

Assessing Local People's Knowledge of the Endangered Cuban Solenodon (*Solenodon cubanus*) in Alejandro de Humboldt National Park, Cuba

Lázaro M. Echenique-Díaz¹, Satoshi OHDACHI², Masaki KITA³, Gerardo Begué-Quiala⁴,
Rafael Borroto Páez⁵, Jorge L. Delgado Labañino⁶, Jorgelino Gámez Díez⁶,
Osamu HOSON⁷ and Chiemi SAITO¹

Abstract: Assessing local people's knowledge of endangered species is important not only for the planning and implementation of environmental education programs, but also to address community-based conservation issues and guarantee an effective engagement of local residents in conservation efforts. A questionnaire-based study conducted in Alejandro de Humboldt National Park assessed local people's knowledge of the endangered Cuban Solenodon (*Solenodon cubanus*). From this it was found that although children seem to be better informed than adults with respect to the Cuban Solenodon, more needs to be done to educate both age groups alike. This study also highlighted local residents' positive disposition to actively participate in the Cuban Solenodon conservation effort.

Keywords: Cuban Solenodon Almiquí, local people, community engagement, conservation, Alejandro de Humboldt National Park

Introduction

The conservation of endangered species in areas where humans also live, requires an understanding of the species ecology along with its social and political context, and the willingness and capacity of the local communities to preserve the species (Knapp *et al.* 2013). Complex conservation contexts and imperfect species knowledge are probably the rule for most species at risk, and therefore the engagement of local communities, one of the so-called nine steps to halt the biodiversity crisis (Roman *et al.* 2009), becomes an imperative. This engagement, however, requires trust-building (Knapp *et al.* 2013), the recognition of local knowledge as a

valid and very often ignored conservation tool, and environmental education aimed at all age groups in the community.

The Cuban Solenodon (*Solenodon cubanus*), is an Endangered (IUCN, 2013) species only living in Cuba. Silva *et al.* (2007) stressed that, by the end of the 20th century, it had vanished from most of its range, remaining only on the northern mountain ranges of eastern Cuba. This species has been, for all its history since it was discovered in the 19th century, very rare (Silva *et al.* 2007). Nonetheless, it has also captured the attention of Cuban institutions such as the Ministry of

¹ Environmental Education Center, Miyagi University of Education, Sendai, Japan. ² Institute of Low Temperature Science, Hokkaido University, Hokkaido, Japan. ³ Department of Chemistry, University of Tsukuba, Ibaraki, Japan. ⁴ Unidad Presupuestada Parque Nacional Alejandro de Humboldt, CITMA-Guantánamo, Cuba. ⁵ Sociedad de Zoología de Cuba, Ciudad de la Habana, Cuba. ⁶ Estación Ecológica La Melba, Unidad Presupuestada Parque Nacional Alejandro de Humboldt, CITMA-Guantánamo, Cuba. ⁷ National Museum of Nature and Science, Tokyo, Japan.

Communication that in several occasions issued stamps and coins with its image (e.g. Cuba-Correos, 1981), and the Cuban Institute of Arts and Cinematography (ICAIC) that made a cartoon on the species (Henríquez, 1976). These popularizations of the Cuban Solenodon were important efforts to educate children and the general public. However, they date back more than 3 decades, and in recent years, despite the species being more at risk than ever before, not many Cubans can tell how the species looks like, if they know of its existence at all.

In 2012, a Cuban-Japanese expedition team, assembled to evaluate the status of the Cuban Solenodon, was able to interact with members of one local community located near the conservation zone of Alejandro de Humboldt National Park, Holguín and Guantánamo provinces, Cuba. Some residents of this community, including children and adults, were able to observe one Cuban Solenodon alive, captured in 2003 and soon released into the wilderness, for about three days (Gerardo Begue Quiala, personal communication). This provided the Cuban-Japanese research team with a unique opportunity to assess the local people's knowledge of the species, evaluate the need for environmental education (EE henceforth), and the potential for community involvement in conservation efforts. In this paper, we report the results of a questionnaire study sought to tackle these issues and purportedly designed to cover different age groups. We then comment on the implications of our findings in the context of the conservation of the Cuban Solenodon.

Materials and Methods

Alejandro de Humboldt National Park is located in the eastern Cuban provinces of Holguín and Guantánamo. Details on the park's biodiversity values have been highlighted elsewhere (The Field Museum, 2005), known to be one of the hotspots for biodiversity in the Caribbean region (Mittermeier, 1999; Myers *et al.*, 2000).

The questionnaire was carried out between March

14th and March 28, 2012, in Arrollo Bueno community (20°26'24.81"N, 74°48'36.77"). Residents of this community (less than 300) are dedicated mostly to subsistence agriculture, and to a lesser degree, working in local education, cultural and commercial centers, and local establishments in which food is prepared (The Field Museum, 2005). Only Cuban members of the expedition talked to subjects of the questionnaire in this community. In all instances, respondents were assured they would remain anonymous. The questionnaire was prepared in Spanish and a brief explanation on how to respond was given to all subjects. In the case of school children, the teacher provided assistance by giving further explanations, but always being careful not to affect the subjects' answer decisions.

Respondents were classified in two age groups, children and adults. For children, the age range was from 6 to 14. For adults, the age range was from 15 to over 50. This age distinction was balanced from the fact that the legal age for adulthood in Cuba is 16 years of age, and the fact that there is only elementary school education in Arrollo Bueno community. The latter implies that children above the age of 13 are likely to be affected by educational trends outside this community. Besides, some children between the age of 14 and 18 in this community are not currently enrolled in a school program, although such opportunity is guaranteed free of charge by the Cuban government. The age structure and number of respondents to the questionnaire are summarized in Table 1.

The questionnaire consisted of two types of questions. For YES or NO questions, the subjects had to choose either YES or NO, and for multiple-choice questions, the subjects could select as many answer choices as they wanted.

The questionnaire

The questionnaire was designed to be answered by

people of very different backgrounds and school levels. Many residents of the Arrollo Bueno community left school during Junior High School, and others, despite having a basic education, are not familiar with the biological or conservation jargon. Therefore, a simple language was used. In this regard, instead of using the internationally known name of the Cuban Solenodon, the name *Almiquí* was used as it is the name by which most Cuban know the species.

The total 8 YES or No and 3 multiple-choice questions were aimed at: 1- assessing the local people's general knowledge of the Cuban Solenodon, and 2- assessing their disposition to participate in conservation efforts, even if this may imply that trees, a very important resource for the community, cannot be cut down.

Questions aimed at 1 were:

- Yes or No questions:

Have you ever heard of the *Almiquí*?

Have you seen one alive?

Have you seen one in books?

Do you know if it is edible?

Did you know it is endemic to this region of Cuba?

- Multiple-choice questions:

Do you know where the *Almiquí* lives?

Do you know what the *Almiquí* eats?

Do you know the enemies of the *Almiquí*?

Questions aimed at 2 were:

- Yes or No questions:

Is it important to protect it?

Would you protect it even if trees cannot be cut?

Would you like to help?

In the multiple-choice questions, items included disparate elements unlikely to be part of a Solenodon diet, its habitat, or its enemies. This items were included so as to control for random answers, but also to test subjects' knowledge of the species.

In addition, subjects were presented with 4 sketches of animals (a cat, a Cuban Solenodon, a bat, and a snake), and were asked to select the one resembling a Solenodon. The disparity in shape among these animals was used to test whether subjects have actually seen a Solenodon.

A total of 29 individuals participated in our survey (Table 1), but our sample was strongly biased towards children from age 6 to 11. This was due to the help of the local school where nearly 35 children attend. On the contrary, a lesser number of adult participants may be the result of the questionnaire being conducted during their busy hours, and the reluctance of some residents to be interviewed.

Our analysis included quantitative counts of participants' answers. In cases where there were conflicting answers in the questionnaire, for instance, when both YES and NO were selected for a single question, they were not counted. Statistical analysis was not performed because of the non-random nature of our sample (not all ages ranges were equally sampled), and a small sample size. Therefore, apparent discrepancies highlighted in the tables are not based in any statistical parameter. They are presented only to direct the readers' attention to potentially informative results in our analysis.

Results and Discussion

Tables 2 and 3 summarize the number of answers to the questionnaire by subjects of both age groups. Not surprisingly, all subjects knew about the species in question. However, it is interesting to see that more children age 6 to 11 reported to have seen the Cuban Solenodon alive than adults did, even though older people are more likely to have encountered a Solenodon in the past. In fact, it is unlikely that this result reflects the truth mainly because the individual Solenodon that was brought to the community in 2003 was there for only a few days and at the time, these children would have been either very small, or had not born yet. It is possible

that children may have interpreted the question in the wrong way. For instance, if they saw a picture of a live Solenodon, they may have considered that they saw one alive. Whatever the case, we reject the idea of a fraud in the procedure. Instead, this result points towards a potential flaw in our questionnaire that needs to be addressed in future surveys.

Regarding the question of selecting the animal sketch, 15 children chose correctly, while the other 3 chose the sketch of a cat. On the contrary, all adults chose correctly the sketch. As for the question related to the access to educational materials depicting the Cuban Solenodon (Table 2), an equal number of children and adults seem to have seen the species in books. However, compared to the 3 adults who reported to never have seen a Solenodon in books, twice the number of children reported to never have seen one. This suggests that more EE materials depicting the Cuban Solenodon should be made accessible to children of this and other communities in and around Alejandro de Humboldt National Park. Similarly, while all children reported to know that the Cuban Solenodon was a regional endemic, nearly half the adults didn't know this fact, suggesting that EE materials aiming at adults are also in need. This is also evident from the result suggesting that children are better informed about where the Solenodon lives (Table 3).

Regarding the feeding habits and enemies of the Cuban Solenodon, both age groups appear to have a basic knowledge of the species ecology. However, they don't consider "man" as a Solenodon enemy, even though it is widely accepted that habitat loss is one of the main reasons of the species disappearance from former distributional areas. This hints to a disconnection between the impact that the community and its local residents can have on the survival of the Cuban Solenodon and their perception of their own role in conservation.

Our results suggest that although adults may have more chances to have seen a Cuban Solenodon alive, children seem more aware and apparently educated about the species. They also indicate that not all individuals are being equally informed about the Cuban Solenodon even though this is a small community in which outreach activities can be easy to implement.

Concerning the subjects' disposition to contribute to the conservation of the Cuban Solenodon, both age groups manifested a 100 % interest. This is a very important issue given that local people's knowledge of the area and its natural resources is an important asset in any endangered species conservation program. Partnership implies scientists' recognition that science alone can not provide solutions to complex conservation problems (Knapp *et al.* 2013), where socioeconomic issues are likely to affect the outcome (Roman *et al.*, 2005).

Fortunately, in all communities of Alejandro de Humboldt National Park, there is a local environmental education program that includes participation in its implementation. Residents recognize Alejandro de Humboldt National Park as a protected area, and as a result, there is motivation to participate in the environmental education program's activities (The Field Museum, 2005). Nevertheless, a previous study suggested that local people's level of interaction with elements of the local fauna is relatively low, and that awareness-raising environmental education programs are needed (The Field Museum, 2005).

The Cuban Solenodon is considered one of the world most endangered animal species. It ranks 8 among the 100 most endangered mammals (Isaac *et al.*, 2007). However, despite the existence of relatively well-organized infrastructure in many areas of Alejandro de Humboldt National Park, the enrollment of communities in conservation efforts is still very poor. Therefore, it is imperative to educate the local residents on the

importance of participating in endangered species conservation, and the role that they play in either accelerating the extinction process or contributing to the recovery one. It is only by incorporating local community residents in all Cuban Solenodon conservation efforts that we can make a transition from a reactive position to a proactive one, and thus positively affect the outcome of these efforts.

Acknowledgments

Many thanks to Lainet García Rivera, Antonio Cádiz Díaz, Emanuel Mora Macías, and José Alberto Alvarez Lemus for constructive comments on the questionnaire design. This study was partially funded by JSPS via Grants-in-Aid for Scientific Research (21681028), and by the Naito Foundation to M.K. Other funding came from private contributions of the authors. Logistic support was provided by the Faculty of Biology, Havana University, the direction of Alejandro de Humboldt National Park at CITMA-Guantanamo, by the Sector La Melba of Alejandro de Humboldt National Park, and the Center for Environmental Management and Control, The Environment Agency, Cuba.

Bibliography

Cuba-Correos (1981). <http://us.fotolia.com/id/55866327>.
Isaac, N. J. B., S. T. Turvey, B. Collen, C. Waterman,

and J. E. M. Baillie (2007). Mammals on the Edge: Conservation Priorities Based on Threat and Phylogeny. *PLoS ONE* 2(3): e296. doi:10.1371/journal.pone.0000296.

Knapp, C.N., J. Cochran, F.S. Chapin, G. Cofinas, and N. Sayre (2013). Putting local knowledge and context to work for Gunnison sage-grouse conservation. *Human-Wildlife Interactions* 7 (2):195-213.

Henríquez, H. (1976). El Tímido Almiquí. ICAIC. https://www.youtube.com/watch?v=U9_2r7aUVZQ.

Mittermeier, R.A., N. Myers, P R. Gil, and C.G. Mittermeier (1999). Hotspots: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions (Cemex, Conservation International and Agrupación Sierra Madre, Monterrey, México).

Myers, N., R.A. Mittermeier, C.G. Mittermeier, da Fonseca G.B., and Kent G. (2000). Biodiversity hotspots for conservation priorities. *Nature* (403): 853-858.

IUCN (2013). The IUCN Red List of Endangered Species. <http://www.iucnredlist.org/details/20320/0>.

Roman, J., P. Ehrlich, J. Pringle, and J. Avise (2009). Facing Extinction: Nine Steps to Save Biodiversity. *Solutions* 1 (1): 50-61.

The Field Museum (2005). *Rapid Biological Inventories, Volume 14: Cuba: Parque Nacional "Alejandro de Humboldt"*. 368 pp.

Table 1: Age structure of participants in the questionnaire from Arrollo Bueno community ($N = 29$).

Age groups	Children ($n = 18$)		Adults ($n = 11$)				
Age range	6 ~11	12 ~ 14	15 ~ 20	21 ~ 30	31 ~ 40	41 ~ 50	Over 50
Number of participants	17	1	3	2	2	3	1
%	62		38				

Table 2: Number of answers to **YES / NO** questions by age groups. Apparent discrepancies in the answers between both groups are highlighted in grey, with % values in parenthesis.

Age groups	Children		Adults	
Questions / answers	Yes	No	Yes	No
Have you ever heard of the Almiquí?	18	0	11	0
Have you seen one alive?	11 (61)	7 (39)	9 (81)	2 (19)
Have you seen one in books?	6 (33)	6 (33)	6 (54)	3 (27)
Do you know if it is edible?	1(6)	17 (94)	3 (27)	8 (73)
Is it important to protect it?	18	0	11	0
Would you protect it even if trees cannot be cut?	18	0	11	0
Would you like to help?	18	0	11	0
Did you know it is endemic to this region of Cuba?	18 (100)	0 (0)	6 (54)	5 (46)

Table 3: Number of answers to **multiple-choice** questions (**A-C**) by age groups. Apparent discrepancies in the answers between both groups are highlighted in grey, with % values in parenthesis.

A: Do you know where the Almiquí lives?

Habitat choices	Age groups	
	Children	Adults
In caves	1	0
On the top of trees	2 (11)	4 (36)
In burrows dug among tree roots	18 (100)	9 (81)
In the river	0	0
In the village	0	0

B: Do you know what the Almiquí eats?

Diet choices	Age groups	
	Children	Adults
Jutías	0	0
Pigs	1	1
Snakes	3	0
Fish	2	1
Insects	12 (66)	9 (81)
Worms	2 (63)	7 (11)
Fruits	0	1
Tubers	1	0
Plants	8	5
Bread	0	0

C: Do you know the enemies of the Almiquí?

Enemy choices	Age groups	
	Children	Adults
Cats	13 (72)	4 (36)
Dogs	17	8
Rats	6	2
Snakes	11	8
Cows	0	0
Manatee	0	0
Birds	1	0
Jutías	0	0
Insects	0	0
Men	2	3