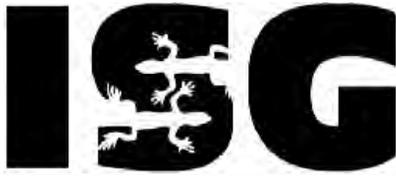


# Iguana Specialist Group Newsletter

Volume 8 • Number 2 • Winter 2005



The Iguana Specialist Group prioritizes and facilitates conservation, science, and awareness programs that help ensure the survival of wild iguanas and their habitats.

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## 2005 ISG Annual Meeting

ISG Meeting Minutes  
November 6-7, 2005  
South Andros, Bahamas

### Welcome and Introduction - Alberts & Hudson

Thanks were expressed to Chuck Knapp (Univ. of Florida/Shedd Aquarium), Sandra Buckner, and the Bahamas National Trust for the extensive planning and organization of a successful ISG meeting and Species Management Workshop for the Andros Island iguana. Special thanks also belong to Mike and Petagay Hartman, of Taimo Resort, for the fabulous accommodation, gourmet food, deeply discounted rate, and warm welcome. It was a truly wonderful meeting that was enjoyed by all.



*Left to Right: Rick Hudson, Peter Tolson, Kirsten Hines, Steve Connors, John Binns, Stesha Pasachnik, Joe Burgess, Quentin Bloxam, Ricardo Johnson, Jeff Lemm, Byron Wilson, Karen Graham, John Iverson, Allison Alberts, Catherine Stephen, Bruce Weissgold, Miguel Garcia, Jan Ramer, Fred Burton, Tandora Grant, Samantha Addinall, Tarren Wagener, Joe Wasilewski, Sandra Buckner, and Chuck Knapp.*



## Session 1: Taxon Updates

GRAND CAYMAN - Burton

### **Blue Iguana Recovery Program Update. Fred Burton (National Trust for the Cayman Islands).**

It is now 14 months since hurricane Ivan, a category 4-5 hurricane, tracked along the south coast of Grand Cayman causing catastrophic damage to human property and livelihoods, and delivering dramatic impacts to natural environments. Aerial photographs eight months after the storm show the island's once extensive Black Mangrove forests shattered and scarcely beginning recovery, while the dry forests are beginning to regenerate a closed canopy despite extensive tree fall. The xerophytic shrubland communities which are habitat to the Grand Cayman Blue Iguana were only lightly impacted, and appear fully recovered. The captive breeding and head-starting facility for the Grand Cayman Blue Iguanas, in the QEII Botanic Park, is now fully restored and has been further expanded and enhanced since the hurricane.

Twenty-three two year-old *Cyclura lewisi*, originally slated for release at the time the hurricane struck, were finally released in December 2005, and were radio-tracked with assistance from a team of international volunteers for two months after release (December 2004-January 2005), and for a further two months over May and June 2005. After a period of weight loss immediately post-release, the iguanas established home ranges and foraging patterns which were characterized in the summer tracking period. Survival over the first seven months was at least 91%.

Summer usage areas of females was 0.6 acres, surprisingly similar to summer usage areas determined by Goodman, et al., for larger mature free-roaming females in the QEII Botanic Park, and a single wild adult female tracked by the program in summer 2005. The released males in the Salina Reserve occupied an average of 1.4 acres each, with much more extensive overlap in usage areas. Spacing and overlap of the usage areas indicates

the iguanas chose to maintain a population density of 4-5 iguanas per hectare, in this unnatural setting of a single age class surrounded by unpopulated habitat. A second release, of 70 individuals, is scheduled for December 2005, into the same areas currently occupied. This release will bring the restored population in the Salina Reserve to approx. 91 individuals, with representation from ten different founder lines. Subsequent releases will require access to the Salina's southernmost soil zones.

The studbook continues to be maintained to a high standard by Tandora Grant (San Diego Zoo/CRES), and is now informing the program's release strategy with a goal to reach representation by at least 20 different founder lines in each restored subpopulation by the time each reaches its anticipated carrying capacity. Progress to date is on target towards this goal. Three new founders bred in captivity for the first time in 2005.

A high infertility rate was observed in nests laid in the southern sector of the QEII Botanic Park, where a new dominant male had taken over a territory of five females, four of which were his siblings. As a result of this unusual infertility, only 92 eggs were initially viable from a total of 166 eggs laid in both the captive and free-roaming populations. The dominant Park male was taken back into captivity to allow unrelated males to claim this territory for the 2006 breeding season.

One hundred new hatchling cages were prefabricated and flat-packed in the USA as the result of a three-month IRCF campaign to secure funds and a manufacturer capable of a customized design in time for the August hatch. They were subsequently assembled in Grand Cayman by volunteers from the Rotary Club of Grand Cayman Central. These lightweight cages are holding the 2005 hatch until the next iguana release in December frees up cage space at the facility. Again with IRCF, assistance funds are currently being sought to complete a security fence around the facility, which will also serve to secure tour income to the program.

A custom non-profit company, Tours for Nature Ltd., has been formed and has secured a contract with Royal Caribbean Cruise lines and Celebrity Cruises to operate cruise passenger tours to the Blue Iguana facility with all profits going to the program. Tours are now operational and are expected to generate useful revenue for the first

time in the coming winter tourist season. Tours are also being expanded to cater for on-island bookings for guests at major hotels.

The program is collaborating with the Fort Worth Zoo in a project to characterize the physical, climatic, and dietary environment in the successful captive breeding facility on Grand Cayman, and to compare this to enclosures at Gladys Porter (Brownsville, Texas) and Indianapolis Zoos, where captive breeding has been less successful to date. Results are intended to guide *ex-situ* captive managers to hopefully improve breeding success, which is currently one constraint on achieving *ex-situ* population goals for this species.

The first Species Recovery Plan for *C. lewisi* (2001-2005) has now run its course. Achievements were reviewed and a new plan developed in a workshop hosted by the Grand Caymanian Resort on Grand Cayman in September 2005. Local participants represented the BIRP's staff, the National Trust for the Cayman Islands, and the Cayman Islands Department of Environment. Visiting participants came from Durrell Wildlife Conservation Trust, San Diego Zoo, ISG?IIF, and IRCF. The workshop was facilitated by Simon Hicks.

Review of the 2001-5 plan shows the protected area goals were substantially not met, but that all other goals in the plan (population restocking, captive breeding, education and awareness, and resource development) have been met and in some cases surpassed. Over the period 2002-5, while the Blue Iguana Recovery Program has been fully operational, \$462,619 (US) has been raised and substantially expended in implementing this plan. This reflects both the ambitious scope of work achieved, and the often unavoidably high cost of doing business in the Cayman Islands. The majority (\$186,000) was contributed by corporate donors within the Cayman Islands. Other leading sources of project financing were raised and channeled through the Durrell Wildlife Conservation Trust (\$89,000), the International Reptile Conservation Foundation (\$73,000), and the International Iguana Foundation (\$45,000). Income from commercial activity (retail products and tours) has been relatively insignificant, but is now targeted to expand.

Volunteerism has expanded greatly. Notable volunteer resources have been recruited internationally via

IRCF, and locally through service clubs and individual long-term volunteers. The program now has three full time staff: a volunteer Director and two salaried Wardens. IRCF continues to provide extensive free services equivalent to additional program staff, as well as consistent contributions from other overseas participants who made commitments in the 2001-5 SRP. The cumulative effect has been a massive savings on the cash cost of the work achieved.

The new Species Recovery Plan 2006-2010 calls for 300-500 acres of xerophytic shrubland on Grand Cayman to be protected to support a restored population of at least 1,000 Blue Iguanas. Plans have been extended to breed and rear sufficient genetically optimal iguanas for release, to safeguard the species via and *ex-situ* captive population, to continue education and awareness activities, and to further build the financial, human and technical resources which will be essential to save this species.

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## DOMINICAN REPUBLIC - Ramer

### **Ricord's Iguana 2005 Update. Jan Ramer (Indianapolis Zoo).**

2005 was a busy year in the Dominican Republic! Grupo Jaragua, Zoodom, and Indianapolis Zoo have been working together to develop a Ricord's iguana curriculum directed toward the 3rd grade classroom. This work is funded by grants from US Fish and Wildlife Service - Wildlife Without Borders Latin America and Caribbean program, and AZA's Conservation Endowment Fund. The curriculum includes a booklet with natural history information about the species and habitat, vocabulary words, maps, etc. There are resource kits that consist of a plastic bin that students will fill with sand. There are plastic eggs, cactus, thermometer, light bulb, etc. so that students can pretend to incubate eggs and take sand temperatures. There is a game board with iguana questions, and a poster for every classroom. Teacher workshops will be held in Santo Domingo, and in the towns closest to Ricord's iguana habitat this spring and the curriculum will be implemented this fall. The Dominican Department of Education is helping fund these workshops!

Zoodom's four Ricord's iguana juveniles that hatched during the ISG meeting in 2002 are all doing very well, and the ten hatchlings from 2004 received PIT tags and physical exams in April when Jan Ramer was there with a group of Indianapolis Zoo members. The breeding pair were also examined and found to be in good health.

Ernst Rupp, of Grupo Jaragua, has been working hard in the Pedernales habitat, noting over hundreds of hatchlings last year! Grupo Jaragua has worked tirelessly on local education and involvement in the conservation program, and also in developing ecotourism opportunities in the area. Ernst received emergency funds last fall from the International Iguana Foundation to conduct survey work on the south shore of Lago Enriquillo when he learned that one of the local senators was planning to bulldoze a prime Ricord's habitat to build houses.

Indianapolis Zoo, Grupo Jaragua, and Durrell Wildlife Conservation Trust recently submitted a proposal to US Fish and Wildlife to continue population and habitat analysis in all three known Ricord's iguana habitat and to conduct workshops for biology students and Department of Wildlife technicians. If funded, this work will continue through 2007.

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JAMAICA - Wilson

**Jamaican Iguana Recovery Project, 2005 Update.**  
Byron Wilson and Rick Van Veen (University of the West Indies).

**Funding** - A grant for \$20,000 (US) was recently obtained from the Disney Wildlife Conservation Trust (submitted through the IIF). Additional funds to support work over the past year were obtained from the International Iguana Foundation, the International Iguana Society, Conservation International, and the Miami Metrozoo. Two new GPS units were purchased with funds from a New Initiative grant awarded to Byron Wilson (BSW) from the University of the West Indies, Mona.

**Research and Outreach Activities** - We continued to encourage protection of the Hellshire Hills ecosystem through the participation of other researchers and interested parties. In the past year we initiated a new project focusing on the intestinal parasites of wild pigs (with Professor Ralph Robinson and postgraduate student Chinedu Okoro from UWI). Ms. Tamia Harker has just begun a postgraduate programme (with BSW) that will involve sea turtle work along the Hellshire coast and Dr. Dave Miller (Geography and Geology, UWI) has been conducting research on the beach profile dynamics of Manatee Bay. Other notable visitors included Dr. William Cooper and Dr. Karl Rollings. In addition, we coordinated camping field trips for three different UWI courses (two in conservation biology, one in forest ecology). We also recently hosted an overnight excursion for the Jamaican Geographical Society, and assisted with a children's show for local television, "Hello World Jamaica," on CVM-TV. In short, we are trying to get as many people involved and interested in conserving the Hellshire Hills as possible.

**Pitfall Trapping Experiment** - This field experiment, examining the impact of mongoose control on the terrestrial herpetofauna of the Hellshire Hills, proceeded into its ninth year. The 2005 results were not remarkable in terms of faunal abundance. 2006 should be an interesting year due to anticipated increases in fauna abundance resulting from high levels of productivity spurred by high levels of rainfall. In addition, removal trapping of mongooses and other mammalian predators from control plots will be conducted during the period of pitfall trapping assessments, to remove the confounding influence of predators tampering with traps or trapped specimens.

**Headstart and Release** - In conjunction with the Fort Worth Zoo we released 15 headstarted *C. collei* in February, 2005, into the core iguana conservation zone. Three UWI undergraduate students also participated in the release, which brought the total number of repatriated headstarters to 75.

**2005 Nesting Season** - The first nest was deposited on 24 May, and the last nest was deposited on 20 June. A total of 14 nests were recorded from the two known communal nesting sites (i.e., "Upper" and "Lower"). Dawn Fleuchaus and Stephanie Wicker assisted with nest watches, as they did during the 2004 nesting sea-

son. Iguanas attempted to nest at the two new nesting areas identified in 2004, but abandoned the effort after the areas were disturbed by wild pigs. One new nesting area was discovered in a rock hole, with egg shell fragments indicating that seven hatchlings emerged in the 2005 season; additional evidence of nesting from previous year(s) was also noted.

**South Camp Reconstruction** - Our primary research station ("South Camp") was severely damaged during Hurricane Ivan in September 2004. Using discounted and salvaged materials, South Camp was re-built in June 2005 with major assistance from Brian and Stephanie Wicker and Larry and Dawn Fleuchaus. In particular, Brian and Larry, both professional tradesmen, put in several days of hard labor and saw the reconstruction effort through to near completion. We are indebted to them all for their hard work, good company, and donations of tools and other camp toys.

**Invasive Predator Control** - Predator control efforts continue to make the core iguana area a safer place for young iguanas and other threatened wildlife species. In addition to the 55-60 small mammal traps that are operated continuously, we also expanded our wild pig and dog control efforts through the deployment of additional snares. Catch totals for the period include: 7 cats, ~85 mongoose, ~25+ pigs, ~50 rats, and 0 dogs. The main problem with our anti-invasive effort continues to be the difficult nature of cat control. It is clearly some individuals are simply not trappable by our current methods. Because leg-hold traps and poisons would pose a risk to native wildlife species, the only solution is to obtain a small caliber rifle outfitted with a spotlight and a silencer. This piece of equipment is at the top of our wish list, but the legal (and illegal) gun situation in Jamaica is not conducive to making this a reality. We would also like to expand our present trapping grid to include a loop trail outside the existing trapping loop. Recent radio-telemetry results indicate that such an expansion would enhance post natal dispersal in *C. collei* (see below). The current trapping programme remains a major effort, owing primarily to the difficulty of accessing the remote interior Hellshire location, not to mention the logistical obstacles posed by the transport of equipment and traps to remote sites. However, continuous removal of mammalian predators is arguably the only conservation activity that is improving conditions for wild iguanas in Hellshire. We thank

other members of the trapping team for their efforts, especially Marlon Osborne and Edwin Duffus.

**2005 Hatching Season** - The 2005 hatching season was extraordinarily successful, with a minimum of 157 hatchlings recorded for the season (2.5 times as many as 2004). Interestingly, and probably attributable to wetter incubation conditions, the average SVL and mass of hatchlings in 2005 was notably greater than in 2004. Twenty hatchlings were taken to the Hope Zoo for headstarting, 41 participated in a radio-telemetry study (see below), and the remainder were marked and released.

**Radio-Telemetry of Hatchlings** - Forty-one hatchlings were outfitted with radio transmitters, of which six slipped out of their harnesses almost immediately; hence, data were collected for 35 individuals. Activity patterns and hide site selection were similar to patterns observed in 2004, though dispersal distances were greater. High mortality attributable to mongoose and cat predation was also noted. Preliminary analysis of mortality data indicate that hatchlings that disperse out of the predator-controlled area are doomed. Direct observation of mongoose predation on a transmitted hatchling was also observed and one hatchling was tracked to the stomach of a young Jamaican boa (*Epicrates subflavus*). Detailed data on dispersal, post-dispersal settling, and subsequent behavior were also obtained. Still on-going, the study will conclude in early December 2005.

**Goat Islands** - Two reconnaissance trips were made to the Goat Islands in 2005. The habitat still looks relatively intact, but a rumored organized charcoal operation on Great Goat Island is of great concern. As always, the critical impediment to a Goat Islands rehabilitation programme concerns the delegation of management authority. Recently however, it appears that the Urban Development Corporation (UDC) has finally been delegated management authority for both of the Goat Islands, as well as for most of the Hellshire Hills (the organization also owns those areas). We are presently in discussions with UDC that should result in the signing of an MOU with the Durrell Wildlife Conservation Trust (DWCT) and the Department of Life Sciences (UWI), so we can initiate fund raising activities and begin the restoration project.

## 2006 Objectives

- Continue existing initiatives (e.g., predator control, headstart and release, monitoring iguana population)
- Radio telemetry of post-partum iguanas
- Biological surveys of the Goat Islands
- Assessment of “western” and “eastern” Hellshire iguana populations
- Consolidation of *C. collei* data set
- Advocacy for management capacity (UDC)
- Formalization of Goat Island restoration agreements (DWCT)
- Initiation of genetic study of iguana
- New postgraduate student to undertake GIS-based habitat assessment of Hellshire
- Revision of species recovery programme (Summer 2006?)
- Iguana project facility - Port Royal Marine Laboratory
- Fund raising...

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## TURKS AND CAICOS ISLANDS - Hudson (for Gerber)

### **Turks and Caicos iguana, 2005 Update.** Glenn Gerber and Allison Alberts (Zoological Society of San Diego).

Translocations - The recently established populations of *Cyclura carinata* on French, Six Hills East, Bay, and Middle Cays were last visited in April/May 2005. All of these populations have exhibited excellent adult survivorship and growth rates. Average adult sizes on all the translocation cays are now larger than those documented for the source cays, Big Ambergris and Little Water. Successful reproduction has occurred on all translocation cays each year since establishment (January 2002 for French, Bay, and Middle Cays; January 2003 for Six Hills East Cay). All animals captured in April/May 2005 from the first cohort of juveniles produced on the cays were determined to be reproductively mature, based on published size at maturity data (Iverson 1979). Compared to the source populations, this represents a reduction in age at maturity on the translocation cays from 6 – 7 years to 1.5 – 2.5 years.

Accelerated growth rates on the translocation cays are occurring despite significantly lower plant diversity than on the source cays and are attributed to low levels of intraspecific competition on these cays relative to the dense source populations. Growth trajectories are expected to decrease as population densities increase.

Big Ambergris Cay - Development activities on Big Ambergris Cay have increased dramatically in the past year due to new partnerships with outside developers resulting in establishment of the Turks and Caicos Sporting Club. Irreparable damage to native habitats was already underway in April 2005, during our last visit, and recent reports from Big Ambergris by TCI-based colleagues are extremely grim. Heavy machinery of all kinds is in daily use and no visible effort is being made with regard to iguanas or other wildlife.

Little Water Cay - Cats, which first crossed the sandbar connecting this cay to Water and Pine Cays in 2000, are still the major concern for this otherwise protected population. A small-scale cat trapping program was initiated last year resulting in the capture and removal of three cats from the island's southern end but this program was suspended in the spring of 2005 and has not yet been reinstated due to a shortage of TCNT staff. No sign of cats were seen at the southern boardwalk study site in May 2005, during my last visit, and recent reports from Bryan Manco of the TCNT suggest this is still the case. Cats were still in evidence at the north boardwalk study site in May and their impact on this population (most notably juveniles) is gradually becoming evident. Glenn will accompany a team from Island Conservation to Little Water, Water, and Pine Cays in March 2006 to assess the situation and begin the preparations necessary for full-scale cat and rat eradications. In collaboration with engineers at Johnston's International, efforts are underway to produce and price a fence design that will stretch across the sandbar and isolate Little Water Cay from Water and Pine Cays. Johnston's has offered to install the fence for free.

Caribbean Wildlife Foundation - The Zoological Society of San Diego is helping to establish a non-profit conservation organization in the TCI through the donation of boats and equipment that have been dedicated to the TCI iguana project for the past five years, and

by covering legal fees associated with incorporation. The new non-profit (tentatively called the “Caribbean Wildlife Foundation”) should be functional by mid 2006. Operation will depend on securing outside funding through grants, donations, and other sources. While much of the initial focus will undoubtedly be on iguanas and the TCI, the organization will not be bound to these taxonomic or geographic restrictions. As a non-profit based in a Caribbean country, the foundation will be eligible for a variety of funding sources closed to US or UK based non-profits.

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## EXUMA ISLANDS, BAHAMAS - Knapp

### 2005 Research Update for *Cyclura cyclura figginsi*. Charles Knapp (John G. Shedd Aquarium and University of Florida).

Iguana populations in the Exumas were monitored briefly in May 2005 by the Shedd Aquarium. The translocated *C.c. figginsi* population on Pasture Cay (see past ISG reports for historic details) was visited for 1.5 days but only six adult iguanas were seen or captured. Pasture Cay is inhabited by rats and this population is being used to investigate the potential impacts of rats on the growth of iguana populations. Sixteen iguanas were translocated originally in 2002. Three iguanas (two in 2003 and one in 2005) have been confirmed dead and six alive. The others remain missing. The lack of adults is a strong concern but mitigated slightly by the presence of hatchlings and juveniles. We have documented extraordinary growth rates in recaptured juveniles. The unintended translocation of a male-biased propagule is suspected as the reason for the apparent loss of adult iguanas. Intensive monitoring of the population is needed to study the long-term effects of the male-biased translocated colony.

Bitter Guana and Gaulin Cays were monitored for a total of four days resulting in 45 iguana captures (18 recaptures). The goats reported previously on Gaulin Cay were not seen, however, we documented the larvae of *Cactoblastis cactorum* for the first time on an *Opuntia* cactus pad. The iguana education signs posted originally in 1998 have fallen and must be replaced. Bitter

Guana Cay was surveyed briefly and two goats were observed. Our concern is the significant increase in tourist traffic on the two cays, especially Gaulin Cay. Over the past decade, rarely did we observe tourists on Gaulin Cay. However, tourists were observed on the cay each day. The visitors come from Staniel Cay located immediately north of the cays. The tourists are being told to visit the island and feed the iguanas. This is a concern because visitor traffic in the Exuma Cays has been increasing significantly over the past decade. Many of these tourists land on cays inhabited by iguanas. For example, the Allens Cays in the northern Exumas experiences up to 600 people each week from one-day Nassau excursions. The islands in the southern Exumas also receive high-impact visitors from Great Exuma aboard one-day excursion tourist trips. Consequently, there are few iguana populations remaining in the Exumas that are free from visitor impacts. Visitors purposely feed the iguanas, thus altering their natural behavior and potentially their health. A study should be initiated to investigate the potential impacts of visitor traffic on iguana populations in the Exumas.

The Exuma Island iguana occurs on only seven cays in the archipelago and their population does not exceed 1500 individuals. Protection offered in the form of isolation is being eroded as more yachtsmen cruise the Exumas and islands are leased. Humans bring with them their dogs, cats, and unwittingly deleterious behavior of feeding the lizards. I have become increasingly concerned for the Exuma iguanas over the last two years because of elevated human activity on the cays they inhabit. More protection in the form of signs with rules should be offered to the few populations remaining throughout the Exumas.



Cuban treefrog on Andros. Photo by Joe Burgess.

## 25 Year Overview for *Cyclura cybdlura inornata*. John Iverson (Earlham College).

We continued our study of the Allen Cays rock iguana with field work in May 2005. Analysis of the mark-recapture data for subadults and adults (>25 cm snout-vent length) over the first 25 years of field work (1980-2004) using Program MARK (courtesy Gary White at Colorado State University) demonstrated that 1) the two natural populations of Leaf and U Cays have more than doubled over those 25 years (total populations on Leaf and U Cay now number about 600 and 300, respectively, excluding young of the year), 2) the sex ratio on both islands has shifted from about two males per female in the early 1980's to one-to-one currently, 3) annual adult survivorship has averaged about 90% (though higher in the more shy females than the bolder males, and higher on U Cay than Leaf Cay where tourist visitation and feeding is much higher), and 4) population growth has slowed to near zero over the last few years. Our analysis suggests that the two populations are approaching or have exceeded the carrying capacity (K) of their respective islands (with standing crop biomass exceeding 100 kg/ha on Leaf Cay).

The fact that adult survivorship is higher on Leaf than U Cay and yet annual population growth rate on Leaf Cay has exceeded that on U Cay seems antithetical. However, we believe this pattern is a result of higher juvenile mortality on U than Leaf Cay. Preliminary

data on nest survivorship for two years (2001-2002) support this hypothesis. Nesting areas on U Cay are less than one meter above sea level, and have wetter, more easily saturated soils. Storms during hatching season in September can cause the suffocation of late stage eggs or hatchlings in the nest.

During our field work in May 2005, we also visited two other islands onto which iguanas were apparently introduced, and we discovered a third. One of these islands had no iguanas in 1996, but now has at least 40, representing all size classes. Field work in March 2006 will focus on more rigorous surveys of these translocated populations, as well as the exploration of many other small cays in the northern Exumas to which iguanas may also have been introduced.

Finally, in December 2004 Holland America Cruise Lines received permission from the Bahamas Ministry of Agriculture to translocate a small group of Allen Cays iguanas to a small cay ("Guana Cay") in the interior tidal lagoon on Little San Salvador (now Half Moon Cay) for ecotourism purposes. In early January 2005 Kirsten Hines and I visited Leaf Cay in the Allen Cays, and captured one hatchling (ca. 3 months of age) and ten sub-young adults (estimated ages 7.3 to 15.3 years; mean body length, 25.9 cm; range, 22.5-31.7 cm; mean body mass, 634 g; range, 420-1028). These 11 were measured and pit-tagged, and transported to and released on the east end of Guana Cay. One of the requirements for issue of the permit was that a fence be built across the cay to restrict the iguanas to the east end, preventing their dispersal to the main island (with feral mammals and high tourist visitation), and preventing the dispersal of predators and competitors to the east end of the island. Unfortunately, on our arrival in January, we found that the fence did not reach even to the high tide lines on either side of the island, and also had an 8" gap under it. We strongly recommended that this deficiency be corrected; however, to our knowledge the fence has not been modified, and some of the iguanas are apparently now found across the length of at least Guana Cay. We are not optimistic that this translocation will be successful.



Resident male *C.c.cyclhura* at Tiamo Resort, Andros.  
Photo by Joe Burgess.

*Cyclura pinguis*: 2005 update. Kelly Bradley (Dallas Zoo) and Glenn Gerber (Zoological Society of San Diego).

The Anegada iguana headstart and release program is going very well, with a consistently high rate of survival. The first 24 headstarted iguanas to be returned to the wild were released in October 2003 and ranged in size from 2050 to 750 grams. Survival after two years has been 79%, with 19 animals still alive. The 24 animals released in 2004 ranged from 1540 to 600 grams. After one year, this group has experienced an 88% survival rate with 21 animals still living.

Because the smallest animals from the 2003 and 2004 releases survived, we decided to further reduce animal size for the October 2005 releases. This past fall, an additional 24 iguanas were released, ranging in size from 1055 to 415 grams. The same release strategy was used as in years past. Twelve animals (6.6) of equivalent sizes were released at each of two study sites: rocky woodland on Middle Cay and sandy scrub in Bones Bight.

The eight smallest iguanas ranged in size from 612 to 415 grams and received internal transmitters to insure our ability to monitor them long-term. Dr. Bonnie Raphael and Nina Palmer from the Wildlife Conservation Society conducted the health screenings and transmitter implantation surgeries. The 16 remaining iguanas were fitted with external transmitters attached to the nuchal crest with nylon coated stainless steel wire and crimping tubes.

All of the animals were released back into the wild during the first week of October. The iguanas were tracked daily for the first month, after which survival was 100%. The first follow-up monitoring trip took place in December 2005. After 60 days, 22 animals were still alive, representing a 91% survival rate. Additional follow-up trips will take place in February, May, July, and October of 2006.

## Conservation Outreach for the Anegada Iguana. Lee Pagni (Zoological Society of San Diego).

Conservation Education continues to play an important role in the recovery of the Anegada iguana. With momentum building from previous years' activities, 2005 saw numerous conservation education activities related to the recovery program.

The program received a grant from the IUCN's Sir Peter Scott Fund for creating outreach materials such as an interpretive guide to the headstart facility and a poster and complementary brochure to raise local awareness about recovery efforts. These materials will be produced and distributed in 2006. Funding was also received from the World Association of Zoos and Aquariums for capacity building of local educators. These funds were used to cover travel expenses for a group of 12 educators from the BVI to attend a one-day workshop on environmental education coordinated by the Virgin Island Network of Environmental educators (VINE) based in St. Thomas, USVI, the BVI National Parks Trust, and the San Diego Zoo. A grant from the Institute of Museum and Library Services helped fund outreach for a genetic analysis of the San Diego Zoo's captive group of Anegada iguanas. The outreach activities include a secondary-level lesson on microsatellite DNA that is posted on the San Diego Zoo's website.

An annual highlight is the release of headstarted iguanas back to the wild. This year 11 members of the Anegada community took part in the October releases. Besides bringing more awareness to the headstart program, local involvement in these types of activities is important to improving local support for other recovery efforts that include protecting key habitat and controlling feral predators.

Finally, outreach efforts were not only contained in the Caribbean. Middle-school students from the San Diego Zoo's ZooCorps program took part in important outreach activities. First, the group learned about Anegada iguana conservation, produced a display about what they learned, and educated visitors on Zoo grounds about the recovery program. ZooCorps members also created "genetic jewelry" based on a sequence of an Anegada iguana gene. These colorful and genetically accurate beaded necklaces were given to students on Anegada during an outreach presentation by Kelly Bradley of the Dallas Zoo.

**Fijian Iguana Update. Peter Harlow (Taronga Zoo).**

Thanks firstly to the 18 Iguana Specialist Group members and all the other international specialists who made the long and expensive trip to Fiji for the 'Conservation and Management Plan Workshop for Fijian Iguanas' in November 2004. The Species Recovery Plan from the workshop should be finalized and printed in early 2006. Several of the recommendations from the workshop have already been completed or are currently being implemented.

Two reports recommended by the workshop have been completed: the first, titled 'Survey Techniques and Data Analyses for Estimating Fijian Iguana Abundance' (by Peter Harlow and Pita Biciloa), has been printed and distributed to all potential users in Fiji. This is a user-friendly description of how to conduct line transect surveys and analyze the data using distance survey techniques to obtain abundance estimates for both species of Fijian iguanas.

The second report, 'Invasive Plant Assessment and Weed Management Plan for the Fijian Crested Iguana Sanctuary Island of Yadua Taba' (by Jennifer Taylor, Peter Harlow, and Jone Niukula) has been printed and distributed. Four species of invasive plant were identified as needing intervention to control and eventually remove from Yadua Taba: Rain tree, *Wedelia trilobata*, Guava and *Lantana*. These species are continuing to spread on Yadua Taba and thus decrease the available dry forest habitat available for crested iguanas. Over 300 rain trees have so far been poisoned, which is more than half of the estimated total on the island. The report includes a five-year plan for the removal of these four invasive species by the sanctuary ranger.

This project began in July 2003, and by September 2005 *Wedelia trilobata* or 'trailing daisy' as it is also called, had been totally eradicated from the island by intensive hand removal. This species is native to the Caribbean but is highly invasive in the Pacific, covering the forest floor with a foot-thick layer of interconnected plants and choking potential iguana nesting habitat. The successful removal of this species from Yadua Taba is the first record of an invasive plant species being removed from any island in Fiji.

In September 2005, Clare Morrison, Isaac Rounds, Nunia Thomas (University of South Pacific), Pita Biciloa and Jone Niukula (Fiji National Trust), and Peter Harlow (Taronga Zoo) completed the first of four two-week field trips to Yadua Taba crested iguana sanctuary. We collected tree-use data and buckets of iguana faecal material (for later analyses) to obtain a better picture of crested iguana diet across all seasons. Six permanent transects were established and a complete vegetation and iguana survey along each transect were completed. Knowledge of the dietary requirements of this herbivorous species across all seasons is needed to assess potential islands suitable for future translocation of Fijian crested iguanas, or for forest restoration on degraded islands. The second trip took place in December 2005, and the fourth and final field trip is scheduled for July 2006.

In September 2005, Craig Morley (University of South Pacific) and Peter Harlow, with local assistance, completed a rapid survey of crested iguanas on the 40 hectare island of Macuata, where crested iguanas were re-discovered in 2004. Based on 22 night-time sightings along 800 metres of transect, an average of 25 iguanas per hectare of forest occur on the island, and almost half this island is currently covered in regenerating forest. This island is one kilometer off the north coast of Viti Levu, Fiji's largest island, and about two hours by road from the capital Suva. It is privately owned, and was heavily burned and goat grazed until 1994 when goats were removed. The forest is now recovering, and most of the iguana's favorite food tree species are present but in low abundance. This island is second in importance after Yadua Taba for the long-term conservation of the crested iguana, and together with Yadua Taba, these are the only crested iguana populations in Fiji where numbers are stable or increasing.

PhD student Suzie Morrison from the Australian National University (Canberra) began her field research on Yadua Taba in September 2005. Suzie and her partner Zach Pierce will be using mark-recapture and radio-tracking techniques to gather basic biological data on reproduction, juvenile recruitment and habitat requirements of crested iguanas. Other projects include seed dispersal by iguanas and rats, the effects of the introduced invasive 'crazy ant' on crested iguanas and their habitat, and dry forest restoration projects. See their project website at: <http://www.fijiancrestediguana.com/>

**Mona Island Iguana, *Cyclura cornuta stejnegeri* Update. Miguel Garcia (Puerto Rico Department of Natural and Environmental Resources).**

The endemic Mona Island Iguana, *Cyclura cornuta stejnegeri*, has been listed as endangered under the Endangered Species Act and the Regulation to Govern the Endangered and Threatened Species of the Commonwealth of Puerto Rico. This is because the species exhibits a limited distribution, relatively low population numbers, and reduced recruitment of juveniles into the breeding stage. Therefore, a head-start program was started in 1999 and is conducted by the Department of Natural and Environmental Resources (PRDNER), the Toledo Zoo, and the University of Puerto Rico. By October 2005, 87 headstart iguanas have been released and of these 33 animals have been recaptured. We have recorded dispersal data from nine individuals and found relatively large home ranges, ranging from 2.4-22.2 hectares. The average home range (MCP) for all individuals was 19.8 hectares. (Kernel 90% = 13.3 and Kernel 50% = 2.3). All the headstart iguanas observed are active and in good health, indicating the success of this management strategy.

Period	Number of Hatchlings Collected	
	Sardinera	Playa de Pájaros
1999-2000	47	4
2000-2001	25	0
2001-2002	2	5
2002-2003	3	34
2003-2004	0	35
2004-2005	6	42

Table 1. Number of hatchlings collected at two sites by year.

**Summary:**

- No released iguanas have been found dead
- Relatively large home ranges (2.4-22.2 ha)
- Survivorship data are still being recorded by active searching of marked individuals (with or without radios)
- Population and Habitat Viability Assessment is needed to determine number of released iguanas necessary to obtain a positive and sustained population growth

**Introduced Cuban Iguana, *Cyclura nubila nubila* on Isla Magueyes. Miguel Garcia (Puerto Rico Department of Natural and Environmental Resources).**

The introduced population of Cuban iguanas on Isla Magueyes has become a problem since it is very charismatic but the Commonwealth of Puerto Rico has a strict public policy against exotic biota. Only researchers, students, and field workers (no tourists) are allowed on the island, but the animals have been fed and are now aggressive and numerous (~500 on 7.2 ha).

A discussion of this issue was held among ISG members and key points are listed below. A sub-group was formed to help the Puerto Rico Department of Natural and Environmental Resources find an acceptable solution to this dilemma.

- The population is exempt from the US ESA rules because it is an introduced population. Legally the animals could be moved from the island to the pet trade within the US. Placing the animals in the US pet trade poses serious risks of: improper care, undesirable precedent, and potential release and conversion to a new feral population.
- They are a CITES I species so trade within the US is not regulated. Translocating the iguanas back to Cuba would involve US export and a Cuban import permits. Translocation back to Cuba is zoonotically risky to other herpetofauna.
- The Cuban government should be contacted by the Puerto Rico Department of Natural and Environmental Resources to assess their interest and involvement in the future of this population.
- The ISG is concerned about stating a policy in the event of backlash. It is preferred to have the Puerto Rican government decide their policy and the ISG can advise on the potential problems of any action.
- Established colonization on the mainland of Puerto Rico is unlikely because there are many predators even though the over-water distance is short.
- A control plan is needed with an analysis of: harvesting of adults through relocation (outside Puerto Rico), stopping population growth (nest destruction), and euthanasia (last resort).

**Molecular analysis of the Ctenosaurs of Nuclear Central America: insights into speciation, conservation and management.** Stesha Pasachnik (University of Tennessee).

Mesoamerica has been defined as one of the earth's biodiversity hotspots. The *Ctenosaura* group exemplifies this pattern because it is an incredibly species rich clade, however, it has received little attention thus far in scientific research. In order to evaluate plausible explanations for speciation within this clade I plan to: 1.) construct a molecular phylogeny of the iguanas of *Ctenosaura melanosterna* complex inhabiting the Caribbean borders and islands of Honduras, the heart of Mesoamerica, (using the *C. quinquecarinata* complex as an outgroup); 2.) investigate the colonization of *C. bakeri*, *C. similis*, *C. melanosterna*, and *C. oedirhina* to the Bay Islands, Cayos Cochinos and various islets in the Caribbean Sea bordering Honduras; and 3.) document the degree and directions of hybridization, between the endemic *C. bakeri* and a wide ranging congener *C. similis*, on the island of Utila, Bay Islands, Honduras. This study will provide insight into diversity, species status, and the conservation and management strategies that are necessary to preserve the *Ctenosaura melanosterna* complex.



Male *Cyclura c. cychlura*, Andros. Photo by Joe Wasilewski.

**Genetic Studies Update.** Catherine Stephen (Utah Valley State College).

**Iguana Phylogeography** - *Iguana* consists of two species, *I. iguana* and *I. delicatissima*. While *I. delicatissima* historically has a very limited range restricted to the Lesser Antilles, *I. iguana* is found throughout the Neotropics and the Lesser Antilles (Burghart & Rand 1982). It seems highly unlikely that *I. iguana* constitutes a single interbreeding population, given the enormous physical distances and barriers to gene flow. We are using nuclear and mitochondrial DNA sequence data to explore the phylogeographic history of this species. Samples included in the preliminary analysis have been collected from 17 different countries. Results from both data sets show a congruent, deep lineage divergence between the Central American populations and the South American plus Lesser Antilles populations of green iguana. The topology of the phylogeny indicates that *Iguana iguana* arose on the South American continent and radiated much more recently into Central America.

**Iguaninae Subfamily Phylogenetics** - Iguaninae is an ancient group with eight modern genera distributed throughout the Western Hemisphere and the Fijian archipelago. Previous morphological and molecular studies of Iguaninae relationships have relied on incomplete sample sets that yield conflicting topologies. The subfamily collectively spans thousands of miles across multiple geographical boundaries, and exhibits a high degree of regional and island endemism. Because of its age and distribution, the group is uniquely suited to test biogeographic hypotheses, such as suggested occurrences of past refugia or relictual fragments, as well as allow empirical evaluation of molecular clock models. In order to generate a robust phylogeny we have collected DNA sequence data at four loci (two nuclear and two mitochondrial) for all eight genera, including 28 of the Iguaninae species. Phylogenies generated from maximum likelihood analysis of separate data sets result in congruent phylogenies with varying levels of resolution.

Preliminary analysis strongly supports *Dipsosaurus* as the most basal lineage in the subfamily, followed by an early dispersal of *Brachylophus* to the Fijian Archipelago and a subsequent divergence of the *Cyclura* lineage. A sister relationship between *Sauromalus* and *Iguana* is supported by the combined analysis, and this clade is sister group to the rest of the subfamily (*Ctenosaur*, *Amblyrhynchus*, and *Conolophus*). Interestingly, *Ctenosaur defensor* falls outside of the *Ctenosaur* clade in the three data sets in which it is included.



Resident male *Cyclura c. cyclura* at Tiamo Resort, Andros.  
Photo by Joe Burgess.

Booby Cay Study Complete - *Cyclura carinata*, a Bahamian rock iguana, currently has two recognized subspecies. *Cyclura c. carinata* is found on several islands and cays throughout the Turks and Caicos Islands. The second subspecies, *C.c. bartschi*, is now only known to exist on Booby Cay, a small island off of Mayaguana Island, Bahamas, which is also within the subspecies historic range. Support for subspecific status is weak. Geographic isolation appears to be the only strong indicator of genetic isolation. Recent conservation attempts made on the species behalf have brought questions regarding the taxonomic status of the species to the fore. We used mtDNA sequence data to ask whether there is any genetic variation that distinguishes *C.c. bartschi* from several sampled populations of *C.c. carinata*. Our findings show that the Booby Cay population of *C. carinata* is fixed for a common mtDNA haplotype found in Caicos Island populations of *C. carinata*. In contrast, four different haplotypes were found among populations designated *C.c. carinata*. We conclude that there is insufficient evidence to support *C.c. bartschi* as a subspecies and recommend that the Booby Cay population of *C. carinata* be included in ongoing conservation efforts currently focused on the Turks and Caicos Islands.

BOOBY CAY, BAHAMAS - Wasilewski and Conners

**Bartsch's Rock Iguana, (*Cyclura carinata bartschi*) 2005 update.** Steve Conners, Joe Wasilewski, Joe Burgess, and John Bendon.

The population of *Cyclura carinata bartschi* found only on Booby Cay, Mayaguana, Bahamas has been monitored annually since 1998. Repeat observations by a core group of team members indicate that the population has remained healthy and stable over this time period. All size classes and sexes have been seen during each visit despite the continued presence of introduced goats, rats, and a strong hurricane. Human activity (periodic camping by fisherman) on the island has had no negative impact on the iguanas. Interviews with local residents indicate that harvesting of goats may be increasing, which would reduce their population, and thus their impact on the vegetation. There are currently 50 individual iguanas marked, but few recaptures have been made. Iguanas were observed foraging on seagrass during extremely low tides. A set of transect surveys has been completed, resulting in a conservative population estimate of 14.5 lizards/hectare, or a total population of 558 animals on the Cay. It is recommended that annual monitoring of this population continue.

## Session 2: General Reports

### International Iguana Foundation Report

*Rick Hudson (Fort Worth Zoo)*

The International Iguana Foundation (IIF) currently has 14 Board members representing zoos, NGO's, corporations, and foundations; the group is largely U.S. based with one foreign partner (Durrell Wildlife Conservation Trust). To date (December 2005) nearly \$400,000 has been raised, through a combination of annual Board pledges, grants, and donations. The IIF has received and administered over \$120,000 in grants from a number of sources including AZA Conservation Endowment Fund, Morris Animal Foundation, SSC Sir Peter Scott Conservation Action Fund, Conservation International, and a host of zoos. One of the IIF's most generous sponsors has been the Disney Wildlife Conservation Fund (DWCF) that has awarded \$68,750 to the IIF for iguana programs in Grand Cayman (2002-2003), Turks and Caicos (2004), and Jamaica (2005).

Where have these funds gone? The IIF has awarded just over \$170,000 over four grant cycles (including the recent 2005 awards) to support iguana conservation work in Grand Cayman, Jamaica, Anegada, St Lucia, Dominican Republic, Mona, the Bahamas, and Fiji. Funds have also been raised to support major projects including emergency relief effort for Hurricane Ivan damage (\$17,000), Hope Zoo iguana facility renovations (\$9,000), and the development of a feral mammal control plan for Anegada (\$11,000, thanks to San Diego Zoo). Highlights of some of the projects and programs that IIF has supported include the following:

- Salary support for manager of the blue iguana headstart and breeding facility on Grand Cayman
- Supported the release and monitoring of 23 blue iguanas in Grand Cayman's Salina Reserve in 2005-06
- Supported biologist Rick Van Veen's salary to conduct fieldwork in Jamaica's Hellshire Hills where he is solving many mysteries on the life (and death) of the Jamaican iguana
- Supported the ongoing predator control effort in Hellshire Hills and studying the impact of their removal

- Supported the repatriation of 28 headstarted Jamaican iguanas (2003 and 2005)
- Provided support to the ongoing iguana headstart program at Jamaica's Hope Zoo
- Supported field surveys and conservation research for the Anegada iguana recovery effort
- Funded the pre-release health screening, repatriation, and follow-up monitoring for 72 Anegada iguanas (2003 – 2005)
- Purchased a dedicated project vehicle for the Anegada field researchers (split with IRCF funds from Daytona NRBA auction)
- Provided training and technical support for the Anegada iguana headstart program
- Funded signage for the protected nesting area for the St. Lucia iguana
- Funded research on the nesting ecology and hatchling survival of the St. Lucia iguana
- Provided funds to the NGO Grupo Jaragua to conduct field research that led to the discovery of a major hotspot of Ricord's iguana habitat in the Pedernales region of the Dominican Republic
- Funded a translocation of ten San Salvador iguanas from Green to Cut Cay in the Bahamas in 2005
- Funded a new iguana population field assessment technique for the Mona iguana
- Supported an ongoing natural history study for the Fiji crested iguana on Yadua Taba

The IIF faces a number of major challenges in 2006 that it intends to work on, including the development of a strategic business plan, identification of corporate partners, ramping up fund-raising efforts, increasing visibility and exposure, and expanding content on the IIF web site.

The IIF Board of Directors met on 9–10 November 2006 following the ISG meeting in South Andros, Bahamas. The Board reviewed five proposals requesting a total of \$53,473. Due to funding constraints, the Board was able to award \$31,864 to the following five programs, four of which provide direct support to iguana species ranked Critically Endangered by the IUCN Red List (*Brachylophus vitiensis*, *Cyclura lewisi*, *C. collei*, and *C. pinguis*). Subsequent to the meeting, emergency funds were awarded for conservation of *C. ricordi*, also Critically Endangered.

- *Restoration of a Second Subpopulation of Wild Grand Cayman Blue Iguanas, Phase 2, \$5,864, Fred Burton.*

This grant provides support for the December 2005 release of an additional 70 two-year old iguanas that will significantly expand the population established in the Salina Reserve in 2004-05. This release will bring this new wild subpopulation half way to its target size of 200 individuals from 20 founder lines. Funds will be used to purchase radio transmitters, pay for helicopter rental to transport artificial iguana burrows, and support volunteer field workers.

- *Jamaica Iguana Recovery Program, \$9,000. Byron Wilson.* This grant provides funding to continue this long-running field program and ensures that the primary field biologist, Rick Van Veen, remains on salary and working in Hellshire. Rick's ongoing conservation activities include predator control, protection of nesting sites, research on ecology and habitat requirement of the iguana, monitoring released iguanas (16 in 2005), and radio-tracking hatchling iguanas.
- *Conservation of the Anegada Iguana: Public Education, Headstart Optimization and Nest Protection, \$8,000, Kelly Bradley and Glenn Gerber.* This grant supports field research and monitoring of the third consecutive annual release of 24 radiotagged headstarted iguanas, and provides funding to assemble a team to search for iguana nests in July 2006 to ensure a large number of hatchlings are brought into the headstart facility in October.
- *Conservation of the Critically Endangered Fijian Crested Iguana, \$3,000. J.S. Keogh, P. Harlow, and S. Morrison.* This awarded proposal provides support to the ongoing natural history study of the Fijian crested iguana on Yadua Taba that will help answer questions regarding the ecological role they play in their native forests.



Andros Town Hall Meeting featuring presentations by Chuck Knapp and Sandra Buckner. Photo by Joe Wasilewski.

Habitat use, reproductive ecology, and juvenile recruitment will be studied.

- *Development of a Cost-efficient and Effective Monitoring Program for the Mona Iguana Population, \$6,000, N. Perez-Buitrago, S.M. Funk, W.O. McMillan and M. Garcia.* Funds will be used to conduct a feasibility study for using non-invasively collected DNA samples (from feces) as a tool for acquiring accurate population estimates. Using existing density estimates on the Mona iguana population, workers will compare conventional field methods (mark recapture) with modern lab techniques using genetic markers. This pilot project has long-term implications for field assessments of other endangered iguanas.
- *Emergency Funds Request for a Ricord's Iguana Population Survey on the South Shore of Lake Enriquillo, Dominican Republic, \$3,000, Ernst Rupp (Grupo Jaragua).* In response to mounting political pressure to convert this area to agriculture, there is an immediate need to document the actual extent of the iguana population and the estimated impact of the proposed habitat conversion. The south shore of Lake Enriquillo supports a major population of Ricord's iguana but does not have legal protective status at present. Imminent conservation measures need to be implemented to protect this area.



### IRCF Report

*John Binns (International Reptile Conservation Foundation)*

In December IRCF was granted \$36,400 by the Dart Foundation towards improvements to the Blue Iguana Recovery Program's captive breeding and head-starting facility on Grand Cayman. IRCF's 501c3 status facilitated this grant, which will be transmitted onwards to the Blue Iguana Conservation Fund on Grand Cayman, where it will be utilized to refurbish and subdivide an oversized breeding pen, complete a storage shed and food preparation area, install piped water throughout the facility, and supplement funds already being raised by an IRCF web appeal to erect a security and tour management fence for the facility.



## Cyclura Studbook

*Tandora Grant (San Diego Zoo, CRES)*

The *Cyclura* studbook contains a record of all animals that have lived in US zoos and some non-zoo facilities.

The current living population is (M.F.Unk):

*Cyclura cornuta cornuta*: 27.23.21 (71) in 20 zoos

*Cyclura cyclura figginsi*: 1.5 (6) at the LA Zoo

*Cyclura nubila nubila*: 7.7 (14) in 4 institutions

*Cyclura nubila caymanensis*: 1.0 at the Atlanta Zoo

*Cyclura ricordi*: 9.7.1 (17) at ZooDom (Dominican Republic)

*Cyclura pinguis*: 9.9 (18) at San Diego, Miami Metro, and recently the Houston Zoo. Fort Worth Zoo will soon house 2.2 of these in their new Animal Outreach and Conservation Center. The US population consists of 1.2 founders and 2.1 potential founders. There are approximately 80 animals living in the headstart facility on Anegada. 24 were released in October 2003, 24 in Fall 2004, and 24 in Fall 2005.

*Cyclura collei*: 7.11 (18) are living in six institutions and females continue to lay infertile eggs. Approximately 224 iguanas have had some headstart time at the Hope Zoo in Kingston, including 19 hatchlings from 2004 and 18 from 2005. There were six deaths due to the 2004 hurricane, but an additional four were captive-hatched in the headstart facility.

*Cyclura lewisi*: 16.13 (29) in ten US institutions, 18.18.160 (196) at the Grand Cayman breeding facility. The US population is currently represented by twelve founders. In 2005, three new founders bred successfully at the Grand Cayman facility, increasing the number to 8.7 founders and 2.3 potential founders. Headstarting of juveniles from nests in the QEII Botanic Park continued with 37 collected in 2005. There are now 26.33.2 animals that have been tagged and released into the park. A second release of juveniles in 2005 in the Salina Reserve brought the total to 47.46.1 (94) iguanas, representing ten founders. The 2000-05 Species Recovery Plan was revised at the end of 2005 to encompass the next five years.



## Husbandry Manual for West Indian Iguanas

*Jeff Lemm (San Diego Zoo, CRES)*

Husbandry manuals are helpful additions to captive animal management programs and are suggested components to IUCN SSC Species Survival Plans. The West Indian Iguana Husbandry Manual was conceived at the ISG meeting in 2002, held in the Dominican Republic. Surveys were sent to researchers working with West Indian iguanas, as well as institutions working with the animals in captivity. Publication of the manual is still delayed. The sections on handling, quarantine, husbandry, breeding and nesting, and Lesser Antillean iguanas have been finished for more than two years. We are still waiting for the nutrition and medical sections from the Fort Worth Zoo. Recent emails indicate the sections are nearly finished and should be delivered in February, 2006. The finished manual will then be edited by members of the group and translated to Spanish by Miguel Garcia. Hopefully the document will be available in mid-2006.



## Digital Photography Guidelines for ISG Biologists

*Thomas Wiewandt (Wild Horizons)*

Like it or not, we are now living in a visual world. With so many demands on our time today, even policy-makers are less willing to read a well-crafted argument. Pictures have become an essential element for quick and effective communication. They can grab attention and entice a reader to spend time with the text, or entice a visitor to donate money for conservation research and education.

As field biologists, we have had and will continue to have, unique photographic opportunities....priceless opportunities for sharing experiences and discoveries with colleagues, educators, politicians, and the public-at-large. Many of us now own and carry digital cameras in the field, yet lack the knowledge to choose and use this equipment effectively.

You can help the ISG and the IIF with educational and fund-raising efforts by contributing useful(!) digital images to our archive. We need your support. The digital picture files required for publication in books, magazines, journals, posters, and special exhibits must

meet certain minimal requirements. I've attempted to outline some of the basics below, things that anyone shooting more than family snapshots ought to know.

**Cameras** - The market is now flooded with digital cameras at reasonable prices. Buy the best one you can afford, but first check out the merits of each model in your price range. Visit: <http://www.dpreview.com> for in-depth technical reviews and comparisons. Features to look for:

- 1) A body offering a 6 megapixel capture or greater; many fine 8+ megapixel cameras are now on the market for under US\$1,000. John Binns (IRCF) has determined that the minimum file size for an 8"x10" color image to be successfully printed on the cover of the journal IGUANA requires greater than 7 megapixels.
- 2) Be sure your camera allows you to shoot in Camera RAW format, and always save the RAW file as your master. This is a 12 to 16-bit file with >64,000 levels of tonality. Copy it and then process/enhance/resize the COPY if you like. But store the RAW files of your "keeper" images in a safe place (see note below about CDs). For our archive, we need your unsharpened, unadjusted RAW (or master TIFF) files, so that we can work with them in Photoshop to get optimal results for each project that comes along. ALL digital images are inherently soft in focus and require sharpening; but to properly sharpen a picture, publishers must first know its end-use and size and apply this to the master file.
- 3) Never shoot in JPEG format (an 8-bit file with only 256 levels of tonality), unless your camera allows you to shoot RAW plus JPEG simultaneously (many do). Yes, you will be able to cram many more JPEG images on a data storage card, but not without a huge trade-off: JPEG images are technically inferior, and this compressed format loses quality each time the image is saved.

- 4) One of your camera settings options should be color space. Choose the Adobe 1998 color space, not sRGB (sRGB is a color space with a greatly restricted number of colors/tones intended for safe use on the worldwide web).
- 5) If your present camera, or one you are considering, doesn't offer the options listed above, look for a better model. And study the instruction manual that comes with your camera. Sounds obvious, but most people don't bother.

**Lenses** - You should consider buying a camera body that accepts interchangeable lenses. These SLR (single lens reflex) designs allow you to see and compose your picture through the lens, certainly much better for telephoto & close-up photography.

Canon leads the pack in the digital photography world, they now hold 75% of the pro digital SLR market, and will probably stay there. Their R&D budget is enormous. For this reason, I recently switched from Nikon to Canon. If you are shopping for a new digital camera for under US\$1,000, I'd recommend the new Canon EOS 350D (Digital Rebel XT). It's a lightweight, compact 8.0 megapixel SLR that can be purchased for about US\$700 (body only) from places like <http://www.buydig.com> and ol' reliable <http://www.BhPhotoVideo.com>

Choose your lenses carefully. For fieldwork, where size and weight are important considerations, you might want two zoom lenses that will give you a wide range of options. Canon, for example, offers an EF-S 17-85mm f/4-5.6 IS Image Stabilizer USM Lens (about \$600 and focuses to 14") and a Telephoto EF 70-300mm f/4.5-5.6 Do IS Image Stabilizer USM lens (about \$1,100). Their built-in image stabilizers produce sharp pictures without a tripod! Although not Canon's top-of-the-line



JOHN BINNS

“L” lenses, both are excellent. The housing is plastic and more sensitive to rough handling, but plastic makes them extremely lightweight.

If your budget is really tight, consider buying Tamron or Sigma lenses, but be careful. SOME are excellent, others are poor. These companies offer different grades of optical quality, and manufacturing quality-control standards are not as reliable as with the major name brands. Use the internet to find comprehensive reviews of lenses that interest you, and after you buy one, test the lens carefully as soon as you get it. Most retailers will allow you to return equipment within the first two weeks after purchase.

Keep in mind that an optically poor lens will produce poor pictures; and in digital cameras, sharp focus on the imaging plane is even more critical than it was in film cameras. Accordingly, always remove the lens from your camera body when packing your gear.

CF Cards for your Camera - Recording media do not perform equally well in different camera models, and some brands are more reliable than others. To find which CF cards will work most efficiently in your camera, visit [http://www.robgalbraith.com/bins/multi\\_page.asp?cid=6007](http://www.robgalbraith.com/bins/multi_page.asp?cid=6007)

ISO/ASA Index - As a general rule, shoot with an ISO of 100; in the newer cameras 200 often works well and 400 can get you through in a pinch. Like film grain, digital noise (expressed as discolored pixels) increases as the ISO index increases, but is aesthetically more distracting than film grain.

Exposure - Digital cameras of merit all provide a small graph (a histogram) of tones with each picture that you take. The graph resembles a mountain range. A standard, bell-shaped curve indicates a nice even spread of brightness values of pixels throughout the image. If you see a clipped histogram curve jammed against the vertical axis, you have underexposed the shot and can expect no detail in the shadows. If the curve rises abruptly from the far right end of the horizontal axis, you have lost detail in the highlights. To correct a bad exposure, use the camera's Exposure Compensation Dial or set the camera on Manual and adjust the exposure up or down as needed to move the histogram right or left towards the center. Vary your settings, shoot more pictures, and watch how the histogram changes.

Tripods - Whether you shoot digital or film, the rules of good technique stay the same. If you hand-hold your camera, many important images will end up looking fuzzy when enlarged. The dimmer the light and the smaller the lens aperture (i.e. bigger f-numbers, which give a greater depth of field), the more important a tripod becomes. But if you'd rather not lug a tripod around or find it's impractical to carry one, try using lenses with built-in image stabilizers, a flash to freeze action and fill shadows, or a higher ISO setting when the light is poor. A monopod can also stabilize your camera, some people swear by them, and they can double as a hiking stick.

In harsh lighting situations (with bright highlights and deep shadows) it's wise to bracket the exposure to cover the full range of light seen by the human eye. Multiple images of varying brightness shot from a tripod can later be easily combined in Photoshop to show detail in both highlights and shadows. TIP: To successfully match two or more images, bracket the shutter speed when shooting, not the lens aperture.

Organizing Storing your Images - In time, an unmanaged picture library will soon become almost useless to yourself and others. After every trip, begin by throwing away your junk images (those that are out of focus, show little of interest, or are inferior duplicates) and keep only the best. If you can use Photoshop, even a little bit, open your RAW file in Photoshop and go to File > Save As > TIFF file, which will then serve as your master. When opening images in Photoshop, always choose to work in the Adobe 1998 color space. Then ATTACH your caption information to the picture file by going to File > File Info and enter, at the very least, your name in the Copyright field and basic caption information in the Description field. If you use Photoshop's latest version, CS2, this should all go smoothly, and any copy you make from this master will contain the caption information you entered (unless you choose the Save for Web option).

Camera RAW formats are proprietary and unique to each camera manufacturer. This lack of standardization can lead to difficulties. If you don't have Photoshop, one of the best solutions is to set up an Excel spreadsheet with your captions identified by a unique image number. Your spreadsheet can then be burned to a CD with your RAW files so that they stay together. Essential caption info includes the name of the subject, common

and full scientific names for animals or plants featured in the photo, any special behavior or attribute shown, and the locality where the picture was taken. Don't abbreviate anything!

Another option, only for Windows users: download the free PixVue image management software. It is extremely friendly, is integrated with Photoshop, and has received great reviews: <http://www.pixvue.com/>. For Mac users, a new digital image editing/managing program called "Aperture" has been released. Though pricey and still in its infancy, it is one to keep an eye on. Adobe is also developing new software that expands the capabilities of the Bridge feature in CS2, to be marketed under the name "Lightroom." Adobe says it will be "an efficient, powerful way to import, select, develop and showcase large volumes of digital images. It allows you to spend less time sorting and organizing images." Its beta test version works on the Mac platform, but soon it will be available for Windows. A word to the wise: always be wary of new software releases – new releases are frequently full of bugs and in need of fundamental enhancements. I usually wait at least a year before taking the plunge.

Not all CD-Rs are Created Equal - I recently received an important memo from the American Society of Media Photographers (July 2003) and have included excerpts in the following paragraphs. Which kind of medium should I use? There is no "best" medium for all recorders. You can't tell how well a disc will work just by looking at it; the only way to know is to put it in \*your\* recorder, write a disc, then put it in \*your\* reader and try it. Statements to the effect that "dark green" is better than "light green" are absurd. Some discs are more translucent than others, but that doesn't matter: they only have to reflect light in the 780nm wavelength, not the entire visible spectrum. It's probably a good idea to start by selecting a medium that is certified for your recorder's desired write speed. Speed considerations are more important for CD-RW than CD-R. Many drives refuse to record at speeds higher than the disc is rated for. on top of that, there are "ultra speed+" blanks (for 32x recording), "ultra speed" blanks (for 8x-24x), "high speed" blanks (for 4x-10x) and "standard" blanks (for 1x-4x). The faster blanks are labeled with a "high Speed CD-RW" or "Ultra Speed CD-RW" logo, and will not work in older drives.

The Orange Book standard was written based on

the original "green" cyanine discs from Taiyo Yuden. Cyanine dye is more forgiving of marginal read/write power variations than "gold" phthalocyanine dye, making them easier to read on some drives. On the other hand, phthalocyanine is less sensitive to sunlight and UV radiation, suggesting that they would last longer under adverse conditions. Manufacturers of phthalocyanine-based media claim it has a longer lifespan and will work better in higher speed recording than cyanine discs. Some good technical information is available from <http://www.msscience.com/>. In particular, "Are green CD-R discs better than gold or blue ones?" at <http://www.msscience.com/faq52.html>.

There is no guarantee that brand X will be the absolute best in recorder Y. however, some brands are recommended more often than others. It does pay to be brand-conscious. Brands most often recommended: Mitsui, Kodak, Taiyo Yuden, and TDK. Sometimes Pioneer and Ricoh. It appears that HP, Philips, Sony, Yamaha, and Fuji use these manufacturers for most of their disks. (Kodak no longer manufactures media.) Brands that are often trashed: Maxell, Verbatim, Memorex, Ritek, Hotan, Princo, Gigastorage, Lead Data, Fonet, CMC Magnetics. Many "no-name" bulk CD-Rs are one of these brands. Sometimes a particular line of discs from a particular manufacturer or reseller will be better than others from the same company. For example, Verbatim DataLifePlus discs are recognized as pretty good, but Verbatim ValuLife are seen as being of much lower quality. Sometimes company names change. For example, in June 2003 Mitsui Advanced Media was purchased from Mitsui Chemicals by Computer Support Italcad (CSI) of Italy to form MAM-A, Inc. The country of manufacture may also be significant. Some manufacturers maintain plants in different countries, and don't always maintain the same level of quality.

In humid tropical climates, care must be taken to find discs that stand up to the weather. One user reported that the data layer on Sony CDQ 74CN discs began cracking after a couple of months in an otherwise sheltered environment (e.g. no direct sunlight). Mitsubishi CD-R 700 and Melody 80 Platinum discs fared much better.

CD-RWs are expected to last about 25 years under ideal conditions (i.e. you write it once and then leave it alone). Repeated rewrites will accelerate this. In

general, CD-RW media aren't recommended for long-term backups or archives of valuable data.

The rest of this section applies to CD-R. The manufacturers claim 75 years (cyanine dye, used in "green" discs), 100 years (phthalocyanine dye, used in "gold" discs), or even 200 years ("advanced" phthalocyanine dye, used in "platinum" discs) once the disc has been written. The shelf-life of an unrecorded disc has been estimated at between 5 and 10 years. There is no standard agreed-upon way to test discs for lifetime viability. Accelerated aging tests have been done, but they may not provide a meaningful analogue to real-world aging.

Exposing the disc to excessive heat, humidity, or to direct sunlight will greatly reduce the lifetime. In general, CD-Rs are far less tolerant of environmental conditions than pressed CDs, and should be treated with greater care. The easiest way to make a CD-R unusable is to scratch the top surface. Find a CD-R you don't want anymore, and try to scratch the top (label side) with your fingernail, a ballpoint pen, a paper clip, and anything else you have handy. The results may surprise you. Keep them in a cool, dark, dry place, and they will probably live longer than you do (emphasis on "probably"). Some newsgroup reports have complained of discs becoming unreadable in as little as three years, but without knowing how the discs were handled and stored such anecdotes are useless. Try to keep a little perspective on the situation: a disc that degrades very little over 100 years is useless if it can't be read in your CD-ROM drive today. One user reported that very inexpensive CD-Rs deteriorated in a mere six weeks, despite careful storage.

Some discs are better than others. An interesting article by Fred Langa (of <http://www.langa.com>) on <http://www.informationweek.com/story/showArticle.jhtml?articleID=15800263&pgno=1> describes how to detect bad discs, and discusses whether putting an adhesive label on the disc causes them to fail more quickly. See "Do gold CD-R discs have better longevity than green discs?" on <http://www.msscience.com/faq53.html>. An interesting document entitled "Care and Handling of CDs and DVDs - A Guide for Librarians and Archivists" can be found on the websites for the National Institute of Standards and Technology (NIST) and the Council on Library and Information Resources (CLIR).

View it on the web as a PDF from <http://www.itl.nist.gov/div895/carefordisc/CDandDVDCareandhandlingGuide.pdf>. It has a wealth of information about disc composition and longevity, as well as recommendations for extending the lifespan of your media.



### IIF Funding Priorities

The ISG brainstormed to compile the following list of funding priorities for each project (not listed in any order).

#### Anegada - *C. pinguis*

Implement Island Conservation predator control program. Nest identification and hatchling collection. 2005 headstart release monitoring. Education materials. Publish recovery plan.

#### Turks and Caicos - *C. carinata*

Cat eradication. Implementation of Island Conservation recommendations. Continued monitoring of translocated populations. Rescue of additional founders from Big Ambergris. Formation of nonprofit organization. Publish recovery plan.

#### Dominican Republic - *C. ricordi*

Helicopter surveys of south shore of Lago Enriqueillo, Pedernales, Cabritos, and subsequent ground work based on the surveys. Capacity building and education on south shore and continued in Pedernales. Salary for field worker on the south shore. Publish recovery plan.

#### Jamaica - *C. collei*

Rick Van Veen's salary. Transportation fuel. Deep cycle battery. Radio transmitters. Vehicle.

#### Mona - *C. cornuta stejnegeri*

Per diem for volunteers. Facilitator for PHVA. Field surveys for population estimates.

#### Little Cayman - *C. nubila caymanensis*

Land acquisition of communal nesting site at Preston Bay.

Grand Cayman - *C. lewisi*

Land purchase fund-raising. Release and monitoring of headstarts in Salina. Pre-release health screening. Initiation of hatchling study. Security fence for captive facility. Funding to publish recovery plan. Increase captive facility pen space. Comprehensive population (captive and wild) genetic analysis.

Cuba - *C. nubila nubila*

Obtain Cuban blood samples throughout island for genetic studies.

Bahamian Iguanas

Educational material: funding for development, implementation, and distribution for general public and schools. Tourism: standardized signs for habitat/species conservation (No Feeding message, etc.) and evaluating tourist impacts (health, behavior, etc.). Formation of subgroup to address tourism issue (S. Buckner).

Andros - *C. cyclura cyclura*

Public education initiative. Government involvement in designating protected areas. Full-time educator and evaluation. Publish recovery plans.

Exuma Cays

Continued monitoring of Pasture Cay. Additional translocations from Leaf to Pasture Cay. Address the potential tourism impact with education/awareness.

Allen's Cay - *C. cyclura inornata*

Survey unauthorized translocations. Identify source populations. Assessment of feral animals. Long-term monitoring. Replace signs.

Booby Cay - *C. carinata*

Annual monitoring. Remove goats.

*C. rileyi rileyi*

Monitor 2004 translocation from Green to Cut Cay.

*C. rileyi cristata*

Monitor Hollywood filming impacts on White Cay.

*Iguana delicatissima*

Assess the potential for reestablishment on Antigua. Comprehensive status survey of all the islands (M. Breuil and R. Powell).

*Iguana iguana*

Phylogenetic analysis of the species. Sampling in South America (entire region particularly Venezuela and Colombia) and Lesser Antilles (Grenadines, St. Vincent, Bay Islands, and others).

St. Lucia - *Iguana iguana*

Remote video cameras. Ongoing education efforts.

Central America - *Ctenosaura*

Check Simon Stuart's global reptile assessment. Phylogenetic analysis of the genus to determine species boundaries. Status surveys of the local endemics.

*Ctenosaura hemilopha*

Resolution of species issues.

*Ctenosaura bakeri*

Evaluate captive and wild population for hybrids and evaluate diversity of captives. Purchase of land (\$100,000+++). Visit offshore cays and Cayos Cochinos for evaluate potential for translocation.

*Ctenosaura defensor*

Establish geographic and taxonomic boundaries.

*Sauromalus*

Status survey and phylogenetic analysis.

*Navassa Island*

Survey for habitat suitability.

*Fiji - Brachylophus*

Consult with Harlow on 2006 priorities.

Galapagos

Priorities unknown.

**Joint ISG and IIF Meeting 2006**

The ISG annual meeting is planned for November 2006 on Puerto Rico and will be held in conjunction with the annual IIF meeting. Miguel Garcia will be coordinating the event and will soon provide final dates.

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ISG Newsletter  
 Published by the  
 Zoological Society of San Diego  
 Applied Animal Ecology Division  
 15600 San Pasqual Valley Road,  
 Escondido, CA 92027  
 USA

Editors:  
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