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BODY SIZE, DEMOGRAPHY, AND BODY CONDITION IN UTILA SPINY-TAILED IGUANAS, *CTENOSAURA BAKERI*

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***Abstract.*—Utila Spiny-tailed Iguanas, *Ctenosaura bakeri*, are listed as Critically Endangered by the IUCN Redlist Assessment and are listed under Appendix II of CITES. This species occupies a portion of Utila, a small continental island located off the northern coast of Honduras, in the Bay Islands chain. Habitat destruction and overharvesting for consumption and the pet trade are among the top threats facing this species. Though first described in 1901 (Stejneger) and currently the focus of a local conservation program, little is known concerning that basic biology of this species. Combining data from six years we examined body size, sexual size dimorphism, and changes in demography and body condition over the study period. Our results indicate that males are larger and heavier than females on average, and have a longer tail for a given snout-vent length, as is the case with most iguanas. Over the study period we found an increase in the ratio of males to females, suggesting that female biased hunting pressure is increasing. This is consistent with an increase in the human population size and a preference for consuming gravid females. The body condition of both males and females declined over the duration of the study, which is suggestive of a decrease in habitat quality. These results indicate that the situation for this endangered species is becoming increasingly threatening. Conservation measures should focus on alleviating these threats through increased law enforcement, outreach, and education.**

Key Words.—*bakeri*; *Ctenosaura*; endangered; growth; Iguana; size; Spiny-tailed; Utila

INTRODUCTION

Utila Spiny-tailed Iguanas, *Ctenosaura bakeri* (Stejneger 1901), are endemic to the island of Utila (de Queiroz 1987), the most westerly of the Bay Islands, located off the Caribbean versant of Honduras (McCranie et al. 2005). *Ctenosaura bakeri* is part of the *C. palearis* clade (*C. palearis*, *C. oedirhina*, and *C. melanosterna*; Pasachnik et al. 2010). This clade is a recent radiation of narrow range insular and mainland endemics, occurring in Honduras and Guatemala. *Ctenosaura bakeri* is distinguished from similar species based on scutellation of the tail, dewlap size, and dorsal crest coloration (Bailey 1928; de Queiroz 1987, 1990). More recent molecular analyses also support the differentiation of this species (Pasachnik et al. 2010).

In recent years, Utila, and the Bay Islands in general, have experienced extensive development associated with the tourist industry, threatening native species through habitat destruction, the introduction of invasive mammal and plants, and pollution. Specifically this development has had a dramatic effect on beach and mangrove areas, as these are the most residentially desirable. Unfortunately these areas are also the nesting grounds and daily use areas for this species. Additionally, the harvesting of *C. bakeri* for human consumption and the pet trade is increasing as the human population size on Utila continues to grow. More specifically the individuals moving to Utila are coming from the adjacent mainland where iguana meat is a more common component of the diet. Likewise jobs are scarce on this small island, and with an increase in overall poverty, people are relying more heavily on wild protein sources. Thus there is an increased demand for this endangered species, and hunting persists due to the lack of active means of protection and enforcement.

The Honduran government designated *C. bakeri* as in need of protection in 1994 (IUCN. 2012. IUCN Red List of Threatened Species, Version 2012.2. Available from www.iucnredlist.org [Accessed 01 September 2012). In 2010 the International Union for the Conservation of Nature (IUCN) re-evaluated the status of *C. bakeri*, concluding that it should remain listed as Critically Endangered (IUCN. 2012. *op. cit.*). This listing is due primarily to its limited geographic range, increased habitat modification and destruction, and overharvesting of adults and eggs. Also in 2010 the Convention on International Trade in Endangered Species (CITES) listed *C. bakeri* under Appendix II due to the presence of this species and closely related species in the pet trade (Pasachnik and Ariano 2010).

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FIGURE 1. Adult male *Ctenosaura bakeri* with bead tags. (Photographed by Andrea Martinez).

Ctenosaura bakeri is a highly threatened species that has been the focus of many conservation initiatives, including a captive breeding program and an outreach and education program for schools and the community in general. Though these efforts have made great progress in raising awareness and in introducing additional individuals into the natural population, little is known concerning the basic biology of this species, outside of limited information on demography and threats (Köhler 1995; Köhler 1998; Gutsche and Streich 2009). For the first time we evaluate individuals and populations from the entirety of the island. Specifically our objectives were to examine: (1) sexual size dimorphism across the island; (2) differences in demography throughout the island and across the study period; and (3) differences in body condition index across sites and years. This information is vital in understanding the status of the species and in the construction of a comprehensive conservation and management plan.

MATERIALS AND METHODS

Study site.—Utila is the smallest and westernmost of the Bay Islands, located approximately 32 km NNW of the mainland city of La Ceiba (McCranie et al. 2005). It differs from the other Bay Islands (Roatan and Guanaja) in that it sits on the Central American continental shelf. The island is divided into a western and eastern portion by the presence of a north-south canal. Though Utila encompasses 41 km^2, the area of occupancy of *C. bakeri* is thought to be approximately 10 km^2 (IUCN. 2012. *Op. cit.*). Historically *C. bakeri* was encountered primarily in mangrove habitats where they seek refuge in the hollows of larger trees (Gutsche 2005). This habitat preference accounts for the reduced area of occupancy. Recently, however, *C. bakeri* has been observed in a variety of habitats, though not necessarily in high densities. This is thought to be at least in part due to the vast destruction of the mangrove habitat, displacing the species (Pasachnik 2006; Pasachnik et al. 2009).

The climate of Utila is tropical. There is one distinct rainy season, lasting roughly from October to January. Average annual rainfall for Utila is 254 cm. The average temperatures range is 24–30.9° C (Servicio Nacional Metereológico de Roatán, Honduras 1990–2011, unpubl. data). Utila consists primarily of karst limestone platforms, but supports a variety of habitats including beach scrub and coconut groves, dry savannahs, mangroves, marshes and semi-deciduous oak forests. There is very little change in elevation across the island, with the highest point being Pumpkin Hill at 74 m.

The eastern side of the island has received more attention from researchers in the past (Köhler 1995; Gutsche 2005, 2006; Gutsche and Streich 2009; Schulte and Köhler 2010). Thus we focused on some of those sites for comparison; however, we included sites from the entire island to ensure we were evaluating the species as a whole, and including sites with differing levels of poaching and habitat destruction. All of the sites evaluated in 2010 and 2011 were those evaluated in 2005 and 2007; however, additional sites were also evaluated during 2005–2007. Genetic analysis indicates that the species is panmictic across the island (Pasachnik et al. 2010). Because this is an endangered species, we do not include references to specific localities, but legitimate researchers may obtain this information by contacting the authors.

Data collection.—We opportunistically captured 722 *Ctenosaura bakeri* on Utila, Bay Islands, Honduras during the summer of 2005, the spring and summer of 2006, the summer of 2007, the fall of 2010, and the spring and summer of 2011. We made captures across the entirety of the island. We captured iguanas using noosing poles, nets, and hand capture. Because two species of ctenosaurs inhabit Utila, we evaluated all individuals morphologically for three characters that are typically used to distinguish between *C. bakeri* and *C. similis* (Köhler 2003; McCranie et al. 2005): (1) color: *C. bakeri* is blue to light gray to black, *C. similis* is a light brownish gray (green on juveniles); (2) pattern: *C. bakeri* may have indistinct crossbands present on the dorsum, *C. similis* has distinct crossbands with a pale center along the dorsomedial line; and (3) scalation: *C. bakeri* has one row of intercalary scales between the third and fifth tail whorls, *C. similis* has two intercalary scale rows.

Upon capture we took a digital photograph of each individual (Fig. 1). We measured snout-vent length (SVL), tail length (TL), and total body mass (BM). We measured SVL and TL to the nearest mm using a tape measure, and BM to the nearest 0.5 g using hanging Pesola scales. We determined sex on the basis of external morphology and cloacal probing. Following Gutsche and Streich (2009), we considered individuals with SVL ≥ 150 mm to be adults for both sexes.

We gave each individual a unique mark to avoid re-sampling over time. From 2005–2007 we used a unique set of toe clips for permanent identification. During 2010 and 2011 we placed bead tags on the nape (Rodda et al. 1998; Fig. 1) and used passive integrated transponders (PIT) tags for permanent identification of adults, and toe clips for hatchlings and small subadults. We used non-toxic paint to temporarily and quickly identify previously captured individuals during the entire study. Our processing procedure lasted no more than 15 min, and we released all individuals at the site of capture upon completion of data collection.

***Statistical analyses*.—**For all analyses we grouped data from 2005, 2006, and 2007 into sampling period one and data from 2010 and 2011 into sampling period two, unless otherwise indicated. We pooled data across years within a given sampling period after first confirming there was no significant difference among years within each sampling period using ANOVA and post hoc Tukey-Kramer pairwise comparisons. We tested for sexual size dimorphism (SSD) in adult *C. bakeri* over the entire study period by comparing SVL and mass separately between the sexes using ANOVAs. We also examined SSD in the relationship between tail length (using only adults with complete tails) and SVL and the relationship between mass and SVL over the entire study period using ANCOVA. Tail length, mass, and SVL were log transformed to linearize the relationships.

We compared SVL and mass for adult males and females between the two sampling periods using ANOVA to determine if average adult size had shifted through time. To test for changes in size class frequency between sexes and between the two sampling periods, we used a Chi-square test of independence. We compared the adult sex ratio between sampling periods using Chi-square test of independence. In addition, we compared sex ratio between 2006 and 2011, the two years with the greatest sample size, using Chi-square test of independence to reduce the potential effect of sample bias.

To test for changes in relative fitness of adult lizards, we compared body condition index (BCI) between the two sampling periods using a t-test for each sex separately. BCI was calculated as the residual of the relationship between the log-transformed variables, mass and SVL, for each sex separately. For all BCI analyses, we calculated BCI based solely on the individuals included in the particular analysis, not the entire dataset. To test for site effects on relative fitness, we compared BCI among study sites using ANOVA for each sex separately. We compared tail break frequencies between sexes and study periods for each sex separately using t-tests. We report all averages as ± 1 SD. We used JMP 7.0 (SAS Institute, Durham, North Carolina, USA) for all statistical analysis and α = 0.05 for all tests.

TABLE 1. Average snout-vent length and mass including standard deviation (SD) of male and female *Ctenosaura bakeri* on Utila, Bay Islands, Honduras.

	SVL (mm)	Mass (g)
Male	215.96 ± 2.01 SD	349.66 ± 10.02 SD
Female	185.40 ± 1.07 SD	206.22 ± 4.19 SD

RESULTS

Of the 722 individuals we captured across the study period, 308 were adult males, 238 adult females, 133 juveniles, and 43 adults for which we could not determine sex. Adult males were significantly longer (Table 1; $F_{1,521}$ = 151.96, P < 0.001) and heavier (Table 1; $F_{1,520}$ = 139.62, P < 0.001) than adult females. The relationship between mass and SVL of adult males and females was not significantly different (Fig. 2, $F_{1,1}$ = 0.28, P = 0.60), with the assumption of homogenous slopes met ($F_{1,1}$ = 1.08, P = 0.30). However, adult males had significantly longer tails at a given SVL than females (slopes: $F_{1,1}$ = 0.68, P = 0.41; intercepts: $F_{1,1}$ = 17.52, P < 0.001; Fig. 2).

The adult sex ratio varied significantly between 2006 (1.04:1) and 2011 (1.67:1; χ^2 = 5.77, P = 0.016), the years with the largest sample size, with an increase in the proportion of males to females. There was no significant difference in sex ratio from period one (1.15:1) to period two (1.65:1; χ^2 = 3.78, P = 0.052), although the trend

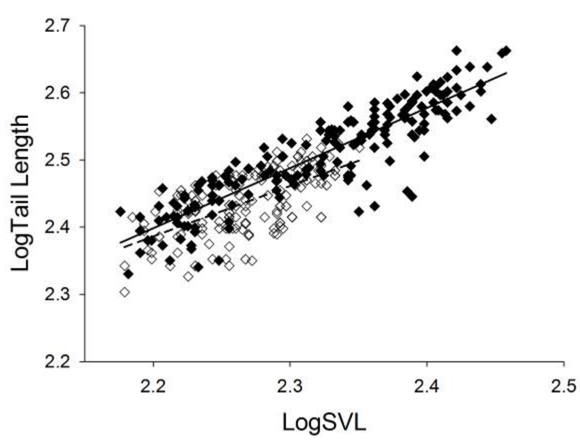

FIGURE 2. Relationship between log-transformed tail length and log-transformed snout-vent length (SVL) for adult male (solid diamonds; solid line) and female (open diamonds; dashed line) *Ctenosaura bakeri* from the island of Utila, Bay Islands, off the Caribbean versant of Honduras.

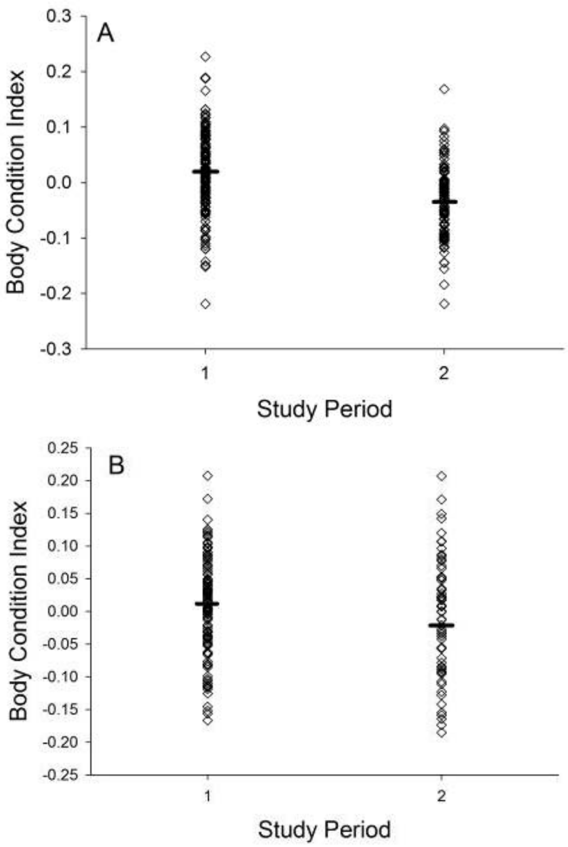

FIGURE 3. Body condition index for male (A) and female (B) *Ctenosaura bakeri* from the island of Utila, Bay Islands, Honduras, for the two study periods (1: 2005–2007 and 2: 2010–2011). Solid black bars indicate respective average values.

follows the aforementioned pattern. The proportion of juveniles captured in study period one (17.7%) did not vary significantly from study period two (20.04%; χ^2 = 0.76, P = 0.431).

There was a higher BCI in sampling period one than sampling period two for males (t = 5.78, P < 0.001; Fig 3a) and females (t = 2.16, P = 0.035; Fig. 3b). There was no significant effect of location on BCI of males in study period one ($F_{11,174}$ = 1.27, P = 0.246) or study period two ($F_{5,101}$ = 1.95, P = 0.092). There was a significant effect of location on BCI of females in study period one ($F_{10,147}$ = 3.00, P = 0.002) but not study period two ($F_{5,55}$ = 1.74, P = 0.141). In study period one, BCI of females was significantly higher, likely due to supplemental feeding at one location, which was not studied during period two. There was no significant difference in BCI across SVL for adult males ($F_{1,297}$ = 0.017, P = 0.896). There was no significant difference in BCI across SVL for adult females ($F_{1,221}$ = 0.001, P = 0.995).

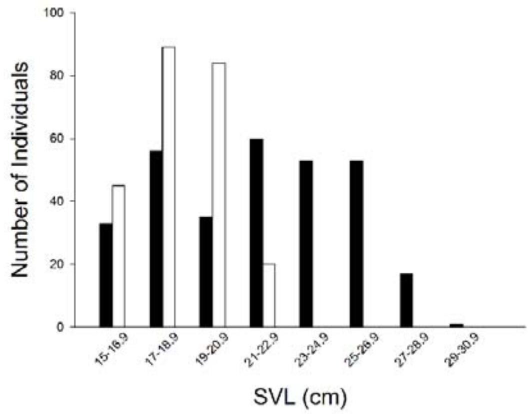

FIGURE 4. Frequency distribution of adult male (black bars) and female (white bars) *Ctenosaura bakeri* from the island of Utila, Bay Islands, Honduras.

There were significantly more males captured in larger size classes than females (Fig. 4; χ^2 = 167.31, P < 0.001). There was no difference in the number of individuals among size class from study period one and study period two in males (χ^2= 7.86, P = 0.346) or females (χ^2 = 4.33, P = 0.228). The adult tail break frequency (TBF) did not vary between study periods (χ^2 = 2.104, P = 0.1470) or between adult males (37.3%) and females (39.1%; χ^2 = 0.19, P = 0.667). There was a significant increase in adult male tail break frequency from period one (31.4%) to period two (54.1%; χ^2 = 7.82, P = 0.0052); however, there was no significant shift in tail break frequency in adult females from period one (40.5%) to period two (36.4%; χ^2 = 0.34, P = 0.561).

DISCUSSION

Ctenosaura bakeri is a narrow range endemic that is threatened most heavily by habitat destruction and alteration and by poaching for human consumption. Given that this species has an incredibly small area of occupancy, monitoring how increases in these threats affect the species is important for conservation. Additionally having a baseline understanding of the biology and demography of the species for future comparison is important.

Our morphometric analyses indicate that adult males are longer and heavier than females, which is consistent with findings from closely related species (Pasachnik in press; Pasachnik et al. 2012) as well as within the Iguaninae subfamily in general (Wikelski and Trillmich 1997; Beovides-Cases and Mancina 2006) and *C. bakeri* specifically from 1999–2003 (Gutsche and Streich 2009). However, for any given SVL, there is no difference between males and females in terms of mass. Though this is consistent with the relationship in other iguanas, it is inconsistent with the results found by

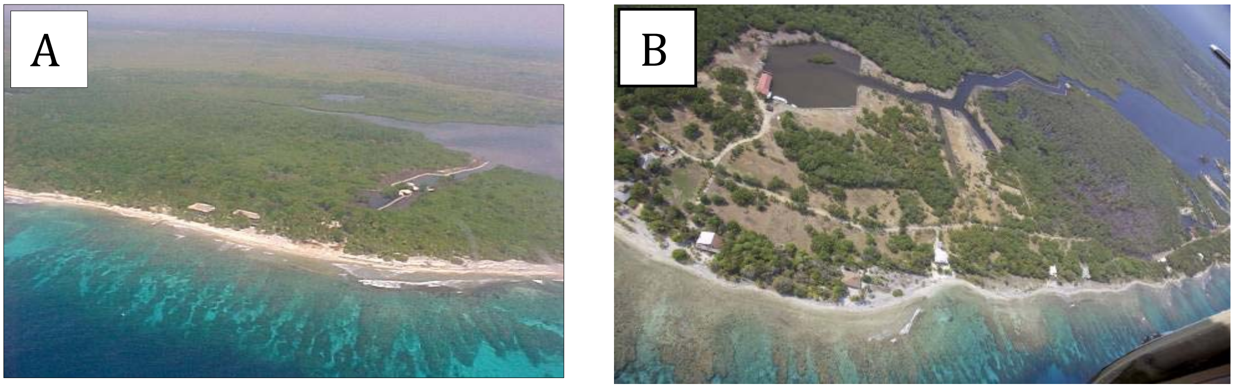

FIGURE 5. Example of the habitat destruction occurring on Utila, Bay Islands, Honduras. The left photograph (A), which was taken before 2001 (date unknown), was obtained from the Utila Iguana Research and Breeding Station. The right photograph (B) was taken in 2012 by Steve Clayson on a LighHawk flight. Note the small pond above the canal in both photos for comparison.

Gutsche and Streich (2009) who reported females as heavier than males for a given SVL. As is also common among lizards and found in this study, adult males have a longer tails than females for any given SVL, potentially due to the presence of hemipenes (King 1989; Barbadillo et al. 1995).

The increase in the ratio of males to females over our two sampling periods, as well as in comparison to the female dominated sex ratio of 0.83 male:1 female found by Gutsche and Streich from 1999–2003 (2009), suggests a consistent decrease of females from 1999 to 2011, where the sex ratio in 2006 was 1.04m:1f and then in 2011 was 1.67m:1f. These findings support the idea that there is a female biased hunting pressure. Through discussions with people on the adjacent mainland, we found that there is a preference for gravid females by hunters. The increased amount of protein and the fact that the eggs are considered medicinal, makes females more desirable than males (Pasachnik et al. unpubl. data). Although poaching has been reported to occur only on the east side of the island (Gutsche and Streich 2009), we have observed poaching throughout the entire island. In addition, our observed sex ratios are more male biased than those observed in other stable iguanid lizard populations. For example, Fitch and Henderson (1977) found a ratio of 0.63m:1f in *C. similis*, Munoz et al. (2003) found 0.40m:1f for *Iguana iguana* in Colombia, and Pasachnik (in press) found a ratio of 0.61m:1f for *C. oedirhina*. This reduction in females has severe repercussions in terms of yearly reproductive output, population structure, and could have a dramatic effect on overall stability of the species as has been observed in other iguanas (e.g., Faria et al. 2010).

Though there was no significant difference in the percentage of juveniles captured over the study periods, the percentage of juveniles captured during this study was lower relative to what was found from 1999–2003 (Gutsche and Streich 2009). Because the capture of juveniles requires a different method of observation and capture than that of adults, it is difficult to draw conclusions in terms of the population structure. However, because a decrease in juveniles is consistent with the observed decrease in the number of females relative to males, further study should be done into this aspect of the demography of the species. Likewise the presence of invasive mammals, in particular, cats, may be having an increasingly negative effect on juveniles (e.g., Iverson 1978; Laurie 1983). Although there are cats, dogs, and rats on the island that most likely pose some threat to this species, we do not feel this is a primary concern, particularly for the adults. In addition these exotic predators have not been observed in the study sites to date, but we recognize that this is a potential threat that needs to be monitored closely over the coming years. Our baseline data should aid in this monitoring.

There was no significant difference in TBF by sex or study period, however male TBF did increase with time. This result could indicate an increase in predation events or attempted poaching events. Alternatively, increased TBF in males may be the result of increased territoriality (Knapp 2000), which could result from decreased habitat quality.

Body condition decreased significantly over time in both males and females. Though weather can have a significant effect on body condition (e.g., Sperry and Weatherhead 2008) no notable weather events (e.g., droughts) were recorded during this study. Season can also have an effect on body condition within a single year due to reproductive condition, activity level, and water availability (e.g., Benabib 1994). However, the seasons represented in the two sampling periods are equivalent and therefore seasonal effects are not likely a factor in this study. Thus we feel our results are suggestive of a decrease in food availability correlated with the decrease in habitat quality. SAP spent time in the field during both sampling periods and was taken aback by the noticeably thin appearance of individuals throughout the island in 2011. Though sites were evaluated with differing levels of destruction there were no observed differences in BCI among sites, suggesting that habitat quality is decreasing across the island.

Utila is well known as a backpackers' destination as well as for its diving, and tourism associated both has been increasing over the past two decades. With these increases come development and the destruction of optimal *C. bakeri* habitat, whether it is the nesting beaches or the daily use mangrove forests (see Fig. 5 for a photographic example). Likewise a recent influx of people from the mainland seeking a better quality of life and employment also has increased the amount of development and, in turn, habitat destruction and hunting pressure of the iguanas.

Frequency of individuals within each adult size class did not vary significantly between sample periods in either males or females. In addition, there was no difference in BCI relative to SVL in males and females. These results indicate that those factors, whether they be hunting pressure and/or habitat destruction, are resulting in a decline in females relative to males. Additionally the decrease in BCI in both males and females is affecting all adult size classes equally.

Our results elucidate a progressively threatening situation for this endangered species. With an increase in the number of people establishing themselves on Utila from mainland Central America, and an increase in poverty due to a lack of jobs, poaching of iguanas is becoming increasingly prevalent. In addition vital habitat is being destroyed for local development related to this migration from the mainland and for development of the tourism industry. Unfortunately most development targets mangrove forests and beachfront habitat, two of the most important ecosystems for the daily activities and nesting of this species. We have demonstrated a dramatic change in both the condition of the species and in the population structure over just six years. Management and conservation initiatives need to address these issues immediately if this species is to survive into the future.

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LITERATURE CITED

Bailey, J.W. 1928. A revision of the lizards of the genus Ctenosaura. Proceedings of the US National Museum 73:1–69.

Barbadillo, L.J., D. Bauwens, F. Barahona, M.J. Sánchez Herráiz. 1995. Sexual differences in caudal morphology and its relation to tail autotomy in lacertid lizards. Journal of Zoology 236:83–93.

Benabib, M. 1994. Reproduction and lipid utilization of tropical populations of *Sceloporus variabilis*. Herpetological Monographs 8:160–180.

Beovides-Cases, K., and C.A. Mancina. 2006. Natural history and morphology of the Cuban Iguana (*Cyclura nubila* Gray, 1831) in Cayo Siju, Cuba. Animal Biodiversity and Conservation 29:1–8.

de Queiroz, K. 1987. A new spiny-tailed iguana from Honduras, with comments on relationships within Ctenosaura (Squamata: Iguania). Copeia 1987:892–902.

de Queiroz, K. 1990. *Ctenosaura bakeri* Stejneger, Utila Island Spiny-tailed Iguana. Catalogue of American Amphibians and Reptiles 465:1–2.

Faria, C.M.A., E. Zarza, V.H. Reynoso, and B.C. Emerson. 2010. Predominance of single paternity in the Black Spiny-tailed Iguana: conservation genetic concerns for female-biased hunting. Conservation Genetics 11:1645–1652.

Fitch, H.S., and R.W. Henderson. 1977. Age and sex differences on the Ctenosaura (*Ctenosaura similis*). Contributions in Biology and Geology, Milwaukee Public Museum 11:1–11.

Gutsche, A. 2005. Distribution and habitat utilization of *Ctenosaura bakeri* on Utila. Iguana 12:143–151.

Gutsche, A. 2006. Population structure and reproduction in *Ctenosaura bakeri* on Isla de Utila. Iguana 13:108–115.

Gutsche, A., and W.J. Streich. 2009. Demography and endangerment of the Utila Island Spiny-tailed Iguana, *Ctenosaura bakeri*. Journal of Herpetology 43:105–113.

Iverson, J.B. 1978. The impact of feral cats and dogs on populations of West Indian Rock Iguana, *Cyclura carinata*. Biological Conservation 14:63–73.

King, B.R. 1989. Sexual dimorphism in snake tail length: sexual selection, natural selection, or morphological constraint? Biological Journal of the Linnean Society 38:133–154.

Köhler, G. 1995. Freilanduntersuchungen zur Morphologie und kologie von *Ctenosaura bakeri* und *C. oedirhina* auf den Islas de la Bahia, Honduras, mit Bemerkungen zur Schutzproblematik. Salamandra 31:93–106.

Köhler, G. 1998. Das Schutz-und Forschungsprojekt Utila-Schwarzleguan. Natur und Museum 128:44–49.

Köhler, G. 2003. The Reptiles of Central America. Herpeton, Verlag Elke Köhler, Offenbach, Germany.

Knapp, C.R. 2000. Home range and intraspecific interactions of a translocated iguana population (*Cyclura cychlura inornata* Barbour and Noble). Caribbean Journal of Science 36:250–257.

Laurie, A.W. 1983. Marine iguanas in Galapagos. Oryx 17:18–25.

McCranie, J.R., L.D. Wilson, and G. Köhler. 2005. Amphibians and Reptiles of the Bay Islands and Cayos Cochinos, Honduras. Bibliomania, Salt Lake City, Utah, USA.

Munoz, E.M., A.M. Ortega, B.C. Bock, and V.P. Paez, 2003. Demographia y ecologia de anidacion de la Iguana Verde, *Iguana iguana* (Squamata: Iguanidae), en dos poblaciones explotadas en la Depression Momposina, Columbia. Revista de Biologia Tropical 52:229–239.

Pasachnik, S.A. 2006. Ctenosaurs of Honduras: notes from the field. Iguana 13:265–271.

Pasachnik, S.A. In press. Growth, reproduction and diet of Roatan Spiny-tailed Iguanas, *Ctenosaura oedirhina*. Herpetological Biology and Conservation.

Pasachnik, S.A., and D. Ariano. 2010. CITES Appendix II listing of the Ctenosaura palearis clade. Reptiles and Amphibians Conservation and Natural History 17:136–139.

Pasachnik, S.A., B.M. Fitzpatrick, and A.C. Echternacht. 2010. Gene trees, species, and species trees in the *Ctenosaura palearis* complex. Conservation Genetics 11:1767–1781.

Pasachnik, S.A., B.M. Fitzpatrick, T.J. Near, and A.C. Echternacht. 2009. Gene flow between an endangered endemic iguana, and its wide spread relative, on the island of Utila, Honduras: When is hybridization a threat? Conservation Genetics 10:1247–1254.

Pasachnik, S.A., C.E. Montgomery, L.E. Ruyle, J.P. Corneil, and E.E. Antunez. 2012. Morphological and demographic analyses of *Ctenosaura melanosterna* across its range: implications for population level management. Herpetological Biology and Conservation 7:399–406.

Rodda, G.H., B.C. Bock, G.M. Burghardt, and S.A. Rand. 1988. Techniques for identifying individual lizards at a distance reveal influences of handling. Copeia 1988:905–913.

Schulte, U., and G. Köhler. 2010. Microhabitat selection in the Spiny-tailed Iguana *Ctenosaura bakeri* on Utila Island, Honduras. Salamandra 46:141–146.

Sperry, J.H., and P.J. Weatherhead. 2008. Prey-mediated effects of drought on condition and survival of a terrestrial snake. Ecology 89:2770–2776.

Stejneger, L. 1901. On a new species of spiny-tailed iguana from Utila Island, Honduras. Proceedings of the US National Museum 23:467–468.

Wikelski, M., and F. Trillmich. 1997. Body size and sexual size dimorphism in marine iguanas fluctuate as a result of opposing natural and sexual selection: an island comparison. Evolution 51:922–936.

STESHA PASACHNIK began her research career as an undergraduate at Earlham College, in Richmond, Indiana, where she received her Bachelor's degree under the mentorship of John Iverson. She completed her Ph.D. from the University of Tennessee researching various aspects of the *Ctenosaura palearis* clade using conservation genetics. After completing her doctorate, she worked as Conservation Director for the Roatan Branch of the Bay Islands Foundation in Honduras. She is now a Postdoctoral Research Associate at the Institute for Conservation Research in San Diego, California. (Photographed by Dennis Baulechner).

CHAD MONTGOMERY is an Assistant Professor in Biology at Truman State University, which is also where he received his B.S. in Biology. Chad received his M.A. thesis degree from the University of Northern Colorado, where he studied clinal variation in Texas Horned Lizards (*Phrynosoma cornutum*). After receiving his M.A., he attended the University of Arkansas to study the effects of foraging mode on life history in Copperheads (*Agkistrodon contortrix*) and Timber Rattlesnakes (*Crotalus horridus*) for his Ph.D. Chad currently conducts research in Central America, including projects on *Ctenosaura* and Boa Constrictor (*Boa constrictor*) on islands off of the north coast of Honduras. (Photographed by John Iverson).

ANDREA M. MARTINEZ received her B.Sc. in Biology from the Universidad Nacional Autonoma de Honduras in 2009. She then began working on the conservation, environmental education, and research of *Ctenosaura bakeri* through the Iguana Research and Breeding Station, a project of the Bay Islands Foundation. She is now one of the founding members of Kanahau Utila Research and Conservation Facility, where she continues her research on *C. bakeri.* (Photographed by Robbie Labanowski).

NARDIAH M. BELAL was an entrepreneur, having two small businesses before starting and now completing her Bachelor's degree in Biology from Cardiff University in 2012. She majored in conservation, land-use, fisheries, and river ecosystems management. During her B.Sc. degree, she completed a voluntary professional training year in Central America where she researched the effects of a degrading natural environment on the health and morphometry of the endangered lizard, *Ctenosaura bakeri*. She has also researched the causes of small-mammal mortality within a trapping protocol, concentrating on the affects that the time between trap checks has on the individual. Additionally, Nardiah has investigated successional ability and habitat preference of river invertebrates in disturbed and unsuitable habitat. She is now beginning a postgraduate course to become a secondary school teacher. (Photographed by Shane Faulkner).

STEVEN M. CLAYSON is a dedicated naturalist who has lived on Utila for many years. He both volunteered and later worked for the Iguana Research and Breeding Station as a Technical Assistant. His experiences led him to open the Kanahau-Utila Research and Conservation Facility. This has allowed him to continue working with *Ctenosaura bakeri.* He hopes in the future to develop nature reserves on Utila. (Photographed by Andrea Martinez).

SHANE FAULKNER is studying for his B.Sc. in Zoology at Cardiff University, Wales, UK. He is currently completing ornithological research of the winter movements and habitat preference of the Grey Wagtail (*Motacilla cinerea*). During his degree, Shane carried out research in Honduras, observing parasite abundance and infestation prevalence of the critically endangered and endemic iguana *Ctenosaura bakeri.* He has also completed research into kleptoparasitism of Herring Gulls *Larus argentatus* and Puffins *Fratercula arctica* on Skomer Island, and entomological population studies of Glow Worms *Lampyridae noctiluca,* focusing on their habitat preferences, mating habits, and orientations to light. Additional research has focused on farming practices and their effects on small mammal populations and work involving various breeding bird surveys and distributions. (Photographed by Nardiah Belal).