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ENDANGERED SPECIES AND LAND USE CONFLICTS: A CASE STUDY OF THE VIRGIN ISLANDS BOA (*EPICRATES GRANTI*)

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***Abstract*.—In situations where land is limited, such as on islands, wildlife conservation often takes a back seat to economic development. This is particularly the case in the Caribbean, where critical coastal resources are frequently converted into upscale developments. The United States Virgin Islands (USVI) has experienced intense and unmitigated development pressures in recent decades, presumably resulting in the loss of habitat for the endangered Virgin Islands Boa (*Epicrates granti*). This species is cryptic and difficult to locate, and thus it has been difficult to determine their full distribution and habitat needs. With ongoing development, there was an urgent need to identify locations where this species was likely to occur and to develop habitat conservation measures appropriate for developers. Using geographical information systems and opportunistic observations collected over 25 years, we created a habitat suitability model for *E. granti* that allowed for the prediction of presence in any particular area. We conducted microhabitat assessments to better understand habitat associations at a fine scale. Using this information, we developed a habitat delineation protocol for identifying appropriate habitat within a particular location. The habitat suitability model is being used by planning agencies to determine whether mitigation might be required for a given development project, and the habitat delineation protocols are being used by developers to identify areas within a proposed site that require additional protective measures. While the process is still in its infancy and not yet widely applied, there has been some success in scaling back development projects.**

Key Words.—conservation; endangered species; *Epicrates granti*; habitat delineation; habitat suitability model; Virgin Islands Boa

INTRODUCTION

In situations where land is limited, such as on islands, wildlife conservation often takes a back seat to economic development. This is particularly the case in the Caribbean, where critical coastal resources are frequently converted into upscale resorts, condominium complexes, and marinas. The desire for revenue tends to take precedence over long-term ecological impact considerations. In the United States Virgin Islands (USVI), the demands for space by a rapidly growing human population of over 100,000 have resulted in extensive loss and degradation of natural ecosystems, especially on densely populated St. Thomas, one of the three main islands of the archipelago. This island has experienced intense and unmitigated development in recent decades, particularly on the eastern end where coastal land comprised of dry tropical forest, habitat for the endangered Virgin Islands Boa (*Epicrates granti*), is at a premium (Harvey and Platenberg 2009).

Epicrates granti is a nocturnal, semi-arboreal snake endemic to the Eastern Puerto Rican Bank (Nellis et al. 1983). Occurrence has been documented on St. Thomas (Sheplan and Schwartz 1974), on several of the British Virgin Islands to the east (Grant 1932; Mayer and Lazell 1988) and on Cayo Diablo and other small islets off the northeast corner of Puerto Rico (Chandler and Tolson 1990). There is also an isolated population on the northeast corner of Puerto Rico (S. Blair Hedges, pers. comm.; Peter Tolson, pers. comm.). Within the USVI, the snake is only known from the eastern end of St. Thomas (Nellis et al. 1983), with anecdotal observations on adjacent uninhabited islands that have been unconfirmed despite considerable survey effort (Erik Miles, pers. comm.; USVI Division of Fish and Wildlife, unpubl. data).

It has always been difficult to gather information about this species on St. Thomas, and efforts to systematically survey boas on St. Thomas have been unproductive due to the snake's highly cryptic and secretive habits (USVI Division of Fish and Wildlife, unpubl. data). Sightings of this species have been sporadic; as late as 1982 it was known from only 12 specimens (Nellis et al. 1983). The nocturnal habits and dense habitat of this species preclude field studies, at least on St. Thomas, where almost all of the land within the known range is contained within small (< 0.2 ha) privately owned land parcels. Native habitat in this area, where presumably the boas are living, is dense and impenetrable. As a result, there have been no studies focusing on the ecological parameters of the St. Thomas population, despite the fact that it is the largest remaining population in the U.S. (Platenberg and Boulon 2006).

As a U.S. territory, the USVI is subject to U.S. federal regulations. The Virgin Islands Boa is protected under two such regulations: the Endangered Species Act of 1973 (ESA) and the Coastal Zone Management (CZM) Act of 1972. The United States Fish and Wildlife Service (USFWS) listed the Virgin Islands Boa as an endangered species in 1979 in response to the its fragmented distribution and development pressures on St. Thomas (USFWS 1980). The CZM Act restricts activities that are detrimental to habitats and species in coastal areas. The Virgin Islands Indigenous and Endangered Species Act of 1990 further protects all native wildlife in the territory. Enforcement of these regulations, however, is inconsistent, and violations are often overlooked (Platenberg and Boulon 2006).

A recovery plan was developed for this species to address threats from habitat loss and mammalian predators (USFWS 1986). The plan outlined three main tasks: captive breeding, reintroduction to sites within its historical range, and studies of the extant St. Thomas population. No critical habitat was ever designated for this species despite a requirement for the USFWS to do so for every designated species, presumably because the species was designated prior to the critical habitat requirement (Jeffery Weiss, pers. comm.). To date, one captive breeding population has been established (Tolson 1989), and specimens are contained in several zoo populations across the U.S. (K. Bradley, pers. comm.). One population has been established on an offshore island in the USVI (Peter Tolson, unpubl. data), although no further release sites within the territory have been identified.

Conservation and management techniques tend to be geared toward populations with sufficient information available to enable appropriate decision making (Thompson 2004). However, these mechanisms often do not adapt to rare and difficult to detect species, which often lack reliable information on population status, distribution, and biological needs, and there is very little guidance when the detection probability of a species hovers around zero. One of the challenges of wildlife conservation is the time required to obtain detailed information about the ecological requirements of species. For poorly understood species, the progression of a particular threat (e.g., habitat loss) could far outpace the years required to fully document patterns of resource use, much less determine the mechanisms underlying resource selection. This issue has fueled the development of methods to derive information from opportunistic observations of species occurrence (e.g., Graham et al. 2004; Roberts et al. 2005; Frey 2006; Lütolf et al. 2006; Elith and Leathwick 2007).

Opportunistic observations can be rapidly compiled from various sources (e.g., museum and herbarium records, government databases) but are usually biased and/or of low resolution in time and space (Elith and Leathwick 2007). Sometimes, however, as in the case of the Virgin Islands Boa, these random observations are the only data available to guide management.

Challenged by largely unregulated and unmitigated habitat loss, coupled with an increasing human population that amplifies the risk of lethal encounters, plus burgeoning populations of predacious domestic cats (*Felis catus*) and rats (*Rattus* spp.), there was an urgent need to develop stringent mitigation measures for the Virgin Islands Boa, even in the absence of comprehensive data. The objectives of this study were to determine the distribution of the species, locate existing habitat, and develop a mechanism to protect habitat in order to promote species conservation. Here we present a case study of the use of opportunistic observations to fulfill these objectives.

MATERIALS AND METHODS

***Geographic setting*.—**The USVI is situated near the eastern terminus of the Greater Antillean chain of islands in the northern Caribbean Sea to the east of Puerto Rico and to the northwest of the British Virgin Islands. The USVI comprises four major inhabited islands and more than 50 smaller offshore cays, with St. Thomas, St. John, and Water Island as the three main northern islands, located on the Puerto Rican Bank to the east of Puerto Rico, while St. Croix is approximately 64 km to the south. St. Thomas is 83 km^2, with an estimated human population of 53,716 (Virgin Islands of the United States Administrative Divisions (population and area). Available from http://www.world-gazetteer.com [Accessed 7 March 2009]). The east end of St. Thomas, to which the boa is restricted (Nellis et al. 1983), is composed of dry subtropical forest with a climate that is hotter and drier than the rest of the island; the moisture and temperature gradient progresses to damper and cooler towards the northwest (Thomas and Devine 2005).

***Distribution*.—**We used records of sightings of live or dead boas on St. Thomas reported to the USVI Division of Fish and Wildlife (DFW) from 1982 to 2006 to identify the distribution of the species. Based on descriptions of locations provided by the observer, which we confirmed by interview if the observer could be located, we geo-referenced the snake observations using a hand-held GPS unit (Garmin Map76S; Garmin Ltd., Olathe, Kansas, USA), and a spatial error was assigned to each location to reflect the degree of uncertainty in its position. We used a minimum convex polygon drawn around all observations to approximate the boa's range for analysis.

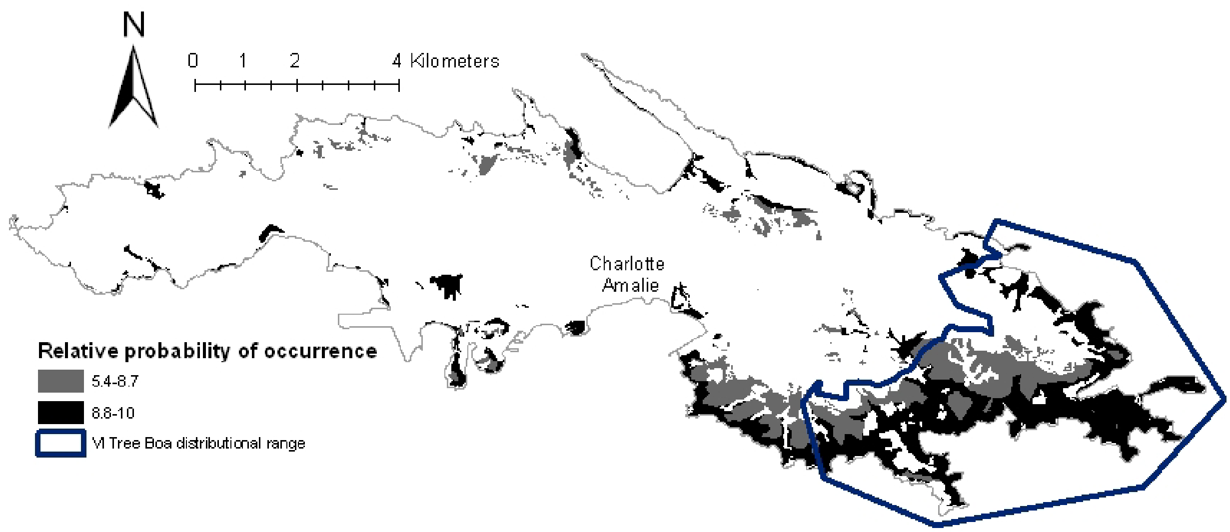

FIGURE 1. Tree Boa distributional range (IV) and high relative probability occurrence on St. Thomas, US Virgin Islands.

Habitat Suitability Model.—Here we present a summary of the habitat model development and microhabitat assessment protocols (for a more detailed account see Harvey and Platenberg 2009). Logistic regression is a standard method of determining habitat suitability based on the contrast between used and unused areas (Elith et al. 2006). We used boa observations to define areas of use and geographic information system (GIS) layers (elevation, soil and alteration, vegetation, land use, and roads) to define habitat properties. We divided the island of St. Thomas into 1 m^2 pixels to conduct the regression analysis. On an island-wide scale, we felt that defining an area of use as the exact pixel in which a snake was found was too restrictive, given the snake would certainly use a larger area and that an observation likely represents areas where multiple snakes are present in a broader radius. For this reason, we considered the area within 100 ha of boa observations as "used". We reduced the buffer size around observations by the equivalent degree of uncertainty in its location to account for the fact that observations were known with variable spatial accuracy. For example, if an observation was known +/- 40 ha, a buffer of 60 ha around the snake (100 ha - 40 ha) was used to define snake presence. In effect, this allowed greater speculation as to the use of an area by snakes if the observations were known with greater certainty. An additional benefit of using buffers around observations to define use is that they may lessen the impact of bias related to the specific capture site (e.g., roads) when determining habitat associations. We only included pixels outside of the boa's range (as defined by a minimum convex polygon around observations) as "unused" in the logistic regression to increase our confidence that unused pixels represented true absences (as opposed to areas where snakes were present but not observed). We determined the discriminatory power of the model using the area under a receiver operating curve (AUC). We performed all map functions with ArcGIS 9.0 (ESRI, Redlands, California, USA) and all statistical functions with Systat Version 11 and SPSS 14.0 (SPSS Inc., Chicago, Illinois, USA).

Microhabitat assessment.—We characterized and compared structural microhabitat features at locations near (< 100 m) boa observations and random locations throughout southeastern St. Thomas. The assessments served a dual purpose: to confirm the accuracy of the GIS layers and to determine which microhabitat features were associated with boa occurrence. We used a simple set of variables that reflected the nature and structure of the vegetation community (e.g., % cover of various types, tree height) and the abundance of potential refuges (e.g., bromeliads, termitaria). We used discriminant function analysis to compare microhabitat between groups with the jackknife procedure post-analysis to determine the predictive power of the classifications.

Habitat delineation.—We developed a protocol for delineating habitat to identify key areas within a given site, based on microhabitat analysis, habitat model results and published information on the *E. granti* and similar species (Tolson 1988; Chandler and Tolson 1990; Wunderle et al. 2004; Tolson et al. 2007; Peter

Tolson, unpubl. data). We classified vegetation identified in published accounts according to habitat types of St. Thomas (Thomas and Devine 2005), and identified habitat characteristics (e.g., canopy cover, refuge types) commonly associated with both these habitats and our microhabitat assessments. We identified key measurable habitat components that best characterize *E. granti* habitat and determined a range of acceptable values for each. A minimum threshold value was designated, below which the component being measured would be unacceptable as comprising boa habitat. We assigned a score for each component so multiple areas containing habitat can be ranked. The habitat delineation protocol was extensively tested in the field and adapted accordingly.

RESULTS

***Distribution*.—**One hundred and forty-three sightings of live or dead boas on St. Thomas were reported to the DFW from 1982 to 2006, only about 80% of which could be confirmed as being *E. granti*. We geo-referenced 126 snake observations with spatial error varying from 10–2400 m; the sightings that referred simply to a neighborhood rather than a specific location could not be precisely located and we assigned a larger spatial error. Virgin Island Boas were observed throughout the eastern portion of St. Thomas, with the majority of observations in the southeast. For management purposes, we used the boundaries of the political units containing boa observations to delineate the distributional range of the species (Fig. 1).

***Habitat suitability model*.—**Of the 126 geo-referenced snake observations, 92 were sufficiently precise to contribute to the habitat model. Boa presence was associated with low elevations (< 150 m) and non-stony soils, and vegetation communities with tall shrubs or short trees (5–10 m tall) with a high degree of vegetation continuity (e.g., mangrove, drought deciduous forest, thicket/shrub). Snakes were disproportionately often found in low-density residential areas and the grounds of hotels and resorts, presumably because of the increased likelihood of human contact and detection in these areas. The discriminatory power of the habitat model was high (AUC = 0.85).

***Microhabitat assessment*.—**We conducted micro-habitat assessments at 24 home range locations and 24 random locations. Shrubs were present in all plots and vegetation was usually continuous or nearly continuous. Herbaceous plants, cacti, succulents, trees, and various types of retreats were all common in both home range and range-wide plots. Home ranges had fewer bromeliads, agaves, rocks, and tree cavities, stumps and logs, but more brush and anthropogenic debris and termitaria. Plots could be assigned to the correct group (home range or random) with 67% accuracy based on the microhabitat features present.

***Habitat delineation*.—**We adopted the habitat model as an initial screening for whether mitigation was necessary for a proposed development. We decided that any areas with a > 50% relative probability of occurrence within the distributional range of the Virgin Islands Boa would require a further investigation of habitat within the site.

Based on literature review and the microhabitat assessment, we identified key measurable habitat characteristics as being vegetation community, location of large trees, percentage canopy cover, degree of tree limb interdigitation, prey base, and refugia density. The minimum requirement for a patch of habitat to be considered viable boa habitat is ≥ 900 m^2 (Peter Tolson, pers. comm.) of complex interdigitated habitat composed of dry forest or woodland, mangrove, mixed dry shrubland, thicket/scrub, or a mixture of these vegetation communities (as defined in Thomas and Devine 2005). Unacceptable habitat has less than 75% canopy cover, as measured with line-point transect sampling using a densitometer. The boundary of a habitat patch is determined to be where percentage canopy cover abruptly decreases.

The delineation protocol integrates the mapping of key habitat characteristics with quantitative assessment, resulting in a relative ‘ranking’ of habitat clumps within a site. The location and extent of the vegetation communities within a given location is mapped using GIS, along with the location of large trees (signifying mature forested habitat) and significant refugia. Distance between patches and presence or potential of linkages between patches, as well as relative prey and refugia densities, provide weight for prioritizing multiple patches within the same site.

The habitat model and delineation protocol was first used to scale back a condominium development (Erik Miles and Gary Ray, upubl.data). The site was within the range of the Virgin Islands Boa, and the habitat suitability model indicated that portions of the site fell within a 60% or greater relative probability of tree boa presence. Habitat delineation surveys indicated that the site contained three distinct patches of suitable habitat. Pathch #1 contained mature native dry forest habitat that was 81% interdigitated, and ranked second in relative prey density and third in number of refugia and trees > 15 cm diameter at breast height. Patch #2 was composed of mature native dry woodland with 76% interdigitation and ranked first in number of large trees and second in refugia and prey density. Patch #3 comprised a mixture of mature native woodland and non-native shrubs with 64% interdigitation. This patch ranked first in both prey and refugia density, and second in number of trees. The composition and structure of patch #3, which had more open, scrubby vegetation than the other two patches, was determined to be less optimal for boas but could be improved with efforts to replace non-native vegetation with native trees.

As a result of the habitat surveys, the developer scaled back the project to retain patches #1 and 3, and agreed to plant more trees in patch #3 to improve interdigitation and to establish habitat corridors between the patches and throughout the site. It should be noted that no live boas were observed during the habitat surveys (Erik Miles, pers. comm.), although one was dislodged during the first week of vegetation clearance (R. Platenberg, pers. obs.).

DISCUSSION

Despite the challenges in obtaining good quality habitat information for the Virgin Islands Boa, we were able to implement some measures to promote recovery and achieve positive results. The opportunistic observations we used were easy to obtain and a small amount of extra effort (about 1 month) was needed to verify and geo-reference the observations, conduct the habitat assessments, and construct the habitat model. We would recommend this approach for situations where managers have limited time and resources for a more comprehensive study, or when issues of land access or detectability make such studies impractical. Even in "data deficient" situations, there is generally some data available, and further development of methods for making sound inference from limited data would help managers implement primary conservation action in many urgent situations.

Although *E. granti* was designated as an endangered species in 1979, little action has been taken to promote recovery of this species in the USVI. The recovery plan mandated a captive breeding program and evaluation of potential sites for release and reintroduction of the boa within its historical range (USFWS 1986), and a captive breeding program was initiated in 1986 by the Toledo Zoological Society in cooperation with the USFWS, the Puerto Rican Department of Natural and Environmental Resources, and DFW (Tolson 1989). The high densities of boas on Puerto Rico's Cayo Diablo support the assumption that the most suitable sites are uninhabited, predator-free islands with substantial dry forest, and in response, captive-bred boas were released onto such an island off Puerto Rico. A suitable offshore cay within the USVI was selected and captive-bred and DFW-confiscated boas were introduced. This population has increased to the point of having reached the island's carrying capacity (Tolson, unpubl. data). However, no additional release sites in the USVI have been identified; potential island sites are currently unsuitable due to the presence of rats (Tolson, unpubl. data). The DFW is addressing this by eradicating rats from these insular reserves, which also benefits breeding seabird colonies (Pierce 2003), but in the meantime habitat loss and presumably population declines continue on St. Thomas. While island populations offer some advantages in terms of security from development and high quality habitat, the largest numbers of boas are likely on the mainland of St. Thomas (Platenberg and Boulon 2006). It is surprising and overdue that, in developing our habitat protection procedure, we have taken some of the first steps towards the protection of the Virgin Islands Boa on the main island.

Without a reliable way to determine presence of an endangered species in a particular area, it is difficult to demonstrate a violation under the ESA or other regulation. Repeated surveys on proposed development sites generally do not reveal the presence of the boa, and the developer attests that the site is free of the species and permission to build is granted unconditionally. Hence, it is difficult to compel mitigation in cases where high quality habitat is slated for destruction. In shifting the focus in endangered species preservation away from individual animals and onto habitat, it becomes possible to strategically assess and protect key areas important for the species concerned. We therefore used the concept of wetlands delineation to develop the tools described. Wetlands are protected in the USVI and prior to the development of any architectural plans for a site, they must be delineated and set aside, along with a 25 foot buffer for protection from disturbance. If endangered species habitat could be treated the same way, real progress could be made towards species recovery in the USVI.

Unrestricted and unmitigated development within the range of the boa on St. Thomas has been accelerating in recent years. Most of these projects, such as private housing, receive no environmental review at all, and therefore no conditions to protect habitat. The only requirement on the landowner is to hand-clear vegetation to avoid direct mortality to the snakes, but this is often ignored and unenforced, and often even the landowner is unaware of this requirement. Using the tools developed, areas slated for development can be assessed for likely impact to boa habitat and by extension to the snakes themselves. The multi-step process calls for first determining if the site is within the range of the boa, then if the site is within a location that has a high probability for boa presence, using the habitat suitability model. If these are both true, then the habitat on the site must be delineated using the protocol to determine location, extent, and linkage corridors and an appropriate mitigation measure must be identified. This process has been applied several times in major developments on St. Thomas, with varying success. Without a legal mechanism to require and enforce these mitigative measures, however, developers have been slow to accept this process. Efforts are currently underway to implement a governmental policy based on the habitat model that also includes compliance mechanisms.

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LITERATURE CITED

Chandler, C.R., and P.J. Tolson. 1990. Habitat use by a boid snake, *Epicrates monensis*, and its anoline prey, *Anolis cristatellus*. Journal of Herpetology 24:151–157.

Elith, J., C.H. Graham, R.P. Anderson, M. Dudik, S. Ferrier, A. Guisan, R.J. Hijmans, F. Huettmann, J.R. Leathwick, A. Lehmann, J. Li, L.G. Lohmann, B.A. Loiselle, G. Manion, C. Moritz, M. Nakamura, Y. Nakazwa, J.M. Overton, A.T. Peterson, S.J. Phillips, K. Richardson, R. Scachetti-Pereira, R.E. Schapire, J. Soberón, S. Williams, M.S. Wisz, and N.E. Zimmermann. 2006. Novel methods improve prediction of species' distributions from occurrence data. Ecography 29:129–151.

Elith, J., and J. Leathwick. 2007. Predicting species distributions from museum and herbarium records using multiresponse models fitted with multivariate adaptive regression splines. Diversity and Distributions 13:265–275.

Frey, J.K. 2006. Inferring species distributions in the absence of occurrence records: An example considering Wolverine (*Gulo gulo*) and Canada Lynx (*Lynx canadensis*) in New Mexico. Biological Conservation 130:16–24.

Graham, C.H., S. Ferrier, F. Huettman, C. Moritz, and A.T. Peterson. 2004. New developments in museum-based informatics and applications in biodiversity analysis. Trends in Ecology and Evolution 19:497–503.

Grant, C. 1932. Herpetology of Tortola; notes on Anegada and Virgin Gorda, British Virgin Islands. Journal of the Department of Agriculture Puerto Rico 16:339–346.

Harvey, D.S., and R.J. Platenberg. 2009. Predicting habitat use from opportunistic observations: a case study of the Virgin Islands Tree Boa (*Epicrates granti*). Herpetological Journal 19:111-118.

Lütolf, M., F. Kienast, and A. Guisan. 2006. The ghost of past species occurrences: improving distribution models for presence-only data. Journal of Applied Ecology 43:802–815.

Mayer, G.C., and J.D. Lazell. 1988. Distributional records for reptiles and amphibians from the Puerto Rican Bank. Herpetological Review 19:23–24.

Nellis, D.W., R.L. Norton, and W.P. MacLean. 1983. On the biogeography of the Virgin Islands Boa, *Epicrates monensis granti*. Journal of Herpetology 17:413–417.

Pierce, J.J. 2003. Eradication of non-native rats from Virgin Islands offshore cays. Environmental Assessment Report, Wildlife Restoration Project W-11. Division of Fish and Wildlife, St. Thomas, United States Virgin Islands. 23 p.

Platenberg, R.J., and R.H. Boulon, Jr. 2006. Conservation status of reptiles and amphibians in the U.S. Virgin Islands. Applied Herpetology 3:215–235.

Roberts, R.L., P.F. Donald, and I.J. Fisher. 2005. Worldbirds: developing a web-based data collection system for the global monitoring of bird distribution and abundance. Biodiversity and Conservation 14:2807–2820.

Sheplan, B.R., and A. Schwartz. 1974. Hispaniolan boas of the genus *Epicrates* (Serpentes, Boidae) and their Antillean relationships. Annales of the Carnegie Museum 45:57–143.

Thomas, T., and B. Devine. 2005. Island Peak to Coral Reef: A Field Guide to the Plant and Marine Communities of the Virgin Islands. University of the Virgin Islands, St. Thomas, United States Virgin Islands.

Thompson, W.L. 2004. Sampling Rare or Elusive Species: Concepts, Designs, and Techniques for Estimating Population Parameters. Thompson, W.L. (Ed.). Island Press, Washington, D.C., USA.

Tolson, P.J. 1988. Critical habitat, predator pressures, and the management of *Epicrates monensis* (Serpentes: Boidae) on the Puerto Rican Bank: a multivariate analysis. United States Department of Agriculture, Forest Service General Technical Report RM-166.

Tolson, P.J. 1989. Breeding the Virgin Islands Boa *Epicrates monensis granti* at the Toledo Zoological Gardens. International Zoo Yearbook 28:163–167.

Tolson, P.J., M.A. Garcia, and C.L. Ellsworth. 2007. Habitat use by the Mona Boa (*Epicrates monensis monensis*) on the Isla Mona, West Indies. Pp. 119–126 *In* Biology of the Boas and Pythons. Henderson, R.W., and R. Powell (Eds.). Eagle Mountain Publishing, Eagle Mountain, Utah, USA.

United States Fish and Wildlife Service. 1980. Status of Virgin Islands boa clarified. Endangered Species Technical Bulletin 5:12.

United States Fish and Wildlife Service. 1986. Virgin Islands Tree Boa Recovery Plan, U.S. Fish and Wildlife Service, Atlanta, Georgia, USA. 26 p.

Wunderle, J.M., Jr., J.E. Mercado, B. Parresol, and E. Terranova. 2004. Spatial ecology of Puerto Rican Boas (*Epicrates inornatus*) in a hurricane impacted forest. Biotropica 36:555–571.

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