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One of a small number of brilliantly-colored Fiji Banded Iguanas, *Brachylophus fasciatus*, part of a special breeding program at the San Diego Zoo. Photograph: John Kinkaid

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Fijian Banded Iguanas at the San Diego Zoo

AJ Gutman

Iguanas of the genus *Brachylophus*, the Fijian banded iguana (*B. fasciatus*) and the crested iguana (*B. vitiensis*), are among the few iguanids found outside the New World. Both species are endangered and protected under international law. On Fiji, exporting these animals is illegal, and fines for poaching are heavy. Both species are listed in CITES, Appendix 1.

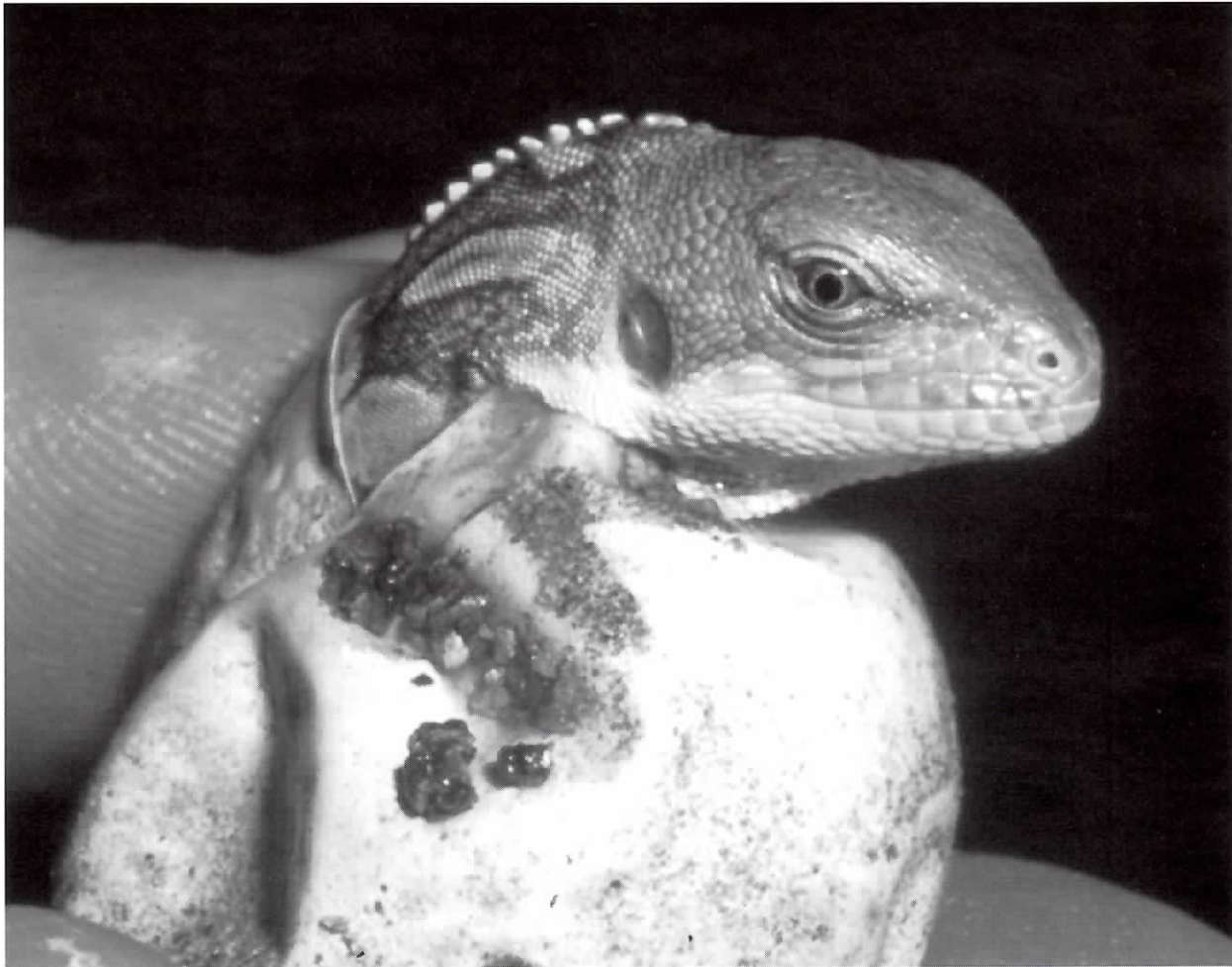
The crested iguana is restricted to the northwestern islands of Fiji, which are fairly dry outside of the hurricane season. *Brachylophus vitiensis* is a

small iguana (75 cm and 300 g) that is dark green with black and white markings and a prominent nuchal crest. They are not sexually dimorphic. Only 5–6,000 animals remain in the wild. Currently, no specimens are kept in American zoos, although a number of Australian zoos have breeding programs.

Brachylophus fasciatus is smaller (about 60 cm and 200 g). These lizards are remarkably beautiful. Males are very bright green with two or three pale blue bands, and females are solid green with blue



Male Fijian banded iguana, *Brachylophus fasciatus*, displaying distinctive bands. Photograph: John Kinkaid



Male banded iguana emerging from the egg. Photograph: John Kinkaid

spots or partial bands. An estimated 10,000 individuals remain in the wild. These are divided into several distinct subpopulations that inhabit the few remaining undisturbed habitats of Fiji, everywhere from high cloud forest to low-lying coastal swamp.

At present, 46 Fijian Banded iguanas (27:19) are housed at the San Diego Zoo, with 25 more (16.9) in 14 other zoological institutions. Wild populations are very much at risk from introduced predators and habitat destruction. With no long-term conservation plan in place and no ongoing research being done in Fiji, this genetic reservoir is essential.

Captive Breeding

In 1987, the San Diego Zoo acquired four pairs of *B. fasciatus* from the Orchid Island Cultural Center on Fiji. Along with four other founding members of the breeding group, over 100 offspring have been produced in both the F₁

and F₂ generations. One of the original founding members is still alive and reproductively active at an estimated 18–20 years of age.

Pairs of animals are housed in large (3' x 3' x 6'), well-ventilated enclosures equipped with visual barriers to keep the very territorial males from becoming overstimulated and attacking the females. The enclosures contain non-toxic plants such as *Ficus*, *Pothos*, *Philodendron*, *Nephtytis*, and several palms on which the animals may perch or browse. Females also will use the plant cover to hide. Fresh water is provided at all times and the cage-bottoms are covered with sphagnum moss in order to hold moisture.

All enclosures are on wheels so that they can be rotated into an open courtyard for exposure to natural sunlight. Indoors, the enclosures are kept under UV-opaque skylights. Indoor temperatures range from 80–88° F during the day and from 72–80° F at night with a 12 hour day/night cycle.

Diet

The omnivorous Fijian banded iguanas are fed three times a week with a mixture of fruit and vegetables chopped to appropriate size. A base of greens, including kale, dandelions, collard greens,

and mustard greens, is topped with broccoli, bean sprouts, sweet potatoes, carrots, and fruits, such as mango, melon, and berries. These animals also relish flowers. In addition, they are fed a variety of insects three or four times a week. All food is



Sexual dimorphism in *B. fasciatus*. Above: male. Below: female. Photographs: John Kinkaid



Above: Breeding pairs of *B. fasciatus* are housed in large enclosures, separated by visual barriers to prevent territorial aggression amongst males.

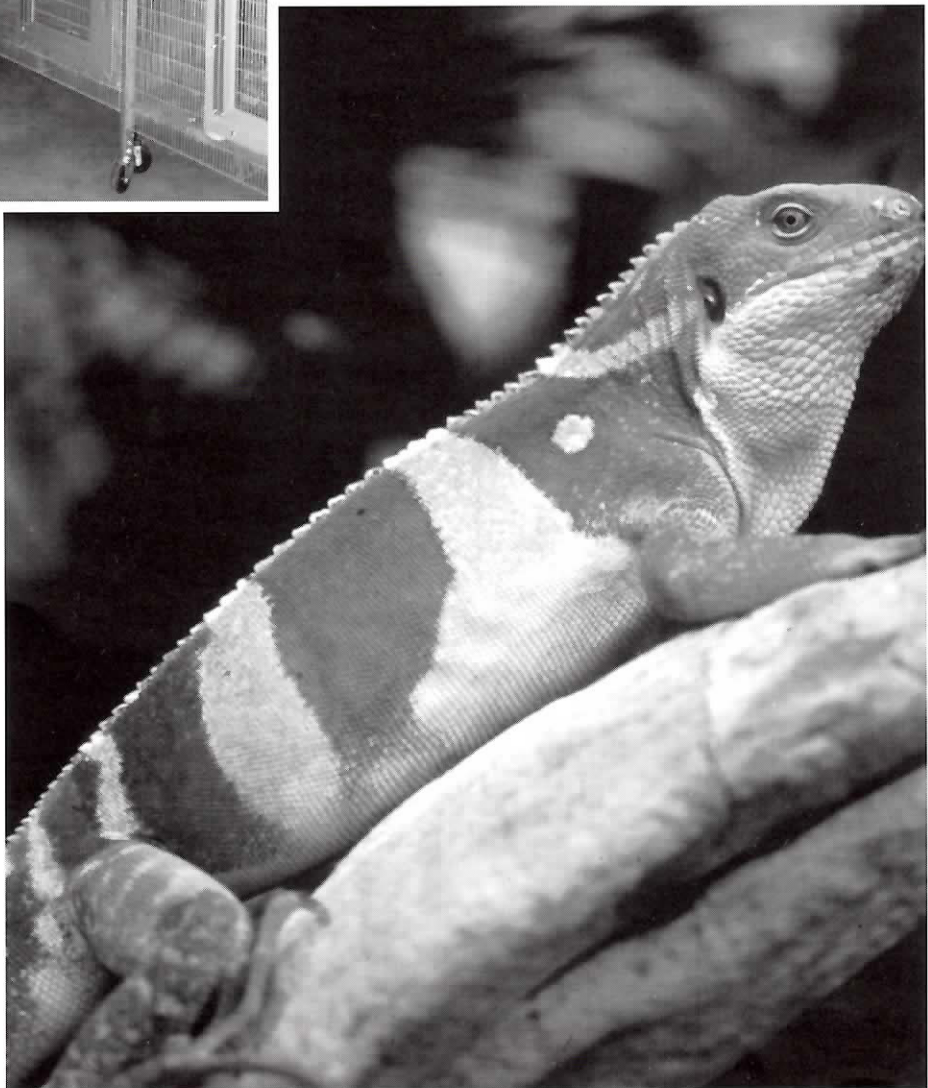
Right: Male *B. fasciatus*.
Photographs: John Kinkaid

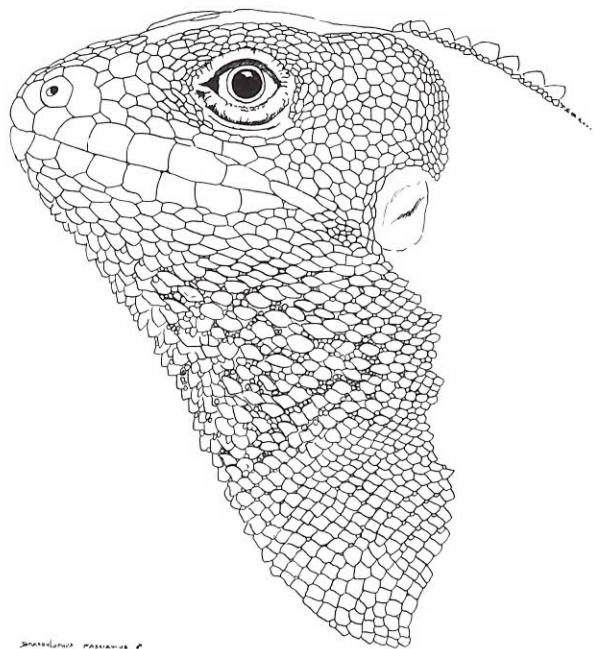
dusted with a 1:1 mixture of calcium carbonate and a vitamin supplement. Reproductively active females are given extra calcium.

Reproduction and Nesting

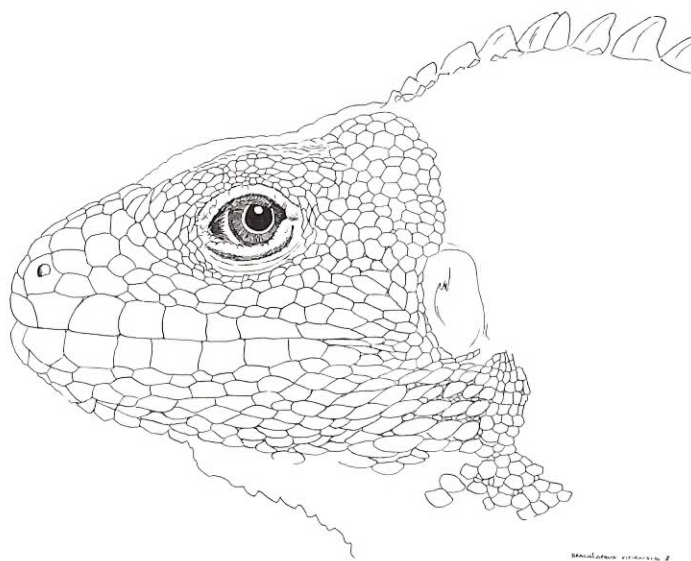
Female banded iguanas may lay eggs in their second year, but these are rarely fertile. Fertile eggs usually are produced for the first time in the third or fourth year. Clutch sizes range from three to seven with an average of five. Eggs, which are as large as those of a green iguana, are laid between April and July.

Nest boxes are large, covered Tupperware containers filled with damp potting soil. Females enter the nest through a hole in the lid and dig diagonally downward to a depth of about 12". Eggs are incubated at 82° F for 121–200 days.





Fijian banded iguana, *Brachylophus fasciatus*. Illustration: John Bendon



Fijian crested iguana, *Brachylophus vitiensis*. Illustration: John Bendon

Hatchlings weigh 7–12 grams and can be sexed immediately by the presence or absence of distinct bands. Young are housed in 20-gallon, screen-sided terraria filled with plants and climbing branches. They are provided with natural sunlight daily and fed the same diet as the adults, although insects are provided more frequently.

Hatchlings at the lower end of the weight range have the conventional banded iguana appearance, whereas a small number of more robust hatchlings tend to have a blend of features characteristic of both species. No one has been able to determine whether these are, in fact, hybrids or naturally occurring variations. Clearly, further examination of the wild subpopulations is necessary.



Acknowledgments

I thank John Kinkaid, Animal Care Manager, and his staff at the Reptile House of the San Diego Zoo for a wonderful experience. I was reassured to know that these precious animals are cared for with both consummate professionalism and great love.

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Female Fijian banded iguana. Photograph: John Kinkaid

UPDATE

Andros Island Iguana Update: 2001

John Bendon

(from on board the RV Coral Reef II, Middle Bight of Andros)

In May 2001, an expedition led by Chuck Knapp of the John G. Shedd Aquarium in Chicago set out to further investigate the Andros rock iguana (*Cyclura cychlura cychlura*). This trip was part of an ongoing study sponsored by the John G. Shedd Aquarium in collaboration with the Bahamas Department of Agriculture and the Bahamas National Trust. Chuck Knapp is a doctoral student at the University of Florida and a conservation biologist at the Shedd Aquarium. He is conducting his doctoral research on the island and has been leading research expeditions to the area since 1999.

This project is extremely important because virtually nothing is known about the natural history, population sizes, and distribution of this iguana. We do know that feral animals and habitat

loss are pervasive problems on North Andros, and the intricacies of Middle and South Andros are just beginning to become apparent.

We spent twelve days in the field with encouraging results. The original itinerary included venturing south to previously unexplored territory, but the weather was too windy and the seas too rough in the Tongue of the Ocean for the Coral Reef to make its way. This did not have a significant impact because many tracts in the northern portions of the island remain unexplored. We also needed to revisit locations where iguanas had been captured in previous years in order to verify their current status.

We visited six different study sites on an undisclosed cay. At one site, we startled a large yellow-headed iguana and it ran off through the bush.



Male Andros Island Rock Iguana, *Cyclura cychlura cychlura*, showing bead in crest. Photograph: John Bendon



Participants of the Shedd expedition assist Chuck Knapp in processing captured iguanas. *Photograph: John Bendon*

On close inspection, this animal was beginning to dig out the bottom of an active termite mound, presumably to make a nest. Chuck instructed me to observe the mound from behind a bush to document any activity in case the animal returned. Unfortunately, our time was limited, so we had to proceed to our next study location without seeing the animal again. The other five sites on this cay produced both captures and sightings. The landscape suggested that we would have experienced additional successes had the party ventured into different areas along the shore. We hope to visit some of these sites in the future.

Another cay that we visited proved to be so difficult and hazardous that we decided to abandon our search in order to avoid scrapes from thorn bushes and broken limbs from dropping into unexpected solution holes. As we returned to the shore, we spotted iguanas and all thoughts of abandoning our search evaporated. We stayed all

afternoon and managed to capture several iguanas. Cays with difficult access may have larger iguana populations. Terrain that we found daunting also appears to deter hunters.

We observed some interesting iguana behavior during this trip. Iguanas do indeed venture out in bad weather. We found iguanas on dark, windy, and even on some rainy days. In fact, they were easier to catch in relatively cool weather.


One Cay that we visited was reputed to be a place where known iguana hunters frequently camp and collect wood. During our visit, we encountered a couple of men who we had met previously on North Andros during the 2001 International Iguana Society Conference. They claimed to be collecting wood to build a sailboat, but they would undoubtedly catch and kill iguanas for food if they happened to encounter them. This location was very accessible and had very few iguanas, probably due to such opportunistic hunting.

In all, we captured 34 iguanas and sighted many more. Several young iguanas, approximately six months old, were caught, and some cays showed healthy signs of reproduction and recruitment. The Shedd Aquarium plans to continue these research expeditions for some time and hopes to find healthy iguana populations farther south.

The previously mentioned discovery of iguanas digging nests in active termite mounds confirmed observations made in the 1970s by Walter Auffenberg (a University of Florida scientist). We actually found and counted eggs from a mound. Future studies should reveal the reasons for this choice of nesting site. Hopefully, further investigation also will reveal that this magnificent creature, probably the world's largest iguana and certainly the largest extant land vertebrate native to the Bahamas, is not on its way to extinction.

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Note: At this stage in the research, populations of *Cyclura cyclura cyclura* should be assumed to be in a precarious state of existence. This study has only begun to address the issue of the continued survival of this species. Support from the appropriate authorities is essential for the continuation of the project. All relevant permits were obtained from Bahamian Government departments, without whose co-operation this work would be impossible. 



Another Andros iguana caught during the Shedd trip displays deep red jowls. *Photograph: John Bendon*

UPDATE

Iguana delicatissima

January 2001

Report from Richard Gibson of the Durrell Wildlife Conservation Trust
Jersey, Channel Islands

In 1997, *Iguana delicatissima* hatched out in captivity for the first time (*Iguana Times* Vol. 6 #2). This occurred at the Jersey Wildlife Preservation Trust, now known as the Durrell Wildlife Conservation Trust after its founder, the late Gerald Durrell. In 2000, a second clutch of eight eggs produced eight hatchlings. This was a real coup, and Richard Gibson, curator of reptiles, reports on how conditions differed for this hatching.

“The original hatchling from 1997 now fares very well. Though it had a very slow and poor start in life and grew very slowly for the first year or so, it improved dramatically after having three juvenile *Basiliscus plumifrons* added to its vivarium. I had always believed that the solitary existence and lack of social cues was negatively affecting this animal, and it seems I was right. This seems quite understandable when one thinks of baby iguanas hatching en masse and hanging out together. This animal is rapidly developing adult coloration and is over one meter long.

“Last year, in November, we hatched eight out of eight eggs after an extended incubation period of 93 or more days. The 1997 period was 73 days! All eight fared extremely well from day one, feeding on almost anything we offered them,

and still loving hibiscus flowers. Within two months they have doubled their body weight and have grown by more than 8 cm in total length. I think the difference between this group and the 1997 singleton is for two reasons: firstly, the social aspect provides competitive cues for basking and feeding; secondly, I suspect the 1997 animal hatched a little too early with a significant yolk reserve and was therefore reluctant to feed in the first week or so, whereas the year 2000 hatchlings hatched perhaps a little late and with basically no yolk reserve and were hungry from day one.

“I also hope we can repeat our recent success. The original pair has been mating recently and the

female is swelling. It’s possible that either Memphis or San Diego Zoo will swap a pair with us so we can try our techniques on a second pair and get some more animals represented at F₁. [Ed. note: F₁ = all of the first generation offspring of a particular parental pair].

“Any serious questions and enquiries about *I. delicatissima* can be emailed to me at zooherps@durrell.org the subject title being Reptile Dept (DWCT) or at rgibson@durrell.org.”

Good luck to the Durrell Trust. No doubt we will hear more of this success story in the future.



A newly hatched *Iguana delicatissima* at Durrell Wildlife Conservation Trust (formerly known as the Jersey Wildlife Preservation Trust). Photograph: Richard Gibson



The Queen of Andros

AJ Gutman
West Hartford, CT

The 2001 International Iguana Society Conference was held on North Andros Island in the Bahamas. Twelve enthusiastic participants were determined to find native *Cyclura cyblura cyblura*. What none of us could have anticipated was just how hard we were going to have to work or how much excitement, anticipation, and drama would be involved.

We had been at Forfar Field Station since Saturday, and so far we had spent one full day and two half days scouring various sites that had been recommended to us as likely iguana habitat. With all 12 of us searching, that amounted to a lot of man hours with little to show but a handful of other animal sightings: a couple of species of anoles, an ameiva, and a few assorted birds. We also found plenty of evidence of the kind of thing that would drive the iguanas away: feral cats, dogs, and pigs, and human garbage riddled with spent shotgun shells. Chuck Knapp, one of our group leaders, has been working on his doctoral thesis on *C. c. cyblura*. Chuck has been working with the University of Florida, the Shedd Aquarium, and the Bahamas Department of Agriculture, which had issued the appropriate permits to capture and release iguanas for this population study. He kept assuring us that it was just as important to know where the iguanas weren't as where they were. Few of us found this especially encouraging.

From the moment we arrived, all of us had been asking questions

of the local people and the Forfar staff to gather as much information as possible about the iguanas, and to get a feel for the attitudes people had toward these large lizards. In general, Androsians were unaware that this particular iguana was unique to this one island. They knew that the iguana was protected, but also believed that hunters continued to pursue them despite the regulations. No verifiable iguana sightings had been made within the past year, yet everyone felt that the iguanas were still plentiful. Indeed, the iguanas had been plentiful as little as ten years ago when surveys determined that thousands of animals still existed.

Monday afternoon in Red Bays we met a man perched on a tree stump outside his hut deftly weaving palm fronds into baskets. His name was Jagger and he wasn't too certain how old he was since he couldn't recall the year in which he had been born. He claimed to know exactly where the iguanas could be found and told us several ways to prepare them for eating. We needed to go to the Middle Bight, and he would be willing to show us the spot if we had a boat. This sounded way too good to be true and, indeed it was. As our conversation continued, it turned out that the price he wanted us to pay for his services was very steep; he intended to kill any iguanas that we found and bring them home for food! Did he know that the iguanas were protected? "God put them there for people to eat," he responded. How prevalent could



The big one that didn't get away—a large male, Andros iguana. Photograph: Carl Fuhri

such an attitude be? Did this explain the demise of thousands of animals? We proceeded to explain that we were doing a scientific survey sanctioned by the Bahamian government. We wanted to capture the animals, measure them, draw blood for DNA analysis, attach beads to their nuchal crests, and insert pit tags under the skin on the right dorsolateral side. Surely such activity seemed nothing short of absurd to such a man, but he agreed to eat the food that we would bring along for the trip.

After a good bit of negotiation, by the end of the afternoon we had put together a plan. We had scrounged up a boat we could borrow from a fellow named

Matt. It would hold four of us along with Jagger and a relative of his named Desmond, who would be our captain. The trip couldn't take place until Wednesday since Matt needed another day to repair his trailer.

Tuesday was spent searching Mastic Point, which proved to have the best terrain we had encountered to date. Some forest cover existed, but plenty of scrub vegetation was there for iguanas to eat, along with likely spots for burrows and sunny areas for basking. Unlike the other sites we had searched, we found little evidence of human intrusion or feral animals, and we had plenty of sightings of other reptiles, including the local racer, *Alsophis vudii*.

Wednesday arrived, and we were ready to go by 5:30 AM. The plan was for Jagger and Desmond to pick us up at Forfar by 6:00 and drive us to Grave's Landing to pick up the boat. We anxiously waited as the clock ticked past 6, then 7 and 8. We couldn't imagine why they hadn't come for us. Finally, about 9:30, we were able to phone Matt, only to find out that the trailer hadn't been repaired yet. He assured us that if it wasn't ready by tomorrow, he would simply borrow a trailer from someone else and the trip would go ahead as planned.

That afternoon we investigated the tidal flats of Fresh Creek. The terrain was pretty muddy inland, but by sticking to the shoreline and walking through the shallow water, we were able to



Above: The beach at Forfar Field Station, Andros Island, Bahamas. Photograph: Michael Ripca



Left: The group aboard one of the boats made available by the Forfar staff, who were as anxious to find iguanas as we were. Photograph: Janet Fuhri

cover a lot of area, even wading across to some of the smaller islands. As at other sites, evidence of feral dogs and cats was plentiful, but we also spotted tracks in the sand that looked like tail drags to our iguana-starved eyes.

Early Thursday morning, I remember sitting on the bench in front of the station waiting for the others, feeling the warm breeze, and watching the moon that had not yet set. Had hunting really led to such a profound drop in the iguana population? Could we somehow influence this hunter and the other remaining iguana hunters? We had to find a way to educate the populace to the value of keeping these animals alive. While I pondered, we once



Chuck Knapp and Joe Wasilewski listen while a long-time Andros resident speaks proudly of hunting iguanas. Photograph: Janet Fuhri

again were left waiting. At least we had a contact number this time and we were able to find out much earlier in the day that the trip was off. What had happened? Had Jagger become too suspicious of us, thinking we were with the Bahamian authorities? Did he think that tagging the animals would somehow keep him from being able to eat them? We never found out.



Above: One of many drags found in the sand, most left by the abundant land crabs of Andros, though some were thought to be iguana tail-drags.

Right: A large termite mound — the perfect spot to incubate *Cyclura* eggs (this one had not been touched by an iguana, though).



Below: Spent shotgun shells were easy to find. Photographs: Michael Ripca



Our group split up for the rest of the day. Some people went snorkeling and were treated to a wealth of interesting sea creatures. Another group went to check the ridge behind Forfar. Banana slices, which had been set out the day before at a number of spots that looked like likely iguana burrows, had clearly been disturbed by something, although it was unclear whether this had been done by birds or reptiles. We found no iguanas, but saw plenty of anoles, ameivas, and several species of birds.

Thursday evening we all went out for dinner. As we piled into the dining room, Joe and Chuck struck up a conversation with a couple of people sitting at the bar. One man turned out to be the brother of Rivean, a talented young artist and staff member at Forfar. He listened to the story of our aborted journey and told us about some of the old fishermen he knew at Grave's Landing. If we could get our group down there in the morning, he would arrange with one of his friends to take us out to Crab Cay to see the iguanas. Was it really this simple? Could this really be our big opportunity?

Friday morning I again waited on my bench with the breeze and the moon. I refused to give up hope. We would see iguanas today. Some had to be left somewhere. A little later, at Grave's Landing, we met our fisherman, Cap'n Johnny. He could take us to Crab Cay, but we wouldn't find any iguanas there. For iguanas we had to go to the Middle Bight but, since we were pay-

ing for the gas, he was willing to take us as far as we wanted to go. Our group of eight, which included Rivean, set out in high spirits.

The trip was over an hour long and the speed of the boat left me chilled to the bone, but none of that was important — nor were the heavy rains that hit just as we were dropped off at our destination. I refused to be daunted. We huddled



Left: Soaking rains did not deter this group, determined to find iguanas on North Andros.

Below: On the last day of the conference, the first live iguana we spotted saw us first and ran for the safety of its burrow. *Photographs:* Janet Fuhri



under a tarp that Cap'n Johnny had lent us. We were all together, enjoying each other's company, and telling the most dreadful jokes knowing that our opportunity would come soon.

Our first foray out from under the tarp was short lived, and we had to make another mad dash for cover as a second deluge poured forth. After another 20 minutes, upon spying just the tiniest bit of blue sky overhead, we set out again. Our first sighting came almost immediately when we spotted a tail sticking out of a burrow. Pulling off the iguana's tail seemed like a bad idea, so we posted a sentry and continued searching. Things happened very quickly after that. I recall a fair bit of noise and scrambling as Joe leaped into the bushes and came up holding one of the most remarkable creatures I have ever seen!

It was a big-jowled male, 44.6 cm long and weighing 4.45 kg. Everyone crowded around with cameras to photograph this remarkable beast. A mere photograph wasn't enough for me. I needed to hold him, to feel the texture of his scales and the life force in his powerful body. It was a moment of tremendous elation for all of us.


Joe was convinced that more animals were to be found, so we left Chuck and Carl to process this one. "So what do you think?" Joe asked me as we continued through the bush. "I think that we mere humans do not appreciate the privilege of living among such magnificent animals. God put us here to care for each other and to care for them, not to

destroy them." "I'm not going to disagree with you. It's people like Jagger who need to be convinced."

We soon spotted another iguana, but it quickly slipped off into the underbrush. Very shortly, Joe spotted yet another animal that was sitting still. He signaled to Rivean and me to come around from behind. No one else was nearby. As I came around the bush, I spotted her. She was as long as our first iguana, but had a slighter frame and was less jowly and less dramatically colored. She heard me behind her and looked over her right shoulder across the length of her body and made eye contact. She showed no fear and gave me a calm head bob. Three carefully metered up and down strokes. "I am the queen. This is my realm. You will respect me." What could I say? I had so much to say to her. I wanted to tell her how much I loved her, and how much I wanted to protect her and her children. All I could do was bob back. I knew then that she would make her escape. We wouldn't capture her and violate her with our beads and pit tags. My heart skipped a beat as she bolted for safety while Joe and Rivean ran off in futile pursuit.

Chuck had spotted a juvenile that had slipped off inside a hollow tree, but that was the only other sighting. Our trip back to Grave's Landing was cold and wet, and we even ran out of gas. We were all still too entranced to notice. Our euphoria continued through the evening as we ended our last night at a local festival celebrating the Chicharney, a legendary beast, half bird and half man. The story goes that if you see the Chicharney, your wish will come true. I wished that my grandchildren could some day come to this island to enjoy the grandchildren of the Andros iguana.

What will it really take to educate Androsians about these gravely endangered animals? Do we have any hope of influencing the behavior of a generation of people who are hunting for food that they feel God provided for them? Perhaps our best hope lies with educating the young people of Andros and with artists like Rivean. The IIS proposes to sponsor the construction of a large sculpture of an Andros iguana to be placed outside Forfar Field Station. Rivean and the other students in his art class have created many other beautiful animal sculptures that grace the outskirts of almost every village in the area. I wish that everyone could

share the poignant image I have in my mind and in my heart of the beautiful Queen of Andros. Surely then we would be able to convince the younger generation of Androsians to respect the uniqueness of this remarkable animal. 



A juvenile *C. cyathura* is found hiding in the hollow trunk of a dead palm tree. *Photograph: Michael Ripca*



Left: Joe Wasilewski displays the catch-of-the-week, a large male Andros iguana. *Photograph: Janet Fuhri*

Below: Having been processed, tagged and released, our "big one" pauses for a moment before heading to a better hiding place. *Photograph: Carl Fuhri*



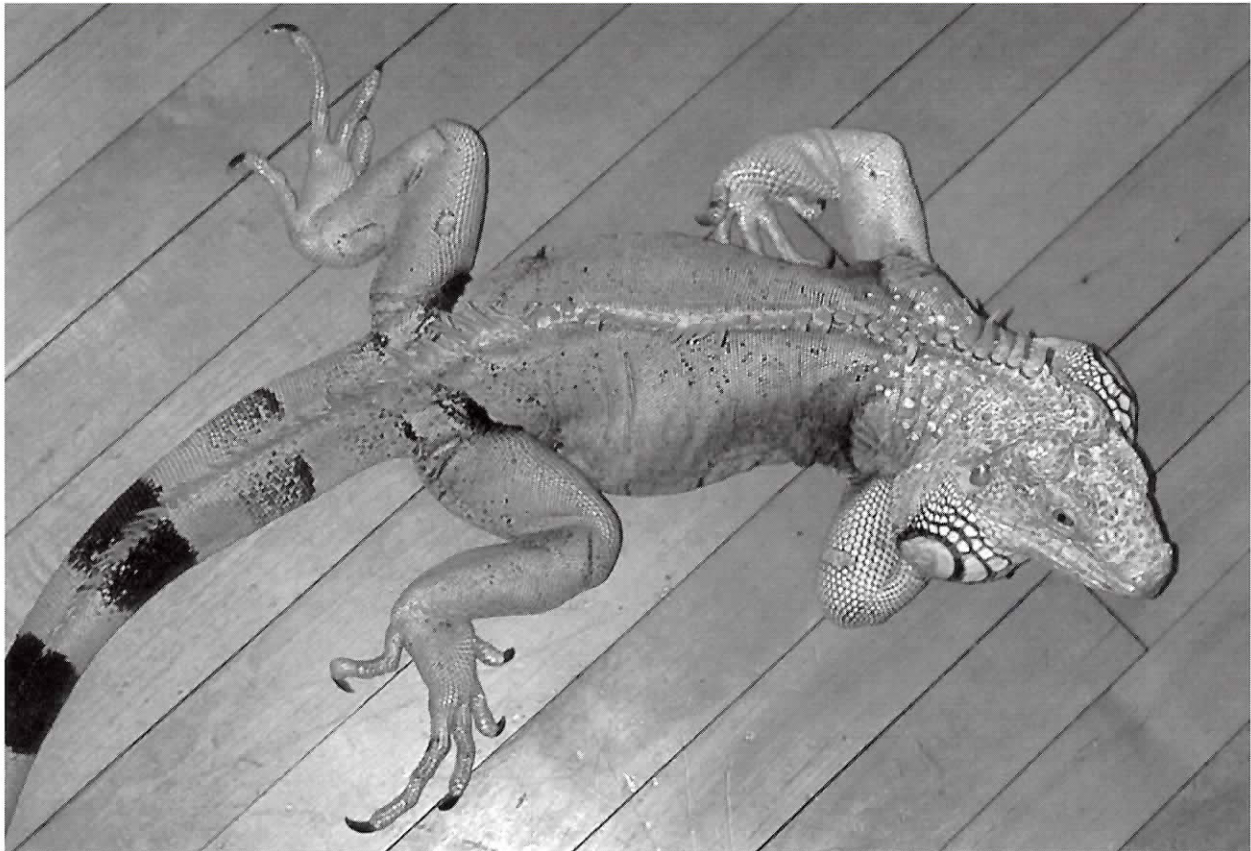
Iguana Nutrition

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One of the most misunderstood areas of iguana husbandry is their nutritional needs. An iguana's health and development are dependent on a balanced diet. Nutritional deficiencies can lead to illness and possible injury. I am amazed at the number of iguana owners who assume that, because iguanas are vegetarian, they only need lettuce and occasionally fruit to survive. Some owners have stated, "I only feed romaine lettuce and not iceberg lettuce." Although romaine lettuce contains slightly more nutrients than iceberg lettuce, both are inadequate as the bulk of an iguana's diet. I strongly advise my

clients not to feed iguanas any food item that ends with the word lettuce.

Iguanans are herbivorous and in nature feed on leaves, fruits, and flowers of many different plants. Iguanans are not insectivorous as juveniles and do not transform into herbivores as they mature. They do not have a gizzard type stomach and do not require grit to help them digest food. They digest their food by microbial fermentation in a fashion similar to cattle and goats. This process requires high environmental or intestinal temperatures to stimulate microbial activity. Inadequate environmental temperatures will lead to poor develop-



A poor diet and lack of UV to facilitate calcium metabolism leads to soft bones which are prone to fractures at the slightest stress. The fractured left limb of this green iguana was incorrectly stabilized, leading to its nonuse. This reinforces the need to seek out a properly qualified reptile veterinarian. *Photograph: Carole Saucier*

Consult the following chart for your iguana's diet:

GOOD	MODERATE	POOR
Turnip Greens	Carrot Tops	Lettuce (head, iceberg)***
Mustard Greens	Green Beans	Romaine Lettuce***
Collard Greens	Asparagus	Zucchini
Dandelion Greens	Yellow Squash	Broccoli*
Broccoli Leaves	Sweet Potato	Brussels Sprouts*
Parsley	Bok Choy*	Cauliflower*
Endive	Kale*	Radish*
Escarole	Chard**	Beets**
Water Cress	Yams	Cucumber
Kaboucha Squash	Turnips*	Spinach**
Acorn Squash	Okra	Carrots***
Butternut Squash	Green Peppers	Cabbage*
Parsnip	Rutabaga*	Sprouts*
Snap Peas	Daises	Mushrooms
Snow Peas	Carnations	Tomatoes
Hibiscus	Geraniums	Celery Stalk**
Rose Petals	Kiwi	Frozen Vegetables
Nasturtiums	Plum	Tofu
Despined Cactus Pads	Pear	Apples
Figs	Apricots	Watermelon
Papaya	Raspberries	Grapes***
Mango	Strawberries	Banana ***
Citrus Fruits	Cantaloupe	
	Dates	

* These food items can cause thyroid problems and if used at all, should be fed in very small amounts.

** These items contain oxalic acid and if used at all, should be fed in very small amounts.

*** These items contain large amounts of tannin and if used at all, should be fed in very small amounts.

ment. In nature, newly hatched iguanas will ingest fresh fecal samples from adult iguanas to “load” their intestines with microbes for digestion. Most iguanas sold now are captive-born, usually separated from adult iguanas, and unable to properly “load” their intestines with a microbial culture. To compensate, we will mix a fresh fecal sample with water and feed it to slowly developing juveniles in an attempt to increase digestive activity and promote growth. Feeding fresh fecal cultures also may be used to treat diarrhea in juveniles.

I recommend about 60% of an iguana diet be composed of green, leafy, calcium-rich vegetables. Preferred items include collard greens, mustard greens, turnip greens, dandelion greens, broccoli leaves, parsley, escarole, endive, and watercress. I like to mix a couple of these together as the base salad of an iguana's daily diet. To ensure proper uptake, pieces should not be larger than the size of

the animal's head. Store the prepared salad in an airtight container in the refrigerator.

The next 30% of the diet should be composed of other vegetables. I feed a large amount of orange-fleshed squash like acorn, butternut, or kaboucha squash. Other good food items include yellow squash, parsnip, snap or snow peas, carrot tops, green beans, and despined cactus pads. These also can be stored in the refrigerator once they have been chopped or grated into bite sized pieces, but not in the same container as the green, leafy vegetables. The daily diet should be thoroughly mixed to prevent an iguana from picking out certain items and ignoring others. Hand-toss the food for a few minutes to allow your body temperature to warm the food.

The final 10% of the diet can be fruits and flowers. Some commonly fed flowers include squash blossoms, hibiscus, nasturtiums, daisies,

Dr. Bruce's Herbivorous Lizard Diet (Iguanas, Skinks, Chuckwallas)

60% Dark Green Leafy Vegetables (Greens, Broccoli Leaves, Endive, Escarole)

15% Orange-fleshed Squash (Acorn, Butternut, Kaboucha, Pumpkin, Spaghetti)

15% Other Vegetables (Parsnips, Snow Peas, Snap Peas, Green Beans, Carrot Tops)

10% Flowers and Fruits (Hibiscus, Rose, Dandelion, Fig, Papaya, Mango)

Avoid feeding these toxic items to your iguana:

- Seeds from Apples, Apricots, Cherries, Nectarines, Peaches, or Pears
- Avocado, Eggplant, Rhubarb, Rosemary, or Sage
- Azalea, Buttercup, Daffodil, Lilly of the Valley, Marijuana, or Tulip

Avoid the following toxic plants found in Florida:

Bird of Paradise, Bottlebrush, Boxwood, Caladium, Chalice (Trumpet Vine), China Berry Tree, Christmas Cactus, Crocus, Croton, Delphinium, Holly, Hyacinth, Ivy, Jasmine, Milkweed, Mistletoe, Morning Glory, Oleander, Periwinkle, Philodendron, Poinsettia, Rhododendron, Spanish Bayonet, Taro (Elephant Ear), Tomato Plant (Foliage and Vines), Wild Parsnip, and Wisteria.

roses, carnations, geraniums, and dandelions. Strongly recommended fruits include figs, mango, papaya, kiwi, melons, and any citrus fruits. Citrus fruits have been shown to help increase calcium absorption. Many people feed bananas; however, I discourage this because they have a poor calcium-to-phosphorus ratio.

Vegetables, including bok choy, broccoli, Brussels sprouts, cabbage, cauliflower, kale, radish, rutabaga, sprouts, and turnips, may cause iodine binding, which can lead to a thyroid deficiency. Hypothyroidism will decrease an iguana's metabolism, resulting in lethargy, muscle pain, and/or joint pain. An iguana may gain weight as a consequence of decreased metabolism, but overall growth will be slowed considerably. Other vegetables, like beets, celery stalk, chard, rhubarb, and spinach, contain oxalic acid, which binds to calcium and prevents its proper uptake. When fed in excessive amounts, this can lead to metabolic bone disease. Food items, including all lettuce products, carrots, bananas, and grapes, contain a high level of tannins. Tannins can affect protein metabolism and alter growth and development patterns.

Avoid freezing or microwaving the food. Although thawed frozen vegetables are easy to use, they have been shown to contain thiaminase, an enzyme that destroys thiamin. Thiamin is important for the nervous system of reptiles and also works with other B vitamins to improve the animal's overall quality of life. An absence of thiamin in an iguana's diet can lead to tremors or partial paralysis. If you must feed frozen vegetables, add a small amount of brewer's yeast to assure an adequate supply of thiamin. I recommend the use of vegetables within two weeks of freezing to ensure proper thiamin levels.

A good variety is important for an iguana's diet. However, toxic food items must be avoided. Most fruits are safe, but seeds from apples, apricots, cherries, nectarines, peaches, or pears are potentially dangerous. In the vegetable family, avocado, eggplant, rhubarb, rosemary, and sage are all toxic to an iguana. Toxic flowers include azalea, buttercup, daffodil, Lilly of the valley, marijuana, and tulip.

An iguana's digestive and renal systems are poorly suited for handling animal protein. Diets

high in these items have been connected to several health problems. If you must feed animal protein, it should not exceed 3–5% of the total diet for juveniles and breeding females. Adult males and non-breeding females should only be allowed 1–2% animal protein, if any. The most commonly fed items are monkey biscuits and dog food. These must be soaked in warm water and cut into small pieces before feeding. Although juvenile iguanas may grow rapidly when fed high levels of animal protein, eventually they will succumb to renal disease. Some of the early literature on the nutritional needs of iguanas was acquired from countries where iguanas were raised for human consumption. Because of this, the reptiles were never alive long enough for the effects of animal protein on the renal system to be noted. Almost all of the new literature on iguana nutrition clearly states the danger of excessive animal protein consumption.

Commercial diets are currently flooding the market. Unfortunately, little is known about their effects after long term use. Several independent reptile breeders have used commercial diets with some success. One problem with commercial diets is that they are unnatural to the animal. Most are dry pellets that do not provide any moisture. This can be adjusted by soaking the food in warm water before feeding. Canned varieties have higher levels of moisture than dry products. Dr. Frye has performed long-term testing on some of the commercial diets. Early findings were published in Volume 7, Number 2 of *Vivarium* magazine. His studies utilized only four different diets. Unfortunately, one of the diets resulted in very poor growth and decreased health. Until long-term studies can be performed on commercial diets, I advise my clients to use them only as a supplement to a natural, healthy iguana diet.

Multivitamin and calcium supplementation is essential for proper growth and development of any iguana. Oversupplementation, however, can lead to several health problems. Weekly use of a multivitamin supplement is recommended for juveniles, but adult iguanas need it only every 10–14 days. I recommend daily, or at least every other day, sprinkling of a calcium supplement, without phosphorus, for any juvenile or breeding female iguana. For adult iguanas, I decrease the frequency to twice a week. All supplements should be thoroughly mixed with the food to insure proper uptake.

An easily avoided problem is overfeeding. This occurs when an iguana is offered more food than it could possibly eat. Overfeeding allows the iguana to pick out its favorite items and avoid others. Selective feeding can lead to nutritional deficiencies even though a completely balanced diet is being offered. To help avoid this problem, thoroughly mix the daily items before feeding, and offer an amount you know the iguana will consume in one feeding.

Iguanas should be fed in the mid- to late-morning hours. They feed more readily after warming up, and subsequent basking promotes effective digestion. The bacteria and protozoa responsible for an iguana's digestion become more active at temperatures over 90° F. To assure efficient digestion, proper daytime temperatures for an iguana should be around 95°, with a basking site closer to 100°. A cool area around 85° should also be provided to prevent heat stress. When housed under optimum conditions, iguanas should engage in a daily pattern of warming, then feeding, and then basking.



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IGUANA NEWSBRIEFS

Ctenosaurs in the Red Creek Biological Reserve

One of the activities of the 1999 International Iguana Society Conference in Belize was the establishment of a population of *Ctenosaura similis*, the spiny tail iguana, at the Red Creek Biological Reserve. Although present in the general area of the Reserve, they had not been observed in the Reserve itself, which is located just to the east of the Cockscomb Basin Wildlife Sanctuary, about four miles inland from the Caribbean Sea. The release site was a hill at the west side of the reserve that was formerly a strip mine for rock fill used in construction of the road through the reserve. The hill is about 100 m above sea level, and is the location of the lodge at Red Creek. Many native trees and shrubs have been planted in beds of soil that have been brought to the site. The hill has been terraced with boulders and rocks to prevent erosion. In several areas, piles of rock have been arranged to provide retreats for ctenosaurs to escape the many local predators. Flowering native trees and fruit trees such as cashew have also been planted to provide food.

In January 1999, a small ctenosaur was released at the site into one of the rock outcrops. On 26 February 1999, four *Ctenosaura similis* were released by an enthusiastic group of IIS members after the animals were marked and blood samples drawn. The population was highly skewed with four males and only a single female. A small animal of unknown sex was released later. The iguanas were caught by society members in Sittee River Village and Hopkins,

except for the first animal released. It was caught at mile 5 on the Western Highway, on the outskirts of Belize City.

The iguanas have thrived at the location and their food supply has been supplemented to allow the vegetation to become well established. Conference participants would be surprised to see the thirty-foot tall trees on the hill. The only fatalities were the three hibiscus bushes that were planted for the iguanas, but did not survive the constant grazing. All of the iguanas have remained wary, except for the original young male who has come to be known as Russell. He has been fed more often than any of the others because he will

allow staff and visitors to approach within a couple of meters. He also will come into the building when the staff is having lunch, knowing that he will be served. Russell relishes chicken and has been fed more tortillas than any other iguana in Belize. He has grown faster than the other ctenosaurs. He was the second smallest and now is the second largest. In addition to the iguanas, the site has become home to many other lizards.

Norops capito, the big-headed anole, *Basiliscus vittatus*, the striped basilisk, *Ameiva undulata*, the rainbow ameiva, and *Sphaerodactylus millepunctatus*, the spotted gecko, have all been seen in the constructed habitat.

In June 2001, hatchling *Ctenosaura similis* were seen at the Reserve for the first time. The most interesting aspect is that none of the "wishwillys," as Belizeans call spiny tail iguanas, have been seen at the hill site. They have been turning up about 300 m away at another restoration area where trees, fruit, and hibiscus have been planted. At least five hatchlings have been observed, although the nest site remains unknown. We are pleased that the project has reached this stage, and two more females will be added to the gene pool in the near future.

Source: Red Creek Biological Reserve, Belize

Green Iguana Produces Clutch of 105 Eggs

Pearl, an approximately seven-year-old green iguana owned by Carole Saucier of Manchester, CT, has produced a possible record size clutch of 105 eggs. Pearl was 1.27 m long and weighed approximately 3.9 kg before laying her eggs. Eighty four eggs were initially laid along with a portion of her left oviduct, which contained one more egg. She was rushed to a veterinarian who removed another twenty eggs along with the right oviduct, which had burst inside her abdominal cavity. Although the iguana survived the surgery, she did not recover from the anesthetic.



Photograph: Carole Saucier

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

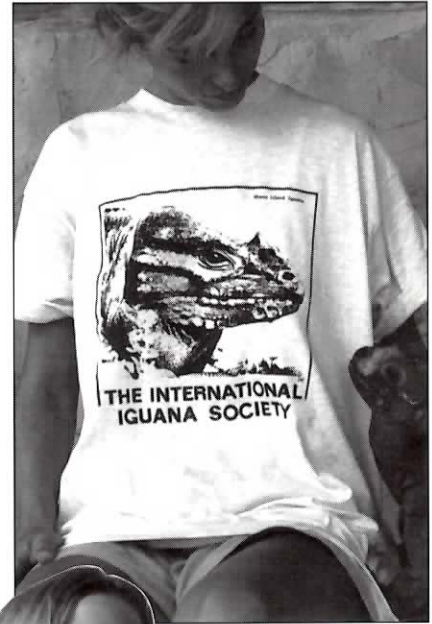
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Illustration by John Bendon.

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A large, male Andros Rock Iguana, *Cyclura cyclura cyclura*, captured during the recent I.I.S. Conference on Andros Island, Bahamas. Photograph: Carl Fuhri