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<p>White Cay Iguana <i>Cyclura nileyi cristata</i> Estimated Population 200</p>	 <p>PHOTOGRAPH BY JOHN EDISON</p>	 <p>PHOTOGRAPH BY JOHN BINNS</p>	<p>Anegada Iguana <i>Cyclura pinguis</i> Estimated Population 400</p>
<p>San Salvador Iguana <i>Cyclura nileyi nileyi</i> Estimated Population 500</p>	 <p>PHOTOGRAPH BY GLEN SHERER</p>	 <p>PHOTOGRAPH BY JOHN EDISON</p>	<p>Bartoli's Iguana <i>Cyclura carinata bartoli</i> Estimated Population 1,000</p>
<p>Allen's Cay Iguana <i>Cyclura cyathura inornata</i> Estimated Population 1,000</p>	 <p>PHOTOGRAPH BY JOHN BINNS</p>	 <p>PHOTOGRAPH BY JOHN BINNS</p>	<p>Ricord's Iguana <i>Cyclura ricordi</i> Estimated Population 1,300</p>
<p>Exuma Islands Iguana <i>Cyclura cyathura faginalis</i> Estimated Population 1,500</p>	 <p>PHOTOGRAPH BY DAVID HOFF</p>	 <p>PHOTOGRAPH BY JOHN BINNS</p>	<p>Sister Isles Rock Iguana <i>Cyclura rubra coymenensis</i> Estimated Population 1,500</p>
<p>Mona Island Iguana <i>Cyclura cornuta alysheperi</i> Estimated Population 1,500</p>	 <p>PHOTOGRAPH BY THOMAS WERNICK</p>	 <p>PHOTOGRAPH BY DAVID HOFF</p>	<p>Andros Island Iguana <i>Cyclura cyathura cyathura</i> Estimated Population 3,500</p>
<p>Acklins Iguana <i>Cyclura nileyi nuchalis</i> Estimated Population 13,000</p>	 <p>PHOTOGRAPH BY WILLIAM HAYES</p>	 <p>PHOTOGRAPH BY JOHN BINNS</p>	<p>Rhinoeros Iguana <i>Cyclura cornuta cornuta</i> Estimated Population 17,000</p>
<p>Cuban Iguana <i>Cyclura rubile rubile</i> Estimated Population 40,000</p>	 <p>PHOTOGRAPH BY JOHN BINNS</p>	 <p>PHOTOGRAPH BY JOHN BINNS</p>	<p>Turks &amp; Caicos Iguana <i>Cyclura carinata carinata</i> Estimated Population 50,000</p>

Estimated population sizes of wild Rock Iguana (*Cyclura*) populations. Based on a graphic by John Binns.

# Conservation Strategies for West Indian Rock Iguanas (Genus *Cyclura*): Current Efforts and Future Directions

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**Abstract.**—As a result of habitat loss and the negative impact of introduced mammalian predators and competitors, West Indian Rock Iguanas (genus *Cyclura*) are among the most endangered lizards in the world. Because they are important seed dispersers for native plants, their loss has serious ecological consequences for dry tropical forest and scrub habitats. Six of the nine species of Rock Iguanas are considered critically endangered by the IUCN (the World Conservation Union), with *C. collei* and *C. pinguis* numbering only a few hundred individuals in the wild and *C. lewisi* fewer than 25 individuals. Conservation recommendations include further research to better understand population dynamics and ecological requirements, establishment of new protected areas and stronger enforcement within existing ones, control programs for introduced species, captive breeding and head-starting where appropriate, and public education at the local, national, and international levels.

**Key Words:** *Cyclura*, Rock Iguana, Conservation, West Indies, Introduced Species, Habitat Destruction

## Introduction

As a result of prolonged geographical isolation, native mammalian species in the West Indies are few and consist mainly of bats and rodents. Birds, reptiles, and amphibians have undergone significant radiations and comprise the majority of the vertebrate biodiversity in the region. Most of the large islands are densely populated by people and suffer from the devastating effects of environmental degradation and introduced species (Case and Bolger 1991). As a result, a significant number of taxa, including many endemics, have disappeared or are on the brink of extinction.

West Indian Rock Iguanas (genus *Cyclura*) are among the largest and most impressive members of the family Iguanidae, yet they are also the rarest. All *Cyclura* taxa are currently protected under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Six of the nine species are considered to be critically endangered by the World Conservation Union (Hilton-Taylor 2000). Although exploitation of West Indian Rock Iguanas began long ago by native peoples, not until the arrival of Europeans did Rock Iguana populations begin their precipitous decline. In addition to the habitat loss and degradation that inevitably result from large-scale human settlement, the commensal species that accompanied human immigrants to the islands have had a devastating impact on iguanas and their ecosystems. Dogs, cats, pigs, and rats prey on iguanas and their eggs, while goats, sheep, cattle, and other livestock trample nest sites and degrade the unique plant communities on which iguanas and other native species depend. The introduction of the mongoose (*Herpestes*

*javanicus*) in a futile attempt to control rats has instead resulted in heavy predation on many native reptilian species, including juvenile iguanas (Nellis and Everard 1983, Wilson et al. 2004).

West Indian Rock Iguanas inhabit dry subtropical thorn forest regions throughout the Greater Antilles and the Bahamas. Rock Iguanas are primarily terrestrial, depending heavily on the presence of rocky crevices to serve as retreats, and require sandy areas with appropriate soil conditions in which to lay their eggs. Most species live for multiple decades and may take several years to reach sexual maturity. Social organization ranges from systems in which adult males are highly aggressive and territorial, to large groups that appear to coexist peacefully (Martins and Lamont



Radiotelemetry has proven critical to understanding movement patterns and nesting ecology of Jamaican Iguanas (*Cyclura collei*) in the wild. Photograph by Rick Hudson.

1998). Mating is seasonal, with a single clutch per year usually laid in May or June. Raptors, cuckoos, herons, osprey, racers, and boas are the main natural predators of West Indian iguanas, usually only of juveniles (Alberts 2000a).

West Indian Rock Iguanas are almost exclusively herbivorous, consuming a wide variety of leaves, fruits, and flowers. The Turks and Caicos Iguana (*C. carinata carinata*) is known to feed on at least 58 plant species (Iverson 1979, Auffenberg 1982), the



The Turks & Caicos Iguana, *Cyclura carinata carinata*, is one of six species of Rock Iguanas ranked as “Critically Endangered” on the IUCN Red List. As a result of the spread of invasive mammals, this species now occupies less than 10% of its historic range. Photograph by Glenn Gerber.

Cuban Iguana (*C. nubila nubila*) on 25 species (Perera 1985), the Grand Cayman Blue Iguana (*C. lewisi*) on 45 species (Burton and Gould, unpublished data), the Sister Isles Rock Iguana (*C. nubila caymanensis*) on over 40 species (G. Gerber, unpublished data), and the Mona Island Iguana (*C. cornuta stejnegeri*) on 71 species (Wiewandt 1977). Because digestion of plant foods is incomplete, seeds generally pass through the digestive tract intact (Iverson 1985). Hartley et al. (2000) dissected seeds from iguana scat collected in the Dominican Republic and compared their germination rates to seeds collected from beneath parent plants. They found that seeds that had passed through the digestive tracts of iguanas germinated more rapidly than seeds that had not, indicating that iguanas may provide significant benefits to native plants, particularly in xeric habitats with sporadic rainfall.

To test whether iguanas otherwise enhance plant regeneration, we conducted an experiment at the San Diego Zoo using Cuban Iguana scat samples. Half of each scat sample was dissected and all seeds removed, while the remaining half was left intact. Both the dissected seeds and the seeds contained in intact scat were planted under identical conditions. While neither the time to germination nor the total number of seeds germinating differed between groups, growth rates of seedlings produced from seeds left in iguana scat were approximately twice those of seedlings originating from seeds dissected from iguana scat (Alberts 2000b). In addition, the repetitive cropping of vegetation by iguanas may encourage additional shoot and foliage



Social organization of Rock Iguanas ranges from highly territorial systems to large groups, such as these Exuma Islands Iguanas (*Cyclura cyclura figginsii*), which appear to coexist peacefully. Photograph by Rick Hudson.



The robust population of Cuban Iguanas (*Cyclura nubila*) at Guantanamo Bay has been the subject of many years of field research by biologists in the San Diego Zoo's Applied Conservation Division. Photograph by John A. Phillips.



Like other Rock Iguanas, Cuban Iguanas (*Cyclura nubila*) help maintain the health of native plant communities through enhanced seed dispersal, germination, and seedling growth. Photograph by John A. Phillips.

development (Knapp and Hudson 2004) and that movement patterns may enhance dispersal of seeds into new microhabitats (Iverson 1985).

#### Current Status

West Indian Rock Iguanas are among the most endangered lizards in the world, in large part because of their exclusively insular distribution. As a result of their low metabolic rates and naturally high population densities, lizards in many mainland habitats are relatively resistant to extinction. However, the restricted ranges and small population sizes of lizards on islands render them highly susceptible to a variety of human-mediated threats. Pressure to exploit undisturbed natural areas is particularly strong in the West Indies, where leaving land unutilized is often perceived as economically undesirable (Barzetti 1993). Recolonization following local extinction on islands is likely to be rare because West Indian Rock Iguanas, like most other terrestrial reptiles, are probably poor over-water dispersers (but see Censky et al. 1998).

According to the IUCN (Hilton-Taylor 2000), three taxa of West Indian Rock Iguanas are considered "Vulnerable," four

"Endangered," and nine "Critically Endangered" (Table 1). Two taxa, the Turks and Caicos Iguana (*C. carinata carinata*) and the Cuban Iguana (*C. nubila nubila*), are still fairly numerous in the wild. However, both have been nearly extirpated on the larger, more populous islands within their ranges, and today are restricted primarily to smaller, uninhabited islets or cays. Although both still occur over a wide area, they are subject to a variety of human disturbances, including habitat loss and negative interactions with feral mammals. The Turks and Caicos Iguana population has been reduced to 10% of its former range. The Rhinoceros Iguana (*C. cornuta cornuta*) and the Andros Island Iguana (*C. cyclura cyclura*), both ranked as vulnerable, inhabit increasingly fragmented ranges and are threatened by invasive exotic species.

The Bahamas supports seven taxa of Rock Iguanas, more than any other nation. The majority of Bahamian Rock Iguanas are restricted to a limited number of small islands or cays, often no more than a few hectares in area. While populations are generally stable, many of these islands are heavily visited by tourists and instances of illegal smuggling have been reported in recent years. Although very small, the single population of Bartsch's

**Table 1.** Current conservation status of West Indian Rock Iguana species and subspecies.

Taxon	Range Countries	Estimated Wild Population Size	IUCN Threat Classification
Turks and Caicos Iguana <i>Cyclura carinata carinata</i>	Turks and Caicos Islands	50,000	Critically Endangered
Bartsch's Iguana <i>Cyclura carinata bartschi</i>	Bahamas	1,000	Critically Endangered
Jamaican Iguana <i>Cyclura collei</i>	Jamaica	150	Critically Endangered
Rhinoceros Iguana <i>Cyclura cornuta cornuta</i>	Dominican Republic & Haiti	17,000	Vulnerable
Mona Island Iguana <i>Cyclura cornuta stejnegeri</i>	Puerto Rico (Isla Mona)	1,500	Endangered
Andros Island Iguana <i>Cyclura cychlura cychlura</i>	Bahamas	3,500	Vulnerable
Exuma Island Iguana <i>Cyclura cychlura figginsi</i>	Bahamas	1,500	Endangered
Allen's Cays Iguana <i>Cyclura cychlura inornata</i>	Bahamas	1,000	Endangered
Cuban Iguana <i>Cyclura nubila nubila</i>	Cuba	40,000	Vulnerable
Sister Isles Rock Iguana <i>Cyclura nubila caymanensis</i>	Cayman Islands	1,500	Critically Endangered
Grand Cayman Blue Iguana <i>Cyclura lewisi</i>	Cayman Islands	30	Critically Endangered
Anegada Iguana <i>Cyclura pinguis</i>	British Virgin Islands (Anegada Island)	400	Critically Endangered
Ricord's Iguana <i>Cyclura ricordii</i>	Dominican Republic	1,300	Critically Endangered
San Salvador Iguana <i>Cyclura rileyi rileyi</i>	Bahamas	500	Critically Endangered
White Cay Iguana <i>Cyclura rileyi cristata</i>	Bahamas	200	Critically Endangered
Acklins Iguana <i>Cyclura rileyi nuchalis</i>	Bahamas	13,000	Endangered

Iguana (*C. carinata bartschi*) in the Bahamas appears to be healthy and stable, supporting all age classes. However, this subspecies is restricted to one tiny cay with a high point of 6.2 m and most of its area less than 3 m above sea level. Under these conditions, environmental catastrophes such as a heavy hurricane is a very real threat. The White Cay Iguana (*C. rileyi cristata*) has only one small population remaining from which illegal smuggling has been confirmed, and populations of the San Salvador Iguana (*C. rileyi rileyi*) have been declining at an alarming rate.

Currently, the Jamaican Iguana (*C. collei*), the Mona Island Iguana (*C. cornuta stejnegeri*), the Sister Isles Rock Iguana (*C. nubila caymanensis*), the Grand Cayman Blue Iguana (*C. lewisi*), the Anegada Iguana (*C. pinguis*), and Ricord's Iguana (*C. ricordii*) are far below natural carrying capacity on the islands where they occur. The Jamaican Iguana was believed to be extinct until the 1990 rediscovery of a tiny remnant population in the remote Hellshire Hills. Since that time, a highly successful captive-rearing program involving over 100 juveniles has helped provide a hedge against extinction, but the wild population remains very much in peril. The Mona Island Iguana (*C. cornuta stejnegeri*) occurs only on the remote island of Mona, where it is scarce due to predation by feral pigs and cats, browsing by feral goats, and destruction of nest sites by feral pigs. The only remaining viable subpopulation of the Sister Isles Rock Iguana is on Little Cayman, and it is subject to a variety of threats including habitat loss and introduced predators. Analysis of recent genetic data indicated that the Grand Cayman Blue

Iguana has probably existed at an extremely small population size for an even longer period than the Jamaican Iguana. Genetic variation among the remaining individuals examined thus far appears to be very low, and the remaining wild population may consist of as few as 30 individuals. The Anegada Iguana has undergone precipitous declines in recent years, primarily due to competition with feral livestock for food. The population of Ricord's Iguana, historically small and disjunct, is declining as a result of habitat degradation and introduced species.



The Mona Island Iguana (*Cyclura cornuta stejnegeri*) is the focus of a successful headstarting program managed by the Puerto Rico Department of Natural Resources and the Environment. Photograph by Glenn Gerber.



Jamaican Iguanas (*Cyclura collei*) were believed extinct until the 1990 discovery of a small remnant population still clinging to existence in the Hellshire Hills. This nesting female is one of only about 150 individuals remaining in the wild. Photograph by Glenn Gerber.

**Table 2.** Summary of recommended conservation action for West Indian Rock Iguanas.

Taxon	Surveys	Protected Areas	Predator Control	Livestock Control	Field Research	Genetic Studies	Education	Head-starting
Turks and Caicos Iguana	•	•	•	•	•	•	•	
Bartsch's Iguana	•	•	•	•	•	•	•	
Jamaican Iguana		•	•	•	•		•	•
Rhinoceros Iguana	•		•	•	•		•	
Mona Island Iguana		•	•	•	•		•	•
Andros Island Iguana	•				•		•	
Exuma Islands Iguana	•	•			•	•	•	
Allen's Cays Iguana					•		•	
Cuban Iguana	•				•			
Sister Isles Rock Iguana	•	•	•		•	•		
Grand Cayman Blue Iguana	•	•	•		•	•	•	•
Anegada Iguana	•	•	•	•	•	•	•	•
Ricord's Iguana	•	•	•		•		•	•
San Salvador Iguana	•	•	•		•	•	•	
White Cay Iguana	•	•	•		•	•	•	
Acklins Iguana	•	•			•	•	•	

### Threats

The major threat to survival of virtually all West Indian Rock Iguanas is habitat loss. This process takes a variety of forms, including conversion of dry forests for mining, agriculture, charcoal production, timber extraction, tourist resorts, housing developments, and other real estate ventures. An inevitable consequence of this disturbance is the arrival of human-commensal species, which can act as unnatural predators or competitors for native species. While feral cats and mongooses primarily threaten juvenile iguanas, dogs are capable of preying on adults.

For some taxa, particularly the Jamaican, Grand Cayman Blue, and Anegada iguanas, predation by introduced species appears severe enough that population recruitment is very low. Wild populations of these species include few juveniles. Similarly, predation by introduced rats on juveniles and feral cats on all age classes can lead to depressed population growth among the smaller species of Rock Iguanas in the Bahamas and the Turks and Caicos Islands. Egg predation by feral pigs is a significant problem on Mona, Andros, parts of Cuba, and possibly Jamaica. Because they trample nesting sites and decimate the native vegetation on which iguanas depend, feral livestock also poses a serious threat, particularly on Anegada, Mona, Booby Cay in the Bahamas, and in parts of the Turks and Caicos and the Dominican Republic. On some of these islands, overgrazing has stunted vegetation and produced radical changes in species composition (Mitchell 1999).

Hunting also is a threat for several taxa. The reasons for this exploitation vary; in Haiti and the Dominican Republic, iguanas are hunted primarily for food, whereas in the Bahamas and the Turks and Caicos, illegal poaching for international trade is

becoming an increasing concern. In addition, road casualties are a significant cause of death for both adults and juveniles on islands undergoing rapid urbanization, particularly the Cayman Islands.

### Current Conservation Measures

All species of Rock Iguanas are protected internationally under Appendix I of CITES. Although most also receive some degree of national legislative protection in the countries where they occur, local enforcement of regulations is sporadic. Protected habitat, in the form of national parks, nature reserves, or sanctuaries, exists for approximately half of all West Indian Rock Iguanas. However, in many cases, these areas are very small or represent only a tiny fraction of the species' total range. Even in countries with fairly extensive reserve systems, such as the Turks and Caicos Islands, Cuba, and the Dominican Republic, limited resources for protected area maintenance hamper enforcement capability.

While some form of introduced species control is underway in the habitats of six West Indian Rock Iguana species, these pilot programs are local and aimed at single species (feral cats on Pine and Water Cays, Turks and Caicos Islands; goats on Booby Cay, Bahamas; mongooses in the Hellshire Hills, Jamaica; feral cats on Mona Island, Puerto Rico; rats on Low and White Cays, Bahamas). While the goal is complete eradication of feral cats and rats, other species such as mongooses will require continuous trapping to keep population numbers low in core iguana habitat (Vogel et al. 1996, Wilson et al. 2004). Fencing has successfully excluded feral goats and pigs from iguana nest sites, particularly on Mona Island. Because of the variety of threats posed



Coastal limestone terrace habitat, such as that shown here at Guantanamo Bay, Cuba, provides important refuges for Cuban Iguanas. *Photograph by Allison Alberts.*



The British Virgin Islands National Parks Trust is working closely with the IUCN Iguana Specialist Group and others to headstart juvenile Anegada Iguanas (*Cyclura pinguis*) in captivity until they grow large enough to defend themselves from feral cats. To date, 48 headstarted animals have been repatriated to the wild, with a survival rate exceeding 90%. *Photograph by Jeff Lemm.*

by invasive mammals to most species of West Indian Rock Iguanas, control programs will need to be expanded in the future and implemented on islands where they do not yet exist.

Field research is making a significant contribution to the conservation of many species of West Indian Rock Iguanas. Current studies range from population censuses to ecological and systematic investigations. These should provide the scientific data necessary to begin developing species conservation plans for many taxa. To date, recovery plans have been drafted for five of the most critically endangered West Indian Rock Iguanas: the Jamaican, Anegada, Grand Cayman Blue, Ricord's, and Turks and Caicos iguanas.

Education programs are critical to the success of conservation efforts on behalf of West Indian iguanas. Each year, the National Trust for the Cayman Islands holds a fair at which several thousand children have the opportunity to learn about iguanas and their habitat requirements. The National Trust for the Turks and Caicos Islands has produced a variety of educational materials, regularly provides information about iguanas to local schools, and has instituted a highly successful nature trail on



Little Water Cay, a nature reserve managed by the National Trust for the Turks & Caicos Islands, supports a healthy population of approximately 2,000 Turks & Caicos Iguanas (*Cyclura carinata carinata*) that is visited by thousands of tourists each year. Unfortunately, the island has been recently threatened by the invasion of feral cats from nearby Water Cay. *Photograph by Glenn Gerber.*

Little Water Cay. The Jamaican Iguana conservation program involves education of local forest habitat users, particularly charcoal burners and pig hunters. In the Bahamas, signs informing tourists of the protected status and vulnerability of iguanas have been helpful, principally on small cays visited by private yachts. In 1997, the IUCN Iguana Specialist Group sponsored production of a color poster urging protection of West Indian Rock Iguanas and distribution of the poster in as many range countries as possible.

Secondary populations have been established for the Anegada Iguana (Goodyear and Lazell 1994), the Acklins Iguana (Hayes and Montanucci 2000), the Allen's Cays Iguana (Knapp 2000), and the Turks and Caicos Iguana (Mitchell et al. 2000; Gerber and Alberts 2000a, 2002). These satellite populations have the potential to serve as reservoirs should primary populations become extinct. Similar programs are planned for the Jamaican Iguana and the White Cay Iguana, but have yet to be implemented. Although habitat enhancement has the potential to contribute to conservation efforts for all West Indian Rock Iguanas, it has only been carried out for a few taxa. Clearing



patches of exotic forest has provided new nesting area on Mona Island, and removal of exotic vegetation to prepare a release site for head-started hatchlings is taking place on Grand Cayman. A dredging program has been proposed for Green Cay in the Bahamas in order to replenish nest site sand lost as a result of Hurricane Lily in 1996 (Hayes et al. 2004).

*Ex situ* captive programs currently exist for six populations of West Indian iguanas. For Jamaican and Grand Cayman Blue iguanas, genetically managed populations are in place in U. S. zoos. These ultimately should provide a hedge against extinction in the wild. Similar programs are in the initial stages for Ricord's and Anegada iguanas. For Cuban and Rhinoceros iguanas, the American Zoo and Aquarium Association has recommended a moratorium on further breeding due to space constraints, although these species are commonly used for display and educational purposes. *In situ* captive programs in Jamaica, Grand Cayman, Anegada, the Dominican Republic, and Mona Island in Puerto Rico are having immediate effects on population viability through the successful repatriation of headstarted juveniles.

#### Recommendations for the Future

For the majority of West Indian Rock Iguanas, further survey work is required in order to design effective management and recovery plans (Table 2). Existing data for some taxa are outdated, whereas for others only a limited part of the range has been adequately documented. In other instances, populations are known to be declining, but quantitative data on rates of population change and their demographic effects are lacking. For all taxa, standardized annual or biannual population monitoring is critical for updating conservation priorities. Detecting population declines before they have significant demographic impacts and while management intervention remains a viable option is increasingly important.

Many Rock Iguana populations remain without adequate protection because no habitat has officially been set aside for them or because existing legislation is only sporadically enforced. To ensure the survival of all taxa, enough suitable habitat to support minimum viable populations should be protected by national law in each country of origin. Because the social struc-



Two adult male Turks & Caicos Iguanas, *Cyclura carinata carinata*, engaged in a display of dominance. Recent studies suggest that the behavioral ecology of Rock Iguanas is more sophisticated and complex than previously believed. Photograph by Glenn Gerber.

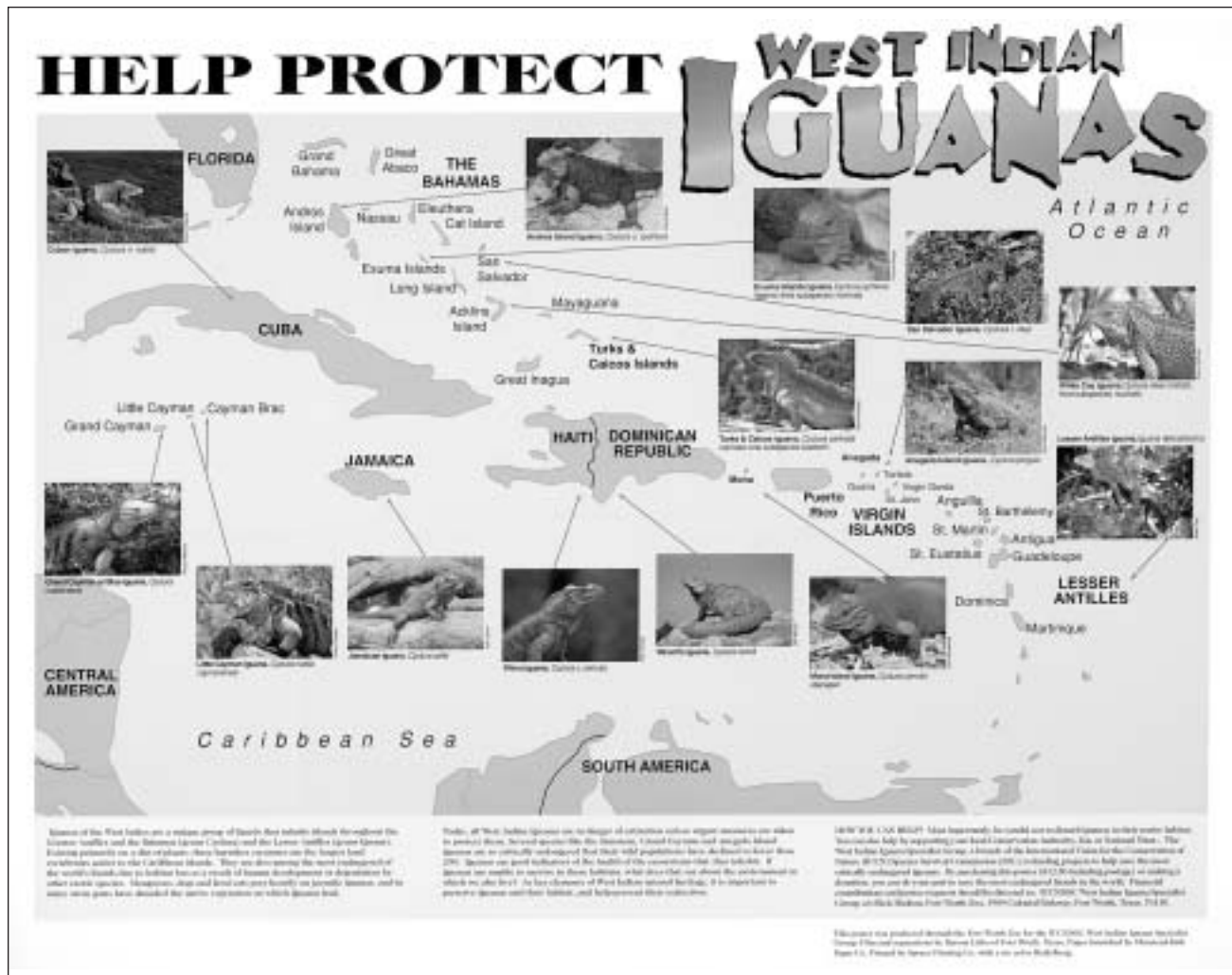
ture, reproductive ecology, and carrying capacity of these iguanas varies considerably across taxa, the amount of habitat required for adequate protection will need to be determined on a taxon-by-taxon basis.

Control of introduced mammalian predators and livestock is crucial to the survival of West Indian Rock Iguanas. Because they are such devastating predators, feral dogs and cats should be eliminated from core iguana habitats whenever they are encountered. Public outreach is essential to ensuring that new nonnative predators are not introduced to iguana-inhabited islands and cays. Although they do not result in complete removal, trapping programs for mongooses seem to be effective in keeping population numbers sufficiently low to reduce their impact on iguanas (Wilson et al. 2004). Fencing in and around iguana nesting areas is a relatively inexpensive means for excluding free-ranging livestock, and should be implemented wherever feasible.

Basic research is critical to many if not all of the proposed conservation initiatives for West Indian Rock Iguanas. In order to conserve and potentially augment wild populations, enough life history data from wild populations must be available in order to predict the long-term effects of alternate management strategies. Such data can help to assess the carrying capacity of proposed reserve sites and determine if reintroduction or translocation is warranted and feasible. Population modeling to estimate



Sandy soils, such as those shown here in coastal Cuba, are essential in order for West Indian Rock Iguanas to nest successfully. Photograph by Allison Alberts.



Educational poster highlighting the need for protection of West Indian Rock Iguanas. Courtesy of the IUCN Iguana Specialist Group.

minimum viable population sizes and to explore the effects of head-starting is crucial to designing successful and practical conservation. Behavioral studies are needed to understand the conservation implications of variation across populations and to assess the influence of human impacts. A complete study of phylogenetic relationships among West Indian Rock Iguanas, including both molecular genetic and morphological data, is a necessary beginning in order to adequately assign priorities to conservation initiatives (Malone and Davis 2004). The availability of such data will contribute toward a better understanding of adaptive trends within the group and will permit informed extrapolations from one taxon to another.

As insurance against extinction in range countries, *ex situ* captive breeding programs are recommended for West Indian Rock Iguanas that have experienced significant population reductions, documented low population size or a severely restricted range, or have an extinction probability of at least 20% within five generations. In order to retain the genetic diversity needed to support these populations over the long term, husbandry and breeding techniques must be improved and the sup-

port and participation of additional institutions enlisted. For taxa in which reduced juvenile recruitment threatens the survival of the wild population, headstarting programs and rigorous predator control are recommended as interim measures to allow for population recovery.

Finally, for the survival of virtually all taxa of West Indian Rock Iguanas, public education is essential. Without effective education at the local, national, and international levels, other conservation initiatives are likely to prove futile. Educational needs range from discouraging people from feeding, hunting, and transporting iguanas between islands to inspiring local and national pride for these impressive lizards and their unique habitats. Raising public awareness regarding the vulnerability of iguanas to dogs, cats, pigs, and livestock is critical to preventing their intentional introduction to new islands. Iguanas represent a unique and irreplaceable component of the West Indian natural heritage that must be preserved for future generations. Only by working closely with local communities can we help foster the sense of pride and stewardship necessary to ensure the survival of West Indian Rock Iguanas.

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The preservation of quality habitat is essential to the survival of Rock Iguanas in the Turks & Caicos Islands (shown here) and elsewhere in the Greater Antilles and the Bahamas. *Photograph by Glenn Gerber.*



Although Cuban Iguanas (*Cyclura nubila*) are not recommended for breeding under the American Zoo and Aquarium Association's Rock Iguana Species Survival Plan, they play a valuable educational role by serving as ambassadors for their more endangered cousins. *Photograph by Allison Alberts.*

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