POPULATION ECOLOGY OF THE CAIMÁN AGUJA (*Crocodylus acutus*; CUVIER 1807) ON TAYRONA NATIONAL NATURAL PARK, COLOMBIAN CARIBBEAN

Nidia Farfán-Ardila
Universidad Pedagógica y Tecnológica de Colombia, Tunja Boyacá
Sergio A. Balaguera-Reina
Advisor, CSG member, Texas Tech University

INTRODUCTION

Colombia has six of 23 crocodile's species currently described representing 26 % of the crocodile's diversity on the world (Morales-Betancourt *et al.*, 2013). At present, *Crocodylus acutus* is catalogued as Vulnerable in the IUCN RedList (Ponce-Campos *et al*., 2012) and make part of the Appendix I of CITES (CITES ,2012). In Colombia, this species is catalogued as Critical Endangered (Castaño-Mora, 2002).

Tayrona National Natural Park, placed in foothills of the Sierra Nevada de Santa Marta (highest coastal mountain in the world), has a high variety of biomes in a small area (15.000 ha, see PNNT, 2006). Currently, this park is included in the Caribbean Crocodile Conservation Unit (CCU; see Thorbjanarson *et al*., 2006) based on its relevance for *C. acutus* conservation. However, until now just one work about this species has been released in this area (Balaguera-Reina *et al*., 2012) showing the necessity to get information about its ecology and conservation status.

OBJECTIVES

General: Assess the population ecology of the Caimán Aguja (*Crocodylus acutus*) on Tayrona National Natural Park (TNNP).

Specifics:

- Estimate relative densities, demographic structure, and distribution.
- Describe the habitat based on landscapes units and fauna present.
- Assess the ethno-zoological relationships between community, tourists, park workers, and *C. acutus* populations.

BIOLOGIA PARA LA CONSERVACION
Crocodile Specialist Group
FUNCROCO Fundación para la Conservación de Caimanes y Cocodrilos de Colombia
Uptc Universidad Pedagógica y Tecnológica de Colombia
REPTIBOL LTDA

- Develop sensitization process focused to increase the general knowledge of people about this species, reduce crocodiles-humans incidents, and stimulate its conservation.

METHODS

Pre sampling – We defined the sampling transects based on an approximation to the area having into account the old records registered from *C. acutus* (Balaguera-Reina *et al*., 2012) and the habitat characteristics. We carried out a training phase on Reptibol Ltda. farming focused on detection, capture, manipulation and differentiation between *C. acutus* and *Caiman crocodilus* (species present in the TNNP as well).

Relative densities, demographic structure, population size and habitat – From November 2012 to March 2013, we carried out walking spotlight surveys between 1900 and 200 h throughout beaches, mangrove and riparian forests with a sampling effort of 10 days/month. These sampling days were chosen based on lunar phases and logistical requirements. We used headlamp of 2600 lumens to detect the animals estimating Total Length (TL) and getting information about geo-reference, hour, habitat, environmental and water temperature, salinity, and fauna present. All individuals were classified based on five size classes (I: < 60 cm, II: 61—120 cm, III: 121—180 cm, IV: 181—240 cm, V: >240 cm, see Seijas 1988). We determined relative densities (individuals/km) per transect, the visible fraction, and the population size (King and Messel In Cerrato, 1991). On the day, we undertook surveys looking for individuals in land and tracks that allowed us determine presence of the species. We analyzed the landscape directly (in field) and indirectly based on the Colombian marine and terrestrial ecosystems geodatabase (IDEAM *et al*., 2007) using ArcGIS 10.1 (ESRI 2012).

Ethno-zoological relationships and sensitization – We applied interviews with data triangulation to local people, tourist, and park workers looking for general knowledge (population ecology and conservation status), hunting, conflicts and beliefs. We also developed workshops and forums with local people, tourist, park workers, and high school students (nearest school to the park) in order to sensitize about crocodiles conservation and safe protocols to avoid incidents with these species.

RESULTS AND DISCUSSION

Relative densities – We obtained 34 sightings, of which one was "eyes" and it did not count in the analysis. The relative density in the TNNP in average was 0.44 ind/km. Los Naranjos and Cañaveral

had the major values (3.0 and 2.6 ind/km, respectively) and Castilletes, Neguanje, Gayraca, Chengue and Concha Bay the lowest (0 ind/km in all of them).

Table 1. Relative densities registered in TNNP per sectors from November 2012 to March 2013.

	Naranjos	Castilletes	Cañaveral	Arrecifes	Cinto	Neguanje	Gayraca	Chengue	Concha
Distance (km)	0.5	1.6	1.5	3.6	2.5	1.4	1.0	2.6	1.2
$\bar{\chi}$ sightings	1.4	0	3.8	1.2	0.4	0	0	0	0
Relative densities (ind/km)	3.0	0	2.6	0.3	0.1	0	0	0	0

Demographic structure – We found a dominance in sightings of individuals Class V throughout transects and months followed by classes IV, III, and II, respectively. We did not found hatchlings or early juveniles (< 50 cm) in this study.

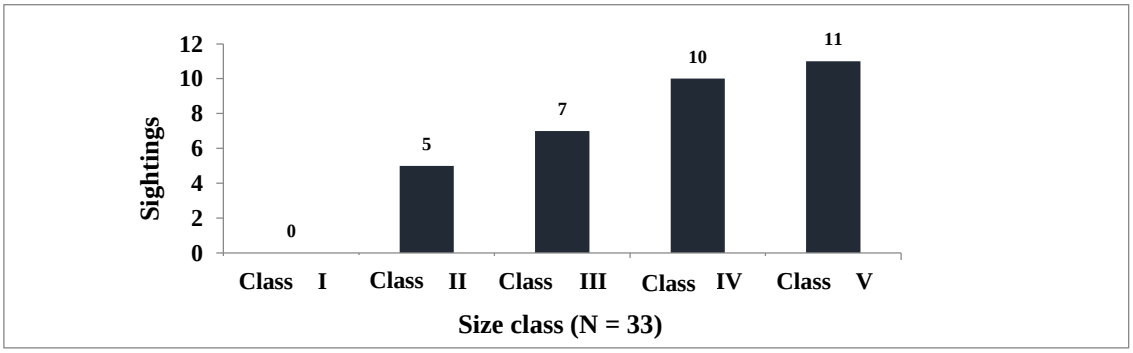


Figure 1. Demographic structure registered in the TNNP from November 2012 to March 2013.

Visible fraction, population size and distribution – We registered a visible fraction of 52 % and a population size of 13.15 ± 4.58 for the study. Los Naranjos showed the maximum value (56 %) and Cinto the minimum (26 %).

Table 2. Visible fraction and population size per sector in the TNNP.

	Naranjos	Cañaveral	Arrecifes	Cinto
Visible Fraction %	56	46	40	26
Population size ind/km	2.50 ± 1.75	8.29 ± 4.37	3.02 ± 3.22	1.57 ± 4.0

We had sightings in four of nine sectors assessed (Fig 2). These areas showed perennial rivers, pounds and open areas (beaches) giving conditions to this species occur. On the other hand, the five areas where we did not sighted the species showed small streams with water only in the rainy season and a reduce vegetal-cover, which we think affected the presence of the species in these sectors.

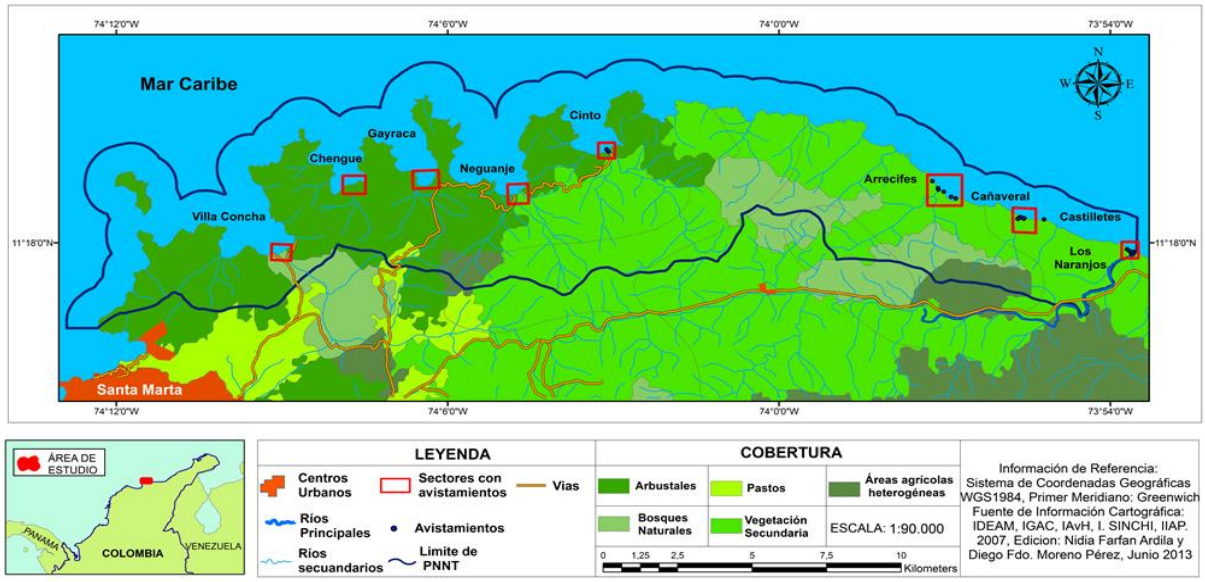


Figure 2. Sectors and sightings in the TNNP.

Ethno-zoological relationships and sensitization– We carried out 96 interviews in the nine sectors assessed, of which 93 % of the local people, 95 % of the park workers, and 40 % of the tourists knew something about the species. We did not registered any information about accidents (bites or deaths because crocodiles) in these areas. Half of these three groups of people interviewed (local people, park workers and tourists) feel fear about crocodiles because they are aggressive and might attack people. On the other hand, half feel respect about crocodiles because they are important in the ecosystem and might be a touristic attraction in these areas.

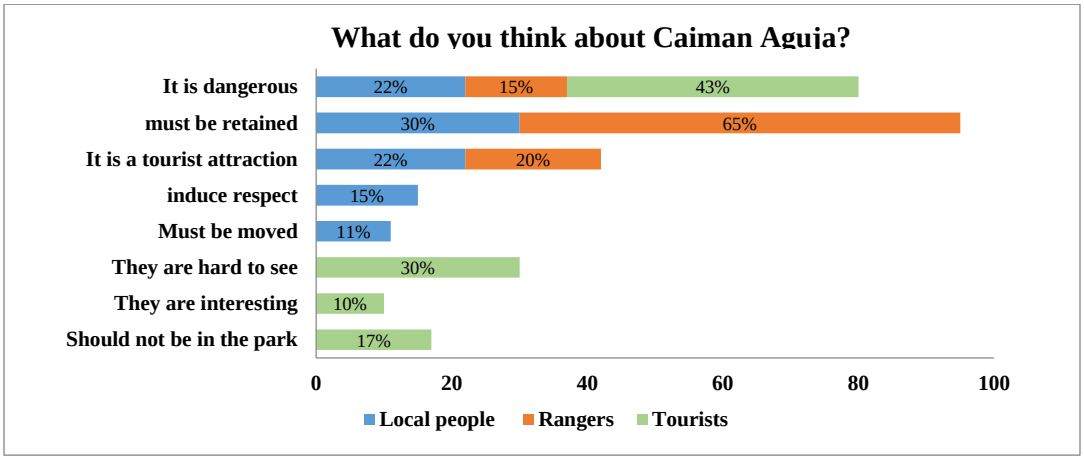


Figure 3. People perception about crocodiles in the TNNP.

About conflicts, we registered one adult-crocodile death by shooting and couple captures of crocodiles in fishnets. Besides, we found a continuous interaction between crocodiles and people in the beaches with low safety protocols increasing the risk of accidents. Management plans should develop and release as soon as possible to increase the people knowledge about crocodiles (local people, park workers and tourists) and avoid fatal encounters stimulating the conservation of this species in the area.

We developed three workshops with park workers and people from the national police that work in the area focused on increase the knowledge about crocodiles, answer questions about this species, and get information about how these people are related with crocodiles in the area. We also trained them about spotlight survey methods and how to use basic gadgets (GPS, thermometer and refractometer). We developed forums in the nine sectors of the study focused on tourists and local people that inhabit in those areas. Finally, we taught to 12-old-childs in two schools near to TNNP in general concepts about crocodiles, ecology and conservation.

CONCLUSIONS

- Relative densities varied temporal (months) and spatial (sectors) across the study due mainly to environmental characteristics as rainy (October and November) and dry (December, January, February, and March) season and the movements of the animals.
- Adults dominated demographic structure in the TNNP, hatchlings and juveniles were not sighted in this study, and the number of sightings were low in general showing likely *C. acutus* is colonizing this area.

- Cañaveral was a sector with the most variety of size classes and small crocodiles sighted showing likely that area had reproductive events in a near past.
- Tayrona National Natural Park has good habitats conditions to support a healthy population of *C. acutus* based on the conservations status of its rivers, forest, and coast.
- Management plans should develop and release as soon as possible in the park to increase the people knowledge about crocodiles (local people, park workers and tourists) and avoid fatal encounters stimulating the conservation of this species in the area.

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