida. Apparently as many as 2,000 *pectinata* live on the island, descended from pet animals released 20 or 30 years ago. They have come to be regarded as pests by the locals, who prefer to preserve their ornamental shrubs, and have resorted to exterminating the iguanas using a variety of inhumane methods. I had heard about a young man named Jonah Coppick who was rescuing *Ctenosaurs* on Gasparilla and relocating them to private homes. I managed to contact Jonah, but had to wait out the winter while the *Ctenosaurs* apparently hibernated in burrows with the gopher tortoises. I was determined, however, to work with this species and see just how adaptable they might be to captivity in the Northeast.

My previous experience with spiny-tailed iguanas had been with *Ctenosaura similis*, a species more commonly available in the pet trade in North America, although the *pectinata* are more common in Europe. My first *similis* was a spunky female named Spinoza, who was famous for Houdini-like escapes from her enclosure. On one memorable occasion, she had slipped under the kitchen stove and gotten herself stuck half-in, half-out, of a small opening on the underside of that appliance. The appliance repair people just couldn't get enough of the 911 pet rescue jokes. With all the laughs I provided them I think they could have charged me just a bit less than \$180 to disassemble the stove so that I could retrieve my lost lizard. Spinoza lived for 3 years, always feisty and always willing to draw blood at any opportunity, but she was also a picky eater, refusing any greens and eating only crickets.

During the I.I.S. conference in Belize, many of us had the privilege of seeing the *similis* in its home territory. They are wily, wary animals, always on the lookout for an escape route. While the green iguanas are eaten in Belize, the *Ctenosaurs* are not. This may be in part due to superstition, but I imagine it also has something to do with the fact that they can be quite fierce and they are just not as easy to catch! Nevertheless, after returning

from Belize, I happily adopted another *Ctenosaura similis*. Ctolemy is a male spiny tail who came to me in good health and with a good appetite, consuming crickets, superworms, and waxworms as well as all types of greens. He is a handsome animal who has grown well and, although he is much less skittish than when I first adopted him, I would still describe him as extremely wary, always ready to bolt or bite at any opportunity.

In the summer of 2000, I finally received a call from Jonah. He had four *pectinata* for me — including one particular female who he knew I would want because she only had one eye. (How is it that people can tell that I'm the sort who would want a one-eyed iguana?) This particular animal had been caught in a trap and then shot with a BB gun. Jonah had



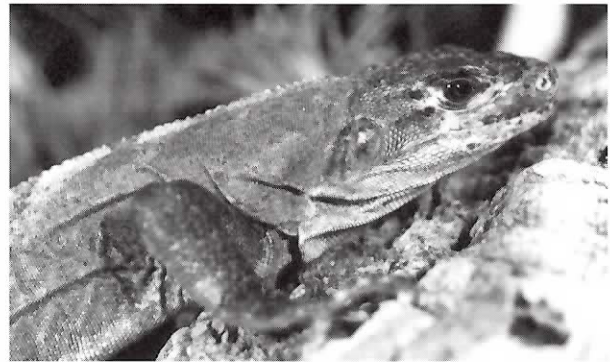
Toricelli, one of four rescued *Ctenosaura pectinata*, displays her rostral abrasion and good eye. Photograph: Robert Cerda



Ctolemy, a healthy male *Ctenosaura similis*, displaying striking coloration and impressive dorsal spines. Photograph: Robert Cerda

taken her to his veterinarian, nursed her through a course of antibiotics and now she was ready for a home. Well, maybe not. She managed to escape from her enclosure shortly after I first heard about her, and then would reappear in Jonah's yard from time to time over the course of the summer. Finally, in the fall, she just showed up back in the enclosure from which she had originally escaped and Jonah quickly packed her up along with four others and mailed them to me overnight.


Given my previous experience, I was astonished to find these animals to be much easier to handle than the *similis*. I had received three females and one male who were all between 250-300 g in weight and 48-66 cm in length, plus one near-hatchling who had already lost and regrown his tail. The smallest animal was the healthiest. He was a hearty eater and must have at least doubled his bulk, if not his length, in the four weeks before he disappeared from his "foolproof" enclosure. I can only hope that he has found the equivalent of a tortoise burrow somewhere in my house. The others had a variety of health problems including mites, rostral abrasions, damaged digits and, I assumed, intestinal parasites. They were all routinely treated with Fenbendazole for the parasites and three of the four were given antibiotics for what appeared to be systemic infection, as they had multiple lesions. Jonah had suggested that I feed them canned monitor food at first, but I found that they would only eat this when force-fed. None of the animals, other than the hatchling, seemed interested in insects either, but all have adapted to the



Gabriella, a female *Ctenosaura pectinata*, has a low, spiked dorsal ridge and peach colored highlights on her back and underbelly. Photograph: Robert Cerda

same diet of fresh greens and vegetables that I use for my green iguanas and *Cyclura*.

At this point, several months later, two of the four remaining *Ctenosaurs* are thriving. The male, Galois, and the female, Gabriella, are quite plump and always bask together. Toricelli, my one-eyed female, continues to have problems with infection in her extremities and she remains extremely shy about basking with the others. I had originally placed her by herself thinking that she would be less able to compete for food due to her disability. She has, however, gained weight and become more active since joining the group, spending most of her time with Maxine. Maxine is the longest of the animals, but she was extremely thin when she arrived and had lesions over much of her body, which is probably why she has been so slow to gain weight. All of them are now shedding which is usually a sign of recovering health.

The *pectinata* are not as dramatically colored as the *similis*, but are nevertheless quite attractive with varying patterns of brown and peach-colored details. Temperamentally, although skittish, they seem more adaptable than the *similis* and much less ill-tempered. On the whole, though, I can't recommend them to the general hobbyist. No wild-caught animal is going to have an easy time adapting to captivity and these animals are easily traumatized due to their high-strung nature. They also find the constant handling for administration of oral and injectable medication quite stressful. Under the circumstances, I think that the difficulty of adapting them to captivity can only be viewed as acceptable to them given the alternative with which they are faced. 

Special thanks to Mary Ann Huntington, whose generous donation helped pay for veterinary care for the CT *Ctenosaurs* and many others.

In Caribbean, Endangered Iguanas Get Their Day

by Mark Derr

(Reprinted from *The New York Times*, 10/10/00, section F, page 5)

While hunting hogs deep in the rugged Hellshire Hills of Jamaica one day in June 1990, Edwin Duffus rescued a large lizard from his dogs and carried it four hours by foot and bicycle to his home and ultimately to Kingston's Hope Zoo.

There, Dr. Peter Vogel, a herpetologist at the University of the West Indies, and Rhema Kerr, a zoo curator, identified the lizard as a Jamaican iguana, believed extinct for nearly 50 years.

The rediscovery inspired an intensive effort to save both the Jamaican iguana and the dry tropical forest of the Hellshire Hills that is its last redoubt. After several exhaustive surveys, Dr. Vogel has estimated the iguana population at fewer than 100.

"The Hellshire Hills has the most significant natural dry forest left in the Caribbean," Dr. Vogel said. "Preserving it is key to the Jamaican iguana's survival and to maintaining the area's biodiversity."

The Jamaican iguana's return from oblivion also focused international attention on the plight of all West Indian iguanas, said Dr. Allison C. Alberts, head of ecology at the San Diego Zoo. In 1997, the World Conservation Union declared these iguanas of the Caribbean islands "the most endangered lizards in the world" and organized a group of scientists devoted to their preservation.

Dr. Alberts is co-chairman of that group and the editor of a report issued by the World Conservation Union in August that summarizes what is known about the genetics, evolution and ecology of West Indian iguanas, the threats to their survival and programs to preserve them. The two most imperiled, she said, are the Anegada iguana, found only on the island for which it is named in the British Virgin Islands, and the Jamaican iguana. The Anegada iguana was once common on Puerto Rico and throughout the Virgin Islands.

Genetic analyses to be published in *The Journal of Molecular Phylogenetics and Evolution* show that the Anegada iguana is the oldest member of the genus *Cyclura*, dating back 15 million to 35 million years. The research was conducted by Catherine Malone, a doctoral candidate in genetics at Texas A&M University.

As the Caribbean archipelago took its present shape, wind and ocean currents occasionally carried iguanas to more western islands, where, isolated, they evolved into 8 species and 16 subspecies.

Every major island has its own species of *Cyclura* iguana, and Hispaniola has two. (Two species of iguana found on islands of the Lesser Antilles are from a different genus.)

Next to the Anegada iguana, Ms. Malone found the Jamaican iguana to be the most genetically distinctive and biologically important species of the group. But inbreeding necessitated by its small numbers has forced the Jamaican iguana into a genetic bottleneck, making it susceptible to dangerous mutations, parasites and disease.

Before European colonization, West Indian iguanas were the largest terrestrial herbivores on their islands, where they dwelled in dry forests and thorny scrub. The lizards can live 40 years, and some, like the Jamaican and Cuban iguanas, can reach five feet in length and weigh around 17 pounds. The iguanas played an important role in island ecology, Dr. Alberts said. According to the recent research, seeds passing through the iguanas' digestive tracts and then dispersed germinate faster and grow better than others.

The iguanas' only natural predators were raptors and snakes. They also served as an important food for the Indians, and are still eaten on some islands. But Europeans and their animals have greatly altered the ecology of the Caribbean archi-



pelago. Goats strip bare the vegetation on which iguanas feed; pigs and cattle disturb nests; cats, rats and Indian mongooses feast on hatchlings and eggs; and dogs kill mature animals.

More recently, resorts and housing developments on some Caribbean islands have reduced iguana habitats to almost nothing and forced scientists to move animals to safe havens on small, unpopulated islands. But sometimes there is little to eat and no place for an iguana to hide.

“There has been an 80 percent decline in the population of the Anegada iguana since the 1960’s, due mostly to feral cats,” Dr. Alberts said. In 1997, with fewer than 200 Anegada iguanas thought to exist and none reaching maturity, biologists began collecting hatchlings and raising them in a special site for release when they are too large for cats to attack. But the key to their preservation, experts agree, is removal of the feral cats.

The situation in Jamaica is more complex, Dr. Vogel said. Once so abundant in southeastern Jamaica that the coastal area around Kingston was named the Liguanea Plain, the native word for the lizards, the iguana population crashed after the human population doubled in the second half of the 19th century and the Indian mongoose was introduced in 1872. Imported to kill nocturnal rats devastating sugar cane fields, the mongooses feasted instead on bird, snake and reptile eggs and hatchlings.

In developed areas, cats and dogs contributed to the slaughter. By the end of the 1940’s, the Jamaican iguana was generally considered extinct.

The conservation effort begun in Jamaica in 1990 has concentrated on protecting the last two nesting sites in the south-central Hellshire Hills and collecting half the hatchlings and raising them at the Hope Zoo, which now holds 100 juveniles. After three to four years, when they are too large to be mongoose prey, some of these iguanas are released. Others are kept as a genetic reservoir.

Since 1996, biologists have released 26 iguanas, each equipped with a miniature radio

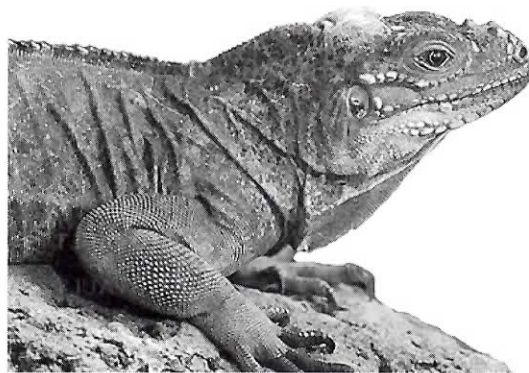
transmitter for monitoring their movements. For the first several years, the abrasive limestone of the Hellshire Hills quickly destroyed the special vests holding those transmitters. So last year, after being approached by researchers, the Nike company provided vests custom-made of abrasive-resistant fabric, said Richard Hudson, a conservation biologist for the Fort Worth Zoo, who works extensively in the Caribbean.

All the released iguanas have survived, leading Mr. Hudson and other biologists to conclude that the lizards are “hard-wired” for life in the wild.

Last year, Dr. Vogel said, a released female nested for the first time. But a captive breeding program under way at the Hope Zoo and six American zoos has failed to produce any offspring, for still unknown reasons.

Since 1997, field workers have trapped and killed mongooses in iguana territory. They also try to persuade dog owners — usually pig hunters and people who gather hardwood for charcoal — to keep their pets out of the area. But, Dr. Vogel cautioned, each year the charcoal makers push deeper into the Hellshire Hills in search of mature trees, driving the pig hunters before them. Without greater protection, he fears that dogs and people may overrun the iguanas’ range.

Last fall, the government of Jamaica established the Portland Bight Protected Area, including the Hellshire Hills, but the preserve is not yet being managed and there are plans to build roads and houses and to mine limestone in the forest’s interior, Dr. Vogel said. Until those plans are dropped, conservationists fear for the iguana and a number of other



species that live only in the Hellshire Hills. While recognizing that the Jamaican iguana and several of its cousins still teeter on the brink of extinction, biologists seeking to rescue the endangered animals remain optimistic that they will succeed, in large part because of increasing public awareness in the Caribbean and abroad.

IGUANA NEWSBRIEFS

USFWS News Release

Thomas E. Scott, United States Attorney for the Southern District of Florida, Lois J. Schiffer, Assistant Attorney General for the Environment and Natural Resources Division of the U.S. Department of Justice, Jorge Picon, Resident Agent in Charge for the U.S. Fish & Wildlife Service in Miami and Frank Figueroa, Special Agent in Charge of the United States Customs Service in Miami, announced that Phillip David Langston, 47, of Naples, Florida pled guilty today to conspiring to violate U.S. and international wildlife protection laws and U.S. Customs laws. Langston entered his plea of guilty to the lead count of an indictment handed-up by a grand jury in Miami on December 21, 1999, charging him with trafficking during the period of November 1994 through July, 1995, in reptile species that originated in Haiti and the Peruvian Amazon and that are protected under an international treaty known as "CITES", the Convention on International Trade in Endangered Species of Fauna and Flora, which is implemented in the United States through the Endangered Species Act. Sentencing is scheduled for May 26 before United States District Court Judge Norman C. Roettger. The conspiracy charge, a felony, is punishable by up to 5 years in jail and up to a \$250,000 fine.

In entering his plea of guilty, Langston admitted to conspiring to smuggle and selling a large variety of reptile species protected under CITES and/or foreign law in the Southern District of Florida,

including caiman lizards, dwarf caimans, frog-headed turtles, galliwasp, giant tree frogs, Gibba turtles, green anacondas, Haitian boas, Haitian dwarf boas, Haitian vine boas, mata mata turtles, red-tailed boas, rhinoceros iguanas, twistneck turtles, white-lipped mud turtles and yellow-footed tortoises. Langston specifically acknowledged selling approximately 60 rhinoceros iguanas, native to Haiti (as well as the Dominican Republic), which is a species currently threatened with extinction, and listed on Appendix I of CITES, the highest level of protection available under the treaty. Many of the other species he trafficked in including the anacondas, boas, caiman lizards, dwarf caimans and yellow-footed tortoises are protected under Appendix II of CITES out of concern that unless trade in this species is strictly regulated they too could come under threat of extinction. The government and the defendant have agreed that the retail market value of the reptiles listed in the conspiracy charge was at least \$120,000.

Langston further admitted to the Court that as part of his scheme to smuggle reptiles into the United States he established a "breeding farm" in Peru for the purpose of making it appear that wild-caught Amazon specimens, protected under U.S. law and Peruvian law, were instead captive-bred.

Under the terms of his plea, Langston, in addition to any imprisonment and fine imposed by the court, must surrender his U.S. Fish and Wildlife import-export license. Langston also surrendered to the U.S. Fish and Wildlife Service five Cuban rock iguanas, *Cyclura nubila*

nubila, a CITES Appendix I species, which were transported in violation of the laws of Puerto Rico.

Mr. Scott commended the work of Special Agents Chip Bepler of the United States Fish and Wildlife Service and George White of the U.S. Customs Service for their work on the case.

The United States was represented in this matter by Thomas Watts-FitzGerald, Chief of the Environmental Crimes Section at the U.S. Attorney's Office and Peter J. Murtha, Senior Trial Attorney, United States Department of Justice, Wildlife & Marine Resources Section.

Peter Murtha, United States Attorney, U.S. Department of Justice, Southern District of Florida

Turks and Caicos Iguana *Cyclura carinata* *carinata*

The big Ambergris Cay iguana relocation project being conducted by the department of the Environment and Coastal Resources, TCI, The Conservation Agency, and the Denver Zoo continues to progress well in its second year. The iguanas on Big Ambergris Cay are currently being displaced by an expansive development project there. The island is populated by an estimated 15,000 *Cyclura c. carinata*. The developer's planned build-out leaves only small areas of the cay undeveloped and it is his desire and that of the DECR that as many of the iguanas as possible be moved before they are killed.

Because the iguana is fecund, it was assumed that all islands currently supporting iguana popula-

tions would be at carrying capacity under the existing environmental conditions on each. Most islands without iguanas were either extremely small or supported populations of feral cats or grazing ungulates (goats, cattle, donkeys, etc.).

Long Cay, Caicos Bank, part of the Admiral Cockburn Nature Reserve, stood out as the best candidate for a relocation site. It is large (111 ha), and could support a large iguana population. The drawback was the population of feral cats, which had presumably extirpated an earlier population of *C. c. carinata*.

An extensive cat-poisoning program was undertaken in July 1999. In three days of surveys of the island in Nov. 1999, no evidence of cats was seen.

In mid-November 1999, the first iguanas, a test group of 25 was taken from Big Ambergris Cay to Long Cay. Survivorship of this small group, which included age classes susceptible to cat predation (75g), would provide a test for the presence/absence of cats. If this translocation was successful, future groups would be larger (200 individuals) and would consist primarily of larger animals (500-1200g).

Between November 1999 and January 2000, during our field sessions and weekly radiotracking, no cat tracks were seen on Long Cay and survivorship of radiotracked iguanas was 100%. On 23 January, however, tracks were found from a cat that had apparently been released on Long Cay by its owner from South Caicos. The cat was trapped and removed from Long Cay.

This event reinforced the

IGUANA NEWSBRIEFS (cont.)

necessity of increasingly involving the community of South Caicos and reaching everyone with the message that unwanted animals were not to be dropped off on uninhabited cays – particularly Long Cay. The education campaign includes signs on all Long Cay beaches, informational TV announcements and a school-based “meet-the-iguana” program operated by local naturalists.

During January and February 2000, radio collared iguanas in the test group of 25 animals were recaptured and radio collars were removed. All appeared healthy and each one had established one or more burrow sites.

208 iguanas were captured and moved from Big Ambergris to Long Cay during the January-February field session. An attempt was made to collect as many females as possible because the first group of 25 animals appeared to be male-biased (16:9). Animals with supposed female characteristics (low crests, small femoral pores and no visible hemipenile bulge) were collected, but many of these proved to be female when probed.

In order to monitor the animals on Long Cay, relocated iguanas are permanently marked with passive integrated transponders. The sex of all iguanas is confirmed by probe, animals are weighed, snout to vent length is recorded, and distinguishing features (e.g., regenerated tails, pigmentation, dorsal spine anomalies) are noted. Ten individuals in each relocated group are fitted with radio collars and are monitored weekly until the next translocation.

As of February 2000, a population of 233 *Cyclura c. carinata* had been

restored to Long Cay. The project will continue for the next 2-3 years with relocations scheduled every 2-3 months. The plan is to relocate 800-1,200 animals per year, 2,400-3,600 in total.

Numi Mitchell & Glenn Mitchell
The Conservation Agency

Michelle Fulford & Wesley Clerveaux
Department of Environment and Coastal Resources, TCI

Rick Haeffner
Denver Zoo

New Census of Allen's Cay Iguana

John Iverson and 11 Earlham College students recensused the Allen's Cay iguana populations during March 19-24, 2000 and captured 423 iguanas, 299 of which had been previously marked, some as much as 20 years earlier. It is clear that these lizards frequently live beyond 30 years in the field, but it may take another 20 years work to calculate longevity more precisely. This summer's (2001) field work will focus on the nesting biology of these animals.

John Iverson
Earlham College

Necker Island Update

In October 1995, four hatchling Anegada iguanas (2.2) were relocated from Guana Island to Necker Island, British Virgin Islands. The animals were cage-reared until October 1996, when one escaped and the other three were released. All four survived and established territories where they could be regularly found and observed. On May 1, 1999, the larger of the two females, the previous escapee, was caught and released, appearing heavily gravid. On October 1,

1999, a hatchling iguana was seen and young iguanas have been spotted frequently since that time. All four original founders, now adults, are also regularly seen.

James Lazell
The Conservation Agency

Lesser Antilles Iguanas

The *Iguana iguana* population of Fort-de-France lives in Fort Saint-Louis, a military and naval base. This is a non-native population released or escaped from a small zoo in the 1960's. A population estimate in April 1991 counted about 500 adults and subadults. By the summer of 1999, no more than 50-60 iguanas were found. The population decline seems due to several causes. Dogs have been seen eating adult iguanas and cats eating hatchlings. Several trees used for basking, hiding and feeding had been removed along with the rubbish pile where the iguanas were known to feed. Numerous construction projects were in progress and one of the most important nesting sites in a sunny and well-drained area was now covered with grass. Where previously this population had been expanding beyond this area, they now pose less of a threat through hybridization and competition with the indigenous *Iguana delicatissima* of Martinique. The *Iguana delicatissima* population of Chancel is doing well. At the nesting sites, some clutches were excavated by other females and the eggs destroyed by crabs, birds, sheep, ants and exposure to the sun. One of the most important nesting sites is situated at the limit of a plateau and its slope were the females will

dig only in the bare soil and not in the surrounding grassy area. During the next dry season (April 2001) researchers will attempt to increase the area by removing the grass, unearthing the biggest stones and replacing these with a mixture of sand, soil and small stones.

There is a small natural population of *Iguana delicatissima* in Guadeloupe but it is now in competition and in danger of hybridization with *Iguana iguana*.

On Les Iles de la Petite Terre, the *Iguana delicatissima* population is thriving at an estimated 10,000 adults but there is also evidence that the nesting sites are overdrug by females resulting in significant egg loss.

Michel Breuil
Paris Museum of Natural History

Cyclura nubila nubila

Current conservation programs for several species of West Indian iguanas are directed toward removal of feral animals to allow locally depleted iguana populations to recover. However, no baseline data exist on expected rates of iguana recovery, or on the relationship between iguanas and their habitat in this process. Because iguanas are important seed dispersers for many native plants, restoration of natural ecosystems depends on establishment of a stable relationship between iguanas and the vegetation on which they feed.

In 1992, the San Diego Zoo's Ecology and Applied Conservation Division initiated a long-term field study of a population of Cuban iguanas inhabiting the U.S. Naval Base at Guantanamo Bay. For three years, baseline data was

IGUANA NEWSBRIEFS (cont.)



collected on population density, social behavior, reproductive hormone cycles, home range size, and daily and seasonal activity patterns. In early 1995, approximately 60,000 Cuban and Haitian refugees arrived unexpectedly at Guantanamo Bay. The dry tropical forest surrounding the study site was reduced to less than 5% of its former extent and only a single adult male was located in the area. A study has been undertaken with funding from the Zoological Society of San Diego's Conservation Fund to determine how rapidly and to what degree the iguana population has been able to achieve its former dimensions, and how the natural process of recolonization of the area by iguanas correlates with recovery of vegetation at the site.

By mid-1999, 15 male and nine female adult iguanas had recolonized the site. For both males and females, the relationship between body mass and body length has remained comparable to that of healthy wild iguanas, indicating that iguanas

have been able to forage effectively at the site following the disturbance.

The total biomass of plants at the site has also been monitored and continues to increase although the rate of increase has slowed. A key question in the recovery process is the role that iguanas may play in the recovery of native vegetation. Studies on related species have shown that the time to germination is shorter in seeds that have passed through the digestive tract of iguanas. An experiment was conducted with iguana scat samples from the study site. Half of each scat sample was dissected and all the seeds removed, while the remaining half was left intact. While neither the time to germination nor the total number of seedlings germinating differed between groups, growth of seedlings produced from seeds left in iguana scat was significantly enhanced compared to seedlings originating from seeds dissected from iguana scat. Thus it appears that iguanas may benefit plant communities in several

important ways, including facilitation of germination, provision of nutrients to developing seedlings, and dispersal of seeds into new microhabitats.

Allison Alberts
San Diego Zoo

IIS replaces Iguana Sign

Sittee River Village, Stann Creek District, Belize

On 13 December, 2000, I.I.S. Vice President Robert Ehrig installed a replacement sign on the main road in Sittee River Village.

Sittee River, one of the sites of the 1999 I.I.S. International Conference is a village stretching out for 3 miles along the beautiful Sittee River in southern Belize. It still has rather

abundant iguana populations (as attendees of the 1999 I.I.S. Conference will remember). The sign was a replacement for one that was put up in the early 1990's by a local resident.

The original sign stated that there was to be no hunting of iguanas in the village. The sign had dissolved by the 1999 conference, but at the May 1999 I.I.S. Board of Directors meeting, the Board decided a replacement was in order.

The area behind where the new sign was installed is a large sandy, hilly area. It is the highest land around, in a large alluvial floodplane. Iguanas migrate from at least a mile or two around to dig nests in the month of March. The owner of the land likes watching the iguanas come in and nest every year and realizes that this spot is why Sittee River still has healthy populations of green iguanas while some villages do not. I.I.S. members should be proud that their society still supports grass roots conservation efforts. The new sign reads, "Please, No Hunting of Iguanas in Sittee River Village." The sign was donated by the International Iguana Society and Red Creek Biological Reserve.

Wanted

Iguana intern in the Florida Keys and possibly Central America. Young, dedicated person that would like to learn everything about iguanas and their habitat. Contact R. Ehrig, P.O. Box 430671, Big Pine Key, FL 33043. Send resume or CV and information about yourself, and what you would like to be a part of.

I.I.S. Bookstore

Photograph courtesy of Jayme Gordon



As a service to our members, a limited number of publications will be distributed through the I.I.S. Bookstore. The following publications are now available:

Green Iguana, The Ultimate Owner's Manual, by James W. Hatfield. 1996. **\$28.00** (including postage); **\$35.00** (nonmembers). Covers just about everything from birth to death of an iguana. 600+ pp. Limited quantities.

The Green Iguana Manual, by Philippe de Vosjoli. 1992. **\$7.00** (including postage); **\$8.75** (nonmembers).

Send check or money order (payable to International Iguana Society) **to:**

I.I.S. Bookstore
P.O. Box 366188
Bonita Springs, FL 34136

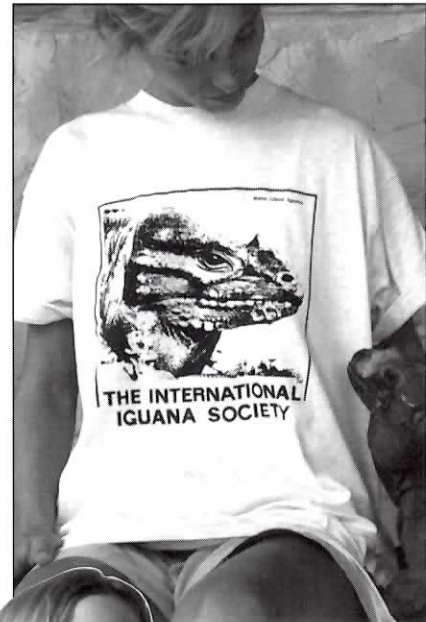
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Illustration by John Bendon.

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Cyclura rileyi nuchalis, from an introduced population in the Exuma Cays Land and Sea Park, Exuma Islands, Bahamas.
Photograph: John Bardon