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Sauromalus klauberi, Isla Santa Catalina, Baja California Sur (see article on p. 78). *Photograph by Brad Hollingsworth.*

Sauromalus varius, Isla Roca Lobos, Baja California. This population is located on a small islet in the San Lorenzo group off Baja California. It is believed to be introduced (see article on p. 78). *Photograph by Brad Hollingsworth.*

Ricord's Iguana, *Cyclura ricordii,* on Isla Cabritos, Dominican Republic (see report on recent survey, p. 88). *Photograph by Kacie Ehrenberger.*

Mona Island Rhinoceros Iguana, *Cyclura cornuta stejnegeri* (see article on p. 98). *Photograph by Robert Powell.*

Cyclura lewisi (Species and Subspecies: What Do They Mean and Why Should We Care?, p. 108). *Photograph by John Binns.*

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A Mexican family prepares an iguana for dinner. Iguana farms that provide meat for locals in El Salvador are seeking to break into the U.S. market (see Newsbriefs, p. 129). *Photograph by Robert F. Wilkinson.*

Sauromalus ater, Rancho Los Tepetates, Sierra La Libertad, Baja California.

Sauromalus ater, Mountain Springs, San Diego County, California. This population and all of those in the United States were previously assigned to *S. obesus*. Chuckwallas typically inhabit arid regions with moderate low-lying shrub cover and usually are found on or near rocky outcrops with plenty of crevices for use as retreats.

Distribution of Chuckwallas. *Illustration by John Binns.*

Understanding the Diversity of Chuckwallas (Genus *Sauromalus*) and a Debate Over Names

Bradford D. Hollingsworth

Department of Herpetology, San Diego Natural History Museum
San Diego, CA 92112

All photographs by the author.

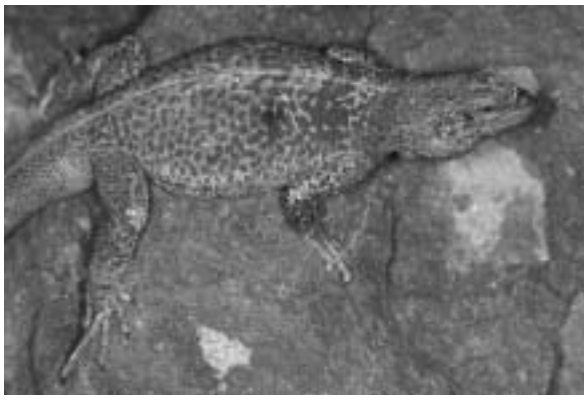
Among iguanid lizards, members in the genus *Sauromalus* represent some of the most divergent forms in the family. Among the 45 species in the family Iguanidae, Chuckwallas represent a modest radiation of five currently recognized species (Hollingsworth 2004, Pregill 2004). *Sauromalus ater* is found in the southwestern United States, adjacent regions in México, much of the Baja California peninsula, and on islas Willard, Tiburón, San Marcos, El Coyote, Danzante, San Cosme, Santa Cruz, San Diego, San José, San Francisco, Ballena, Gallo, Partida Sur, and Espíritu Santo in the Gulf of California. The other four species are restricted to islands in the Gulf of California. *Sauromalus hispidus* occurs on islas Ángel de La Guarda, Granito, Mejía, Pond, San Lorenzo Norte, San Lorenzo Sur, Cabeza de Caballo, La Ventana, Piojo, Flecha, Mitlán, and Smith; *S. varius* on islas San Esteban and Roca Lobos; *S. klauberi* only on Isla Santa Catalina; and *S. slevini* on islas Carmen, Los Coronados, and Monserrate.

Over the past few years, a sometimes heated nomenclatural debate has raged regarding the best way in which to represent the species-level diversity within the genus (Montanucci et al. 2001, McDiarmid et al. 2002; see also *Iguana Times* 9(1–2):18–26,

Sauromalus varius, Isla San Esteban, Sonora. This large species is commonly found in both the arroyo bottoms and on the rocky hillsides.

Sauromalus ater, Sierra Vizcaíno, Baja California Sur. This population was previously assigned to *S. australis*.

Sauromalus varius, Isla San Esteban, Sonora.



Adult male *Sauromalus slevini*, Isla Monserrate, Baja California Sur.

A speckled juvenile *Sauromalus hispidus,* Isla La Ventana, Baja California. Note the faint cross-barring remnant of the juvenile pattern.

Sauromalus klauberi, Isla Santa Catalina, Baja California Sur.

which includes the text of the Montanucci et al. petition). The debate has focused on the choice of names for the widespread populations that inhabit the deserts of the southwestern United States, northwestern México, peninsular Baja California, and numerous islands in the Gulf of California. The root cause of this controversy was the synonymy of three species found to intergrade with one another and which lacked diagnosable characters (Hollingsworth 1998). The recent ruling by the International Commission of Zoological Nomenclature (ICZN) brought this specific matter to a close (ICZN 2004; see also p. 10) — but for

Sauromalus ater, Sierra Vizcaíno, Baja California Sur. This population was previously assigned to *S. australis.*

biologists studying these lizards, understanding this nomenclatural debate, the process of nomenclatural decision-making, and the species diversity within *Sauromalus* is important.

As many as ten different species of Chuckwallas have been recognized since Duméril (1856) first described *Sauromalus ater*, but today, only half are considered valid. Evaluating how best to represent biodiversity is the primary motivation of systematic biologists. Since species are regarded as hypotheses to be continually tested, taxonomies inevitably and naturally will change as new information is evaluated. Unfortunately, when systematists modify taxonomies, confusion often develops. Among the users of these taxonomies, the first concern usually centers on the adoption of the new naming system and how to recover information from previously published works that may have used one or more different names. Secondary to these immediate responses is how the new naming system changes previous ideas on diversity, distributional limits, and levels of variance in ecological preferences.

Prior to the synonymy of the three formerly recognized species of Chuckwallas, the name *Sauromalus obesus* was used to describe populations from Arizona, California, Nevada, and Utah. *Sauromalus obesus* also was applied to populations found in western Sonora, northern Baja California, and some islands in the Gulf of California. In the more remote regions of Baja California, the name *S. australis* was used to describe populations inhabiting the southern portion of the peninsula, and the name *S. ater* described populations on islands off its southern peninsular coastline in the Gulf of California. Each of these names had

Adult male *Sauromalus ater*, South Mountain, Maricopa County, Arizona. Some isolated populations of *S. ater* may yet reveal species-level diversity within the genus.

Sauromalus hispidus, Isla San Lorenzo Norte, Baja California. A gravid adult female excavating a burrow.

An adult *Sauromalus hispidus* basking outside a burrow on Isla Ángel de La Guardia, Baja California.

Sauromalus ater, Isla Espirítu Santo, Baja California Sur. This population served as the type locality for many years.

Sauromalus ater, Bahía Kino, Sonora. This population and all of those in mainland Sonora were previously assigned to *S. obesus*.

Adult male *Sauromalus hispidus*, Isla San Lorenzo Sur, Baja California.

been in use since Charles Shaw revised the genus in 1945, and his taxonomy had provided stability for nearly a half century.

The synonymy of *Sauromalus obesus* and *S. australis* with *S. ater* was based on an analysis of additional specimens and previously used diagnostic characters, as well as a search for new characters that could help delimit the species boundaries within the genus (Hollingsworth 1998). With evidence of intergrades and the overlap of diagnostic characters, the species limits between the three could not be determined. Consequently, the familiar name of *S. obesus* was subsumed into *S. ater*, because the former now was considered a junior synonym of the latter.

Decisions regarding the application of zoological names are governed by the ICZN and the rules established in the Code (ICZN 1999). Here, the decision to select *Sauromalus ater* to represent the combined species was based on the Principle of Priority (Article 23). Since *S. ater* was the oldest of the three names, the Principle of Priority gives it precedence over the others. Without the overseeing body of the ICZN and the Code, the authority of researchers who first describe taxa could be undermined at the will of subsequent authors. In extreme cases, a new name could be applied to the same population every year, which would result in taxonomic instability.

Petitions to the ICZN can be submitted when clarification is needed on the validity of names or exceptions to the Code are requested. Montanucci et al. (2001) petitioned the ICZN and requested that the long-used and well-known name, *Sauromalus obesus*, be given precedence over the little-used and older name, *S. ater*. For two years, the ICZN received and published comments on the petition. One of the greatest concerns was the taxonomic stability of *Sauromalus obesus* and its abundant use in the scientific literature. In opposition to the petition, McDiarmid et al. (2002) commented that the discrepancy in usage between *S. obesus* and *S. ater* reflected the large number of papers published on *S. obesus* in the United States, which could not have been expected to mention *S. ater*. In addition, the name *S. ater* has been used regularly for the last 145 years and should not be regarded as a name infrequently used. In its recent decision (Opinion 2072), the ICZN ruled that the priority of the name *Sauromalus ater* should be maintained (ICZN 2004). In their comments, commissioners stated that publication capacity should not be given precedence over the Principle of Priority and reversing priority does not achieve stability.

During the intervening period, when petitions, comments, and opinions are published, confusion often develops as to which nomenclature to follow. Many invoke a section of the Code (Article 82.1) that requires that the prevailing usage of names be maintained while a case is under consideration. In this instance, authors have chosen to use either *Sauromalus obesus* or *S. ater*. Because different interpretations of prevailing usage can result,

Adult male *Sauromalus hispidus*, Isla San Lorenzo Sur, Baja California.

Sauromalus varius, Isla San Esteban, Sonora.

Chuckwallas from Isla Acatraz, Sonora represent hybrids among two or even three species, all or some of which are probably introduced.

both names have appeared in the literature. Deciding which name best reflected the populations under consideration was subjective, because the petition did not question the synonymy of the three species. However, now that Opinion 2072 has been issued, *Sauromalus ater* should be used.

Before the time of formal taxonomies, the understanding of biodiversity was based on common names. The inherent instability of common names provides insights into the importance of the ICZN and the Code. Stability is relative and our judgment on acceptable levels of change should be gauged against informal versus formal taxonomies. For example, the Indian origin for the name Chuckwalla appears to be derived from as many as four different variants used by tribes in the southwestern United States. Merriam (1979) recorded Chah´^{ch} wahl from the Cahuilla, Chah-kwar´-rah from the Southern Paiute, Chuk-war´-rah from the Mono Paiute, and Cha-gwar´-rah from the Kawaiisu. English-speaking peoples most likely adopted the word "Chuckwalla" from one or more of these variations. Other names for Chuckwallas recorded by Merriam (1979) include Hum-sooth´ (Kamia), Hum-sool´ (Yuma), Um thool´ya (Mohave), Tsah-wahr´ (Southern Paiute), Sow-wahr´(Chemehuevi), Sow-war´-rah (Panamint Shoshone), Sah-gwar´-rah (Southern Nevada Shoshone), Sahk-war´-rah (Shivwits), and Chak^{t}´-^{tch} (Serrano). Without the use of scientific names and the guidance of the ICZN rules, names describing the same animals could be as diverse as regional differences in dialects and languages.

Now that this specific nomenclatural debate has come to a close, we can move on to evaluating the consequences of lumping the three species into one. Chuckwalla diversity and their overall biology should be reevaluated in light of our new interpretation of their relationships. The widespread *Sauromalus ater* is found across an extensive range of arid habitats with different plant communities and climatic cycles. Well-known populations should be compared to populations in more remote regions. Many populations are continuously distributed, whereas others are isolated in mountain ranges or on islands. Of the five recognized species of Chuckwallas, four are insular endemics in the Gulf of California. *Sauromalus varius*, *S. hispidus*, *S. slevini*, and *S. klauberi* were each described as a distinct insular species and little controversy has surrounded their recognition (see Grismer 2003 for a review). Since the greatest diversity of Chuckwallas occurs in relatively small, isolated islands or groups of islands, further diversity may be found in isolated populations of *Sauromalus ater*. This wide-ranging species will likely be the source of many more fascinating discoveries.

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OPINION 2072 (Case 3143)

***Euphryne obesa* Baird, 1858 (currently *Sauromalus obesus* Reptilia, Squamata): proposal to give the specific name precedence over that of *Sauromalus ater* Duméril, 1856 not approved**

Abstract. The Commission has ruled that the priority of the name *Sauromalus ater* Duméril, 1856 should be maintained. *Sauromalus ater* is the senior name for the chuckwalla (family IGUANIDAE) from the southwest of North America. A proposal had been made to give precedence to a junior subjective synonym *S. obesus* (Baird, 1858).

Keywords. Nomenclature; taxonomy; Reptilia; Squamata; IGUANIDAE; *Sauromalus ater*; *Sauromalus obesus*; chuckwallas; southwestern North America.

Ruling

(1) The name *obesa* Baird, 1858 (specific name corrected under Article 34.2 of the Code), as published in the binomen *Euphryne obesus*, is not to be given priority over *Sauromalus ater* Duméril, 1856, as published in the binomen *Sauromalus ater*, whenever the two names are considered to be synonyms. The Principle of Priority is upheld and *S. ater* Duméril, 1856 has priority over *Euphryne obesa* Baird, 1858 whenever the two names are considered to be synonyms.

(2) The name *Sauromalus* Duméril, 1856 (gender: masculine), type species by monotypy *Sauromalus ater* Duméril, 1856, is hereby placed on the Official List of Generic Names in Zoology.

(3) The following names are hereby placed on the Official List of Specific Names in Zoology:

(a) *ater* Duméril, 1856, as published in the binomen *Sauromalus ater* (specific name of the type species of *Sauromalus* Duméril, 1856);

(b) *obesa* Baird, 1858, as published in the binomen *Euphryne obesus*.

History of Case 3143

An application to conserve the specific name of *Euphryne obesa* Baird, 1858 (specific name corrected to agree in gender with the feminine generic name under Article 34.2 of the Code) for the chuckwalla (family IGUANIDAE) from the southwest of North America by giving it precedence over its junior subjective synonym *Sauromalus ater* Duméril, 1856 was received from Richard R. Montanucci (*Clemson University, South Carolina*), Hobart M. Smith and David Chiszar (*University of Colorado*), Kraig Adler (*Cornell University, Ithaca, New York*), David L. Auth (*University of Florida, Gainesville*), Ralph W. Axtell (*Southern Illinois University, Edwardsville*), Ted J. Case (*University of California at San Diego*), Joseph T. Collins (*The Center for North American Amphibians and Reptiles, Lawrence, Kansas*), Roger Conant (*Albuquerque, New Mexico*), Robert Murphy (*Royal Ontario Museum, Ontario, Canada*), Kenneth Petren (*University of Cincinnati, Ohio*) & Robert C. Stebbins (*Kensington, California*) on 10 September 1999. After correspondence the case was published in BZN 58: 37-40 (March 2001). The title, abstract and keywords of the case were published on the Commission's website. Comments opposing the application were published in BZN 58: 307-308; BZN 59: 45-48 and 205. Comments in support of the application were published in BZN 58: 229; 307-308.

Decision of the Commission

On 1 December 2002 the members of the Commission were invited to vote on the proposals published in BZN 58: 39. At the close of the voting period on 1 March 2003 the votes were as follows: 12 Commissioners voted FOR the proposals, 12 Commissioners (Alonso-Zarazaga, Bouchet, Brothers, Calder, Halliday, Kraus, Lamas, Macpherson, Minelli, Patterson, Rosenberg and van Tol) voted AGAINST, no votes were received from Cogger, Dupuis and Mahnert. Ng was on leave of absence.

Voting against, Alonso-Zarazaga commented that stability is not better achieved by reversing priority. A junior name should not be given precedence because of preference by a particular school, or as a result of the publication capacity by a given set of researchers. Also voting against, Halliday commented that the case rests on two arguments. First, that there is uncertainty surrounding the type locality of *S. ater*. This is irrelevant to the nomenclatural issue. Second, it is argued that *S. obesus* should be preferred because it is used in a greater number of papers than *S. ater*. There is no Article in the Code that invites the use of this argument, nor do the authors invoke any particular Article to support their case. The nearest relevant Article would be 23.9.3, however, both *S. ater* and *S. obesus* have been in continuous use for over 100 years. Therefore, the Principle of Priority should be upheld and the proposals should be rejected.

Original References

The following are the original references to the names placed on Official Lists by the ruling given in the present Opinion:

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Sauromalus Duméril, 1856, *Archives du Muséum d'Histoire Naturelle, Paris*, 8: 536.

SPECIES PROFILE

The Tortuga Island Rattlesnake (*Crotalus tortugensis*)

Kent R. Beaman
Section of Herpetology, Natural History Museum of Los Angeles County
and
Carol L. Spencer
Museum of Vertebrate Zoology University of California–Berkeley

Islands in the Gulf of California support a variety of endemic species that have differentiated from their mainland ancestors after various periods of isolation. Some have become distinct as a consequence of adapting to local conditions on their new island homes, whereas others differ from their continental relatives as a consequence of the "founder's effect." This is basically a random process that can cause populations that have descended from a tiny number of founding individuals to vary considerably from the stem population solely because the small sample of founders represents but a tiny fraction of the diverse gene pool present in the larger aggregate of individuals from which they have become separated. When that tiny fraction of the gene pool is atypical of the populational "norms," the descendant populations may begin their isolated existence already quite different in appearance or behavior than their ancestors — and, if they remain separated for a sufficient number of generations, they are quite capable of achieving full-species status.

The Tortuga Island Rattlesnake (*Crotalus tortugensis*) is endemic to Isla Tortuga in the Gulf of California. It is a medium-sized rattlesnake, smaller than its nearest relative, the widely distributed Western Diamondback Rattlesnake (*C. atrox*), with large males reaching only about one meter in total length. The head size is relatively small when compared to *C. atrox*, a characteristic that may indicate dwarfing. Although insular forms sometimes become giants, larger species and especially predatory forms often become smaller when isolated on small, resource-deficient islands.

Crotalus tortugensis is not well differentiated from *C. atrox*, although our current understanding of their relationships is "tenuous." Differences in the dorsal blotches (diamonds) are the most noticeable divergence, with those of *C. tortugensis* less pronounced and less distinctly bordered than those of *C. atrox*. In addition, nearly all specimens of *C. tortugensis* lack an upper (second) loreal scale between the nostrils and eyes and most have at least one intergenial scale on both sides of their jaws. Also, the squamosal bone of *C. tortugensis* is relatively shorter than that of *C. atrox*.

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Crotalus tortugensis from Isla Tortuga, Baja California Sur, México. *Photograph by L. Lee Grismer.*

A very thin *Cyclura ricordii* on the southern slope. *Photograph by Joe Ehrenberger.*

Rhinoceros Iguana (*Cyclura cornuta*). *Photograph by Joe Ehrenberger.*

Day's end on Isla Cabritos. *Photograph by Jennifer Niederlander.*

Isla Cabritos lies in Lago Enriquillo, which is in the valley formed by the former marine channel that separated the North and South paleoislands that joined to form Hispaniola. *Illustration by John Binns.*

A Survey of Ricord's Iguanas (*Cyclura ricordii*) and Rhinoceros Iguanas (*Cyclura cornuta cornuta*) in Isla Cabritos National Park, Dominican Republic 2003: A Preliminary Report

Jan Ramer

Indianapolis Zoo

Introduction

West Indian Rock Iguanas of the genus *Cyclura* are the largest living land vertebrates endemic to the Caribbean islands. As a group, they are considered to be among the most endangered lizards in the world. Hispaniola is the only West Indian island on which two species of *Cyclura* are sympatric. Ricord's Iguanas (*Cyclura ricordii*) are critically endangered according to the International Union for the Conservation of Nature (IUCN) Red List. Only two or three populations, which inhabit xeric lowlands

Isla Cabritos, terrain along the northern slope. *Photograph by Kacie Ehrenberger.*

Slope approaching the central limestone plateau. *Photograph by Joe Ehrenberger.*

On the limestone plateau. *Photograph by Joe Ehrenberger.*

of the southwestern Dominican Republic, remain. Rhinoceros Iguanas (*Cyclura cornuta cornuta*) have a much larger range throughout the Dominican Republic than Ricord's Iguanas, and are listed as threatened on the IUCN Red List.[1,3,4]

Isla Cabritos National Park is situated on an island in Lago Enriquillo, a hypersaline lake that represents a remnant of the marine channel that once separated the North and South paleoislands that joined to form Hispaniola. The park is home to one of the two or three known populations of wild Ricord's Iguanas in the Dominican Republic. Rhinoceros Iguanas are sympatric with Ricord's Iguanas throughout their range on Isla Cabritos. The island is roughly 4 km wide and 12 km long, with dry, sandy shores and a central plateau of fossilized coralline limestone.[3]

American Crocodile (*Crocodylus acutus*) along the southern shore of Isla Cabritos. *Photograph by Joe Ehrenberger.*

The "landbridge" exposed during periods of low water level connects the west end of Isla Cabritos to the main island shore. *Photograph by Joe Ehrenberger.*

Feral donkeys along the southern shore. *Photograph by Joe Ehrenberger.*

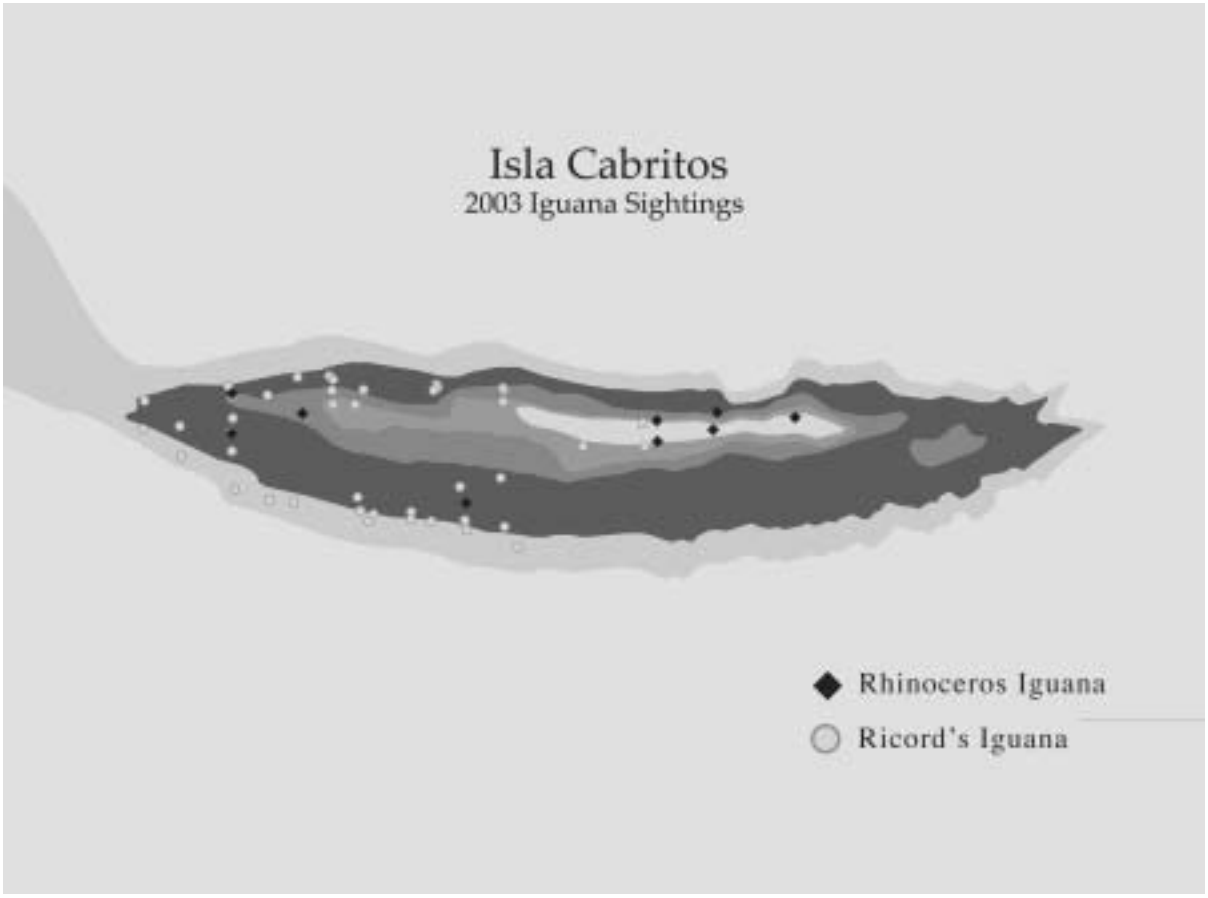
Technically, the island has been protected as a National Park since 1974. It also is somewhat protected by virtue of the fact that it is an island. Unfortunately, in approximately 10-year cycles, the water level of the lake falls enough for the formation of a land bridge on the western end of the island, allowing feral cows, horses, donkeys, and cats to cross to the National Park. These introduced domestic animals compete with the iguanas for resources or, in the case of cats, prey on young iguanas. Collectively, they constitute a direct threat to the survival of these endangered animals. The island also is home to several native raptors (e.g., American Kestrels, Burrowing Owls) that prey on hatchling iguanas. The iguanas of Isla Cabritos were well-studied in the 1980s by José Ottenwalder, and Sixto Incháustegui, and, in 2000, Gloria Santana surveyed the west end of the island.

In late 2002, the IUCN Iguana Specialist Group held a workshop in Santo Domingo, Dominican Republic to develop a Species Recovery Plan for Ricord's Iguanas. In fulfillment of one the objectives of this plan, the Indianapolis Zoo (IZS) and Parque Zoológico Nacional (ZooDom) conducted a census of Ricord's Iguanas and Rhinoceros Iguanas on Isla Cabritos. This preliminary report is a summary of that work.

Methods

Research groups visited Isla Cabritos on three different occasions in 2003, corresponding roughly to Ricord's Iguana breeding, nesting, and hatching seasons. The first group worked on Isla Cabritos in late April through early May 2003 and was composed of personnel from ZooDom and IZS, along with Isla Cabritos National Park rangers. Using Global Positioning Service units, 15 transects were set with an average length of 2 km and a sight-line width of roughly 40 m in either direction, depending on density of vegetation. Each transect ran the width of the island every 500 m. Each transect was walked once, and the position of every Ricord's and Rhinoceros iguana was recorded, including gender and age, if these could be determined. If species could not be positively identified visually, the sighting was marked simply

Seeking shade after working a transect; from left to right: Francisco Alberto Paredes, Leandro DelaCruz, Kacie Ehrenberger. *Photograph by Joe Ehrenberger.*

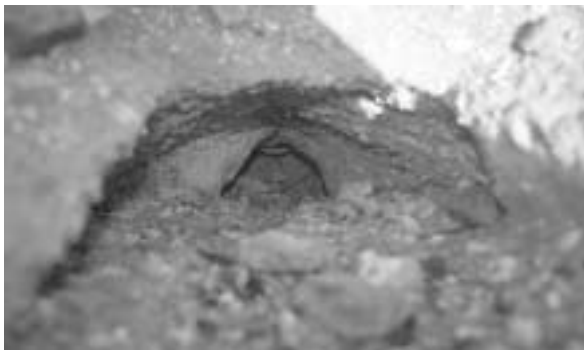


Isla Cabritos showing the transects marked during the iguana surveys (bottom) and locations where iguanas were sighted during the June survey (top).

Typical *Cyclura ricordii* burrow in a dense cactus stand. *Photograph by Joe Ehrenberger.*

Vegetation around the opening of a *Cyclura ricordii* burrow. *Photograph by Joe Ehrenberger.*

A common cactus (*Harrisia nashii*) bears yellow fruits eaten by iguanas. *Photograph by Kacie Ehrenberger.*



Typical *Cyclura cornuta cornuta* burrow, large and in an open area. *Photograph by Joe Ehrenberger.*

as "iguana." Iguana dens and scat also were recorded. Three adult Ricord's Iguanas were captured, affixed with microchips, given complete physical examinations, and released. All domestic animals (burros, cattle, horses, and cats) were recorded, as were any other significant observations.

The second group consisted of personnel from ZooDom, IZS, and the Fort Worth Zoo, and Isla Cabritos National Park rangers. This group worked on Isla Cabritos in late June through early July 2004. This group set five additional transects and walked each transect once using the methods established in April. A horticulturist from the Indianapolis Zoo began cataloging plant species during this visit.

The last group worked on Isla Cabritos just after the hatching season, in late September 2004. Zoodom and IZS personnel, along with Isla Cabritos National Park rangers walked each transect using the same methods as the first two groups. Unsuccessful attempts were made at capturing hatchling Ricord's Iguanas for collection of biological data. Three adult Ricord's Iguanas were captured, affixed with microchips, and released.

Results

In April, researchers sighted a total of 31 Ricord's Iguanas, including 11 males, 12 females, five adults of unknown gender, and three juveniles of unknown gender. In contrast, only seven Rhinoceros Iguanas were seen, including one male, five females, and one adult of unknown gender. Rhinoceros Iguanas were seen on transects nearest the tourist trail and at the far eastern end of the island, but the majority of sightings on the interior of the island were Ricord's Iguanas. Six donkeys and one horse were sighted while walking transects in April, but herds of up to 12 horses were noted at other times. A total of 32 active dens were found while walking transects; one known to be inhabited by a Rhinoceros Iguana and five known to be inhabited by Ricord's Iguanas. These dens were found primarily on either slope of the island throughout its length. Few den or iguana sightings occurred on the rocky plateau.

In June, the team arrived just after the nesting season because the rains came early and nesting had occurred earlier than expected. A total of 16 Ricord's Iguanas (10.6) and three Rhinoceros Iguanas (2.1) were sighted on transects. The pattern of sightings was consistent with the April trip. Many active dens were noted, including those of 34 Rhinoceros Iguanas and 39 Ricord's Iguanas. Dens were designated as being inhabited by Ricord's or Rhinoceros Iguanas either by sighting an animal entering the den, or by the shape and location of the den. Ricord's Iguana dens tend to have openings with a greater soil spread of a finer size and are commonly associated with areas of thorny vegetation consisting mainly of *Cylindropuntia caribaea*. In contrast, Rhinoceros Iguana dens often have openings with larger size soil particles that fan out less widely and tend to be in more open areas. Ernst Rupp reported in his survey of the Barahona Peninsula (see IGUANA 11(1): 8–14) that Ricord's Iguana tail drags are much smoother in fine sand, and therefore notably different than Rhinoceros Iguana tail drags.[2] However, this was not the case on Isla Cabritos, possibly due to differences in substrate consistency. One nest was seen, but the species was unknown. Far more domestic animals were seen in June; these included eight donkeys, four cows, two horses, and two sets of cat tracks.

Plant communities found on the island during the June trip varied according to the different microclimates and substrates. Certain plants such as *Calotropis procera* were widespread, but tended to be most common in the sandier soils found near the beaches. The limestone plateau supported less plant life. However, *Melocactus* sp., the fruits of which are known to be eaten by iguanas, was only found growing in the limestone and nowhere else on the island. Many other cacti, including *Cylindropuntia caribaea*, *Harrisia nashii*, and *Pilosocereus polygonus*, were fairly widespread, although they were absent from the limestone plateau. The most prevalent cactus found near the limestone was *Consolea moniliformis*. Scrubby vegetation, such as *Guiacum officinale*, *Guapira brevipetiolata*, *Prosopsis* sp., and *Ziziphus rignonii*, was found throughout the island as well, but seemed to be in higher concentrations near the limestone outcroppings.

Fewer iguanas were seen in September, but the areas in which they were seen corresponded well to the first two trips. Ten Ricord's Iguanas (3.5.2) were seen and only two female Rhinoceros Iguanas were seen on transects. Recent scat and tail drags were evident in many areas. Forty-two active Ricord's Iguana dens and 27 active Rhinoceros Iguana dens were noted. Donkeys (4) and cows (1) were seen while walking transects. Horses, cows, and donkeys also were observed around camp, and larger numbers of these animals were reported by Park rangers. Two hatchling Ricord's Iguanas were seen on this trip, but could not be caught for measuring and microchip placement.

Discussion and Recommendations

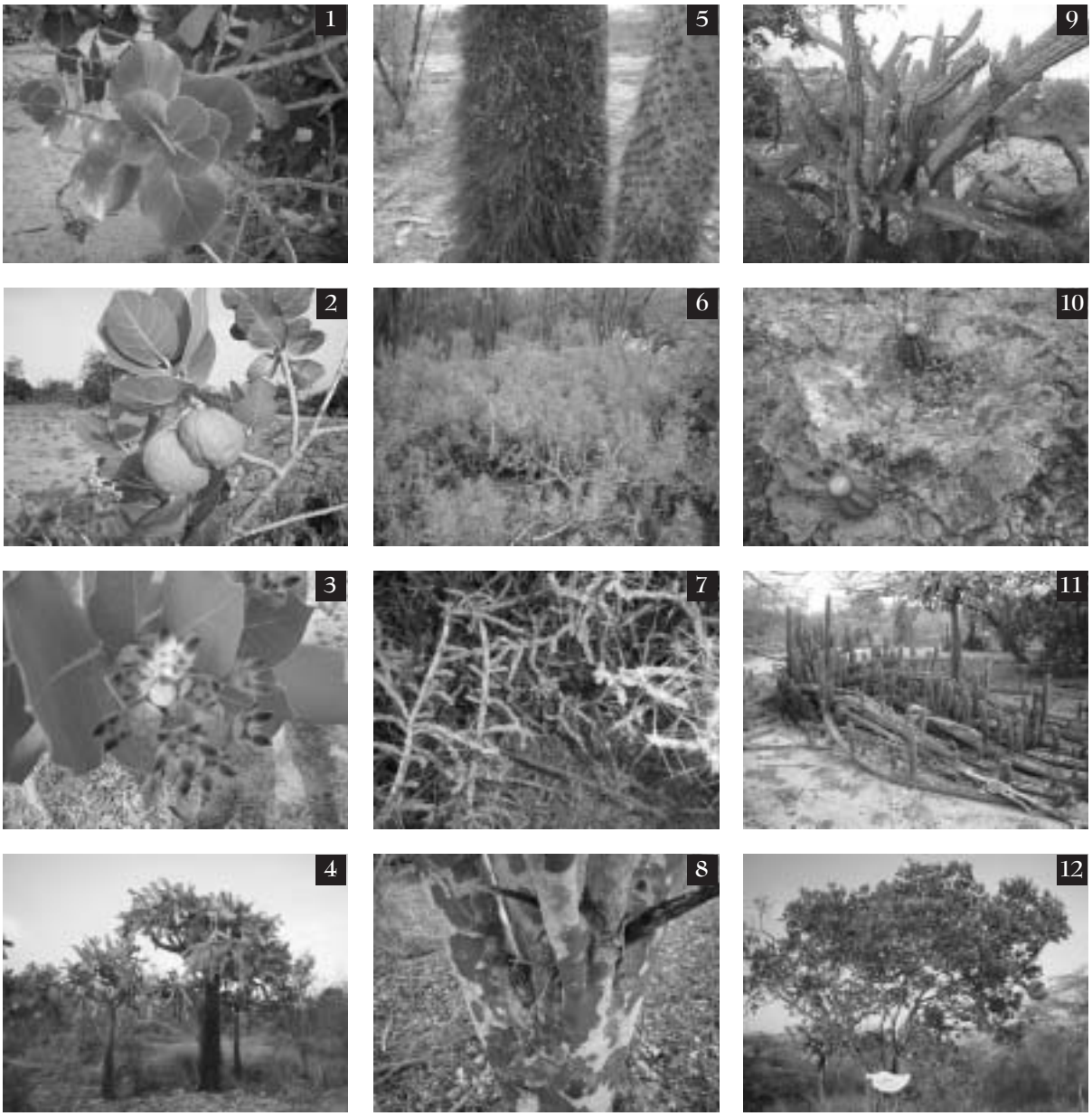
Using the April data of 31 Ricord's iguana sightings on the 15 transects walked, crude population estimates are calculated at 0.13 Ricord's iguanas and 0.03 Rhinoceros iguanas per hectare surveyed. Curiously, Rhinoceros Iguanas were found only along the edges of the island on the central and eastern end, and near the tourist trail on the west end of the island. The sighting of 43 active Ricord's Iguana dens on the 20 transects walked in June also is encouraging, and, if one assumes one adult animal/den, a crude estimate of population density remains around 0.13 Ricord's Iguanas per hectare surveyed. These estimates are considerably lower than densities calculated by Incháustegui, who reported 8 iguanas/hectare on Isla Cabritos in 1985.[5] In her survey of the west end of Isla Cabritos in 2000, Gloria Santana estimated the density of Ricord's Iguanas to be 1.8 individuals/hectare and Rhinoceros Iguanas to be 1.75 individuals/hectare.[5] Population densities quite possibly are lower now than in 2000, but another explanation is that the current survey covered the whole island, including habitat that is not necessarily suitable iguana habitat. The nearly 1:1 ratio of Ricord's:Rhinoceros iguanas in Santana's work is consistent with current observations of larger numbers of Rhinoceros Iguanas near the tourist trail and west end than in the central region and the eastern end of the island.

The only other Ricord's Iguana habitat that has been actively surveyed on Hispaniola in recent years is the work of Ernst Rupp et al. in 2003. He estimated roughly 32 iguanas per hectare in the Los Alivares area of Pedernales Province based on number of active dens sited along one transect.[2] While these data appear to suggest that populations on Isla Cabritos may be very depleted, the estimates in Los Alivares were based on work in areas known to support iguanas. Also, population estimates based on the very low number of sightings made in the current survey are extremely crude and are almost guaranteed to provide low estimates. More detailed analyses of the data are in progress, and continued annual surveys and more detailed behavioral observations are needed to better understand the biology of these animals.

The large number of domestic livestock noted on all three trips is troublesome. Not only do they directly compete with iguanas for forage, they also cave in dens and trample nests. The water level was considerably lower in September than in April, making the land bridge very wide and easily crossed by livestock and predators. Ideally, the land bridge should be fenced, and livestock should be driven off the island. Very few signs of feral cats were noted during this survey; however, no attempts were made to survey for cats at dusk or night. The fact that cat sign was seen at all indicates that a program to reduce the number of cats is needed, and this could include night trapping or shooting of animals.

These data will be presented at a meeting of the Ricord's Iguana Recovery Group in Santo Domingo this summer, and, based on this work and the work of Rupp et al., the nature of future conservation efforts for Ricord's Iguanas will be determined at that meeting. The Isla Cabritos population remains very important to the conservation of this critically endangered species, and further work there could include the following:

- Continued annual surveys (easily accomplished by park rangers if proper equipment and training were available).
- Additional transponder and telemetry studies (also by park rangers in many instances).
- Perform mark/recapture studies to more clearly establish population densities in different parts of the island.
- Track hatchlings (longer-term studies to identify relationships between animals of all ages and vegetation and substrate patterns on the island).



Vegetation of Isla Cabritos: **1–3.** *Caloptropis procera* leaves, fruits, and flowers, all of which are eaten by iguanas; **4–5.** *Consolea moniliformis* stand and close-up of the trunk; **6–7.** *Cylindropuntia caribaea* forms impenetrable forests; **8.** *Guaiacum officinale* bark; **9.** *Harrisia nashii* grow very large and often provide shelter for *C. ricordii* burrows; **10.** *Melocactus* sp. are scattered across most areas of the island; **11.** *C. ricordii* burrows are frequently associated with *Pilosocereus polygonus*, another abundant cactus; **12.** *Ziziphus rignonii* seeds germinate more rapidly after passing through the digestive tracts of iguanas. *Photographs by Lori Johnson-Roedell.*

Participants

APRIL: Roberto Maria, Senior Veterinarian, ZooDom; Melvin D'Oleo, Isla Cabritos National Park Ranger; Adriano Menier, Senior Keeper, ZooDom; Jan Ramer, Associate Veterinarian, Indianapolis Zoo; John Wyatt, Deserts Senior Keeper, Indianapolis Zoo.

JUNE: Francisco Alberto Paredes, Senior Keeper, ZooDom; Jennifer Niederlander, Veterinary Technician, Indianapolis Zoo; Leandro DelaCruz, Veterinary Student, ZooDom; Lori Johnson-Roedell Curator of Horticulture, Indianapolis Zoo; Meg Bommarito, Conservation Department, Fort Worth Zoo; Melvin D'Oleo, Isla Cabritos National Park Ranger; Adriano Menier,

The September surveying team (from left to right): Melvin D'Oleo, the author, Alice Wright, Adriano Menier, Francisco Alberto Paredes, Joe Ehrenberger, Leandro DelaCruz, Kacie Ehrenberger, and Emily Hansen.

Seeking shade after working a transect; from left to right: Leandro DelaCruz, Emily Hanson, Kacie Ehrenberger, Jan Ramer, Alice Wright. *Photograph by Joe Ehrenberger.*

Senior Keeper, ZooDom; Richard Searcy, Deserts Keeper, Indianapolis Zoo.

SEPTEMBER: Francisco Alberto Paredes, Senior Keeper, ZooDom; Leandro DelaCruz, veterinary student, ZooDom; Joe Ehrenberger, Deserts Keeper, Indianapolis Zoo; Kacie Ehrenberger, Wildlife Biologist and Indianapolis Zoo Volunteer; Emily Hansen, Educator, Indianapolis Zoo; Melvin D'Oleo, Isla Cabritos National Park Ranger; Adriano Menier, Senior Keeper, ZooDom; Jan Ramer, Associate Veterinarian, Indianapolis Zoo, Alice Wright, veterinary student, Edinburgh, Scotland.

Acknowledgements

This work was supported by the Indianapolis Zoo Conservation and Research Department, the Miami Metrozoo, Cleveland Zoo, Parque Zoologico Nacional (ZooDom), and the American Association of Zoo Keepers, Indianapolis Zoo Chapter. Many thanks to Richard Searcy for compiling GPS data and making maps. John Binns can never be thanked enough for his many contributions to iguana conservation, this project being no exception; thank you, John. And finally thanks go to all of the survey participants for their hard work under considerably less than comfortable conditions.

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Male Ricord's Iguana on Isla Cabritos (November 2002). *Photograph by John Binns.*

Threat to Dominican Protected Areas

Dominican Protected Areas are Threatened by Congressional Action

23 April 2004 — Santo Domingo, Dominican Republic

The Dominican Republic, with its 48,700 km^2 of land, is home to some of the most diverse habitat in the Caribbean Islands, and to extremely rich, largely endemic, and highly threatened biotic communities. These factors are very significant in placing the Caribbean Islands among the five most important global biodiversity hotspots. In 1974, an important process was initiated to establish a comprehensive system of protected areas. Today, these areas encompass 16.2 % of the land area of the country and include nearly all of the most critical ecosystems.

Throughout this period, the Dominican institutional and legal framework has evolved to the point where a General Framework Environmental Law (Law 64-00) was passed in 2000. This law reformed and modernized the environmental sector, created the Ministry for Environment and Natural Resources, and mandated the development of other environmentally relevant laws, including a new Protected Areas Law. The Ministry of Environment developed a proposed Sectorial Protected Areas Law and submitted it to the National Congress in August 2002. This proposed law included certain changes and revisions in the Dominican Protected Areas System, within the general framework of the existing system.

On 13 April 2004, the Dominican Senate read and approved the proposed Protected Areas Law with significant changes that drastically reduce and render unsustainable the Dominican System of Protected Areas, which were created through the hard work of many individuals and institutions over the past 30 years. The proposal still must be approved by the deputies and signed by the President of the Republic in order to become law.

The drastic reduction, almost destruction, of the protected areas system is supposedly based on the need to fight poverty by allowing local development in formerly protected habitats. In fact, all restrictions are removed in areas considered of potential interest for intensive beach/costal tourism and/or mining development. Besides destroying the protected areas, strong evidence exists that the so-called "developmental initiatives" sought by this proposal do not have strong popular support, nor do they include provisions for adequate inclusion of locals in development projects.

Among other things, the proposed law removes protection from all the costal areas of Jaragua and Parque del Este national parks. Jaragua, included in the first Biosphere Reserve of the Dominican Republic, was just approved at the end of 2002 by the present administration. Regional, insular, and national resources are at risk with this initiative. Globally important sites for endangered and critically endangered ecosystems and species would disappear. These include coastal wetlands, areas important for migratory, resident, and marine birds, and globally significant sites for the critically endangered species such as the Hawksbill Sea Turtle (*Eretmochelys imbricata*), West Indian Manatee (*Trichechus manatus*), and Rock Iguanas (*Cyclura ricordii* and *Cyclura cornuta*).

Rushing to Sell Park Beaches

6 May 2004 — Santo Domingo, Dominican Republic

Four of today's Dominican newspapers, *La Informacion* from Santiago, *Diario Libre*, *Listin Diario*, and *El Caribe*, all from Sto. Domingo, featured the hurried passage of the much-debated bill that would reduce from 30 to 15% the extent of protected areas in the National Parks of the Dominican Republic.

By a vote of 93 to 14, the PRD majority, together with some members of the PRSC, rolled over some very heated opposition. If ratified in a second reading, the action would grant access for tourist development of beaches located within the National Park of the East and Jaragua National Park (in the southwest), as well as areas in the southwestern Bani dunes and along the Costa Azul Panoramic Highway in Macao in the east. The bill's provisions also authorize mining exploitation of the Pomier Caves in San Cristobal. The bill, first passed in the Senate, supposedly in the name of pragmatism, removed from the National Parks Bill practically any area that could be developed for tourism or mining. The bill also diminishes the role of the Ministry of Environment in environmental matters.

In what the *Listin Diario* calls a "huge uproar," the session attempted to debate the merits of the changes to the national parks. As soon as the PRD deputy from Pedernales, Rafael Torres, took the floor in support of the bill, the PLD deputies and their allies from the FNP (National Progressive Force) actively challenged the proposal. They accused the Presdient of the Chamber of Deputies, Alfredo Pacheco (PRD-National District), of being "arbitrary and abusing his powers" as he tried to push the legislation through without review by the appropriate legislative commission.

Things got so interesting that Pacheco ordered the military security detail to remove the environmental editor of *Hoy* newspaper, Domingo Abreu Collado, from the Chamber because he was filming the session. Although PLD deputies Alfredo Cruz, Abel Martinez, Clodomiro Chavez, and Minu Tavarez Mirabal opposed the steamrolling tactics and requested that the final vote be taken after the 16 May elections, the overwhelming PRD majority seconded by PRSC deputies voted down their motion and passed the proposal. While the deputies were in session, a small group of picketers protested outside the building.

The Santiago newspaper, *La Informacion*, reported that a large public protest outside of the Municipal Palace started in the evening and featured speeches by ecologists and environmental groups as well as the politicians who fought to have the bill stopped. A candlelight vigil was held into the early morning hours. No public hearings were held, nor were the different ecological groups allowed to present their case before the Chamber of Deputies.

According to *El Caribe*, the Foundation for Institutionalism and Justice (FINJUS) warned deputy Pacheco that the style of his term as president of the Chamber of Deputies should not be stained by the hurried approval and no consensus of the modifications to the law that has protected the National Park system. In what has to be seen as an ironic coincidence, even the "La Vida" section of the government-operated *Listin Diario* featured a long article on the Bay of Eagles losing its "virginity." The writer lamented that this would be the last time that she would see the "Bahia de las Aguilas" intact and pristine. The new bill also would violate an agreement signed with UNESCO that had declared the area a UNESCO biosphere reserve (see http://www2.unesco.org/mab/br/brdir/directory/biores.asp?code=DOM+01&mode=all).

Meanwhile, well-respected investigative journalist Ana Mitila Lora wondered in her column in *Listin Diario*, "What's the rush?"

President Mejia has been a strong supporter of the development of National Parks for tourism or mining, and has issued several decrees authorizing private companies to begin development. The only obstacle, however, has been that, at the onset of this administration, Mejia had signed Environmental Law 64-00, which established guidelines for the conservation of natural resources. The new bill that is moving ahead in Congress would resolve this impasse and enable unchecked development of the new areas by companies chosen by the Mejia government.

Dominican Legislature Passes the Revised Protected Areas Law

13 May 2004 — Santo Domingo, Dominican Republic

Today, the Dominican Congress approved the Protected Areas Law with significant changes that drastically reduce and render unsustainable the Dominican System of Protected Areas The two areas that have suffered the most are Parque Nacional Jaragua and Parque Nacional del Este. The struggle by Dominican and international environmentalists continues, but is becoming more and more difficult. The bill will now pass to the President for approval — but he has stated publicly on several occasions that he favors it.

SPECIES PROFILE

Leiocephalus semilineatus

Robert Powell

Avila University, Kansas City, Missouri

Nine species of Hispaniolan Curly-tailed Lizards (Genus *Leiocephalus*) are currently recognized. Of these, *L. semilineatus* is the smallest, with a maximum known snout-vent length of 53 mm. In addition to its small size, this species is distinguished by the light-bordered, dark brown lateral stripes that begin as a mask and extend onto the body before fading near the hindlimbs. These fading lateral stripes are responsible for the species' scientific name.

The species is known from the Llanos de Azua and also from the Valle de Neiba of the Dominican Republic through the Cul-de-Sac plain of Haiti. The latter area is largely below sea level and is a remnant of the marine channel that once separated the North and South paleoislands that joined to form Hispaniola. An apparent hiatus in the range separates those two areas.

These little lizards are found in extremely dry habitats and may be among the most drought-tolerant of Hispaniolan lizards. They frequently occur in sympatry with *Ameiva lineolata*, a very small member of its genus and equally xerophilic (from the Greek meaning "dry-loving"). Although both species feed primarily on small arthropods, they apparently avoid most competition with one another by employing different foraging strategies. *Leiocephalus semilineatus*, like all of its congeners, is a sit-and-wait forager. Using an elevated perch on a rock or log, these lizards respond to movement by ambushing their prey. In contrast, *Ameiva lineolata*, is an active forager, constantly on the move and rooting in surface litter, while searching for anything edible. Although their diets overlap, a large proportion of that taken by *L. semilineatus* is composed of insects, such as ants and beetles, that move and attract the attention of lizards, whereas that of *A. lineolata* includes many prey items, such as pupae and larvae, that rest immobile under surface debris and would escape the notice of a sit-and-wait forager.

Like other Curlytails, *L. semilineatus* coils its tail. Unlike some members of the genus, however, the tail is never curled vertically over the lizard's body. The reasons for this behavior are unknown, although luring insect prey, communication, and confusing predators have been mentioned as possibilities.

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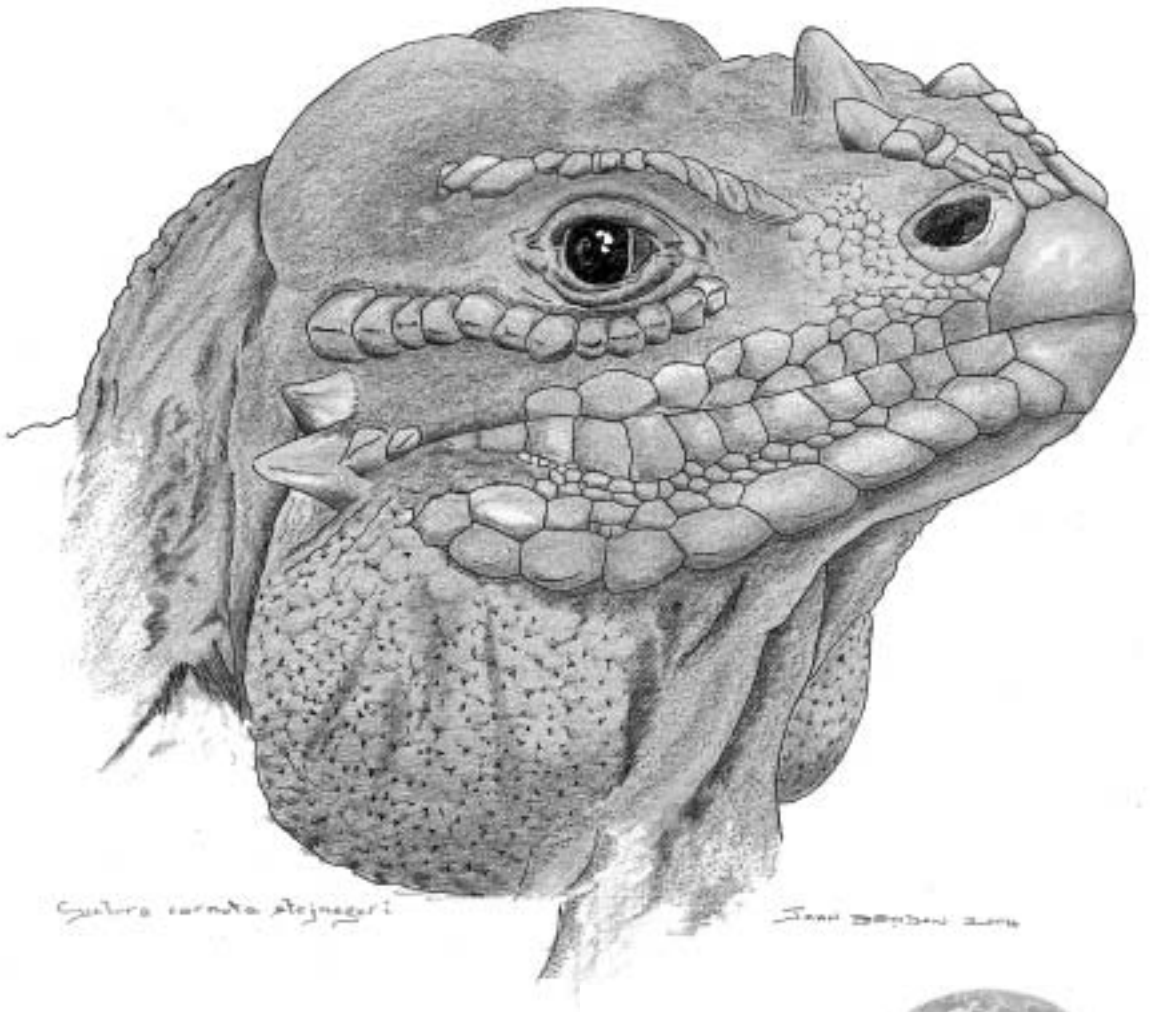
An adult male *Leiocephalus semilineatus* from near Hatillo, Azua Province, Dominican Republic. *Photograph by Robert Powell.*



The Mona Island Rhinoceros Iguana, *Cyclura cornuta stejnegeri. Illustration by John Bendon.*

Juvenile Rhinoceros Iguana at the headstarting facility on Mona. *Photograph by Alberto Alvarez.*

Mona Island lies between Puerto Rico and the Dominican Republic. *Illustration by John Binns.*

Magnificent Iguanas of Isla Mona

John Bendon

Bath, England

Photographs by the author except where indicated.

Isla Mona is paradise!
When God created Eden,
He probably thought of Mona.
If you go to Mona —
it will change your life!

— Rafael Joglar, 2003

I stepped off the plane exhausted and excited, about 7000 miles and 31 hours away from where my journey began. The time in Puerto Rico was 9:30 pm, but my body told me that it was really 2:30 am the next morning. This trip was very special; I had volunteered to be a field assistant on a research project currently underway on Mona Island, the home of *Cyclura cornuta stejnegeri,* the Mona Island Rhinoceros Iguana. This magnificent creature has lived untouched on this island, separated from other large iguanines, for thousands of years, although an alternative school of thought suggests that the lack of substantial genetic differentiation from *Cyclura cornuta* of Hispaniola speaks to a recent, possibly even human-mediated, arrival on the island.

Aerial view of Isla Mona. *Photograph by Alberto Alvarez.*

The entire human population of Mona Island taking a lunch break.

Alighting from the aircraft, I was immediately struck by the grand tropical aspect of the place, the cacti growing at the airstrip, unusual birds, and strange noises. That night, I was amazed by the innumerable stars bright against the black sky, and by an immense silence that covered us like a cloak and was interrupted only occasionally by the bark of a Night Heron. Lying in bed, knowing I was on an island in the middle of nowhere, no one walking down the street, and hearing no cars or other sounds of a modern metropolis was a strange and wonderful sensation.

Mona Island is a unique ecosystem, with considerable endemism. In addition to the iguana, the island hosts an endemic frog (*Eleutherodactylus monensis*), three endemic lizards (*Anolis monensis*, *Sphaerodactylus monensis*, and *Ameiva alboguttata*), three endemic snakes (*Typhlops monensis*, *Epicrates monensis monensis*, and *Alsophis portoricensis variegatus*), and an endemic, albeit extinct, tortoise (*Geochelone monensis*). Non-endemic reptiles include widely distributed skinks in the *Mabuya sloanii* complex, the introduced gecko, *Hemidactylus mabouia*, and three species of sea turtles.

In October, hundreds of Careys (Hawksbill Turtles, *Eretmochelys imbricata*) hatch on the beaches. They are gathered by the researchers, duly processed, and returned to the beach for their crawl to the sea. Although clutches may contain as many as 120 eggs, the chance of survival to adulthood is only one in 10,000. Their lives are fraught with danger; en route to the water they are eaten by hawks and herons; once in the water, they become prey for fish; and, if any survive, humans hunt them for the rest of their lives. A 200-lb. turtle takes fifty years to grow, one minute to kill, an hour to cook, and thirty minutes to eat. I am genuinely surprised that any are left.

The climate on Mona is hot. The island consists mainly of an elevated plateau. Beaches are scarce and the only substantive one is on the southwestern shore. The unique vegetation includes 84% plateau forest, 8.7% shrub forest, 0.6% cliff forest, and 6.7% coastal plain. Eleven varieties of cacti and 29 different species of *Euphorbia* have been identified. Two of these (*E. petiolaris* and *E. mancinella*) are poisonous to humans, although iguanas eat fruits of the latter.

At any time, only about 12 persons, including two rangers, inhabit the island. Facilities for the human population are limited to a few houses, a communal kitchen, a couple of workshops, a hurricane-destroyed theater/museum, and a new shower and toilet facility. Two vehicles, plus a digger, several bikes, and a boat provide transportation. Nine years ago, the only two cars on the island smashed into each other in a freak accident (don't ask!).

What I find most appealing about Mona is that the iguanas don't just frequent the wilder, more distant parts of the island. Finding one right there on the doorstep was not unusual. Mostly, they would ignore me completely, looking to the left and right, perhaps munching on a couple of fallen fruits or a leaf or two as they moved about. Their lives seem quite tranquil — but, after all, they've been living here since long before the research station was built, walking the same routes, soaking up the sun's rays, and just being iguanas.

Returning from the kitchen to the bunkhouse, coffee in hand, the early morning sun already hot, I see a big, calm, gray iguana. He seems to be staring at the trees, maybe wondering what's for breakfast.

Two iguana-related projects are ongoing. Alberto Alvarez, Department of Natural and Environmental Resources (DNER), heads an Iguana Headstarting Program, and Nestor Pérez, a Colombian post-graduate at the University of Puerto Rico–Río Piedras (UPR), is conducting research on reproductive and territorial behavior. The latter project, funded by UPR and DNER, is currently in the third of a projected five years. The only substantive prior research on Mona Island Iguanas was the basis of Thomas Wiewandt's 1977 doctoral thesis.

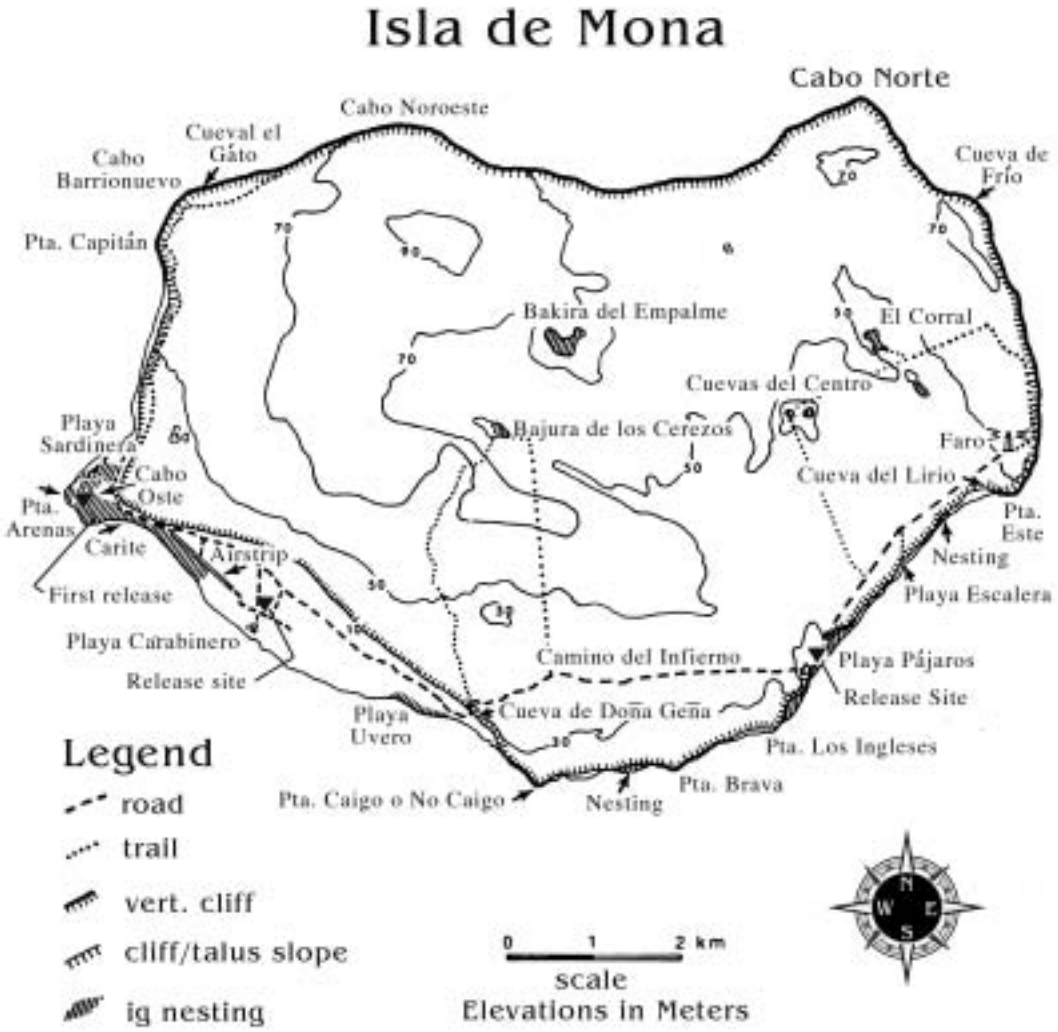
Nestor's study uses nest monitoring, radiotracking, and individual identity numbers in an effort to determine sex ratios, paternity information, size of home ranges and territories, movements, survival rates, and total population size. Mona Island covers about 65 km^2 and much of it is very difficult terrain. Nesting sites are scattered widely and some are almost inaccessible. Twelve nests have been carefully monitored and surrounded by zinc fences. These are visited daily during the expected time of hatching. Hatchlings are trapped inside the fences, collected, and taken to the research station for processing. Each is measured and weighed, blood samples are taken, and transponders inserted. This year, 121 hatchlings were processed. At about 30 minutes per lizard, this entailed 60 hours of work for each of two people.

Twelve carefully monitored nests were surrounded by zinc fences.

About half of the lizards are released in designated areas and the rest are held in headstarting cages. Some of those remain for several years and attain sizes sufficient to enhance chances for survival after release. Others may be released earlier, according to their progress, and the capacity of the headstarting facility.

Three different radio transmitters are used. One, for the larger animals, is enclosed in a pouch attached to a collar made out of plastic tubing, and hangs loosely around the neck. These present some risk of strangulation, and radios attached directly to iguanas without straps are generally preferred. The second type of radio is much smaller and is used for juveniles and even occasional hatchlings. Because young animals grow quickly, these transmitters are tied around the lower part of the body above the pelvis, swing loosely, and usually fall off after some time. Not only does this prevent the ties becoming too tight over time, but also the transmitters can be recovered and re-used. The third type of

Radio transmitters used for the larger animals are enclosed in a pouch attached to a collar made out of plastic tubing.



Hatchlings are collected from the nesting sites and processed at the field station. About half of them are returned to the wild at the release sites and the remainder are placed in headstarting cages.

This large male was about to shed its skin.

This occupant of *Ciudad Lagarto* monopolizes a prized basking site. *Photograph by Alberto Alvarez.*

transmitter, about the size of an AA battery, is implanted in the body cavity of larger animals. Although a longer recovery period might be preferable, animals are usually released after three days due to space and time constraints. Once transmitters are fitted, animals are individually tracked using a VHF receiver. Radio transmitters usually last three months to three years, depending on type.

My own experiences tracking iguanas were mixtures of struggle and elation. One day, in the very dense, almost "jungle-like" part of Mona, I set out with the radio receiver to find iguana #22. The antenna was unwieldy and kept getting caught on branches. I kept getting tangled in vines, and had a difficult time determining in which direction I was going and where I had been. Finding an iguana was not so easy. I would turn the antenna until the signal was stronger and then walk in that direction. Then the signal would fade and I would turn, lose the signal, lose myself, trip a lot, but eventually catch the signal again. I followed it until I reached a sheer rock wall. Shouldering the radio equipment, my tote bag, and a camera, I clambered up more easily than I had suspected I could — only to find, sitting on the top, a few feet away from the edge, staring at me, a beautiful female iguana with #22 painted in red latex on her side. The experience of stumbling through the jungle, scratched, badly bitten, and very dirty, was well worth the reward of seeing her nod "hello." The sight of number twenty two at the end of all that will stay with me forever.

Headstarted iguanas spend the first months of their lives in one of ten contiguous units.

Adventures with Iguanas

Ciudad Lagarto.—A garbage dump near the headstarting facility has grown steadily over the years. I named it *Ciudad Lagarto* ("Lizard City") and erected a large sign to that effect. Many of the released headstarters don't stray very far and several of them have taken up residence, along with wild animals, in the dump, which supports a total population of about 20 lizards. If I approached slowly and stayed low, I could easily observe them, and I noted that each one had its own place. Once I stood up, however, most of them quickly disappeared.

A fairly large iguana lived near the front by a pile of old doors. She was beaded and tagged and had made a "nest" of dead grass under one of the doors. She was the largest and obviously the "alpha" animal in the area, even though a female. Quite assertive and very much the "home-body", she was close and easy to recapture, and had been weighed and measured more often than most of the other iguanas, providing us with important information on growth in large adults.

Other individuals, several of them similarly prone to recapture, lived inside refrigerators. Resultant data demonstrate that, in 18 months, between the ages of about two to three years, weight gain ranged from a quite satisfactory 500 g to as much as one kilo.

I visited *Ciudad Lagarto* and the inhabitants of the enclosure nearly every day that I was on the island. I very much enjoyed sitting inside the cages and watching them. If I was still and did not attempt to grab them, they would go on about their business and ignore me. I only did this at the beginning and end of the day, since the animals go "mad" when disturbed during the heat of the day and rush headlong into the wire mesh sides of the cages. But, in the evening, when the last rays of sunshine dip into the ocean, whole new hordes of life forms awaken, namely the mosquitoes and sand flies. That was my signal to get out as quickly as possible and slap on the repellent (one can't wear it near the reptiles, as it may harm them).

Bathroom Hatchlings.—Gravid iguanas enter the nesting burrows and emerge looking spent and emaciated. One nest site was in an open area where the station's massive grass cutter would pass over it. Fearing that the nest or emerging hatchlings might be damaged, the eggs were removed and reburied elsewhere. The reburied eggs were late in hatching; so, after some discussion, we dug them up and placed them in a container filled with soil from the site and set it under the house.

Although quite warm by temperate standards, October temperatures drop each day — and iguana eggs need temperatures of about 30 °C to hatch. Nothing was happening. We peered into the container each day and checked the temperature, which was hovering around 26 °C. Finally, we decided to bring them into the old wooden house and, more specifically, into the bathroom, which seemed to be the warmest place, especially when we added a light. A little water stabilized the humidity and the temperature settled at 31 °C under the sand and at 35 °C on the surface. Now, all we had to do was continue waiting.

The very next morning, I was in the bathroom brushing my teeth when, as an afterthought, I removed the light to see what was going on in our incubator. There, poking up like dark, wet pebbles on a beach, were four heads. The first hatchlings had started to come out of their eggs. This continued for four days. Every so often, I would go into the bathroom and another head would have popped up like a crocus in spring. I kept them warm and watered them, just as one would with delicate flowers — and they responded by growing larger in front of my eyes (they really did grow, as they were absorbing their yolk sacs). Thirteen little iguanas eventually sprang to life. It was like magic. Even the seasoned researchers were excited and appeared from time to time with their cameras. Hatching is typically a very private enterprise, as the eggs are normally underground.

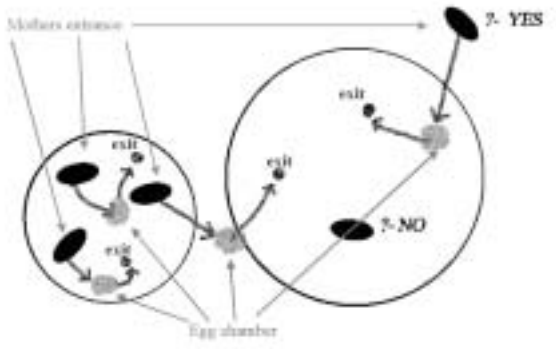
This individual is one of the largest iguanas on the island.

What we learned from this exercise is that we could not process these babies straight away. When hatchlings appear above ground for the first time, they may be anywhere from a few days to well over a week in age. At that age, they could be safely handled, if the yolk sac has shrunken and dried and the skin has healed. If we tried to handle them at a younger age, their moist and slippery skin wouldn't take the paint with which we wrote their numbers, nor would it cut cleanly for the insertion of transmitters. So, the bathroom hatchlings taught us to use the umbilical scar as an indicator of when processing could begin.

Two for the Price of One.—The fences placed around iguana nests sometimes did not work. In one instance, two fences next to each other were supposed to yield three sets and one set of hatchlings, respectively. Instead, the former yielded only two and the latter two as well. We think that the third set from the first fence tunneled to the surface at an angle, only to emerge within the second fence — mystery solved. Unfortunately, when the time came to collect the second set of hatchlings, the heat of the day was upon us. The little lizards running around the circular wall of their enclosure were far too fast to catch, and, if we came close to succeeding, they disappeared into their own hatching tunnel. As we needed to process them the next morning, I suggested that we go out at night with headlamps and grab them while they were sleeping. The result was a comic farce.

Most were hidden under some pipes that had been cut down the middle. I suggested that we hold a pillowcase at one end and scare them into it. It didn't work — about nine iguanas ran out all at once, and the pillowcase caught only two. The rest ran round and round the circular fence as we turned on our heels trying to follow them, the bouncing lights on our heads only adding to the confusion. Somehow, we discovered the rest of the hatchlings, all buried in the sand, jumbled together in a misshapen ball. Neither of us had ever seen this kind of behavior, but we quickly took advantage of it and bagged some more of the lizards. Eventually, we caught all fifteen, but we were pretty sure that we had played the fools while the little iguanas outsmarted us. We were laughing out loud, but silently pleased that no one had been watching.

The Legend of 98.—The day iguana #98 escaped, he just jumped out of my hand, ran up the mosquito screen, found a small hole, and was suddenly outside. I ran down the stairs and looked up at him perched on the window ledge. He jumped, landed beside me, and started looking around. However, as I bent to pick him up, he took off, running about 3 m. I just watched, knowing it would be futile to try to chase him. By then, he had spotted the outside world for the first time. The sun shone down on him and, when he looked up, he didn't see me any more. Stepping lightly across the grass, stopping and nodding, then running, he fled into the brush and was gone. Unfortunately his number will have shed with his skin by the next time I visit



The fences placed around iguana nests sometimes did not work as intended.

Fights between adult males can be vicious.

Mona; I will never know if he survived. If this was a novel, I would say that, "the legend of 98 lives on."

Battles.—I had seen iguanas fighting in photographs only. It looked pretty vicious, but didn't prepare me at all for what I saw on Mona. These iguanas are among the largest and toughest species of *Cyclura*. They scramble over sharp rocks and cactus, they lose tails and fingers, and they're not fazed by harsh conditions — except possibly for cold weather, which forces them into a cozy hole somewhere. They are stocky and muscular, many have battle scars, and their horns and spikes often are worn or broken as a consequence of fighting or the mere wear and tear of living in a harsh environment.

A couple of hardened old hands lived near the research station. One was iguana #21, who I called "Tough Guy 21," and the other was just "Tough Guy." Both were aggressive. Tough Guy 21 had been around for a long time and was the uncrowned king of the area. He would swagger around and chase lesser males away. He always got the girl. One day during lunch, someone yelled: "Hey, iguanas are fighting over here." We dropped our rice and beans and dashed over, cameras at the ready, to find #21 fighting with Tough Guy. The new arrival was larger than our #21 and Nestor told me he had never seen him before. He was identifiable by a white spot of detached skin just behind his right shoulder (which we duly noted and recorded). The fight appeared to be a stalemate, either that or both combatants lost interest. After several minutes, each went his own way, nodding furiously and gaping so widely that it seemed like one could park a car in the cavity.

We didn't think much more about that encounter until a few days later. Female #27 seemed to be minding her own business under the watchful gaze of Tough Guy 21, when, out of nowhere, came the new Tough Guy. He sidled up to her and, from where we stood, appeared to be chatting to her amiably. Tough Guy 21 approached, the female backed off, and, like jousting knights, the two males rose up on their haunches, tipped

Many of the headstarted iguanas don't stray very far after they are released. Several have taken up residence, along with wild animals, in the dump, which supports a total population of about 20 lizards. *Photograph by Alberto Alverez.*

A young Rhinoceros Iguana peers out from the safety of a PVC pipe within the headstarting cages. *Photograph by Alberto Alverez.*

their heads and bodies slightly to the side, and began trotting around each other. All at once, #21 pounced forward and spat with a kind of hissing roar. This seemed to inflame the newcomer, who opened his mouth and went for 21. Now, with both their mouths wide open, they scraped alongside each other's faces, turning in a circle. They did not lock jaws, but continued turning and scraping and drawing blood all the while. This went on for about ten minutes, during which they ignored us as we approached rather closely to get photographs. Suddenly, they stopped, seemingly taking a break — or was the battle over?

Apparently, the new Tough Guy had won. The next day we saw all three animals again. The new guy and the female wandered off together, while #21 skulked in the background. This behavior was quite unusual for that time of year. It was like mating behavior, but occurred during the hatching season.

The third fight I saw was so vicious that I got a bucket of water and threw it over the two combatants like they were dogs, after which they dashed off in opposite directions. I was admonished by the biologists for "interfering with nature," which I should have let take its course. I argued that the cat we caught had just killed and eaten three hatchling iguanas and also had interfered with nature, as it was not supposed to be on Mona at all. I felt that I had merely tipped the balance a little by ensuring two big, healthy iguanas would survive. I can see the other side of the argument, but I still believe I did the right thing. I was not going to watch two endangered lizards kill each other.[1]

Epilogue

Two nests, each surrounded by aluminum flashing, are on Pajaros Beach. Although 9 km from the station, we check them daily. This day, nothing. Perhaps, if it thunders again tonight, events will move along and tomorrow, early, the hatchlings may emerge. But now, I walk along the beach, watch the birds, move inland to a Seagrape tree, and find a place to sit in the shade. Alerted by a rustle in the leaves, I see an enormous iguana amble toward me. Unbelievably, he sits and rests beside me, right beside me, nodding. I nod back. I stare at his big black eye, sunlight glinting off the blackness. All at once we are friends, sitting there together.

[1] Editors' note: Although male iguanas sometimes die as a consequence of complications from combat-related wounds, most conflicts in nature cease before fatal injuries are inflicted — as long as the "loser" has an opportunity to escape.

Mash is placed daily in split-bamboo feeding "stations" for young Mona Island Iguanas (*Cyclura cornuta stejnegeri*) at the headstarting facility. *Photograph by Alberto Alverez.*

The magic of Mona was working again; the place weaves spells around those who visit, and I know I shall return again and again, if only I can. Presently, the lizard rose, glanced at me, and walked away. As he did, he looked back one last time before disappearing into the brush. I've had many experiences during my travels, but this beat them all. From the back streets of Cairo to the caves of Kandahar, travel is enlightening, but sharing the shade of a tree on a blazing afternoon with my lizard companion is a memory that will remain with me always.

Acknowledgments

I thank Thomas Wiewandt, Nestor Pérez, Robert W. Ehrig, M.P.C. Lawton, Alberto Alvarez, and Charles Knapp for inspiration, information, and guidance.

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HEADSTARTING

Adapted from a report by Alberto Alvarez and used with permission.

The iguana headstarting program began in October 1999 with the construction of an enclosure on Playa Sardinera (in the west of Mona Island) where the DNER facilities are located. The enclosure is composed of ten contiguous units, each 3 m x 3 m x 2.3 m. Landscape arrays simulate a natural environment. Rocks and logs provide perches, plants provide shade, hiding places, and water reservoirs, PVC pipes (4" diameter, 1 m long), approximately 6.5' above the ground, provide climbing opportunities and more hiding and basking places. Several units contain smaller pipes (3") and bamboo sticks for hatchlings, an average of eight of which are kept in each unit, with the number of individuals in each enclosure depending on landscape characteristics, food resources, aggressiveness, and individual needs.

In 1999–2000, 47 hatchlings were collected at Sardinera and 4 at Playa de Pájaros; in 2000–2001, the numbers were 25 and 0; in 2001–2002, 1 and 5; and, in 2002–2003, 3 and 34, respectively.

Iguanas are fed daily or on alternate days with a mixture of moisturized prepared food (Zeigler® Iguana Mash) and wild fruits, flowers, and, less abundantly, leaves. Fruits and flowers have higher nutritional value. In general, about 30% of iguana food intake consists of collected natural food items. Mash (5–10 g for hatchlings, 10–15 g for older animals) is placed daily in split bamboo feeding "stations," whereas collected foods are spread randomly in each unit. Late in the afternoon, food stations are removed and cleaned. Regular cleaning is important to reduce infestation by fire ants, centipedes, scorpions, land crabs, and rodents. Vegetation inside the enclosure is watered as needed.

By the end of November 2002, all the signals from transmitters implanted in August 2002 were lost. Two signals from transmitters implanted in April 2002 were still detectable, but one was lost in December and the other one in January 2003. We discount animal predation, and believe that a combination of out-of-range signals and transmitter malfunction may be responsible. Collected data reveal that the fastest and farthest any one individual had moved was about 1 km in 3 days. The remaining animals were lost no more than 400 m from the release site. Animals with transmitters implanted in April 2002 were less than 800 m from the release point when the signal was lost.

Hatchling iguanas at the headstart facility in 2003. *Photograph by John Bendon.*

In December 2002, seven juvenile iguanas hatched in 2000 and weighing more than 1 kg, were released in the Sardinera and Playa Mujeres nesting sites. These were dominant individuals and responsible for considerable aggression in some enclosure units.

Six released iguanas have been recaptured in June and July 2003, including one with a disabled transmitter that had been implanted in April 2002. The remaining animals were from August 2002 and one from December 2002 releases.

SPECIES PROFILE

The Ground Lizards of Isla Mona: *Ameiva alboguttata*

Robert Powell

Avila University, Kansas City, Missouri

In addition to the Mona Island Iguana, the island supports one endemic frog (*Eleutherodactylus monensis*), four other lizards, and three snakes. Of the lizards, one is a widely distributed exotic species (*Hemidactylus mabouia*), a second also is widely distributed in the West Indies, but probably native to the region (*Mabuya sloanii* complex), and the other two are endemic to the island (*Sphaerodactylus monensis*, *Ameiva alboguttata*). Of the snakes, one is an endemic species (*Typhlops monensis*) and the other two are endemic subspecies (*Epicrates monensis monensis*, *Alsophis portoricensis variegatus*), although, as for the iguana, some authorities consider the Isla Mona populations to be full species (see also article on facing page).

Until recently, *Ameiva alboguttata* was considered to be a subspecies of *A. exsul*, a species that is widely distributed on the Puerto Rico Bank. However, the two species differ consistently in color and pattern and are precluded from any gene exchange by the insular distribution of the Isla Mona form.

As for many of its relatives throughout the Neotropics, surface activity of *A. alboguttata* often is restricted to the period from mid-morning to early afternoon, although some individuals may reappear during the late afternoon. This activity period allows these lizards to avoid cooler mornings and evenings and to avoid the very hot mid-afternoons when temperatures frequently exceed even the tolerance of these heat-loving animals. At first glance, Mona Ground Lizards appear to move constantly, but closer observations will reveal short pauses in direct sunlight or shade. These allow the relatively precise thermoregulation designed to maintain optimal temperatures approaching 40 °C.

Also like other species of *Ameiva*, *A. alboguttata* is an active forager. Rather than sitting on an elevated perch looking for movement by potential prey (a "sit-and-wait" strategy), Ground Lizards actively search for food, often rooting vigorously in leaves and other debris. Prey consists largely of small arthropods, and otherwise inactive life stages (pupae and larvae) are sometimes excavated during the search. Although not documented on Isla Mona, larger individuals of other species of *Ameiva* are known to consume vertebrates, including smaller lizards, and may occasionally eat carrion. Ground Lizards also may consume plant material, especially seasonally abundant fruits or flowers.

As the common name implies, Ground Lizards are essentially terrestrial, foraging on the surface and retreating into self-excavated burrows. However, one documented observation described a subadult *A. alboguttata* following a trail of ants high on the trunk of a large tree. Although obviously capable of climbing, such arboreal activity has been observed only very rarely.

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Adult and juvenile (lower right) *Ameiva alboguttata* foraging in leaf litter on Isla Mona. *Photographs by Robert Powell.*

Species and Subspecies: What Do They Mean and Why Should We Care?

Robert Powell

Avila University, Kansas City, Missouri

"Our knowledge of iguanid diversity will likely increase as different philosophical approaches to species are applied and further insights into relationships revealed" (Hollingsworth 2004). Why should we care?

Not too long ago, I wrote an article about animal classification (Powell 2002), in which I suggested that even the experts, systematic biologists who study the evolutionary relationships among animals, differ in their views of species and higher categories. If the experts cannot agree, why should those of us who merely want an accurate name to attach to a particular type of animal seek an inevitably elusive answer or merely put up with what seems like a constant litany of taxonomic changes that accrue when the systematists use new data to change a name that seemed to serve our purposes just fine?

I suggest that we should care and that we also should tolerate — and even welcome — the inevitable confusion that comes with new knowledge, for reasons both philosophical and practical. As an educator, I strongly believe that knowledge for its own sake is valuable, not just because it conceivably could lead to practical applications (pretty far-fetched when discussing lizard phylogenies), but because a knowledge of real relationships reflected in an accurate taxonomy is, in effect, a search for truth. Both in the scientific and human realms, this is a worthy goal, even if no cure for cancer is forthcoming.

The practical aspect reflects our commitment to conserving biodiversity. "Species in peril rightly receive more attention than subspecies [or populations] in peril" (Malone and Davis 2004). Even though any population of an endangered animal is worthy

The three traditionally recognized subspecies of *Cyclura rileyi* , *C. r. rileyi* (above), *C. r. cristata*, and *C. r. nuchalis*, show essentially no genetic differentiation (Malone and Davis 2004) and probably should not be recognized taxonomically. Investing sparse resources to manage them as distinct entities may not be appropriate. *Photograph by John Binns.*

Cyclura carinata bartschi is not genetically distinct from the nominate subspecies (Malone and Davis 2004) and probably should not be recognized taxonomically. *Photograph by John Bendon.*

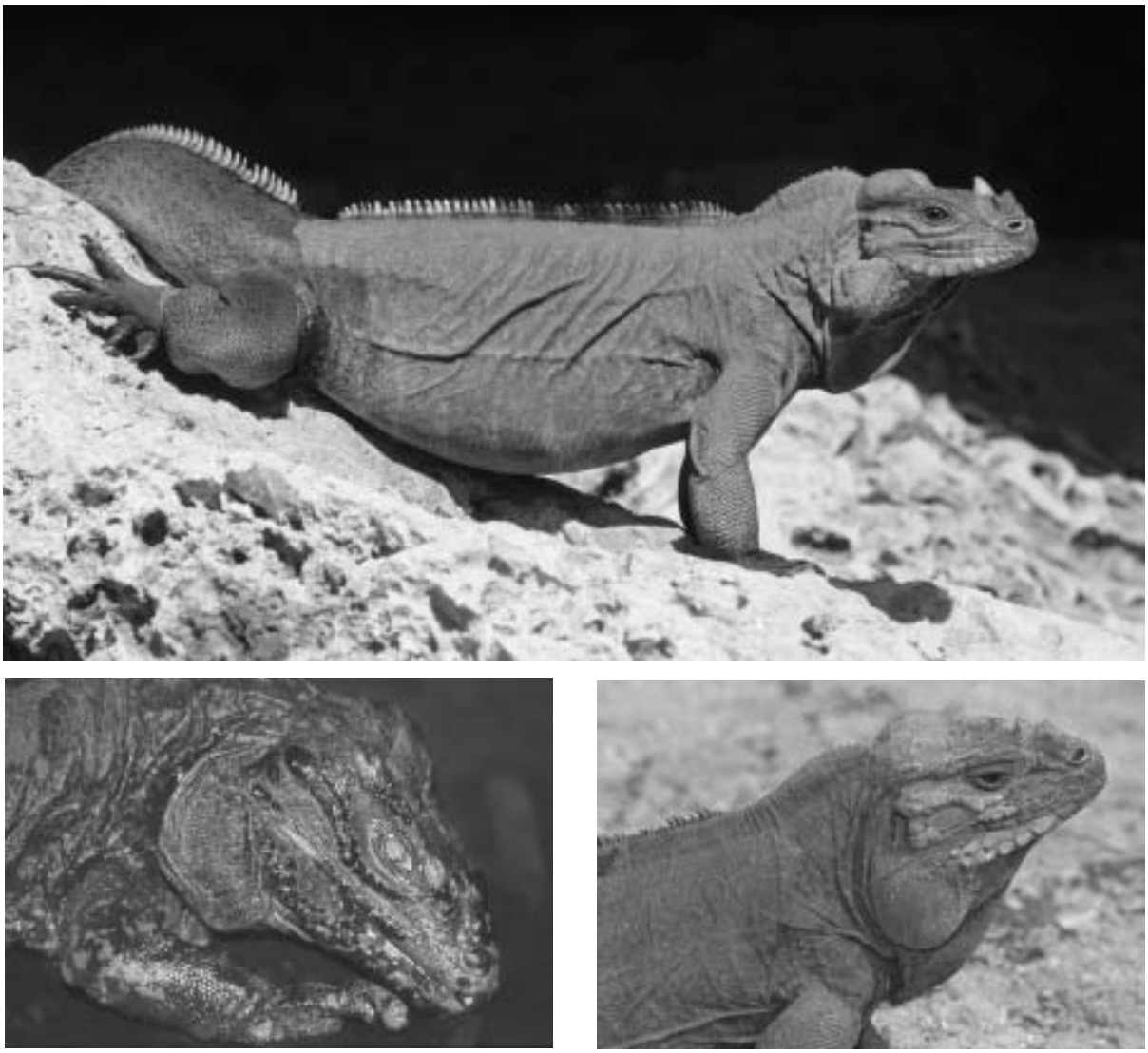
of conservation, especially the very tiny, fragmented populations that characterize the distributions of so many island-dwelling iguanas, that statement reflects the unfortunate reality that resources allocated to conservation are limited and "some form of triage is necessary in any conservation plan" (Malone and Davis 2004). I have heard even professional natural resource managers say that "it's only a subspecies," as if that rendered the entity in question of no value.

So, where should the lines be drawn? Species concepts range from wanting to designate as "full species" every isolated population with its own "evolutionary fate" to a rigid application of the "biological species concept," in which reproductive isolation (an inability to successfully reproduce under natural conditions) is the defining criterion. The former would create an unmanageable morass of new names, many of them applied to populations indistinguishable from one another, whereas the latter leads inevitably to highly subjective conclusions when parthenogenetic groups, asexually reproducing organisms, or geographically isolated populations are considered.

If species are difficult to delineate, what about subspecies? This concept has been variously applied to everything from "incipient species" (itself an undefined entity) to localized pattern variants and geographic isolates of uncertain status (Powell and Henderson 2003a). Because of the ambiguity of subspecies, the entire concept has fallen into disfavor in recent years. For example, only four new subspecies of West Indian amphibians and reptiles have been formally described in the last decade, in stark contrast to the convention that reigned throughout much of the 1950s and 1960s, when hundreds of subspecies were described, many of them placed in the same "species" for reasons no more substantive than an overall similarity in appearance.

If species and subspecies are difficult, if not impossible, to define accurately, how can we distinguish between them? In most instances, the criteria used for this purpose involve "degrees of difference." If two groups of obviously related animals can be distinguished consistently by means of one or several unambiguous characters, most experts would agree that we're dealing with two species. If, however, the diagnostic features are few or don't apply in all cases, especially if we have evidence that hybridization occurs regularly, a dilemma exists. Are we dealing with species

Cyclura cychlura has long been considered to have three subspecies, *C. c. cychlura* (above), *C. c. inornata*, and *C. c. figginsi*, but recent studies suggest that only the latter two genetically and geographically defined units exist (Malone et al. 2003). *Photograph by Chuck Knapp.*



Cyclura stejnegeri (top), from Isla Mona (see article on p. 98), and *C. onchiopsis* (above left), from Navassa Island and extinct since the late 19th century, were considered subspecies of *C. cornuta* (above right) until the application of modern species concepts resulted in a reevaluation of distinctive characters (Powell 1999, 2000). *Cyclura stejnegeri* is less distinctively different from *C. cornuta* morphologically than is *C. onchiopsis*, but biological differences may provide sufficient justification for recognition as a full species (e.g., Wiewandt 1977, Powell and Glor 2000). *Photographs by Robert Powell.*

that have yet to evolve the differences that allow us to accurately distinguish them, are we dealing with something best defined as a subspecies, or are we really only dealing with slight geographic variations unworthy of any taxonomic recognition? What makes this decision even more difficult is the realization that the evolution of new species usually is not a sudden occurrence, but takes time measured in many generations, sometimes extending over millennia or even periods of time best defined by geological means. Consequently, at any time, such as the present, for example, we are likely to encounter populations in various stages of that process, with the almost infinite number of possible variations represented by at least some groups.

Does a solution exist? Not really. In spite of inevitable gaps and errors that will have to be "fixed" down the road, we have to strive to evaluate all of the available and pertinent evidence in an effort to construct a taxonomy that most accurately reflects reality as it currently exists — and we should never recognize a species based on anything other than evolutionary relationships. For example, using the need to protect a population to justify its designation as a full species would be wrong. Similarly inappropriate would be letting a desire to draw hard lines where none are possible or blind allegiance to a traditionally accepted name or concept stand in the way of objectively evaluating new information or interpretations.

So, if we want to conserve imperiled iguanas and we accept the unfortunate reality that populations recognized as species are going to be given more consideration than those that are not, what do we do? We could designate every isolated population a species, but that would not reflect reality nor would it be legitimate or even really helpful. If faced with a large number of

"species" and still-limited resources, the criteria used in the inevitable triage would simply be adjusted. Consequently, the only realistic solution is to evaluate each situation independently, endeavoring to apply the relevant criteria as consistently and accurately as possible, given the uneven states of knowledge and the inevitable disagreements regarding taxonomic ranks.

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Iguana iguana, as traditionally defined, is actually a complex of closely related species (Malone 2000), and all translocations of Green Iguanas between South America, Central America, and the Lesser Antilles should cease in order to prevent the loss of unique genetic variation and disruption of locally adaptive gene complexes (Malone and Davis 2004). *Photograph by Thomas Wiewandt.*

Until about 10 years ago, some authorities thought that the variable morphology and lack of definitive characters used to distinguish *Ctenosaura acanthura* (top), *C. pectinata* (center), and *C. similis* (bottom) would result in these three species being subsumed into a single species that ranged from Sinaloa, México to Panamá (Köhler 2002). Recent, detailed studies have since revealed several consistently diagnostic characters, and these have been confirmed using modern molecular techniques. *Top and center photographs by Gunther Köhler, bottom photograph by John Binns.*

Cyclura lewisi (below) was until recently treated as a subspecies of *C. nubila* (above) (Burton 2004, Malone et al. 2000, Powell and Henderson 2003b). Although considerable effort had been made to conserve what may be the world's most endangered lizard when it was generally considered to be "only" a subspecies, its elevation to full species status is a much more accurate reflection of real relationships within the genus *Cyclura*. *Top photograph by John Binns, bottom photograph by Fred Burton.*

Ctenosaura oedirhina (above) from Isla Roatán, Honduran Bay Islands, was considered a second population of *C. bakeri* (below), known only from Isla Utila, until the distinctiveness of the two populations was recognized (de Queiroz 1987). *Top photograph by Randy McCranie, bottom photograph by Gunther Köhler.*

Ctenosaura conspicuosa, *C. hemilopha*, *C. macrolopha*, and *C. nolascensis* (above), from the circum-Gulf of California region of northwestern México, were considered subspecifically related until reevaluated in light of modern species concepts (Grismer 1999). Of particular interest is the suggestion that *C. conspicuosa* evolved from ancestors whose original populations on islas Cholludo and San Esteban may have had a human facilitated origin (Grismer 2002). *Photograph by John Binns.*

Populations of *Iguana delicatissima* show very little genetic differentiation (Malone 2000). However, because of the ongoing threats that endanger all of the species' fragmented populations and their vulnerability to stochastic events, each should be afforded the highest level of protection possible. *Photograph by Glenn Gerber.*

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HUSBANDRY

Captive Husbandry of the Chuckwalla (*Sauromalus ater*)

Brian Aucone

Curator of Reptiles, Amphibians, & Aquatics
Oklahoma City Zoo

Chuckwallas (*Sauromalus* spp.) are iguanid lizards inhabiting the southwestern portion of North America. Approximately seven species have been described and generally accepted, and additional subspecies or full species can be added to the count, depending on how one defines those terms. The common Chuckwalla (*Sauromalus ater* Duméril 1856) is the most widely distributed species, occurring from southwestern Utah and southern Nevada, south through the eastern portion of southern California and western Arizona, down into the Baja Peninsula and the Sonoran Desert of México. Until recently, U.S. populations often were referred to as *S. obesus* (see article on p. 78). One of the largest native lizards in the United States, Chuckwallas range in size from 13 to over 20 cm in snout–vent length (SVL) (Stebbins 1985). Adult males are larger than adult females. The head is distinct from the body and the heads of males are much broader than those of females. Scales at the back of the head form small spikes, which are most prominent in adult males. These lizards have stout bodies and, when relaxed, have multiple folds of skin along their sides.

Adult male *Sauromalus ater,* Joshua Tree National Monument, Porcupine Wash, California. *Photograph by Brad Hollingsworth.*

Coloration varies considerably over the range of *S. ater*. Some animals have 3–5 dark dorsal bands on a light background. Others have solid black heads and bodies with either white, bright orange, or red tails. Numerous variations on these patterns occur. Juveniles tend to have the dorsal bands with black freckling in the interspaces. Most young animals also have bands on the tail, and these may be retained into adulthood in some populations. The transition to adult coloration generally occurs within the first two years of life.

These lizards inhabit arid regions with moderate shrub cover and usually are found on or near rocky outcrops with plenty of crevices in which they take refuge from predators and at night. Primarily diurnal, they actively forage for plant material and can regularly be found climbing low foliage to retrieve leaves from overhead branches. When threatened, they retreat into rocky crevices and fill their lungs with air, expanding the torso and compressing their body into the crack, preventing extraction by potential predators and even most collectors (a pry-bar is standard collecting gear when hunting Chuckwallas). Although they look somewhat cumbersome with their relatively short legs and stout bodies, they are agile runners and can move with surprising speed when threatened.

Chuckwallas in Captivity

Because they are diurnally active and tend to have calm dispositions, Chuckwallas can make excellent pets. They can be housed in small groups, if enough cage space is provided. Their moderate size (compared to most other iguanids) also means that an enclosure does not need to fill an entire room to house a breeding group. Taking into consideration their requirements in captivity, they are an easy and rewarding species with which to work.

A Chuckwalla habitat should be well-structured to provide climbing space, basking areas, and crevices into which the lizard can wedge itself. The crevices in the habitat have been created by stacking various types of cinder blocks to provide spaces of varying size. *Photograph by Carole Saucier.*

This captive *Sauromalus ater* prefers to bask atop the cinder block structure and sleep in the tightest crevices in the lower block. *Photograph by Carole Saucier.*

Enclosure

The type of enclosure one should select for Chuckwallas depends on the number of animals to be housed and how natural and aesthetically pleasing the display is to be. At a minimum, for adult animals, a 40-gallon breeder-size tank can suitably house an adult pair. This setup provides approximately 4.5 ft^2 of floor space. In general, another 2–2.5 ft^2 of floor space is necessary for each additional animal in order to provide adequate individual space for each lizard. Cages can be built out of wood or other materials (as long as they are constructed in a fashion that permits thorough cleaning), but floor space should be a primary consideration. Vertical height is much less important. Also, any cage, whether purchased or constructed, should have good ventilation. Chuckwallas like hot basking spots and these must be provided. If ventilation is inadequate, temperatures in the enclosure can quickly rise to dangerous levels.

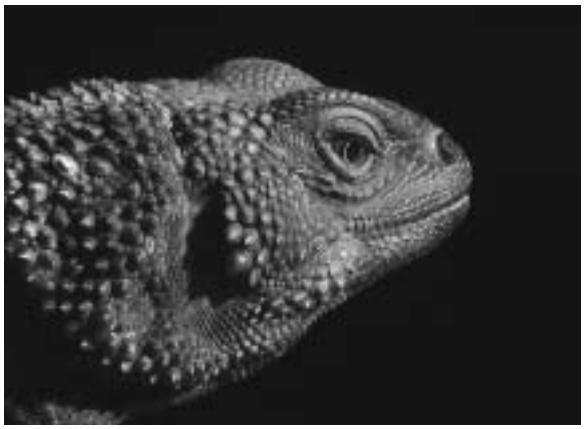
Props and substrate for the cage should be selected based on functionality as well as aesthetics; more elaborate designs often require considerably more maintenance. An effective substrate can be made up of playground sand and dirt in approximately a 2:1 ratio. Gravel should not be used as it can be inadvertently ingested and cause intestinal impaction. Wood shavings or other substrates, such as ground coconut shells, are not recommended because they retain moisture that can lead to bacterial or fungal growth, which can adversely affect the health of the animals. The substrate should be at least 2–3 in deep to allow for digging. Individual fecal pellets should be removed frequently, and the entire substrate should be replaced at least twice each year to ensure adequate cleanliness.

Props in the cage should consist minimally of piled rocks, leaving crevices and openings into which the animals can retreat for security. This mimics their natural habitat and is much more suited behaviorally than a hide-box. When piling rocks, be sure that they are stable; if they shift they could injure or kill the lizards. Artificial rock outcroppings may be constructed (see article in IGUANA 11:39–51). These often are more stable and easier to clean than piles of real rocks, and are readily accepted by Chuckwallas. Regardless of whether natural or artificial rocks are used, if multiple specimens are being housed, retreats should be sufficiently abundant so that each lizard has access to a separate area. In addition to rocks, props such as branches or plants can be added to the enclosure. When using live plants, however, keep in mind that Chuckwallas are herbivorous and any plants selected should be resistant to consumption (such as cacti) and non-toxic. Artificial plants with large leaves may be preferable; avoid those with small leaves, which may be ingested and result in intestinal impaction. The effective use of props in a cage will not only improve the appearance of the enclosure, but may well enhance the psychological well-being of its inhabitants, and produce behavior much like that which they exhibit in the wild.

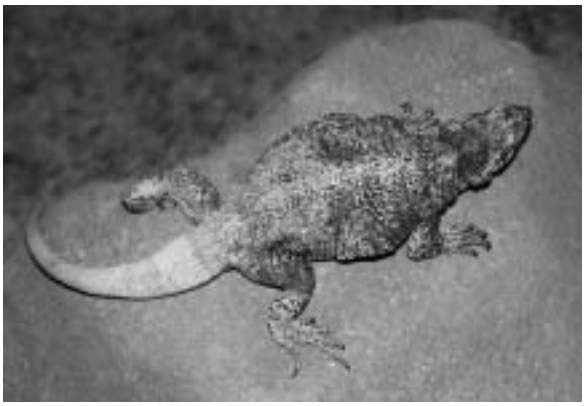
Selecting an Animal

Although *Sauromalus ater* can be collected with permits across most of its range, this species is of special concern in many areas, and I do not recommend obtaining wild-caught specimens. Fortunately, these lizards are commonly bred in captivity. Captive-bred individuals are ideal, because wild populations are not adversely affected and captive-bred animals should be relatively free of diseases and parasites.

When selecting specimens, choose animals that appear healthy. The base of the tail should be full and rounded. A drawn appearance is indicative of deficient fat stores or improper nutrition. Legs should be solid and muscular. Individuals should be bright-eyed, alert, and attentive to activity around them. When handled, they should not be placid, but rather wiggling around.



A healthy male captive *Sauromalus hispidus.* Note the broad head and the scales at the back of the head that form small spikes, which are most prominent in adult males. *Photograph by John Binns.*



This female *Sauromalus ater* was recently received by a rescuer in Michigan. Its age and history are unknown. Although this individual is thin, the folds of skin along its sides are normal. Also note the relatively narrow head and that the "spikes" at the back of the head are barely noticeable. *Photograph by Carole Saucier.*

Juveniles and most adults will usually inflate their torso to some degree when handled, as wild animals would in rock crevices. If these behaviors are not observed, something is probably wrong, and another animal should be selected.

When considering the acquisition of more than one specimen to be housed in a single enclosure, purchase only one male. Males are territorial and will defend their territories to the detriment of other males in the enclosure. Several females can be housed with a single male, as long as the caging provides adequate space for the number of animals. Sexing individuals, however, can be difficult when purchasing very young specimens. Although adult *S. ater* are sexually dimorphic, with males much larger than females, this doesn't help when dealing with hatchlings of the same size. Unfortunately, at this age, no effective way exists for determining the differences between the sexes, and probing is not recommended for hatchlings due to the likelihood of injury. Once lizards reach 6–12 months of age, an accurate determination of sex is possible. The base of the head in males is wider than that of females. Also, as males mature, the femoral pores, located on the undersides of the thighs, become prominent and can be used to reliably ascertain sex. If animals are too young to use these features and comparing multiple specimens to one another does not help identify the subtle differences, the buyer inevitably will be unsure of establishing the proper sex ratio. If the purchase cannot be delayed until the animals are older, extra males will need to be removed to a separate enclosure before they reach sexual maturity.

Lighting

Ultraviolet radiation, specifically ultraviolet B (UVB), must be provided via either natural sunlight or UVB-emitting bulbs. Reptiles use UVB to produce vitamin D_3 that, in turn, is used to metabolize calcium (Aucone et al. 2003, Ferguson et al. 2003, Laing and Fraser 1999, Lian et al. 1999). Without vitamin D_3, bone density can be compromised and this potentially can lead to metabolic bone disease. Vitamin D_3 supplements can be added to the food, but the amount required is not known, so animals can easily be over- or undersupplemented. Adequate lighting is always preferable.

Short of natural sunlight, artificial lights that produce wavelengths in the UVB spectrum are the best means for providing adequate UVB for Chuckwallas in captivity. Chuckwallas can bask naturally to regulate their vitamin D_3 blood levels and body temperatures. Two bulbs in particular have been shown to provide enough UVB for proper growth and maintenance: the Westron Active UV Heat Lamp (Oceanside, New York; Aucone et al. 2003) and the Zoo-Med Repti-Sun 5.0 fluorescent bulb (San Luis Obispo, California; W.H. Gehrmann, pers. comm.). The Active UV Heat Lamp is an incandescent bulb that emits heat as well as UVB. The UVB will penetrate to 36 in, which is ideal in larger enclosures. The Repti-Sun 5.0 is a fluorescent bulb, meaning that additional heat sources will be required. Also, if the Repti-Sun 5.0 is used, lizards must be able to bask within 8 in of the bulb in order to assure adequate UVB exposure. Finally, fluorescent bulbs should be replaced every six months, as UVB emission declines dramatically beyond that time. Regardless of the type of UVB source used, an artificial light cycle should be set to vary seasonally. In the summer, a 16D:8N (day:night) cycle is ideal; in the winter, the cycle should be adjusted to 12D:12N, with appropriate incremental adjustments during fall and spring.

Temperature and Humidity

Chuckwallas are native to desert regions. In captivity, temperatures should mimic those that they would encounter in their natural habitat. Daytime temperatures should average 80–82 °F throughout the cage. In addition, a heat lamp should provide a basking spot of 110–120 °F during the day. This can be either an Active UV Heat Lamp or an incandescent spot lamp. If an incandescent spot lamp is used, also be sure to provide a fluorescent UVB-emitting bulb (Repti-Sun 5.0). In a large enclosure and if multiple animals are housed together, more than one basking site must be provided. Otherwise, dominant individuals will prevent cagemates from adequately thermoregulating. Temperatures should drop at night. To follow a reasonably natural cycle during

Adult male *Sauromalus ater,* Cataviña, Baja California. *Photograph by Brad Hollingsworth.*

the summer, nighttime lows should be in the low to mid-70s (°F); in the winter, temperatures can drop to the low to mid-60s (°F). Chuckwallas will "hibernate" during the winter if temperatures are allowed to drop to the low to mid 60s (°F) with daytime temperatures increasing into the 80s (°F) and basking spot(s) removed.

Humidity in natural Chuckwalla habitat is very low. These lizards, however, do not seem to be adversely affected by higher humidity levels. No humidity control should be necessary, even in naturally humid areas. Residents of arid regions obviously need not worry about humidity levels.

Diet

Chuckwallas are primarily herbivorous, but may consume live prey at times. A varied diet consisting primarily of dark greens should be provided to captive animals on a daily basis (see also the sidebar on p. 43). Escarole, chicory, dandelions, collards, and turnip and mustard greens can provide an adequate level of nutrition. This diet can be supplemented sparingly with other leafy greens, such as romaine lettuce, as well as fruits like apples, pears, or bananas. When dandelions (or other, but especially yellow flowers) are blooming, Chuckwallas will happily munch on as many of them as you can gather. Just be cautious and make sure that they are collected from areas where pesticides and herbicides have not been applied. Occasional individuals may take crickets, wax worms, mealworms, and even pinkie mice, but these should constitute a very minimal part of the overall diet. Calcium carbonate ($CaCO_3$) should be supplemented to the diet once each week. This is readily available in powdered form and should be sprinkled over the food to help ensure that enough calcium is being provided in the diet. Even with adequate UVB lighting, sufficient dietary calcium is necessary for proper bone growth and maintenance.

A stable water bowl that cannot be overturned should be provided. Water should be replaced daily. As a rule, Chuckwallas get the majority of their water from food, but they will drink occasionally from a bowl. Adequate water is critical, and a bowl will provide assurance that an animal can supplement its water intake as needed.

Reproduction

In captivity, reproduction should coincide with natural seasonal variations in temperature. A cooling period (or "hibernation") during the winter is usually necessary to induce reproductive activity. After emergence in the spring, males will undertake a courtship display consisting of a variety of head bobs and pushups in an effort to induce the females to breed. Following successful mating, females will deposit eggs approximately 30 days later. In the wild, Chuckwallas lay 5–16 eggs per clutch (Stebbins 1985). A nest box containing vermiculite, moist sphagnum, or perlite can be provided, but females also may choose to lay their eggs under a rock in the enclosure. Any digging activity should be closely monitored. Eggs can be artificially incubated in a sealed container of vermiculite mixed with water at a ratio of

Sauromalus ater, Isla Tiburón, Sonora. When threatened, Chuckwallas retreat into rocky crevices and fill their lungs with air, expanding the torso and compressing their body into the crack, preventing extraction by potential predators. *Photograph by Brad Hollingsworth.*

0.75:1. The container should be opened twice each week to allow fresh air to circulate. Eggs should be incubated at 80–82 °F and will hatch about 90 days after laying.

Juveniles can be housed and fed similarly to the adults. Multiple males can usually be maintained together until they are 6–12 months of age. At that point, males must be separated, as aggressive behavior inevitably will increase. If keeping groups of juveniles together, individuals should be weighed weekly to ensure that all animals are gaining weight normally. If an individual is found to be significantly smaller than companions of equal age, too many animals may be in the enclosure, resulting in competition for food and ideal basking spots. Smaller groupings may be necessary and undersized individuals must be maintained separately.

Conclusion

Chuckwallas are a fascinating species and they can be very rewarding captives. Private collectors appreciate their relatively large size and docile personalities. Parameters for keeping this species are straightforward and, if followed, Chuckwallas can thrive for many years in a captive environment. With captive breeding becoming increasingly more commonplace, healthy individuals are readily available for the home terrarium. However, as for all reptiles, prospective owners should prepare thoroughly before acquiring animals. Thought must be given to adequate housing, because certain conditions must be met before one can properly care for these unique lizards.

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In addition, the following webpage is quite informative: http://www.reptilesofaz.com/

FEEDING FREQUENCY

AJ Gutman

West Hartford, Connecticut

Some iguanas, such as Chuckwallas, inhabit arid climatic zones and are well-adapted to scarcity. Feeding these animals only three times per week is probably adequate. However, as a reptile rescuer and rehabilitator, I am loathe to publish any iguana feeding schedule that suggests anything less than fresh food and water being provided on a daily basis. "Three times a week" is far too easily misinterpreted by the all-too-many pet owners who devote less than the appropriate amount of attention to their animals' needs. "Three times a week" too easily segues into "twice a week" or "once a week" or "I fed it last week; I don't have any food handy so I'll feed it again next week." As implausible as this may seem to those of us who strive to provide our captive animals with the best possible care, my experience has, unfortunately, taught me otherwise.

A case in point: a male Green Iguana and a male Spiny-tailed Iguana (*Ctenosaura similis*) were each kept for 12 years in a large (150 gal), tidy enclosure with cypress mulch substrate and branches for climbing. Ceramic heat emitters were used to provide heat and Reptisun 5.0 UVB fluorescent tubes provided light. Both animals received the same diet: once a week they were fed an unknown amount of kale and organic spinach, with mango, melon, and occasionally other fruit. I was told they were always fed on Sunday and would have polished off all their food by Tuesday. Once a month, they would receive an unknown quantity of kitten chow. The effect of this highly questionable diet proved to be very different for these two animals in different genera.

"Ctolstoy" is a large, impressive, Spiny-tailed Iguana that appears to be in good health. His body is a bit slim, even for a species known to be lanky, but, compared to two other male *C. similis* that have been with me for several years, his size seems reasonable and his temperament is remarkably calm.

"Schiller," on the other hand, is smaller than healthy 12–18 month-old Green Iguanas. He has no obvious deformities and, superficially, has the appearance of a juvenile female (with the exception of hemipenial bulges). Personality? This little guy has what is currently referred to as "attitude," but, after a few short weeks of being provided with food on a daily basis, he is much calmer and quite easy to handle.

I see far too many stunted Green Iguanas. However, most of them come to me with no history, making it impossible to tease out what factors might have led to that state. Given their identical histories of long-term deprivation, I was curious as to why Ctolstoy and Schiller had fared so differently.

I posed my query to Dr. Gunther Köhler, who is both a trained veterinarian and a biologist whose research has focused primarily on ctenosaurs, and Dr. John Iverson, who has investigated the digestive physiology of various species of iguanas. Both provided me with insightful responses, which served to raise further questions.

Dr. Iverson pointed out that a sample size of 2 was insufficient for any definitive determination and that a host of reasons (unrelated to digestive physiology) might be responsible for why one animal might prosper and the other not. Factors such as parasites, diet as a juvenile, stored fat at the beginning of study, and incubation temperature of the original eggs, among other things, might have come into play. He also suggested that Schiller might have had a developmental problem since hatching (or even before).

In my experience (with a limited sample size), iguanas with developmental disorders also tend to have anatomical anomalies that are visible externally (e.g., twisted vertebral columns, misshapen or malproportioned heads, extra or missing digits). In my experience with stunted iguanas, which, unfortunately, is much more extensive, I find that when they are provided with a nutritious diet on a regular basis, they grow to a variable extent.

Dr. Köhler pointed out that ctenosaurs usually inhabit arid regions that experience a distinct (sometimes severe) dry season during which food is scarce. Green Iguanas usually live in the forest (at least gallery forest along rivers) that tend to provide food more regularly. Therefore, ctenosaurs might be better adapted for irregular food-intake.

Fascinating information to ponder, but what does this prove? Chuckwallas, like ctenosaurs, can probably survive (and even thrive) on an intermittent feeding schedule — if they are cared for by professional zoo personnel or responsible pet owners. Even so, approximating the seasonal availability of foods in an animals' natural environment remains difficult. Also, given the sheer number of animals that come past my door that have been nutritionally deprived, I strenuously advocate daily feeding. Although individuals may not always feed, if given the opportunity each day, they are much more likely to remain healthy and grow to their genetically determined potential.

In any case, I am pleased to report that both Schiller and Ctolstoy have both been eating ravenously on a regular basis and both are gaining weight.

"Schiller," a 12-year-old male Green Iguana, is smaller than healthy 12–18 month-old iguanas. He lacks obvious deformities, but has the superficial appearance of a juvenile female. *Photograph by Carole Saucier.*

PROFILE

James "Skip" Lazell

Numi Mitchell

The Conservation Agency

Never mind the 219 publications, the dozens of new species described, and the unlikely places he's been to find or rediscover some of the world's rarest creatures, James "Skip" Lazell will always be a snake dangler. It began in early childhood, when he startled relatives with creatures thrust at them from a sock or pocket. Ultimately, this was not "just a phase." In man's clothing, Skip remains the boy who revels in disrupting the complacent with uncomfortable surprises pulled from beneath rocks or the recesses of his fertile mind. And this is the enthusiast who has become an interventionist on behalf of the Rock Iguana in the British Virgin Islands.

Skip knew his calling from the start. Joe Cadbury, Science Teacher at Germantown Friends School, first took him seriously. Under Cadbury's wing, Skip began his first collections of animals in suburban Philadelphia. In his parents' small house, he raised woodchucks (which subsequently colonized the neighborhood), young bats (which he nursed through gassy colic), and uncountable stacks of caged amphibians and reptiles.

His family and friends were tolerant, but made him impatient with what he considered sanctimonious responses to extremely reasonable requests (e.g., May I bring home this rattlesnake?). That impatience led to a lifetime commitment to torment them in every way possible (as well as any others who, as he saw it, irrationally blocked his progress). Cadbury ran interference with his parents, assuring them that Skip's passion for animals would later translate into scientific prowess. Meanwhile, Skip's live animal collection was burgeoning, and he needed funds to support them. To this end, as an elementary schoolchild, Skip opened an aquarium repair business. Resourcefully, the glass he used was removed from portraits of The Venerable in the halls of Germantown Friends. When the Headmaster questioned and accused him, young Skip was outraged that the man had con-

James D. (Skip) Lazell on Guana Island (October 2002). *Photograph by John Binns.*

Even during the war years (December 1944), Skip was able to pursue his interest in animals. *Photograph by Katee Lazell.*

fronted him "without a shred of evidence." At this point, Skip was probably lucky that he fell under the influence of the late Roger Conant, author of *A Field Guide to Reptiles and Amphibians of the Eastern United States*. Skip so revered his work that Conant could control Skip's wilder side by using a strong dose of conditional acceptance. For example, Skip was not allowed to catch venomous snakes until Roger Conant — not his parents — gave him permission to do so.

At 17 years of age, Skip, because of Conant's referral, was funded by the Philadelphia Zoo to go to the West Indies to collect specimens. Here he began the biogeographical and taxonomic studies of *Anolis*, which would later become the focus of his doctoral work. Along the way, he so offended his major professor, the late Ernest Williams at Harvard, with his outspoken (and maybe impertinent) ideas on iguanine relationships that he was dropped as a student. Years later, Williams revealed his hidden regard for Skip's work by publishing the dissertation as a *Bulletin of the Museum of Comparative Zoology* (MCZ) with full color plates, and reinstating him at the Museum.

Skip has never wavered from his mission of documenting the rare or new. Once on Saint Lucia, he rented a used car that lost its brakes as he crested a mountain peak. He remembers only the tumbling plummet. He was found hours later, 300 feet down the mountainside, in a tree, clutching an iguana. His glasses, without which he is basically blind, were gone and he was repeatedly mumbling, "That's all I needed: just one iguana." It is in the MCZ.

After his university days, his lean wrestler's physique gravitated toward that of a sit-and-wait predator. Nevertheless, I have seen him spring fifteen feet from a standstill to nail a Red-bellied Watersnake on a riverbank. He is an adventurer. He tackles even well traveled biogeographical regions of the globe like a lunar explorer: he assumes he will find something new — and usually does.

Skip is concerned about and enjoys people, but rarely allows his mission to be slowed by political correctness. He has no time for foot-dragging. One of his most controversial and ongoing projects has involved one of the rarest West Indian iguanas, *Cyclura pinguis*. Originally distributed across the entire Puerto Rico Bank, this iguana's range had shrunk to one peripheral population on Anegada. Researcher Michael Carey had noted in 1968 that the Anegada population was threatened by food competition from free ranging livestock. A national park, which could protect this last naturally occurring population, had been proposed by 1980, but Skip, who was working for The Nature Conservancy in the British Virgin Islands at the time, judged it was a long way from becoming reality. Skip came in contact with the owners of Guana Island, part of the iguana's former range. The owners, Henry and Gloria Jarecki, had established a native wildlife sanctuary consisting of most of the 850-acre island. Skip

He believes bats make fine pets

A VETERAN naturalist at 18, James D. (Skip) Lazell recently completed a definitive study of the local long-tailed salamander. He has been working on the project since he was 12. "I dabble in birds, small mammals and spiders," says Skip, "but reptiles are my principal interest."

Last summer he accompanied a moth-collecting expedition to the Caribbean, then struck out on his own on an assignment for the Philadelphia Zoo. He captured crocodiles in Jamaica, had only one mishap. "I had a beautiful eight-foot Yellow snake eaten by a mongoose," he reports.

An habitué of the Zoo from the time he was old enough to ride a trolley car alone, he was formerly one of the three juvenile panelists on the "Meet Mr. at the Zoo" television program. "He knew how to say *Anolis carolinensis* before he could say *chameleon*," his mother recalls.

In first grade he started taxidermy, bringing home badly-mangled stuffed specimens of local fauna for his mother's admiration. This stocked her for his later enthusiasms, including a collection of live bats which she was obliged to feed and exercise when Skip was away for the week end. "Bats make wonderful pets," he insists. "They tame in two weeks."

Graduated from Germantown Friends School last June—where he made his letter in football and wrestling—he lives with his parents, Mr. and Mrs. J. D. Lazell, at 133 Harvey st. Currently he is a freshman at The University of the South in Sewanee, Tenn. His gear for college included one pet—a three-foot King snake.

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THE PHILADELPHIA INQUIRER MAGAZINE, DECEMBER 1, 1957

This article about the young naturalist appeared in the *Philadelphia Inquirer* magazine (December 1957).

saw and seized an opportunity to restore and protect *C. pinguis*. He swiftly walked a proposal through government channels and relocated eight iguanas from Anegada to Guana Island. Although the paper trail shows that he did have both governmental permission and local cooperation, the people originally involved have since died, changed positions, or changed stories.

Collecting Haitian Boas (*Epicrates striatus*) for the Philadelphia Zoo (ca. 1957). Serge Brierre is on the left. *Photograph by John Coutsis.*

During his brief career as a teacher, Skip graphically explained to his students how they could be improved (March 1978). *Photograph by Nancy Nielsen.*

Skip with an Hawaiian Rock Wallaby on Oahu in 1979. *Photograph by Guy Slaughter.*

Skip and the "Devil" (Tasmania, 1981). *Photograph by Marshall Sklar.*

Skip in the field on Guana Island (British Virgin Islands, 2002). *Photograph by Gad Perry.*

Part of the team conducting a population census of *Cyclura pinguis* on Guana Island (October 2002); left to right: Lynford Cooper, Gad Perry, and Skip. *Photograph by Kate LeVering.*

Consequently, long after the relocation, Skip still is being characterized as a loose cannon or a renegade; his choice to relocate has been questioned by almost everyone.

Undaunted, Skip has continued for almost two decades with his program to restore *C. pinguis* to parts of its former range. As a result of his efforts, Guana has a population of over 100 iguanas, Necker Island has approximately 30, and Norman Island received a dozen colonizers in the fall of 2003 (I was pleased to be a part of the latter effort). These animals, all descendants of the eight individuals from Anegada, now represent approximately half of the world's population. As of 2004, local people remain divided over a proposal to establish a national park on Anegada, and the iguana population there continues to decline, primarily as a consequence of livestock competition for food and feral cat predation. Establishing a protected area on Anegada remains vital in order to preserve as much of the species' genetic diversity as possible. However, unless and until that becomes a reality, we are fortunate that the iguanas' eggs are in more than one basket.

For the 30 plus years I have known him, Skip has generated a "theory of the day" for everything he observes of biological interest. If the next bit of additional data topples the idea, he cheerfully abandons old Theory A for new Theory B. Skip is not wedded to his postulates; they merely reflect his all-or-none approach. As outrageous as some of his ideas may sound initially, Skip has not infrequently been proven correct by more conservative and methodical scientists. Herpetological colleague, C. Robert Shoop, who died in late 2003, characterized Skip in the following way: "He provides an absolutely critical function: inspiration."

Additional Reading

Lazell, J. 2003. Looking for lizards in all the right places, pp. 215–231. In: R.W. Henderson and R. Powell (eds.), *Islands and the Sea: Essays on Herpetological Exploration in the West Indies.* Society for the Study of Amphibians and Reptiles Contributions to Herpetology, vol. 20. Ithaca, New York.

Skip at day's end during the *Cyclura pinguis* population assessment on Necker Island, BVI (October 2002). *Photograph by John Binns.*

HISTORICAL PERSPECTIVES

Food Habits of the Chuckwalla, *Sauromalus obesus*[1]

Charles E. Shaw

San Diego Reptile Club, San Diego, California

During April 1938 the writer collected twelve chuckwallas in order to make a study of the food habits of this species. Specimens were collected in creosote bush and ocotillo associations at Borego Mountain, Tubbs Canyon, and Palm Canyon in San Diego County, California.

Stomachs of the Borego Mountain specimens contained stems and leaves of *Phacelia* sp. [the Phacelias, which include the Desert Primrose, the Wild Heliotropes, and the Desert Bells]; leaves, stems and blossoms of *Franseria dumosa* [= *Ambrosia dumosa*, the Burro Bush, Burro Weed, or White Bursage]; leaves of *Encelia farinosa* [Brittlebush]; leaves and a seedling of *Eriogonum* sp. [Buckwheat]; leaves of *Ditaxis lanceolata* [Narrowleaf Silverbush]; blossoms and leaves of *Larrea divaricata* [a Creosote Bush]; and the blossoms of *Fouquieria splendens* [Engelmann Ocotillo] which the lizards had picked up around the bases of these plants. Sand was also found in the stomachs which contained the *Fouquieria* blossoms. Specimens from Borego Mountain seemed to prefer the leaves and stems of *Franseria dumosa* as their stomachs were filled largely with the leaves and stems of this plant.

The stomachs of the 8 specimens from Tubbs Canyon contained leaves of *Encelia farinosa*; leaves, seed-pods and stems of *Lotus* sp. [the Trefoils]; leaves of *Phacelia* sp., seedling of *Festuca* sp. [a Fescue]; blossoms, leaves and stems of *Cryptantha* sp. [the Cryptanthas or White Forget-me-nots]; and the blossoms, leaves and stems of *Lotus strigosus* [Strigose Bird's-foot Trefoil]. These specimens showed equal taste for *F. dumosa* and *E. farinosa.*

The single specimen collected at Palm Canyon contained several large blossoms, about 10 x 15 mm. when pressed, of *Chænactis* sp. [the Pincushions]; one blossom of *Cryptantha* sp.; and the blossoms of *Tropidocarpum gracile* [Slender Tropidocarpum, a Mustard].

No animal remains were found in any of the stomachs.

I am grateful to Mr. Frank F. Gander of the San Diego Natural History Museum for assistance in the identification of the plant material.

[1] Originally published in *Herpetologica* 1:153 (1939). Reprinted with permission. Common names in brackets were not included in the original publication. Also note that the species is now known as *S. ater* (see article on p. 78).

An adult *Sauromalus ater* from the foothills of the Sierra de Las Asemblea, northern Baja California. *Encelia farinosa* (Brittlebush) and *Franseria dumosa* (White Bursage) are visible in the background; both are eaten by Chuckwallas. *Photograph by L. Lee Grismer.*

BIOGRAPHICAL SKETCH

Johann Baptist von Spix

Although Prince Maximilian zu Wied-Neuwied had previously explored the coastal regions of Brazil, zoologist J.B. von Spix and botanist C.F.P. von Martius were the first biologists to visit the interior. Johann Baptist von Spix was born in Bavaria in 1781. Planning a career in theology, he spent several years in seminaries, but, in 1804, decided to pursue medicine at the University of Würzburg, where he also studied natural history. After graduating in 1806, he practiced medicine in Würzburg and Bamberg, but, in 1811, became the first Curator of Zoology at the Bavarian Academy of Science in Munich.

Correspondence with Alexander von Humboldt triggered plans for a South American expedition. In 1817, Spix and Martius began at Rio de Janeiro, moved inland, crossed the coastal mountains, proceeded north through the dry caatingas, and eventually traveled up the Amazon River. The dangers, including violent encounters with native tribes, were very real. In addition, Spix became quite ill. Nevertheless, he continued to collect specimens and record observations, primarily on animals, but also on the native tribes he had encountered. The two Germans departed from Belém, at the mouth of the Amazon, for Europe in 1820.

Lithograph of "IGUANA squamosa" (= *Iguana iguana*) by Philip Schmid. This lithograph is in *Lacertarum* by J.B. Spix. An original of this volume and the other herpetogical volumes based on Spix's travels to Brazil are in the Kenneth Spencer Research Library at the University of Kansas. This lithograph was previously reproduced (in color) in *Slithy Toves*.

Johann Baptist von Spix. *Illustration courtesy of Kraig Adler.*

Spix died in 1826 of complications from a disease contracted during his trip to Brazil. However, in the period between the trip and his untimely death, either alone or with collaborators, he produced eight books on all of the vertebrate classes plus molluscs and arthropods. Three of the volumes addressed herpetological topics: *Serpentum* (on snakes, but also including caecilians and amphisbaenians) was written by Spix's assistant, J.B. Wagler, from Spix's notes and published in 1824; *Testudinum et Ranarum* (on turtles and frogs) was written by Spix and published in 1824; and *Lacertarum* (on lizards and crocodiles) also was written by Spix and was published in 1825. These volumes, profusely illustrated with hand-colored prints, together with Wied-Neuwied's works, provided the foundation for the study of the rich Brazilian herpetofauna.

Sources

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

Haines, S. 2000. *Slithy Toves. Illustrated Classic Herpetological Books at the University of Kansas in Pictures and Conversations*. Society for the Study of Amphibians and Reptiles in cooperation with the Kenneth Spencer Research Library at the University of Kansas, Contributions to Herpetology, vol. 5. Ithaca, New York.

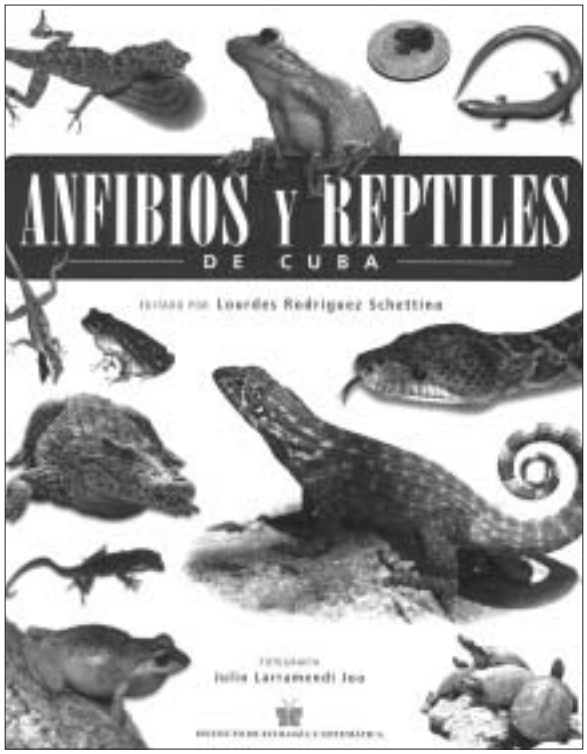
BOOK REVIEWS

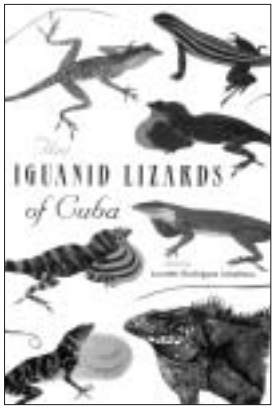
Cuban Herpetology

Barbour, T. and C.T. Ramsden. 2003. *The Herpetology of Cuba* (facsimile reprint of the original 1919 edition, with an introduction by R. Ruibal). Society for the Study of Amphibians and Reptiles, Ithaca, New York. vii + 142 pp. (numbered 71–213 + cover and 15 plates, as in the original publication). Hardcover. $55.00.

Rodríguez Schettino, L. (ed.). 1999. *The Iguanid Lizards of Cuba*. University Press of Florida, Gainesville. xx + 428 pp. Hardcover. $85.00.

Rodríguez Schettino, L. (ed.). 2003. *Anfibios y Reptiles de Cuba*. Photography by J. Larramendi Joa. Instituto de Ecología y Sistemática, La Habana, Cuba. vi + 169 pp. Hardcover. U.S. price not established (currently unavailable).



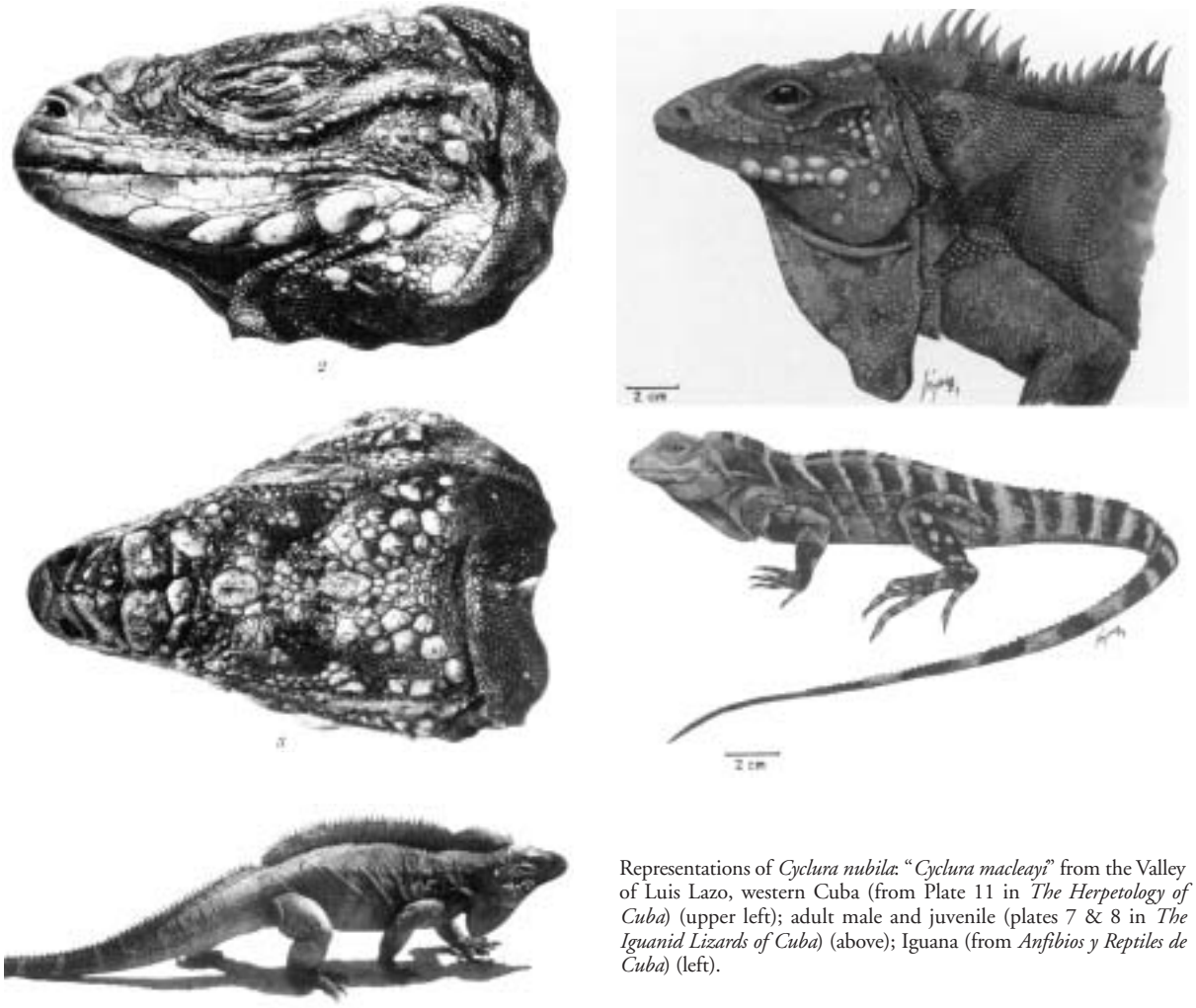


About 200 species of amphibians and reptiles are known to occur in Cuba, and more are being described each year as researchers more thoroughly investigate that island nation's less-explored regions and implement modern methods to better understand relationships within this phenomenally diverse herpetofauna. Our collective knowledge of the Cuban biota is growing exponentially, and ecological and behavioral work on at least some species is beginning to catch up with systematic research, but the biodiversity remains one of the least well-documented in the Americas. Although geographically proximate to the United States, current political realities preclude most U.S. citizens (and researchers) from experiencing Cuba's many unique biotic communities. Residents of other nations are free to travel to Cuba, but most of the recent work on amphibians and reptiles is being conducted by Cuban nationals, whose commitment and expertise is frequently impaired by scarce resources, both human and material — and both the quality and quantity of their work is testament to their dedication.

In this brief review, I introduce the reader to three recently published volumes (one a reprint of an historically important work that appeared initially in 1919). They collectively serve as an effective introduction to Cuba's amphibians and reptiles.

Thomas Barbour and Charles Ramsden's synthesis of all that was known in 1919 about Cuban herpetology was an update of Juan Gundlach's 1880 *Erpetología Cubana*. In the foreword of the original edition, Barbour noted that "… in the natural course of events many changes have taken place since that time [1880] which have affected the nomenclature and status of the species treated, while new forms have been discovered." That statement would be just as relevant today. Barbour and Ramsden's work listed 68 species and two more were added in a postscript. This stands in stark contrast to the approximately 200 Cuban species recognized today. Also, in addition to the many new taxa, much of the nomenclature has changed (a perpetual process that is as necessary as it is sometimes confusing; see, for example, the article on p. 78 of this issue) and we have certainly learned much about the distributions and ecological relationships of the various species.

The question may arise why anyone other than the most ardent bibliophile would want to invest in a reprint of a very old book, much of the content of which is dramatically out-of-date. I would respond that the study of history is just as important in biology as in world affairs. We gain considerably by knowing where we've been; if nothing else, such knowledge provides us with insights on how we've gotten to where we are now and may also tease us with a glimpse of where we might go in the future. Furthermore, Barbour's writing (he claimed responsibility for having written the text, noting that Ramsden's contributions consisted mostly of information gleaned during his many years of residency in eastern Cuba) clearly demonstrated not only his knowledge but also his passion for the fauna and all things Cuban. Rudofo Ruibal, in his introduction to the facsimile



Representations of *Cyclura nubila*: "*Cyclura macleayi*" from the Valley of Luis Lazo, western Cuba (from Plate 11 in *The Herpetology of Cuba*) (upper left); adult male and juvenile (plates 7 & 8 in *The Iguanid Lizards of Cuba*) (above); Iguana (from *Anfibios y Reptiles de Cuba*) (left).

reprint, made a point of stating that Barbour described himself as "aplatanado" (bananafied), a Cuban term for a foreigner who has acquired Cuban characteristics. That attitude is clearly evident, causing a perusal of the book to be pleasurable as well as educational.

The Iguanid Lizards of Cuba is a thorough review of the phenomenally diverse Cuban species in the family Iguanidae (*sensu lato*; for discussion of the familial status, see the article by Köhler et al., *IGUANA* 10(3): 79–81). After an introduction, which includes an overview of the subject and a summary of studies on Cuban species, chapters of varying length and detail cover morphology (with keys to the identification of Cuban species), ecology and behavior, genetics, parasites, and biogeography. These are followed by systematic accounts of the Cuban species. Each account provides a list of synonyms, an overview of the species' geographic range followed by a list of specific localities, coverage of subspecies (if applicable), a detailed description, a list of bibliographic sources arranged by topic, notations of morphological, geographic, sexual, and age variation, and extensive comments on natural history. As one might suspect, the accounts for the better known species are extensive and those for the species that have received less attention are often quite cursory. However, nowhere else can one find as much readily attainable information in one place. Each account is accompanied by a detailed dot map. Centrally located color plates provide illustrations of each species. These were painted from live models by Lázaro González Pino. Many are striking, although a few seem to be a bit too stylized for my taste; nevertheless, the illustrations, although live models were used, often are more effective than photographs in documenting the principal characteristics of each taxon. Also included in the plates is a current vegetation map of Cuba, which confirms the common plight of so many island nations and clearly shows that most of the land is devoted to cultivation or pastures.

This book, like that by Barbour and Ramsden, was written for professional biologists, but the effectively edited text renders it fully accessible to the informed amateur. Also, although illustrated, this is less a taxonomic handbook or guide than it is a phenomenally valuable reference and resource for those who are serious about the study of West Indian reptiles.

The third volume in this brief summary poses an unfortunate conundrum. Although potentially of the greatest interest to the greatest number of readers, it is by far the least accessible of

these three books. Not only is it written in Spanish, it is essentially unavailable in the United States at this time. If those hurdles are overcome, however, this volume provides a very effective introduction to the Cuban herpetofauna. The science is solid enough to hold the interest of a professional, but the coverage is very user-friendly. Lacking much of the often stultifying detail of *Iguanid Lizards*, this book concentrates on the bigger picture, addressing questions like: What species live where and why? What do they do to make a living? How do they interact with the nation's human population? What are the principal conservation needs? Furthermore, the book is profusely illustrated with photos of many species and habitats, some of them absolutely breath-taking. It's a pleasure to merely flip the pages, even if one can't read a single word.

The initial chapter, by the editor and entitled "Generalities," introduces the reader to the herpetofauna, describes amphibians and reptiles in broad terms using Cuban species as examples, and provides an overview of the island's myriad habitats. Subsequent chapters are organized by topics, some of them based on systematic relationships, others on habitat-dependent communities, and still others by particularly intriguing subjects. Contributing authors addressed their own areas of expertise and interest, yet the composite flows nicely, a tribute to the editor and to decisions regarding the common format elements that provide continuity. Individual chapters address treefrogs, cave dwellers, inhabitants of the leaf litter, aquatic frogs, frogs of the city, tiny anurans, toads, reptilian morphology and color, giants and dwarves, terrestrial lizards and snakes, anoles, aquatic reptiles, species that function as human commensals, popular myths, beliefs, and uses of amphibians and reptiles, and endangered species. That on myths, beliefs, and uses, albeit uniquely Cuban in nature, reads surprisingly like comparable chapters detailing the many misperceptions North Americans have about amphibians and reptiles, and the exploitation of many species is but a local chapter in a worldwide volume of abuses. Similarly, the chapter on conservation needs, although focusing on Cuban concerns, deals with situations equally applicable to those of any country, especially those of developing island nations. A checklist showing distribution by biotic provinces, a glossary, a short list of selected references, and information about the authors complete the volume.

Other than the expected discrepancies between the coverages of common, well-studied species and those about which almost nothing is known, the book provides a surprisingly complete coverage. I sometimes found myself wishing for references to source publications, but then I remembered that the intended audience wasn't the professional biologist. I also wanted more detailed accounts of individual species, but had to remind myself that this volume was designed to serve as an overview and not as an intensive reference. Its stated goals, however, to educate and entertain, are admirably achieved. My wanting more speaks eloquently to the quality of what is there. One can only hope for an English translation in the near future.

So, should readers invest a considerable sum of money and possibly even more effort to acquire these books, none of which are likely to be found on the shelves of major retailers or in a neighborhood library? I can't speak for everyone, but I did — and am eminently pleased that I did. I enjoyed each book the first time I opened its pages, and I not infrequently pull one or more of them from the shelf, often to look up a particular piece of information, but at least occasionally to merely experience, albeit vicariously, the Cuban amphibians and reptiles I would dearly love to study firsthand, an opportunity so far denied, except for an all-too brief visit to the Guantanamo Naval Base on a trip to Navassa Island — but that's another story altogether.

Robert Powell
Avila University
Kansas City, Missouri

Additional References

Readers who have an interest in the Cuban herpetofauna, or that of the West Indies in general, or merely enjoy the historical perspectives of herpetology might want to examine the following volumes:

Crother, B.I. (ed.). 1999. *Caribbean Amphibians and Reptiles*. Academic Press, San Diego, California. This edited volume includes an historical perspective, detailed reviews of the Greater Antillean islands and of the Lesser Antilles (that on Cuba, by Alberto Estrada and Rodolfo Ruibal, is particularly pertinent to this review), plus chapters on ecology, evolutionary relationships, biogeography, and a comparison of the West Indian and Middle American faunas.

Henderson, R.W. and R. Powell (eds.). 2003. *Islands and the Sea: Essays on Herpetological Exploration in the West Indies*. Contributions to Herpetology, volume 20. Society for the Study of Amphibians and Reptiles, Ithaca, New York (reviewed by Rick Hudson, *IGUANA* 10(4): 151–152). Although written by many of the same scientists who contributed to some of the other volumes listed here, the essays contained in this book tell of experiences and events. Although many of the chapters are informative, the delight comes from hearing the stories to which anyone who has participated in fieldwork can relate. An introduction and a chapter on historical perspectives provide some context, with the emphasis on people and their impressions rather than their research.

Powell, R. and R.W. Henderson (eds.). 1996. *Contributions to West Indian Herpetology: A Tribute to Albert Schwartz*. Contributions to Herpetology, volume 12. Society for the Study of Amphibians and Reptiles, Ithaca, New York. Still another edited volume, this book includes vignettes about Albert Schwartz, in whose memory it was published, an historical perspective, a checklist of West Indian species (since updated on two occasions in *Herpetological Review*), and 27 research reports by various scientists working in the region.

Schwartz, A. and R.W. Henderson. 1991. *Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History*. University of Florida Press, Gainesville. This volume provides detailed descriptions, dot maps, and extensive notes on the natural history of the region's many species of amphibians and reptiles. Note that this is not a guide, animals are not illustrated — but, for anyone with more than a casual interest in the topic, this volume is essential. The brief "envoi" testifies to the passion of the authors.

IGUANA NEWSBRIEFS

Stout Iguana Conservation

Facing near extinction in the 1980s, the Stout Iguana (*Cyclura pinguis*), the only remaining natural population of which is found on Anegada in the British Virgin Islands, has been championed by two groups of scientists with different strategies to preserve the species. Human population growth and introduced animals such as cats, dogs, and goats had decimated populations which once roamed throughout the species' historical range that included Puerto Rico and all of the Virgin Islands.

A group led by Skip Lazell and Numi Mitchell chose to relocate animals to other predator-free islands. With the cooperation of the BVI Ministry of Natural Resources, an initial group of eight animals was translocated to Guana in 1984. It has since expanded to more than 300 individuals. With abundant vegetation and freed of competition, the animals are able to flourish. Further translocations to Necker and Norman islands have also proven successful.

Other scientists are seeking to restore the Stout Iguana to reasonable numbers on Anegada itself. Since 1997, the BVI National Parks Trust has operated a headstart facility. Iguanas could be raised until they were large enough to be safe from most predators. To date, 24 adult iguanas have been released back to the wild and another 66 remain at the facility.

Skip Lazell on Guana with *Cyclura pinguis*. *Photograph by Gad Perry.*

Anegada Headstart facility. *Photograph by John Binns.*

Rick Hudson, co-chair of the IUCN/SSC Iguana Specialist Group, points out that headstarting has been successfully used in both Cuba and Jamaica to help preserve iguana species. However, the underlying problems on Anegada remain to be addressed. Feral cats still prey on hatchling iguanas, while wild goats and other livestock compete for the limited available vegetation.

Long-term survival for the Stout Iguana can only be ensured by the creation of a national park. However, the long-standing legal quagmire of land ownership on Anegada must first be resolved. Historically, people on the island survived by farming, fishing, and raising livestock. Land ownership was well-defined by a series of stone walls, which contained the livestock and kept the iguanas safe from predators. In 1961, the crown assumed ownership of almost all of the land and leased it to a development company, which began by tearing down the stone walls. Public outcry put an end to development, but the damage had been done. With livestock roaming free, devouring any available vegetation, the iguana population rapidly plummeted. Although creation of a national park was approved by the Executive Council as early as 1981, the land disputes have yet to be resolved. Most Anegadians support such a move, yet wish to retain the right to use resources such as wood, salt, and fish within the park.

Condensed from an article that appeared in the StandPoint (BVI), 18 November 2003

Iguana Farms Produce Meat

A recent article appearing in the Christian Science Monitor described the sale of frozen iguana meat to Central American immigrants living in the United States. Importer Frank Rodriguez, an American businessman who owns *Distribuidora Cuscatlan*, imports the meat from iguana farms in El Salvador and supplies it to 60 markets in the Washington, D.C. area at $14 a pound. Iguana meat has long been a staple in Central America, where it has a reputation "as a cure-all for everything from colds to poor sexual performance."

Iguana hunting is prohibited in El Salvador, where populations have been decimated by overhunting. Farming iguanas, argue proponents of the practice, provides much-needed jobs, helps keep the tropical rain forests intact, and even rebuilds wild populations as farmers release part of their stock.

Businesses are eager to create increased demand for their products, not

Traditional method of preparing iguana in southern Mexico. *Photograph by Robert F. Wilkinson.*

just among immigrants in the United States, but in Asian markets, where an interest in exotic foods is a strong tradition. Some entrepreneurs, going beyond supplying frozen meat, are seeking to perfect a recipe for canned iguana soup. The Food and Drug Administration has yet to issue a license for the sale of this product.

Iguanas on Boca Grande

A report by Wendy Fullerton (news-press.com, 26 April 2004) noted the abundance of iguanas and described some of the resultant problems faced by residents of Boca Grande, Florida. A community growth and development plan being developed for the 7-mile long resort island seeks to address iguana population control. The report claims that the approximately 1,000 year-round residents are outnumbered by more than 2 to 1 by the non-native Spiny-tailed Iguanas (*Ctenosaura similis*). The iguanas cause damage to both ornamental and native vegetation and concerns have been raised regarding their impact on native endangered Gopher Tortoises, with which iguanas may compete for food and whose burrows they share during winter cold spells.

The article described how these fearless climbers find their way into attics, air conditioning ducts and dryer vents, and are even known to plod through the plumbing and emerge through toilets. Residents have armed themselves with pellet guns for protection and are ready to stomp out these invasive pests, which were described as being as thick as palmetto bugs but a lot more difficult to kill.

Joe Wasilewski, President of the International Iguana Society, agreed that some intervention is necessary. However, sensationalizing the presence of introduced animals is hardly an appropriate response, as their very presence is due to human agency. Overstating the threat also does little more than inflame emotions, which can lead to actions that will serve neither humans nor reptiles. A rational control plan must be humane as well as effective, and all responsible parties should invest the time and energy to implement a program that meets both of those criteria.

IIS Draws Attention to Statian Iguanas

The Lesser Antillean Iguana (*Iguana delicatissima*) is found only on a very few West Indian islands. Although some populations are doing better than others, evidence suggests that all populations are in decline. The principal causes include encroachment by humans on already small ranges and limited nesting areas, habitat degradation by introduced herbivores (e.g., goats and cattle) with which the iguanas compete, often unsuccessfully, for limited forage, predation by introduced carnivores (e.g., dogs, cats, mongooses), active hunting, and, on at least a few islands, hybridization with introduced Green Iguanas (*Iguana iguana*).

St. Eustatius (= Statia) supports one of the remaining populations of *I. delicatissima.* Despite relatively little development, compared, for example, to St. Maarten, where the population has been extirpated, and a much smaller human population than other islands of comparable size, iguanas are not faring well (see *Iguana Times* 8(1): 3–6). Although many of the factors listed above are operative (although *I. iguana* is not present on Statia), ongoing hunting pressure may be responsible for the inability of the population to grow. Although some animals persist in the rugged and largely inaccessible Boven Hills and a few remain on the slopes of the Quill, an inactive volcano, a number of individuals survive within privately held properties solely at the pleasure of the landowners.

In an effort to increase awareness of the precarious status of Statia's largest native land animal, the IIS, in cooperation with the St. Eustatius National Parks Foundation (STENAPA), has funded educational signs that will be posted at STENAPA headquarters, the botanical garden, all trail heads, the tourist bureau, airport, hotels, and dive shops. In combination with educational programs planned for June of this year, the hope is that Statians will develop a greater pride in their natural heritage (symbolized by the Iguana) and succeed in preserving this unique population.

Jamaican Iguanas Get a Lift from Down Under

Beginning with its "re-discovery" in 1990, the Jamaican Iguana has been the subject of a recovery effort that is now in its 15th year. Despite some notable achievements — particularly the continued protection of known nesting sites, the control of exotic predators, and the establishment of a successful headstart-and-release program — much work remains to be done.

A chronic problem plaguing the recovery effort in Jamaica remains the availability of biologists willing to devote the large blocks of field time needed to

South Camp in the Hellshire Hills is the command center and living shelter for Byron Wilson (shown) and Rick van Veen. Sheltered deep in the upper region, conditions are blazingly hot, rugged, and an acid test of the researchers' stamina. *Photograph by John Binns.*

accomplish research objectives. Here, two issues are of relevance. First, accessing the remote field site in the central Hellshire Hills is time consuming (over half a day round-trip); hence, day trips and "weekend warrior" research efforts do not provide the opportunity to conduct intensive investigations. Second, the remoteness and the ruggedness of the Hellshire environment has made it difficult to recruit personnel willing to camp out and work for extended periods, often alone.

Fortunately, the project has recently obtained the services of Rick van Veen — an enthusiastic, if not maniacal, iguana biologist. By way of Australia, Rick passed through the Fort Worth Zoo, where Rick Hudson nudged him south toward Jamaica. With funding from the Audubon Zoo and the Miami Metrozoo, Rick joined the iguana project in late January 2004, and within weeks was residing in central Hellshire for a nearly 40-day stint. With significant help and training from John Kunna (who returned for a 3rd consecutive field season), Rick coordinated the completion of an 8th year of pitfall trapping, part of a long-term assessment of the relative abundance of ground reptiles on mongoose-free versus mongoose-infested plots.

The best news for the iguana is that Rick has proved to be especially adept at dealing with the threat posed by introduced mammals. Indeed, Rick has made few friends among the local rats, pigs, and mongooses. Perhaps most significantly, Rick has rendered central Hellshire a decidedly less pleasant and more risky environment for feral cats — unquestionably the most insidious threat to the iguana's persistence.

Byron S. Wilson
Jamaican Iguana Project

Help is desperately needed to secure equipment for Byron Wilson's and Rick van Veen's efforts in Hellshire Hills, Jamaica. Please visit: http://cyclura.com/Jamaica.php

International Iguana Foundation Announces 2004 Grants

The Board of Directors of the International Iguana Foundation (IIF) held their annual meeting at the Miami Metrozoo in Florida on 3 April 2004. The Board evaluated a total of seven proposals and awarded grants totaling $48,550 for the following five projects:

(1) Establishing a second subpopulation of released Grand Cayman Blue Iguanas, *Cyclura lewisi*. Fred Burton (Blue Iguana Recovery Program), $11,000.
(2) Conservation of the critically endangered Jamaican iguana, *Cyclura collei*. Peter Vogel and Byron Wilson (Jamaican Iguana Research and Conservation Group), $11,300.
(3) Maintaining and optimizing the headstart release program for the Anegada Iguana, *Cyclura pinguis*. Glenn Gerber (San Diego Zoo CRES) and Kelly Bradley (Dallas Zoo and UTA), $11,250.
(4) Translocation, Population Surveys, and Habitat Restoration for the Bahamian Iguanas, *Cyclura r. rileyi* and *Cyclura r. cristata*. William Hayes (Loma Linda University), $7,500.
(5) Conservation Biology and Management of the Saint Lucian Iguana, *Iguana iguana*. Matt Morton (Durrell Wildlife Conservation Trust) and Karen Graham (Sedgwick County Zoo), $7,500.

Rick Hudson
IIF Program Officer

New International Iguana Foundation logo.

Species Recovery Plan Workshop held for Anegada Iguana

In response to the need for a unified conservation strategy for the critically endangered Anegada Iguana, *Cyclura pinguis*, a Species Recovery Plan (SRP) workshop was recently conducted at the Miami Metrozoo on 1–2 April 2004. Workshop participants represented the IUCN Iguana Specialist Group (ISG) and the National Parks Trust of the British Virgin Islands (BVINPT) and included Joseph Smith-Abbott (BVINPT Director), Allison Alberts (ISG co-chair, San Diego Zoo), John Binns (International Reptile Conservation Foundation), Quentin Bloxam (Durrell Wildlife Conservation Trust), Kelly Bradley (Dallas Zoo), Fred Burton (Blue Iguana Recovery Program), Steve Conners (Miami Metrozoo), Rick Hudson (ISG co-chair, Fort Worth Zoo), and Lee Pagni (San Diego Zoo). To insure consistency in the ISG Species Recovery Planning process, Fred and Quentin were brought in as facilitators. This team previously ran successful SRP workshops in Grand Cayman (2001), the Dominican Republic (2002), and the Turks & Caicos Islands (2003).

Species Recovery Plan Workshop participants from the left: Kelly Bradley, Allison Alberts, Quentin Bloxam, Lee Pagni, John Binns, Rick Hudson, Steve Conners, Joseph Smith-Abbott, and Fred Burton.

An SRP workshop had been conducted in July 2001 in Tortola, but that plan was never finalized or formally ratified, and was largely out of date. Also, although significant progress has been made toward saving *Cyclura pinguis* on Anegada, a number of "big picture" issues were not being addressed. A coor-

Rob Dorson (1970 – 2004)

By Jill R. Dorson

Barking dogs announce your arrival at my brother's house. Then there are the cats, birds, spiders, turtles, tortoises, terrapins and a pot-bellied pig. But even after meeting these critters, you still haven't met the gentle, scaly, fascinating creatures that were his passion. In cages he built himself in a large, lush yard in Jacksonville, Fla., six Green Iguanas and three Rock Iguanas, lounge in huge cages filled with branches to climb, greens to eat and shade to sleep in.

My brother, Rob Dorson, died suddenly on May 16 of coronary artery disease. He was 34. Besides his family - my mother, Marilyn, my father, Lee, my husband, Sam, his life partner Lee Hanks, and me - Rob left a family of critters, as he called them. His passion, though, was the iguanas, which had fascinated him since he was a kid.

When Rob and I were growing up, he had some tiny pet lizards, which created quite a ruckus in our childhood home, particularly when one got out of its cage and we spent days looking through the kitchen, the bathrooms, the bedrooms, and the laundry room before it was rescued.

Little did we know that that little lizard had started a love affair. Rob took in animals of all kinds, from stray dogs and cats to a pig that lived at an animal farm he had worked at to exotic birds. He was also an avid fisherman, who enjoyed his time on the water much more than his time on land. But in all the years he fished, my brother never ate a fish, always catch and release. He had a soft spot for all the earth's creatures and gave them more love and attention than many people give their own families.

In 2000, Rob and Lee decided to turn their passion into a business and Creature Features, an exotic pet store in Jacksonville, was born. They started on a shoestring and built a successful business that was also a meeting place for friends and acquaintances that shared that special enthusiasm for four-legged creatures.

In the more than two years that Rob and Lee owned the store, it grew from a business to a community, a place they used to educate as well as place animals. Rob took every opportunity to teach customers and friends about his animal kingdom and he always welcomed customers with a smile.

Since closing the store, Rob and Lee dedicated their efforts to their animal family at home. Rob worked for my husband and I this last year and not a day passed by that he didn't regale us with a story of one of his pets. And he was always looking for ways to make them more comfortable - in fact, a large branch that he had hoped to use in an iguana cage still sits in my backyard.

Since Rob's death, my family has been working with the International Iguana Society, which has started a trust fund in his name. We know that he would have loved the idea of helping to save the reptiles that brought him so much joy.

Please help us keep Rob's memory alive by making a donation to the International Iguana Society's Rob Dorson Trust Fund. Proceeds will benefit the Blue Iguana Recovery Program on Grand Cayman.

dinated plan of action, specifically dealing with local public awareness and perceptions, land development plans and protected areas, and invasive species control, was lacking. Thus, the purpose of this workshop was to review the 2001 report and condense it into prioritized action components. Crucially important to this process was that each actionable component have a time line, a potential funding source if needed, and a point person who would be responsible for implementation.

The next step is for BVINPT staff member Nancy Woodfield to compile the document for review and publication; it will then go to John Binns for layout and creative design (envisioned as resembling the Ricord's Iguana SRP). Funds to publish a high-quality document have been identified and a late 2004 publication date is anticipated. This document will prove useful on a number of fronts, including guiding the recovery plan process, providing accountability, heightening local and international awareness for the plight of the iguana, and highlighting critical funding needs for granting agencies. However, the most important immediate goal for this document is that it be accepted and publicly ratified by the appropriate governmental agencies in the British Virgin Islands. This action is vital to saving the Anegada Iguana on Anegada, and is essential to this species' long-term survival.

Rick Hudson
ISG Co-chair, Fort Worth Zoo

Triangle Iguana Rescue

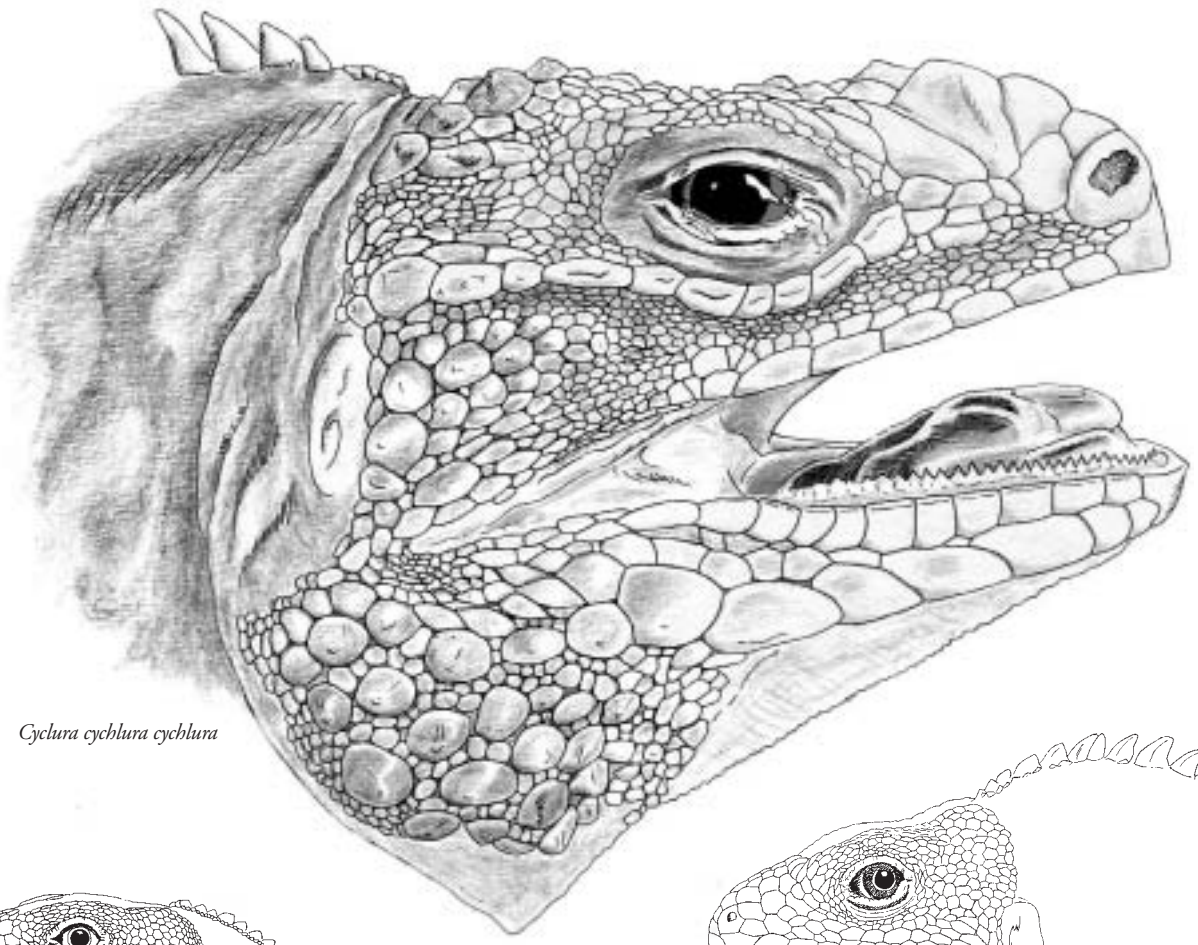
Started over four years ago, this group of over 70 volunteers is scattered throughout North Carolina and has affiliates in surrounding states. Our main foci are on husbandry education and striving to prevent neglect and abuse. Over 20 iguanas are currently available for adoption within our limited network of foster/rehabilitation homes.

Since we are self-funded at this point, individual foster homes carry the burden of veterinary costs, food, added utility bills, etc. We have a hard time finding good adoptive homes and sometimes end up keeping foster animals for over a year. We have decided that rather than taking in more iguanas and placing them less selectively, we will only take as many animals as we can provide with proper care and place in truly good homes.

We do require a home visit before leaving an iguana in a new adoptive home, and we have an adoption contract, which new owners must sign, agreeing to keep us updated on the iguana's progress and health.

We can be found online at TriangleIguanaRescue.com. Locate an affiliate in your area in the "TIR

Triangle Iguana Rescue actively promotes responsible iguana husbandry; from left to right: Mark Boudreaux, Al Johnson, Sherry Johnson, Darry Conner, Dominick Giorgianni.

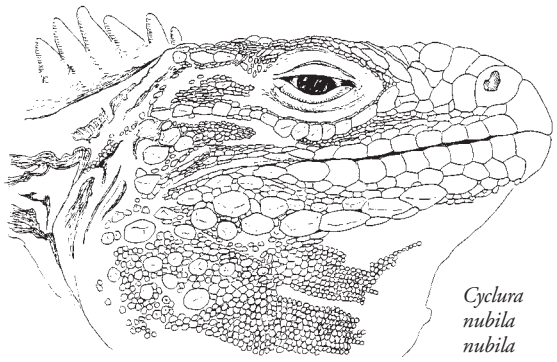


Cyclura cychlura cychlura

Brachylophus vitiensis

Brachylophus fasciatus

John Bendon at the ISG Annual Meeting on Grand Cayman (November 2001). *Photograph by John Binns.*



Cyclura nubila nubila

John Bendon, long-time IIS member, actively supports iguana conservation. A regular contributor to IGUANA, he frequently assists with efforts to conserve threatened populations, most recently on Isla Mona (see p. 98). In addition, John's beautiful and anatomically accurate renderings of iguanas have contributed greatly to many feature articles. Sales of individual prints have helped fund iguana work by John and others, and his drawings have been used as chapter headers in recently published books edited by Alberts et al. (2004. *Iguanas: Biology and Conservation.* Reviewed in IGUANA 11(1):60-61) and Henderson and Powell (2003. *Islands and the Sea: Essays on Herpetological Exploration in the West Indies.* Reviewed in IGUANA 10(4):151-152).

Editors' Remarks

As promised in this space in the previous issue, we want to explain our reasoning for including profiles of "iguana people" and of species that coexist with the iguanas that are and will continue to be the focus of every issue. "Iguana people" fall into several categories. Most of the individuals we've profiled to date and probably most of those we'll feature in future issues have been heavily involved in conservation of iguanas. However, we have and will continue to feature researchers whose work has provided new insights into the evolutionary relationships, behavior, or ecology of iguanas. We also intend to profile individuals whose expertise is in husbandry. Regardless, however, of an individual's specialties, these are folks who have made an impact in the arena of iguana biology. Why do we think this is important? Three main reasons apply: (1) These are people who can and should serve as role models for aspiring conservationists, academics, researchers, or advanced herpetoculturists. (2) We would like to think that reading about these persons will inspire readers to emulate them, even if that requires an expansion of one's "comfort zone" by tackling issues that seem beyond one's ability. (3) These are neat folks and reading about their exploits can be fun as well as inspiring and educational.

"Species profiles" are not intended to be inspirational — but they are intended to be educational. Because we believe that most persons interested in iguanas also have an interest in their habitats and in the other animals with which those are shared, providing brief glimpses into the lives of reptiles that live in areas that are featured in the iguana-centered articles should serve to enlighten and entertain.

These regular features, along with those that focus on husbandry and historical perspectives, reflect our efforts to meet the needs and special interests of our readers. We remain open, however, to the inclusion of more and different sorts of information. If you have ideas about articles that you would like to see in IGUANA, please feel free to contact any member of the editorial board. We'd enjoy hearing from you.

Bob Powell, AJ Gutman, and John Binns

Statement of Purpose

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

Membership Information

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

Individual U.S. and Canadian Membership $25.00
Individual Foreign Membership $35.00
U.S. and Canadian Organizational Membership* $35.00
Foreign Organizational Membership* $45.00
(*receives double copies of *Iguana*)

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

JOIN ON-LINE AT: www.IguanaSociety.org

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

Solicitations

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

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

Advertising Policy of *IGUANA*

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

LETTER FROM THE PRESIDENT

The San Salvador Iguana (*Cyclura rileyi rileyi*)

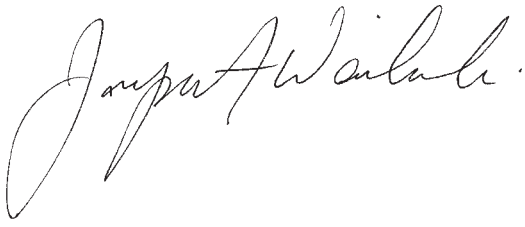
On a recent trip to San Salvador in the Bahamas, IIS Board Members Joe Burgess, John Binns, and I had an opportunity to visit a very rare Rock Iguana, *Cyclura rileyi rileyi*. Once found on a number of cays in and around San Salvador, these animals are presently restricted to several small cays near San Salvador and a couple of cays in some salt ponds in the southern part of the island. With a total population estimated at no more than 500 individuals, *C. r. rileyi* is undergoing a rapid decline and has recently been extirpated from several cays. The population decline is due to the same stressors faced by all too many other species of *Cyclura*, with predation by dogs and cats playing the major role in this instance.

Iguana awareness sign proudly displayed on Green Cay, San Salvador, Bahamas donated by the IIS. *Photograph by John Binns*

Cyclura rileyi rileyi is a relatively small iguana with a maximum total length of no more than 700 mm. Two other subspecies (*C. r. cristata* and *C. r. nuchalis*) are currently recognized and are similar in size. All are beautiful animals with a dull gray background accentuated with blotches of blue and yellow. Some specimens are a bright orange. No more than 200 *C. r. cristata* remain on White Cay in the southern Exuma Island chain. To gauge just how fragile certain populations are, a few years ago, these iguanas were nearly extirpated by a single raccoon released on the island by passing boaters. Both of these populations also have suffered at the hands of wildlife poachers. *Cyclura rileyi nuchalis* is found primarily in the Acklins Islands and has been successfully translocated to an island near the Allen's Cays. Largely due to their remote range, these populations seem to be holding their own and currently number around 13,000 individuals.

Drs. Bill Hayes and Ron Carter of Loma Linda University in California have studied all three subspecies for many years, and an action plan for the conservation of the San Salvador Iguana has been developed. Most recently, Hayes and Carter have proposed a headstart facility. Headstarting has proven to be a relatively successful strategy for other species, such as *Cyclura pinguis* on Anegada, *Cyclura collei* in the Hellshire Hills of Jamaica, and *Cyclura lewisi* on Grand Cayman.

The Gerace Research Center on San Salvador is an ideal site for a headstart facility. On-site staff could easily be trained in the husbandry of *Cyclura rileyi*. Once raised to a manageable size, iguanas could be translocated to suitable cays. To date, no such conservation project exists anywhere in the Bahamas, despite the presence of three species and seven varieties of *Cyclura* — all of which are endangered to varying degrees. A project like the proposed headstart facility may be all that it takes to trigger the development of a fully integrated wildlife conservation program in the Bahamas.



Godzilla (1935–2004). *Photograph by John Binns.*

The herpetology and veterinary staff of the Gladys Porter Zoo sadly report the passing of the longest living member of the genus *Cyclura* on record.

At an estimated age of 69 years, "Godzilla," a male Grand Cayman Blue Iguana died on 26 May 2004 of apparent chronic hepatic insufficiency. He was ill for about two weeks prior to his death, although, at his advanced age, Godzilla required extraordinary maintenance for the seven years he resided at the Zoo. Totally blind in one eye and almost blind in the other, this animal routinely brought out the "hero" in the Gladys Porter Zoo's veterinarians.

Captured as a full-grown adult on Grand Cayman in 1950 by naturalist Ira Thompson, Godzilla weighed over 15 pounds and was estimated to be at least 15 years of age at the time of capture. He was imported to the U.S. in 1985 by Ramon Noegel and was placed on loan to the Gladys Porter Zoo in 1997.

Though gaunt and aged in appearance, Godzilla retained the characteristics of a territorial, dominant *C. lewisi* until the time of his final illness. He was a favorite of the Zoo's keeper staff and volunteers; he will truly be missed.

Adult male San Salvador Iguana (*Cyclura rileyi rileyi*) on Green Cay, San Salvador, Bahamas. *Photograph by John Binns.*