

AGENDA

2008 IUCN SSC Iguana Specialist Group Meeting 12-14 November White Oak Plantation, Yulee, Florida

WEDNESDAY AFTERNOON, 12 NOVEMBER: COMMENCING @ 1:30 PM

<u>Sessions/Presentations</u>	<u>Minutes</u>	<u>Presenter</u>
Opening remarks	10	Co-Chairs
Species Conservation and Status Reports		
<i>Cyclura collei</i> (Jamaica)	30	Wilson
<i>Cyclura cyclura</i> (Allen Cays, Bahamas) & <i>Cyclura rileyi</i> (Bush Hill Cay, Bahamas)	20	Iverson
<i>Cyclura carinata</i> (Booby Cay, Bahamas)	10	Connors
<i>Cyclura carinata</i> (Turks and Caicos Islands)	10	Gerber
<i>Cyclura ricordii</i> & <i>cornuta</i> (Isla Cabritos, DR)	10	Ramer
<i>C. ricordii</i> & <i>cornuta</i> (Pedernales, DR & Haiti)	10	Accimé/Rupp
<i>Cyclura pinguis</i> (Anegada, BVI)	10	Bradley
Break	20	
Species Reports (continued)		
<i>Iguana delicatissima</i> (Dominica)	10	Knapp
<i>Iguana delicatissima</i> (Martinique)	10	Knapp for Legouez
<i>Ctenosaura palearis</i> (Guatemala)	10	Ariano
Plus <i>Ctenosaura</i> & CITES	10	Weissgold
Applied Research		
<i>Cyclura cornuta</i> (Mona Island) PVA	10	Garcia
<i>Cyclura cyclura</i> health assessments	10	Knapp
Hatchling <i>I. iguana</i> transmitter burdening study	10	Knapp
Dinner		

WEDNESDAY EVENING, NOVEMBER 12: TIMES TO BE ANNOUNCED

Working Group meetings

Genetics Working Group meeting	TBA	Stephen et al.
Anegada Iguana Group meeting (invitation only)	TBA	Smith-Abbott et al.

THURSDAY MORNING, 13 NOVEMBER: COMMENCING @ 8 AM

<u>Sessions/Presentations</u>	<u>Minutes</u>	<u>Presenter</u>
Evolutionary Relationships		
Update on genetics working group meeting	10	Stephen
Iguanidae morphological & molecular evolution	20	Buckley
<i>Brachylophus</i> systematics	20	Fisher
<i>Ctenosaura defensor</i>	10	Stephen
<i>Ctenosaura palearis</i> clade	20	Pasachnik
<i>Cyclura carinata</i>	20	Welch
Break	20	
Misc. Presentations & Group Discussions		
The death of 71 & making a rubber iguana mold	20	Bendon
Climate change implications for iguanids	5	Gerber for Ehrig
New ZSSD iguana facility	10	Lemm
& husbandry manual update		
CITES permit issues: tips, traps, & taxonomy	10	Weissgold
Carcass collection, preservation, & disposition	10	Buckley
Species Recovery Plan challenges	20	Pagni
IUCN SCC mission and the ISG	20	Pagni

Lunch

Thursday Afternoon, 13 November: Commencing @ 1:30

Group Business & Discussion

ISG position on iguana introductions?	Co-Chairs
<i>I. iguana</i> in Haiti? What to put on Navassa? Etc.	
ISG blanket CITES import permit	Grant
ISG Newsletter	Grant
ISG Website	Co-Chairs
Red List assessments	Hudson
ISG Steering Committee	Co-Chairs
2009 ISG meeting (Dominica)	Knapp
2010 ISG meeting (Mexico?)	Gerber for Reynosa
Other possible future venues?	ISG members
Other issues needing attention?	ISG members

Dinner

Friday Morning, 14 November

If needed, we will reconvene at 9 AM to conclude any unfinished business

PRESENTATIONS AND ABSTRACTS
2008 IUCN/SSC IGUANA SPECIALIST GROUP MEETING
WHITE OAK, FL

Daniel Ariano (Zootropic, darianosanchez@gmail.com) and Valentina Ibañez (Universidad de Caldas, Colombia, valentinaibanezjurado@yahoo.es)

Threats and conservation strategies for the Guatemalan Spiny-tailed iguana, *Ctenosaura palearis*, in the dry forests of Motagua Valley, Guatemala

Ctenosaura palearis is an endemic iguana of the dry forests of Motagua Valley in Guatemala. It is endangered due to hunting, commercial traffic, and habitat loss. Habitat loss has been caused mainly for cantaloupe and watermelon crops, tobacco plantations, cattle, and now open-air mining projects within the area have become a new threat to its populations. Studies on its ecology have progressed to the second phase and a proposal is planned to include this iguana on CITES, because it is highly appreciated for its size and character as an exotic pet. The government of Guatemala has offered support for this proposal. This demand as exotic pets has apparently been the main cause that this species has become extinct in some portions of its range, especially on the western part of it. The populations throughout the rest of the range remain stable, but loss of forest cover is a big threat. Its traditional use as bush meat is also a threat and development of a sustainable-use management plan for wild populations of this species is planned. We are now close to buying another piece of land for conservation in the Motagua Valley, with an extension of 150 acres. This land will join a previous parcel of 146 acres bought for conservation of dry forest in the area. Education programs are ongoing also, with local communities promoting species conservation and sustainable use. A t-shirt for local kids has been made and distributed. Four schools in the area have adopted this t-shirt as the uniform for the physical activity day and they use it every Wednesday. Conservation efforts are supported by IRCF, Zoo Atlanta, Disney Conservation Fund and private donors.

Kelly Bradley (Dallas Zoo) and Glenn Gerber (Zoological Society of San Diego)

Conservation program update for the Anegada Iguana, *Cyclura pinguis*

Cyclura pinguis is a critically endangered species from Anegada Island in the British Virgin Islands. This large iguana is the subject of a long-term conservation program, currently centered on a headstarting. The ISG and the British Virgin Islands National Parks Trust began returning headstarted animals to the wild in 2003. Twenty-four animals were released for three consecutive years, 2003-2005, following an experimental design intended to determine the minimum size for release. In 2006, all animals in the headstart facility over 400 grams were returned to the wild. The most recent release took place in December of 2007, when 14 animals were released in the Windlass Bight area. To date, a total of 115 headstarted animals have been returned to the wild.

In an effort to establish a more accurate estimation of the wild population size, mark and recapture efforts have been increased. During the most recent trapping effort in May 2008, 15 animals were captured. The captures represented one new unmarked wild adult, four previously marked wild adults, and eleven released headstarted animals. Recaptured headstarted animals were evenly distributed for release years between 2003-2006.

The retreat mapping and monitoring program also continued in 2008. Using GPS locations for previously known retreats, we checked the status of these retreats and added newly found retreats to our GIS database. We also experimented with a new burrow scope camera in an effort to document retreat structure and identify other animals using iguana retreats. The next field trip will be in October 2008, just prior to the ISG meeting, and results of this trip will be shared at the meetings.

Larry Buckley

The reconciliation of morphological and molecular evolution of iguanas

A. Farkas, L. Buckley, Rochester Institute of Technology Department of Biological Sciences, arf8670@rit.edu, ljbsbi@rit.edu; Dr. Catherine Stephen, Utah Valley State College; Dr. Oscar Flores-Villela, Universidad Nacional Autónoma de México-Mexico City.

There have been two comprehensive comparative studies on the morphology of iguanas, primarily on skeletal and soft tissue characters. Several studies using mitochondrial DNA to reconstruct evolutionary relationships among iguanas have also been published. Nuclear genes are currently being examined to assist in this reconstruction of those relationships. Morphological and molecular data suggest conflicting evolutionary histories for iguanid lizards. Morphological data suggest that the genus *Iguana* and *Cyclura* are sister groups. Molecular data suggest that *Iguana* is instead, a sister group to *Sauromalus*. There is also disagreement about the placement of *Cyclura* and *Ctenosaura*. Studies have compared morphological and molecular trees from a statistical perspective, but have ignored the evolution of specific morphological features as a means of evaluating hypothesis support. As an alternative to test competing hypotheses, we have identified 12 key morphological characters that drive the morphological hypothesis of evolutionary relationships. These characters are temporal scales, size of anterior auricular scales, chinshields II, chinshields III, number of ventral transverse scale rows within a caudal segment, parasagittal gular folds, dewlap, squamosal bone, cristae of ventrolaterals of the parabasisphenoid bone, angular bone shape, anterior extent of surangular bone, and length of second ceratobranchials. We mapped these characters onto both trees to determine how much less parsimonious their evolution is on a molecular tree vs. a morphological tree. We argue that claims of unrealistic morphological evolution on molecular hypothesis of relationships are weak reasons for rejecting molecular phylogenies of iguana relationships.

Steve Conners (Miami Metro Zoo) and Joe Wasilewski

Current status and future outlook for the rock iguana, *Cyclura carinata*, in the Bahamas

The Turks and Caicos iguana, *Cyclura carinata*, is widespread in its namesake archipelago but limited in range to one small island in the easternmost Bahamas. The two-km² island of Booby Cay, located only 200m east of the main island of Mayaguana, has an estimated population of 500 iguanas. Researchers have monitored this population for over ten years and in spite of extreme weather events and some introduced non-native mammals, this population has remained stable. Currently Mayaguana, with a human population of only 300-400, is undergoing a large-scale development boom. A private firm is investing heavily in new infrastructure, which will vastly increase the population and tourist capacity of the island. It is recommended that Booby Cay be afforded greater government protection, such as national park status, to counter any threats development on Mayaguana may pose to its unique wildlife and iguanas in particular.

Robert N. Fisher¹, J. Scott Keogh², Peter S. Harlow³

Update on the systematics of living *Brachylophus* iguanas from Fiji

¹U. S. Geological Survey, San Diego Field Station, USA; ²School of Botany and Zoology, The Australian National University; ³School of Biological Sciences, Macquarie University, Australia.

In 2004 the ISG met in Fiji to conduct its recovery workshop for the two species of *Brachylophus*. Initial genetic results were presented there on the variability within *Brachylophus vitiensis*. This work was expanded after the meeting to include many more samples of *Brachylophus* iguanas, including the introduced populations on Tonga and Vanuatu. The analysis of this enlarged molecular dataset indicated that there were three clear genetic units within *Brachylophus*. A morphological assessment of museum specimens, combined with limited data for captive and wild animals, indicated that there is a suite of external characteristics that can be used to define these three groups. A third living species of *Brachylophus* was named in 2008 as a result of this study. Here we review some of this data and discuss the priority outstanding issues involved in conserving these three species, including a need for further analysis of populations not included in our study.

Miguel Garcia^{1,7}, Maria Eglée Perez^{2,7}, Nestor Perez^{3,7}, Alberto Alvarez^{1,7}, Raymond L. Tremblay^{4,7}, John Iverson⁵, and Glenn Gerber⁶

Developing a population viability analysis for the Mona Iguana

¹Department of Natural Resources and Environment, San Juan, Puerto Rico; ²Department of Mathematics, University of Puerto Rico, Río Piedras campus; ³Department of Biology, University of Puerto Rico, Río Piedras campus; ⁴Department of Biology, University of Puerto Rico, Humacao campus; raymond@hpcf.upr.edu; ⁵Department of Biology, Earlham College, Indiana USA; ⁶Zoological Society of San Diego; ⁷Crest-Catec, Center for Applied Tropical Ecology and Conservation, University of Puerto Rico, Río Piedras campus.

Predicting population survivorship requires integrating in a single model all of the variables that are likely to have a substantial impact on survivorship. Field data on a variety of life history parameters have been collected for the Mona Iguana since 1996. Here we use data from single or multiple studies that incorporate egg-laying behavior by females, egg to hatchling survivorship, and juvenile and adult growth and survivorship in a Bayesian model. We are interested in determining the impact of the head-start program on the wild population and, more specifically, how many individuals per year need to be released to attain a population with a stable size-class distribution. We chose to use a Lefkovich (stage-based) analysis, and parameters and their variance will be estimated using a Bayesian approach.

Glenn Gerber (Zoological Society of San Diego)

2008 update for the Turks and Caicos iguana conservation program: translocations, hurricanes, and development threats

In February 2008, a fifth translocation of *Cyclura carinata* was conducted in the TCI. Big Ambergris Cay, undergoing extensive development, was used as the source for translocated animals. Sixty adult iguanas were captured, measured, marked with bead and PIT tags, sampled for genetics, and released on Bush Cay, a 12-ha island located 10-km south of Big Ambergris. A follow-up trip will be made to Bush Cay in the winter of 2009 to assess translocation success, as indicated by adult survivorship and growth, and the presence or absence of juveniles.

The TCI were hit by two powerful hurricanes in 2008, Hanna and Ike. Both storms caused extensive damage, and Ike, which went directly over the TCI as a category-4 hurricane with sustained winds of 135 mph, was also accompanied by a significant storm surge. The effects of these storms on TCI iguana populations is presently unknown but will be investigated in 2009. Our fear is that some of the small low islands, including two of the cays harboring translocated populations, may have been inundated by storm surge for an extended period. If so, we may have to revise our recovery strategy for this species.

Finally, threats from new developments reached a new high in 2008. At least five developments, backed by the current government, were proposed for TCI protected areas in the past year. Several of these developments would directly impact large iguana populations, including Little Ambergris Cay and Mangrove Cay.

John B. Iverson (Earlham College)

Annual report on the Allen Cays iguana (*Cyclura cychlura inornata*)

This year was the 29th year of our studies of the Allen Cays iguanas in the Bahamas and we captured 422 iguanas during May (289 on Leaf Cay, 85% of them recaptures; 114 on U Cay, 82.5% being recaptures; 5 on Allen Cay; and 37 on Flat Rock Reef Cay, 51% recaptures). The decline in numbers of large males on the main beach areas of both Leaf and U Cay was again evident this year; annual survivorship rates for large males are < 70%, well below long-term rates of 88-89%. Iguana sex ratios are becoming increasingly female biased, presumably because of the disappearance of large males. We believe that this loss of large males on both Leaf and U Cays over the past 8 years is attributable to mischievous human activity, and we hope to add educational signage in the near future to help curb this trend. Most captures were made on the main landing/tourist feeding beach of Leaf Cay (only ~2% of the total island area), with 68% being made there. On U Cay, 75% were made along or immediately adjacent to the north beach where nearly all visitors land. The attraction of the iguanas to the feeding beaches is obvious, and our concern about this pattern is increasing. The iguana population on Flat Rock Reef Cay (FRRC) now exceeds 100 iguanas, following the introduction of several iguanas in ca. 1996. Kirsten Hines and I continued our nesting ecology study on FRRC during additional fieldwork in July. Kirsten and I also traveled to Half Moon Cay (Little San Salvador) in July to assess the success of the Allen Cays iguanas introduced there in January 2005. We found evidence of at least six of the original introduced lizards. Three recaptured iguanas exhibited growth rates 3 to 5 times their rates before introduction and three nests were located. These data suggest a successful colonization.

For the sixth year, we visited Bush Hill Cay at the northern limit of the Exuma Cays Land and Sea Park to census the introduced population of Acklins iguanas (*Cyclura rileyi*) there. We caught 80 iguanas (29 males, 44 females, 6 unsexed, 1 skeleton; 14 new, 65 recaptures). Capture rates (especially for males) were lower than in previous years, which may be due to increases lizard wariness or (of more concern) the possible removal of animals. Census work in 2009 will address this question.

Charles Knapp (John G. Shedd Aquarium & Zoological Society of San Diego), Kirsten Hines (Institute for Regional Conservation), and Trevor T. Zachariah (University of Illinois at Urbana-Champaign)

Health Assessment for Exuma Island iguanas (*Cyclura cychlura inornata* and *C. c. figginsi*)

This primary goal of the 2008 Shedd Aquarium iguana research excursion was to assess the impacts of tourist visitation and food supplementation on endangered Bahamian iguanas. Specifically we investigated the physiological parameters and behaviors of iguanas (*Cyclura cychlura inornata* and *C. c. figginsi*) living under different degrees of visitation pressure in the Exuma Islands. Research was conducted with the assistance from “citizen scientists” aboard the R/V Coral Reef II from March 22 – 30, 2008. The research team worked on three islands visited by tourists and two unvisited islands to assess behavioral and physiological differences among resident iguanas. The visited islands include White Bay Cay (*C. c. figginsi*) in the Central Exumas, and Leaf and U-Cays in the Northern Exumas (*C. c. inornata*). The two non-visited islands included North Adderly and Noddy Cays (*C. c. figginsi*) located north of Lee Stocking Island in the Central Exumas. We also visited briefly an introduced iguana population on Leaf Cay (*C. c. figginsi*) located north of Lee Stocking Island.

To assess behavioral and physiological differences between populations under contrasting visitation intensity, we collected behavioral and morphometric data along with blood samples. We used standard flight distance analyses to document behavioral differences among iguana populations. Blood samples were collected within three minutes of capture and divided into genetic vials with buffer for future analyses, and vials stored on ice for physiological analyses. Immediately following blood extraction in the field, approximately 0.1 ml of blood was analyzed using portable i-STAT blood gas analyzers with CG8+ cartridges to examine glucose, sodium, potassium, ionized calcium, hematocrit, hemoglobin, pH, partial pressure of carbon dioxide, partial pressure of oxygen, total carbon dioxide, bicarbonate, base excess in extracellular fluid, and oxygen saturation. On board the Coral Reef II we assessed general physiology between islands using manual complete blood counts (CBC), total solids, and packed cell volume. Plasma was collected from blood and frozen for later analysis of stress hormone level (i.e., corticosterone), biochemical concentrations, and nutritional parameters (e.g., vitamin A, C, E, and D concentrations). We attempted to capture an equal number of iguanas from prominent feeding beaches and areas less visited by tourists.

All captured iguanas were measured for general morphometrics and were sexed by cloacal probing for hemipenes. Condition indices based on body mass versus length will be used to compare values between iguana populations. Sandra Buckner led the vegetation team in conducting from three to four 100 m cross-island transects to record abundance and incidence data of plant species from each island. These data will be used to analyze potential differences in plant species composition between islands. We collected scat samples from each cay. Samples were dried on-board the research vessel, weighed, and sorted for contents. The data will be used to analyze potential diet

differences between main feeding beaches and island interiors, and also between islands. Preliminary data demonstrate that scats from Leaf Cay (Allen Cays) are often packed solid with sand and dried to the consistency of a cement pellet. We suspect these scats are caused by ingestion of sand during mass tourist feeding events.

Preliminary analyses of the data reveal physiological differences between islands. We are currently applying for funding for further corticosterone and nutritional analyses.

Charles Knapp (Zoological Society of San Diego)

Effects of radio transmitter burdening on locomotor ability of green iguana hatchlings

Radio telemetry is an effective method for acquiring ecological and demographic information that can be used when designing and implementing wildlife management strategies, or for investigating hypothesis-driven research questions. An important assumption associated with telemetry studies, however, is that the behavior and survival of tagged individuals is representative of those in the population at large, yet to my knowledge there are no investigations pertaining to effects of transmitter burdening on lizards. Using sprint and climb activity as performance variables, the first objective for this study included testing initial velocity, maximum burst speed, and overall speed of *I. iguana* hatchlings affixed with radio transmitters ranging from a control and 2.5 to 15% of their body mass. The second objective was to release and track hatchlings in a natural setting to test survival differences between treatment groups (control, 5.0, 7.5, and 10% of their body mass).

Performance trials were conducted in 2007 and 2008 at the Iguana Verde Foundation located within the Gandoca-Manzanillo Wildlife Refuge (5,013 terrestrial ha) on the south Caribbean coast of Costa Rica. Sprint speed was measured using a 2 m long electronic raceway with a high-friction sandpaper substrate. Laser break beams with corresponding photocells placed every 50 cm and connected to an electronic clock recorded the time taken for lizards to cross each successive beam. The performance tests for each treatment in 2007 consisted of a control, 2.5, 5.0, and 7.5% transmitter to body mass. The tests in 2008 consisted of a control, 5.0, 10.0, and 15.0% transmitter to body mass. Climb speed using the same protocol as above was measured on a 1 m electronic racetrack with photocells placed every 25 cm, and tilted to an angle of 80°. Wire screen was used as a substrate to mimic climbing conditions up bark and in a vegetation matrix.

Survival was investigated in 2007 using iguana hatchlings affixed with transmitters representing 5.0% and 7.5% transmitter to body mass. In 2008, hatchlings were affixed with 5.0% and 10.0% transmitter to body mass packages. A control group of iguanas with no transmitters were also released with the 2008 study cohort. Hatchlings were released within the forest of the Gandoca-Manzanillo Wildlife Refuge and tracked using

radio telemetry or visual surveys for up to 30 days. I recorded activity, distance from release site, and survival status daily.

In sprint trials (2007 and 2008) across all performance variables and treatment groups, speed was not statistically significant between treatments. There also were no significant differences between climbing variables during 2007 tests. However, in 2008 the data suggest a reduced ability for hatchlings to climb at the 10.0 and 15.0% transmitter to body mass treatment levels. The probability of survival did not differ between treatment groups (excluding the control group in 2008) at the end of the study during both years. However, growth rate percentage for hatchling body mass in the 10% treatment group was marginally significant suggesting that hatchlings with larger transmitter packages grew less than hatchlings in the control group or with smaller packages. Straight-line distance from release site was not different between all treatment groups. This study suggests that transmitter packages of less than 7.5% have potentially no effect on the performance ability of hatchling green iguanas. The data also suggest that survival of hatchling iguanas is similar for hatchlings with 5.0, 7.5, and 10% transmitter to body mass packages. These data should be interpreted with caution and judged on a species-specific basis because lizards differ in predator avoidance and foraging strategies. Investigations should therefore be expanded to other lizard taxa and performance variables. In addition, future investigations should be expanded to include the effects of mass burdening versus physical burdening of external versus internal transmitters.

Charles Knapp (Zoological Society of San Diego)

Status update for the Lesser Antillean iguana (*Iguana delicatissima*) on Dominica

The Lesser Antillean Iguana (*Iguana delicatissima*) occupies less than 10 main Caribbean islands of the northern Lesser Antilles. Few populations are considered stable and most are in decline. Habitat degradation, non-native predators and competitors, hunting, road mortality, and genetic introgression with common green iguana (*I. iguana*) threaten Lesser Antillean iguanas with extinction across their range. In 2006, the San Diego Zoo's Conservation and Research for Endangered Species (CRES) initiated a study on Dominica to investigate survival and life history variation between coastal populations under varying degrees of anthropogenic perturbations.

In 2008, research sites were expanded to include additional perturbed locations. Also, road surveys for iguanas killed by collisions were expanded, post-nesting movement patterns of adult females were investigated using telemetry, hatchling emergence patterns were recorded, and an island-wide public awareness campaign was launched. Our capture efforts focused on five main study sites; however, 392 iguanas (including 46 recaptures) were captured in 18 different localities along the Caribbean coast. The recapture data will be used to understand the population dynamics of iguanas inhabiting locations differing in anthropogenic disturbance. The data will also be used to determine nesting frequency of females that migrate to coastal localities to construct nest burrows.

Between 17 April and 20 June, 35 iguanas were found dead on the west coastal road after colliding with cars. Twenty-three of the iguanas were confirmed female (others too badly damaged to identify) and two were tagged animals. Clutch size based on necropsies of killed females is 11.5 eggs (S.D. = 4.5; range 5-18; N = 13).

To understand post-nesting movement patterns of adult females, radio transmitters were affixed to nine iguanas after oviposition in May/June 2008 and tracked into August/September. Female iguanas located using telemetry were inhabiting river valleys at a mean distance of 2170 ± 116 m (range 1340-3100 m) from a coastal communal nest site. The animals were tracked to a mean elevation of 142 ± 115 m (range 23-315m).

In order to record patterns and numbers of emerging hatchlings, we constructed an enclosure, measuring 7 m x 14 m (98 m²), of construction plastic around approximately half of a communal nesting area on the Caribbean coast. Iguana hatchlings were either captured by hand or removed from buckets that were sunk along the fence at the bottom of the enclosure. We also constructed a 50 m drift fence of construction plastic with bucket traps along the ridge above the enclosure. From 17 August to 17 September the enclosure and fence were monitored a minimum of five times daily from 645 to 1900 hrs. We also monitored the enclosure using time-lapse video. These data will be used to estimate the number of females using the coastal slope as a nesting site and to identify factors causing high emergence events.

The awareness campaign was launched with the distribution of bumper stickers and giving iguana conservation presentations at several primary schools. In August, my research team was a guest on the Forestry Division's television program, *Environment Corner*. The program was filmed on location and shown repeatedly on the GIS (Government Information Services) network. In September, we appeared on live radio call-in programs with the DBS (Dominica Broadcasting Services) and "Voice of Life" stations. Finally, I presented iguana PowerPoint presentations to the Forestry Division officers and to the general public at the University of the West Indies Dominica Open Campus.

The research and public awareness programs will be expanded in 2009. In addition, the 2009 ISG meeting will be held on Dominica to raise the conservation profile of *I. delicatissima* across its range.

Caroline Legouez (Office National de la Chasse et de la Faune Sauvage) – presented by Chuck Knapp

A new Lesser Antillean iguana population in Martinique: reintroduction of nine iguanas in a protected islet

Basse-Terre and Grande-Terre (Guadeloupe), les Saintes, and Saint-Martin lost their last pure *Iguana delicatissima* populations in the last few years through competition and hybridization. At the time of the evaluation of the IUCN threat status (1999) for this

species, the situation was not as it is now. Only Petite Terre, la Désirade and Chancel are islands with no *Iguana iguana* present. The main population of Martinique is located on an islet (Islet Chancel), which could be accidentally colonized by *Iguana iguana*. The population living in the north of Martinique is now in close contact with the common iguana, but no hybridization was found. The presence of *Iguana iguana* in Saint-Barthélemy is now well-known and hybrids are found on this island. The common iguanas in Saint-Barthélemy are from Saint-Martin and were freed by people as well as colonizing as stowaways. This population is now also in great danger. We propose that *Iguana delicatissima* should be elevated higher in threat status than Vulnerable.

Over the past fifteen years, Michel Breuil (Paris Muséum National D'Histoire Naturelle) has carried out studies on *Iguana delicatissima* and proposed several actions to save these populations. The French Overseas Biodiversity department and the French government have launched an action plan for the recovery of the Lesser Antillean iguanas. Several actions such as: scientific and genetic studies, shooting of *Iguana iguana* in Martinique, and map localization of *Iguana delicatissima*, *Iguana iguana*, and hybrids in Guadeloupe, are under process. We stress that the proliferation of *Iguana iguana* in Guadeloupe is a major threat to the population of *Iguana delicatissima* as in all islands in the Lesser Antilles. The arrival of *Iguana iguana* in La Désirade and Petite-Terre, as well as in Chancel, is very possible as demonstrated by swimming common iguanas arriving in Marie-Galante in 2007.

This year, the newspaper “France Antilles” reported the testimony of a person that, as a young boy at the beginning of the 1960s, translocated common iguanas from Les Saintes to the south of Basse-Terre where they have since reproduced. The localization of the second initial population of *Iguana iguana* in Guadeloupe is the harbour of Pointe-à-Pître. These two facts show that the presence of *Iguana iguana* in Guadeloupe is not natural and a control plan must be undertaken to control this invasive species (as in Martinique).

A plan to introduce *I. delicatissima* has been undertaken on an islet in Martinique (Ramier) where *Iguana iguana* is absent. This islet provides *I. delicatissima* with good food and nesting conditions.

In Martinique, *Iguana iguana* was introduced in Fort Saint-Louis (Fort-de-France) in the 1960s. This population has spread out due to human displacement and natural dispersion. The largest *I. delicatissima* population is found on Chancel Islet, Robert Bay. Surveys started on islet Chancel in 1993 and increased in frequency since 2006. So far, 300 *Iguana delicatissima* adults have been PIT-tagged.

On the 12th of July 2006, with support from the Defense Ministry, the agents of the National Hunting and Wildlife Agency translocated nine *Iguana delicatissima* (four adult males and five adult females, four of which were gravid) from Chancel to Ramier islet. Nesting sites were initially laid out. Each captured iguana was measured and PIT-tagged. Post-release monitoring was frequently performed in order to document the dispersal of iguanas on the islet. We observed that most of the iguanas had moved to the east parapet,

where the vegetation is particularly dense and is a positive sign for their feeding. Unfortunately, four of the eight transmitters were found on the ground and the signal from two others was not detected. As a consequence, radiotracking did not give us accurate localizations. The radio attachment method must be improved. Nevertheless, in April 2008, we excavated a putative nest and found fourteen eggshells among which twelve had hatched. This crucial observation, coupled with the direct observation of some iguanas, enables us to foresee a success in this introduction - the first one in Martinique. Since the introduction, three laying seasons have passed and from five females we estimate about 150 eggs should have hatched. However, we have no idea of the survival rate of these predicted hatchlings.

Based on the preliminary success on Ramier, future introductions could be undertaken in Martinique and Guadeloupe, as well as other islands in the Lesser Antilles (for example, on Green island, Antigua). Before additional introductions could take place, it would be essential to determine the exact current state of common iguana and *Iguana delicatissima* populations and their genetic diversity in the entire Lesser Antilles region.

Lee Pagni

Species Recovery Plans: challenges to creation, publication, and implementation

Planning for species recovery often results in the creation of a plan known as a Species Recovery Plan (SRP), also sometimes called a Conservation and Management Plan (CAMP). When done correctly, both the actual process and the plan itself can be very valuable for conservation efforts. Yet even the best plans have limited utility when they are not used. I will review the challenges to SRP publication and implementation based on the partial results of an IIF supported grant to help implement plans published for the Anegada iguana and the Turks and Caicos iguana, and to revise a publication plan for the Andros Iguana. My goal is to have participants provide their own expectations and experiences with recovery plans and to come up with possible solutions to specific issues in the planning and implementation process.

Iguanas of the World: the ISG's role in species conservation

In creating a poster for the recent IUCN World Conservation Congress, I encountered several issues having to do with iguana conservation. Using the poster "Iguanas of the World" as a starting point, I will review these issues including 1) updating the Red List for the world's iguanas, 2) reviewing international, national, and local policies to protect iguanas, and 3) evaluating the ISG's progress in iguana protection and recovery. The Iguana Specialist Group is part of a larger network of species conservation groups under the IUCN's Species Survival Commission (SSC). It is important to frame the discussion of our group's role within the larger context of the IUCN SSC and to discuss ways in which we can improve our ability to meet our mission.

Stesha A. Pasachnik (Department of Ecology and Evolutionary Biology, University of Tennessee, spasachn@utk.edu)

Resolving species relationships within the *Ctenosaura palearis* clade with a more in-depth look at the population structure of *C. melanosterna*

We use the recently developed Bayesian Estimation of Species Trees (BEST) approach to analyze the relationships between four Critically Endangered species of iguana in the genus *Ctenosaura*. This genus is the most diverse within the Iguaninae, is comprised of many Critically Endangered species, and is in need of immediate protection. Species delimitation, however, is not well understood within this group. The results of this study, conducted on a subset of this genus, suggest that the *C. palearis* clade, formally referred to as the *C. melanosterna* clade, has gone through recent and rapid speciation, resulting in closely related narrow-range endemics. The former morphologically defined nominal grouping is supported, though the inter-specific relationships vary by loci. A more in-depth look at the population structure of *C. melanosterna* suggests that the disjunct island populations may be the result of human introductions, thus we caution their use as a strong-hold or rescue population.

Jan Ramer (Indianapolis Zoo)

Updates on *Cyclura ricordi* and *Cyclura cornuta* on Isla Cabritos in the Dominican Republic

The Indianapolis Zoo, in partnership with the National Zoo of the Dominican Republic (ZooDom) and Grupo Jaragua, conducted the second of ten annual Ricord's and Rhinoceros iguana population assessments on Isla Cabritos, Dominican Republic. The Indianapolis Zoo team included Dr. Betsy Stringer (Eli Lilly Intern Veterinarian), Renae Burks (Veterinary Technician), Dr. Jason Williams (Nutritionist), Richard Searcy (Senior Keeper, Deserts Biome), and John E. Wyatt III (Senior Keeper, Deserts Biome). Dr. Gerard Garcia (ZooDom veterinarian) and Dr. Laura Perdomo (Grupo Jaragua veterinarian) also participated in all aspects of this project. A local guide Moná (Lago Enriquillo Guides) assisted with locating iguanas, dens, and food plants during our stay on the island. Funding for the project was made possible with generous grants from Maine Community Foundation, administered by Indianapolis Zoo, and the American Association of Zoo Veterinarians' Mazuri Fund administered by the IIF. The team walked transects every 500 meters that were set in 2003 and refined in 2007, recording all iguana sightings, as well as dens, tail drags, scat, and invasive species. This year the water level was extremely high, and several iguana den GPS points from 2003 are now under water. A total of 18 Ricord's iguanas and 9 Rhinoceros iguanas were seen. All data points are being analyzed by Jim Dine as part of his Master's thesis.

In addition to the population assessment, the team continued a biomedical assessment of Ricord's iguanas on Cabritos, which included physical exams, morphometrics, blood collection, and fecal collection. These individuals were also bead-tagged and had

microchips placed. Health assessments were also conducted on all Ricord's iguanas at Zoodom, which included 29 individuals ranging in age from five months to 30+ years old.

Nutritional studies were also initiated on this trip and will be continue annually. Both predetermined and novel food sources were identified and collected with the assistance of our local guide. Fecal samples were also collected for dissection, to aid in the determination of potential food resources through plant part identification. Samples of the various food plants were dehydrated in the field using a portable food dehydrator to inhibit nutrient degradation and all samples were subsequently stored for transport back to the United States. Approximately 13 separate plant species are theorized to compose the majority of the iguana's diet at the time of collection. Each of these samples has been shipped to a commercial laboratory for determination of a variety of dietary metabolites. The data obtained from this research will be utilized for comparison with nutrient information collected from diets fed to captive *Cyclura* in hopes of developing nutrition protocols that more closely predict actual dietary requirements for this species.

Catherine Stephen (Utah Valley University) and Larry Buckley (Rochester Institute of Technology)

To be or not to be a *Ctenosaura*

While we continue to collect tissue and genetic data for a broad study of Iguaninae evolutionary history, we are currently focusing attention on the relationship of the *Ctenosaura defensor* lineage to its congeners. All genetic data to date support this lineage as being only distantly related to the *Ctenosaura* clade. Data presented are the result of sequencing most species within the Iguaninae subfamily, including all species of *Ctenosaura*. Data has been collected from 55-71 individuals at 3 loci (nDNA: Cmos, NT3; mtDNA: ND4+CytB). These loci have varying rates of evolution and coalescence, thus we are able to resolve most nodes throughout the tree with strong support (using MP, MLE, and Bayesian analyses). Results of phylogenetic analyses are compared to prior studies of the genus.

Mark Welch (Mississippi State University)

Conservation genetics and population dynamics in *Cyclura carinata*

Cyclura carinata, the Turks and Caicos rock iguana, is critically endangered due to human mediated disturbance and predation by feral mammals. As part of an established conservation program, a large collaborative effort has been developing genetic markers and techniques to aid in assessing and monitoring populations of conservation concern. To date, this work has resulted in a large number of molecular tools with several more under development. Preliminary analyses of mitochondrial sequence markers and single nucleotide polymorphisms (SNPs) in the nuclear genome suggest that *C. carinata* likely

represents multiple evolutionarily significant units (ESUs). The presence of definable ESUs indicates that individual *C. carinata* populations may require different conservation strategies and that care should be taken to prevent the loss of genetic variation represented by these ESUs. Also, 18 nuclear microsatellites originally characterized for *C. pinguis* and *C. nubila* are now known to be informative in *C. carinata*. These markers are proving useful and further development may allow for molecular fingerprinting techniques such as paternity analyses. Such approaches will ultimately allow for the estimation of several parameters associated with population viability analyses and should be readily transferable to other iguanids. Further, the natural history of iguanas makes them prime candidates for exploring major questions in the field of population biology.

Byron Wilson and Rick van Veen (University of the West Indies, Mona)

2008 progress report for Jamaican Iguana Recovery Program

The Jamaican Iguana Recovery Group (JIRG) enjoyed what was perhaps its most productive year to date. Fieldwork was conducted during every week of the year and increased human resources permitted the expansion of activities to include wide-range surveys of the Hellshire Hills as well as biological surveys on the Goat Islands. Critical, on-going program components, such as predator control and iguana monitoring in the core area, were continued. Increasing regularity of young iguana sightings suggests that predator control is enhancing survival among hatchlings. Moreover, the number of females using the two primary nesting sites appears to have doubled since those areas were first monitored in 1991. Notably, nearly half of that nesting population is now comprised of repatriated headstarters, highlighting the efficacy of that intervention.

For wide-range surveys we employed the “Judas Iguana” technique in conjunction with standard visual surveys. The Judas Iguana concept is based on the fact that iguanas are social and territorial, such that released animals are likely to contact any wild individuals resident in the release area. We released 11 (7:4) radio-transmitted individuals into five sites spread over nearly the entire southern portion of the peninsula. Unfortunately, our results suggest that iguanas may indeed be limited to the core central portion of Hellshire. Results also indicate that even some highly degraded portions of Hellshire may have the food resources required to support iguanas but the high density of invasive predators in those areas, especially cats and dogs, apparently prevents iguana persistence.

Ever on the front burner, the Goat Islands were again the focus of considerable attention in 2008. Based on a site visit conducted in 2007, Island Conservation generated an eradication plan that is now in the hands of important government agencies and individuals. On the practical (field) front, the JIRG made three survey trips to Great Goat Island in 2008, including a 3-day camping survey in October. Of note, no evidence of non-target (native) species has been detected, nor has the presence of cats or dogs been noted. Hence, eradication efforts may be necessary only for goats and mongooses, and will not be complicated by concerns over threatened endemics such as the iguana or the Jamaican hutia.

In addition to providing helicopter support for reconnaissance, survey, and Judas Iguana work, the Jamaica Defense Force (JDF) delivered eight loads of supplies directly to South Camp; this effort resulted in major infrastructure improvements to our field base in central Hellshire. In addition to a propane-fueled freezer and an 800-gallon water tank, the JDF also transported over three tons of concrete materials for use in various construction projects. Our goal of transforming South Camp into a modern field station is rapidly becoming a reality. Establishing such a permanent base for research and conservation may ultimately have important implications for the long-term protection of the iguana's remaining habitat.

Minutes of ISG Business Meeting
13 November 2008

Jeff Lemm reported that the *Cyclura* husbandry manual is currently being translated via Miguel Garcia. Once that translation is complete, publication will follow (hopefully early spring 2009).

Bruce Weissgold made recommendations on the efficient and proper use of the ISG blanket CITES permit. He urged users to:

- 1) Be absolutely certain that all permits (CITES export and import, country of origin collecting permits, etc.) are accurate and record the precise conditions of the export (taxonomy correct, no typos, tissue types precisely recorded, numbers matching, etc.)
- 2) Contact Port of Entry officials and provide them with copies of all permits and other pertinent materials well in advance of the export. Not only will this allow you to be sure that all permits are in order and acceptable to them, but it will likely speed up your importation when you arrive at that Port of Entry.

Larry Buckley (ljbsbi@rit.edu) pleaded for the collection, proper preservation, and appropriate disposition of all possible iguana carcass materials. This includes everything from archiving tissues in appropriate repositories, but especially salvaging skeletal materials from the field and from deceased captive animals. He volunteered to provide anyone with assistance in proper methods, as well as offering to prepare skeletal material and deposit that material in a national collection (Smithsonian) for future study. Larry will send out a protocol for carcass handling and shipment, and urged that if at all possible, the brain case should not be cracked (for brain removal) during necropsy; such disfigurement renders the specimen useless for skeletal prep. Tandora agreed to look into the CITES permit expectations with regard to the disposition of specimens of *Cyclura*.

Lee Pagni reported that it is imperative that we regularly follow through with monitoring of our Species Recovery Plans. We should not automatically assume that these plans will proceed on their own without such monitoring. He and Rick Hudson also reported that the IUCN expects Specialist Groups to actively review and update Red List listings. To that end, volunteers agreed to be the point persons on updates of the following taxa: *Ctenosaura* (Stesha Pasachnik), *Cyclura* (Glenn Gerber), *Dipsosaurus* (Catherine Stephen), *Iguana* (Chuck Knapp, Bob Powell, and Catherine Stephen), and *Brachylophus* (Robert Fisher), and *Sauromalus* (Rex McAiley). A post-meeting request will go out to Martin Wikelski for the Galapagos taxa. In addition, Fred Burton has agreed to be the intermediary between the ISG and the IUCN; Tandora will assist. These point people will enlist the help of persons working on individual taxa to update each species listing. This must be a high priority over the next year.

The group discussed the general subject of iguana introductions, including those that are accidental (e.g., *Iguana* in Haiti) as well as those that would be intentional (*Cyclura collei* on Goat Island, what species on Navassa, etc). Attention focused on Navassa

Island with the primary candidates for introduction being *Cyclura cornuta stejnegeri* or *Cyclura lewisi*.

Tandora Grant asked for someone to volunteer to take over the responsibility of oversight of the ISG blanket CITES permit, particularly the annual reapplication process. The Fort Worth Zoo's Registrar Annabel Ross will assume this duty in 2009. Tandora also asked for a volunteer to take over the production of the ISG Newsletter (twice a year). Tarren Wagener and her staff at the Fort Worth Zoo will take over this responsibility in early 2009. We minuted our approval of Tandora's hard work on the CITES permit since 2005 and the ISG Newsletter since its inception in 1998. Tandora has also been maintaining a *Cyclura* bibliography and an electronic library of iguana papers. She will continue that activity and everyone was urged to send her pdfs of papers on iguanas that she might not have.

We discussed the ISG website and how we might make it more effective to users. We need a website person within the ISG to lead this effort, rather than rely on John Binns, who has done an excellent job creating the site we have, but who is over-committed with other activities. We suggested that an ISG person solicit and "filter" content, in addition to the overhaul. Suggestions for improvement include an 1) a full taxon list of all iguanas (preferably with distribution maps, type specimen information, and current phylogenetic trees - John Iverson will spearhead this), 2) on-line bibliography (Tandora Grant), 3) all action plans, recovery plans, and reports that we generate, and 4) eventually, full detailed species accounts. The latter should be easily done once the Red List drafts have been prepared. Tandora agreed to contact John Binns to ask if there are limitations to contents on the ISG website that he maintains. [Note: post meeting update, George Waters has begun developing a framework for revamping the ISG website to make it more content-rich and a greater resource to the iguana conservation community.]

We need an easily available updated ISG membership list with emails and addresses and specialties (preferably posted on the web site). Tandora has sent this out in the past and a small group updated the list during this meeting.

The ISG needs to prioritize the many invasive species removal projects that have been suggested to protect iguana populations and it was suggested that this be combined with the Red Listing process for efficiency. This would help the appropriate agencies determine which projects to fund and how soon.

The 2009 venue for the ISG meetings on Dominica during the end of the first week in November (after Independence Day on 3 November) was discussed. Host Chuck Knapp reported that most participants will have to fly through Miami and/or Puerto Rico (RT Dominica ca. \$750) and hence travel to the meetings will likely take two days. Return trips within one day should be possible for most people. A suggestion was made that a large group of us might consider flying to Puerto Rico for the first night and flying out to Dominica as a group the next morning. This would allow the serious ISG business discussions (and the IIF meetings) to begin prior to arrival on Dominica. Either that or the group would be too incapacitated to make the flight to Dominica. Accommodations

would likely be at the Fort Young Hotel (estimated cost \$80/night) and there would be many field trip options. We would strive to do an *Iguana delicatissima* workshop during the meetings.

Glenn Gerber reported that we have a tentative invitation from Victor Reynosa for our 2010 ISG meeting at Kino Bay in Sonora, Mexico (with flights in and out of Hermosillo). This would allow some excellent field trip possibilities to the Gulf of California islands, although some concern was expressed that there might not be adequate housing or meeting facilities at Kino Bay. Should that venue fall through for 2010, we mentioned the possibility of choosing a conference hotel somewhere else in Mexico with easy access (e.g., Cancun, Puerto Vallarta) and without a formal local host.

Jan Ramer suggested that we consider a return trip to the Dominican Republic in 2011 or 2012. Our last meeting there was 2002, so the timing would be appropriate. We are also hopeful that a future meeting might be in the Galapagos or on Cuba, but we would need a local host. ISGers going to the Herpetological Congress this fall in Cuba will assess the potential contacts who might be willing to host a meeting there.

The meeting closed with Rick Hudson's revelation of the formal Gerber Cup trophy that he had recently procured. Debate over which names should be engraved on the trophy was tabled for now, but might be appropriately discussed next November in Puerto Rico.

Respectfully submitted,

John Iverson
Jan Ramer
ISG Deputy Co-Chairs