

HC216 Population monitoring and ecology of the Hog Island Boa Constrictor in the Cayos Cochinos, Honduras

Dr Steve Green, Operation Wallacea

Global declines in reptile populations are similar in their taxonomic breadth, geographic distribution and severity as those experienced by amphibians, and constitute a worldwide crisis. Such declines have been attributed to a number of causes including; habitat loss and degradation, introduced invasive species, environmental pollution, disease and parasitism, unsustainable use and global climate change, as well as enigmatic decline. Although many declines are likely to be the result of a cumulative effect of two or more of these causes, habitat loss and degradation are often perceived to be the greatest threats to populations. In contrast, the impact of exploitation of reptiles for food, wildlife products and the live animal trade are often overlooked as significant causes of population decline.

Human use and consumption of wild animals, including reptiles, is an integral part of many cultures. However, harvesting must be carried out at a biologically sustainable level in order for both the species and the practice of sustainable use to persist long-term. Article 2 of the Convention on Biological Diversity (CBD) defines sustainable use as “the use of components of biological diversity *in a way and at a rate* that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations”. It is clear that for many populations of reptiles, exploitation has been unsustainable and a major cause of their declines.

The relatively recent and rapid expansion in the trade of live reptiles as pets has raised concerns about the sustainability of such commercial exploitation. In recent years, reports of rapid population declines and extirpation events of reptiles have been, at least in part, attributed to unsustainable harvesting for the pet trade. The negative impact of unsustainably harvesting reptiles for the pet trade is exemplified by the Hog Island Boa constrictor (*Boa constrictor imperator*), an insular dwarfed race endemic to the Cayos Cochinos archipelago, Honduras. The population reportedly experienced severe decline as a result of intense collection for the pet trade throughout the late 1970s and 1980s, during which time thousands of snakes were removed from the islands. Just a decade after collection began, a herpetological expedition to the Cayos Cochinos was unable to find a single specimen of this previously abundant snake, and local residents involved in the trade confirmed that as of 1988 virtually all adult boas had been removed from the islands.

Fortunately, in 1993 the Cayos Cochinos was declared a protected area and in 1994 the Honduran Coral Reef Foundation (HCRF) was established to facilitate the protection, restoration and sustainable management of the area under the legislative decree 1928-93. Since this time, the removal of boas has been dramatically reduced and the population appears to be recovering, although illegal poaching of boas from the islands remains problematic. In 2004, the *Boa constrictor* research group was initiated in collaboration with Operation Wallacea and the HCRF to investigate the current population status and to determine to what extent the population has been able to recover since the creation of the protected area. Other research objectives included collecting data on the ecology of the population and

determining the phylogenetic relationship of these snakes to populations of *B. c. Imperator* on the nearby Bay Islands and mainland Honduras.

The research is primarily focused on the smaller of the two islands, Cayo Cochino Pequeño (CCP), also known as Cayo Menor, where the HCRF scientific research centre is based and from where the Operation Wallacea expeditions are run. However, one day per week is also spent on the larger island Cayo Cochino Grande (CCG), also known as Cayo Mayor, to allow comparisons to be made between the two islands.

Visual encounter surveys (VES) for boas are conducted systematically on CCP, making sure that the entire island is surveyed evenly during the Operation Wallacea season. VES on CCG are limited to the areas of the island to which we have been granted access. The number of participants and the time spent searching are recorded for each VES in an attempt to quantify search effort. Boas are also captured opportunistically at other times while moving around the islands.

All boas encountered are captured by hand and either placed in a cloth snake bag and taken back to the field station for processing, or processed in situ and released immediately. The Universal Transverse Mercator (UTM) coordinates of the exact capture site are obtained using a hand-held Global Positioning System (GPS) in order to plot capture locations across the island and estimate local abundance and density.

Snout-vent length (SVL) and tail length (TL) are measured by stretching the snake along a tape measure fixed to the laboratory bench, or if processing in the field, by stretching the tape measure along the snake. Sex is determined by observing the size of the cloacal spurs and the relative length of TL to SVL (males having enlarged spurs compared to females and relatively longer tails). If sex cannot be determined with confidence, sex is confirmed by the use of hemipenial probes. All new captures are implanted with a Passive Integrated Transponder (PIT) tag (11 x 3 mm) and the unique ten digit identification code recorded. Subsequent recaptures are identified by scanning boas using a Biomark PIT tag reader. A tissue sample is then taken in the form of 1-3 ventral scale clips from every new snake captured and retained for genetic analysis. Tissue samples are stored in >75% ethanol in screw top plastic sample tubes.

Since the initiation of the project, a wealth of data has been collected and many of the original questions about population size, ecology and phylogenetic relationships are now being addressed in detail. Students will benefit from the large volume of data available to them from previous years and may design projects in a number of possible areas. However, in particular, the long term nature of the mark-recapture data set will allow students to model annual survival and detectability using the freely available software Program MARK, from which population estimates can be inferred.

Suggested Reading

Bermingham, E., Coates, A., Cruz, G., Emmons, L., Foster, R. B., Leschen, R., Seutin, G., Thorn, S., Wcislo, W. & Werfel, B. 1998 Geology and terrestrial flora and fauna of Cayos Cochinos, Honduras. *Revista De Biología Tropical* **46**, 15-37.

- Boback, S. M. 2003 Body size evolution in snakes: evidence from island populations. *Copeia* **2003**, 81-94.
- Boback, S. M. 2005 Natural history and conservation of island boas (*Boa constrictor*) in Belize. *Copeia* **2005**, 879-884.
- Boback, S. M. 2006 A morphometric comparison of island and mainland boas (*Boa constrictor*) in Belize. *Copeia* **2006**, 261-267.
- Boback, S. M. & Carpenter, D. M. 2007 Body size and head shape of island *Boa constrictor* in Belize: environmental versus genetic contributions. In *Biology of the Boas and Pythons* (ed. R. W. Henderson & R. Powell). Utah: Eagle Mountain Publishing.
- Boback, S. M. & Guyer, C. 2003 Empirical evidence for an optimal body size in snakes. *Evolution* **57**, 345-351.
- Boback, S. M. & Siefferman, L. M. 2010 Variation in color and color change in island and mainland boas (*Boa constrictor*). *Journal of Herpetology* **44**, 506-515.
- Gibbons, W. J., Scott, D. E., Ryan, T. J., Buhlmann, K. A., Turberville, T. D., Metts, B. S., Greene, J. L., Mills, T., Leiden, Y., Poppy, S. & Winne, C. T. 2000 The global decline of reptiles, déjà vu amphibians. *BioScience* **50**, 653-666.
- Green 2010 Evolutionary biology and conservation of the Hog Island Boa constrictor. Ph.D. thesis. University of Kent, UK. (available online at <http://www.opwall.com/Library/phd%20theses.shtml>)
- Hynkova, I., Starostova, Z. & Frynta, D. 2009 Mitochondrial DNA variation reveals recent evolutionary history of main *Boa constrictor* clades. *Zoological Science* **26**, 623-631.
- Keogh, J. S., Scott, I. A. W. & Hayes, C. 2005 Rapid and repeated origin of insular gigantism and dwarfism in Australian Tiger Snakes. *Evolution* **59**, 226-233.
- Porras, L. W. 1999 Island Boa Constrictors (*Boa constrictor*). *Reptiles Magazine* **7**, 48-61.
- Reed, R. N., Boback, S. M., Montgomery, C. E., Green, S., Stevens, Z. & Watson, D. 2007 Ecology and conservation of an exploited insular population of *Boa constrictor* (Squamata: Boidae) on the Cayos Cochinos, Honduras. In *Biology of the Boas and Pythons* (ed. R. W. Henderson & R. Powell). Utah: Eagle Mountain Publishing.
- Schlaepfer, M. A., Hoover, C. & Dodd, C. K. 2005 Challenges in evaluating the impact of the trade in amphibians and reptiles on wild populations. *BioScience* **55**, 256-264.
- Wilson, L. D. & Cruz Diaz, G. 1993 The herpetofauna of the Cayos Cochinos, Honduras. *Herpetological Natural History* **1**, 13-23.
- Wilson, L. D. & Hahn, D. E. 1973 The Herpetofauna of the Islas de la Bahía, Honduras. *Bulletin Florida State Museum* **17**, 93-150.
- Wilson, L. D. & McCranie, J. R. 2004 The Conservation Status of the herpetofauna of Honduras. *Amphibian and Reptile Conservation* **3**, 6-33.