CROCODILE SPECIALIST GROUP-CSG/IUCN/SSC

Student Research Assistance Scheme (SRAS)

FINAL REPORT

Some ecological aspects of *Caiman crocodilus chiapasius* in la Encrucijada Biosphere Reserve, Chiapas, México.

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Introduction

Caiman crocodilus chiapasius, in Mexico, is distributed in the coastal zone of the state of Chiapas (Casas-Andreu, 1995; Escobedo-Galván et al., 2015). In this state, Crocodilians face several threats that reduce their populations, such as the use of body parts (blood, skin, and fat) for traditional medicine, interaction with other wildlife species, and crocodilian sacrifice or destruction of nests by negative human-crocodile interactions (Barrasa, 2013; González-Desales et al, 2016, 2020, 2021). *Caiman crocodilus* is listed as a species Subject to Special Protection within the official Mexican standard NOM-059-SEMARNAT-2010 (Federation Official, 2010), and is in the category of Least Concern on the Red List of threatened species of the IUCN (Balaguera-Reina & Velasco, 2019). To our knowledge, the conservation status of the Mexican populations of spectacled caiman from Chiapas is unknown, and the existing biological information is summarized in: 1- generalities of the species and its populations (Casas-Andreu & Guzmán-Arroyo, 1970; Álvarez del Toro, 1974), 2- some morphological characteristics (Macip-Rios et al., 2012), 3- distribution (Venegas-Anaya et al., 2008; Escobedo-Galván et al., 2011, 2015; Serna-Lagunes et al., 2017), 4- nesting ecology (González-Desales et al., 2016, 2020), 5- ecological interactions (Charruau et al., 2016;

Soria-Ortiz et al., 2020), and 6- unpublished documents on abundance (Martínez, 1996; Aguilar-Galindo, 2005; Flores-Ortiz, 2005; Flores-Ortiz, 2010; Peña, 2011 ; Romero-Tirado, 2011; Sarmiento-Marina, 2018; Trujillo-Martínez, 2018). To date, the Chiapas spectacled caiman remains the least studied crocodilian species in Mexico, as identified by García-Grajales and López-Luna (2010) more than a decade ago.

Methods

Study zone. La Encrucijada Biosphere Reserve is located on the coast of the state of Chiapas, covering the municipalities of Pijijiapan, Mapastepec, Acapetahua, Huixtla, Villa Comaltitlán and Mazatán. It has two core areas called El Palmarcito and La Encrucijada. The representative vegetation of the site are mangroves, tulares, zapotonales, palm groves, floating and underwater vegetation (INE-SEMARNAP, 1999). The El Hueyate estuary is located within the core area of La Encrucijada, in which approximately 28km were traveled on board a 6m-long boat with an outboard motor to monitor the Chiapas Spectacled Caiman (Figure 1).

Abundance. The Relative Abundance Index (IAR) was obtained through the Night Visual Detection method (caimans observed/kilometers traveled; Sigler et al, 2011), for which night tours were carried out during June 2016, May 2017, July 2019, January 2020, July 2021, January 2022 and July 2002, visiting the study area between 3 and 5 nights (Figure 1). The brightness of the caimans eyes was sought with the help of a lamp, directing the beam of light between the water mirror and the roots of the mangroves, tulars and floating vegetation. For each sighting, geographic coordinates, type of vegetation, number of individuals observed, and size category were obtained. The caiman size categories or classes were considered based on the snout-cloaca length (Seijas; 1983): a) Class 1, neonates (size less than 19 cm), b) Class 2, juveniles (size between 20 to 59 cm), Class 3, subadults (size between 60 to 89 cm), Class 4, adults (sizes greater than 90 cm).

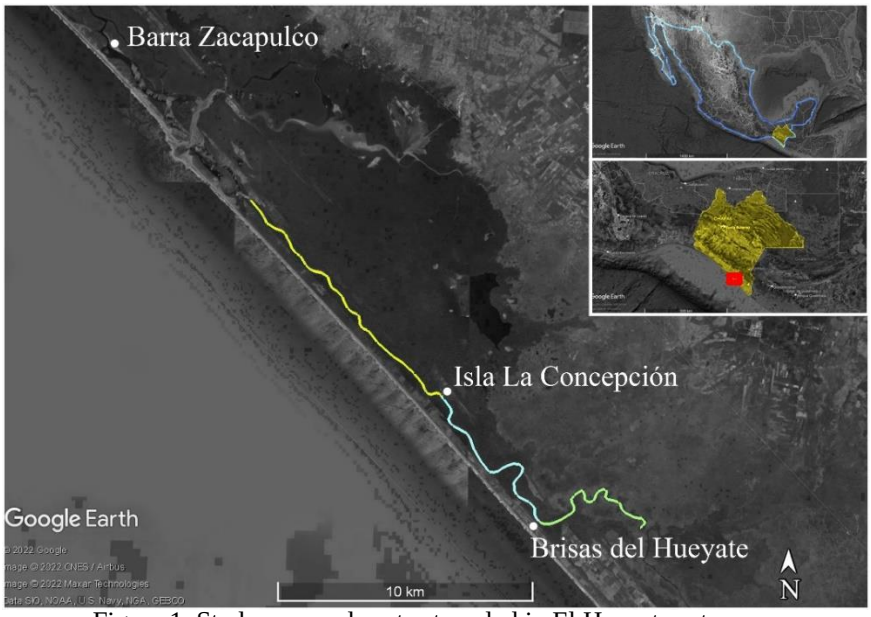


Figure 1. Study area and routes traveled in El Hueyate estuary.

Feeding Habits. Stomach flushing of adult caimans captured in the study area were performed and subsequently the components and the frequency of appearance were identified. The individuals were immobilized and through the snout we introduced a 2-inch-diameter PVC tube and inserted a flexible probe connected to a commercial fumigation pump with a capacity of 5 liters (for exclusive use to obtain stomach contents), and we proceed to fill the stomach with pressurized water with approximately 3-4 liters, finally we perform a massage in the abdominal region causing regurgitation of stomach content (Taylor, et al, 1978; Ayarzagüena, 1984; Magnusson, et al, 1987; Fitzgerald, 1989). Stomach contents were filtered through a 0.3mm mesh opening sieve and stored in containers with 70% alcohol for later identification in the laboratory. We classify the contents into: parasites, gastroliths, hair, plastics, leaves, roots and stems, crustaceans, spiders and insects, reptile scales and fish scales. Subsequently, recapitulating the results of Soria-Ortiz et al. (2020) for the rest of caimans sizes, we performed the analysis of the use of food resources through the Jacob II Index and the breadth of the trophic niche was calculated through the Shannon-Wiener Estimator (Colwell and Futuyma, 1971).

Nuchal scutellation patterns. Because the variation in the nuchal scutellation of the Chiapas spectacled caiman is not known and is considered a diagnostic characteristic, we obtained photographic records of the nuchal region from individuals captured in the study area to characterize the type and frequency of appearance of the caiman. different arrangements that the scales have, we count the number of rows that are formed and the number of scales that compose them (Figure 2).



Figure 2. Exemplification of the count of rows and nuchal scales in a Chiapas spectacled caiman, in this case, it is an individual that has 4 rows with a 2-4-2-2 pattern.

Results and Discussion (Advances)

Abundance. It was possible to count 303 individuals traveling approximately 28km for each monitoring. The maximum IAR obtained was 2.17 caimans/km in July 2016 and the minimum IAR was 0.57 caimans/km during July 2021 (Figure 3). In other studies within the same study area, they mention IAR between 0 and 5.8 caimans/km (Martínez, 1996; Peña, 2011; González-Desales et al. 2021).

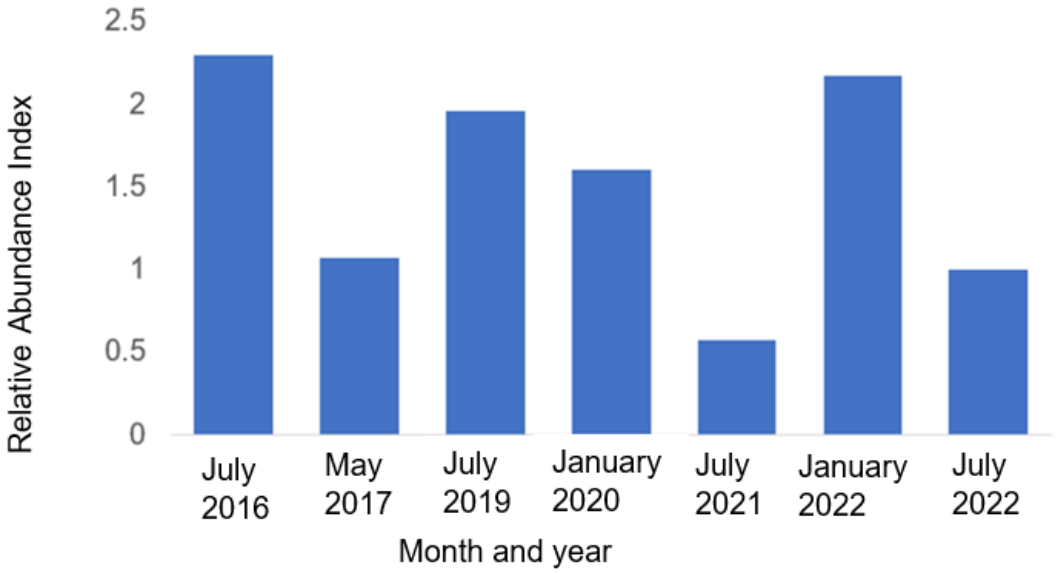


Figure 3. Relative abundance index per month and year.

Feeding Habits. The stomach contents of adult caimans indicated that they feed on fish, reptiles, mammals, crustaceans. Considering the results of Soria-Ortiz et al. (2020), the composition of stomach contents was divided into four categories: 1- intake by nutritional contribution (mammals, crustaceans, spiders and insects, reptiles, fish, and birds), 2- intake by accident (plastic waste, stems, leaves and roots), 3- intake for crushing (gastroliths), 4- ecological interactions (parasites). The diet (Table 1) was described for each size category as follows: 1- the diet of hatchlings is made up of crustaceans, spiders and insects, 2- in juveniles the consumption of spiders and insects decreases and at this size there is already presence of intestinal parasites, 3- subadults feed on crustaceans and fish, and we identify the presence of plastic waste more frequently, and 4- adults feed on mammals, reptiles, fish and crustaceans. The niche width indicates that caimans from neonates to adults consume crustaceans (SHi= 0.9), some sizes prefer spiders and insects (SHi= 0.8) and fish (SHi= 0.8), and there are sizes that consume reptiles (SHi= 0), birds (SHi= 0) and mammals (SHi= 0). In other areas of the American continent, adult caimans mainly consume fish, since it is the most widely available resource, but they also include other vertebrates such as mammals and reptiles (Seijas & Ramos, 1980; Silveira & Magnusson, 1999), our results are similarly, adult caimans, in addition to crustaceans and fish, also consume reptiles and mammals. This makes the ontogenetic variation in the diet of the Chiapas Spectacled Caiman, mentioned by Soria-Ortiz et al. (2020).

Table 1. Values of the use of food resources (Jacob II), presents values between -1 and 1, with the following decision criteria: a) strong evasion= -1 to -0.5, b) moderate evasion= -0.49 to - 0.26, c) indifference= -0.25 to 0.25, d) neutral selection= 0.26 to 0.49, and e) strong selection= 0.50 to 1.

Intake category	Composition	Hatchlings (n=16)	Juvenil (n=30)	Subadults (n=3)	Adults (n=13)
Intake by nutritional aport	Mammals	-1	-1	-1	1
	Crustaceans	-0.2	-0.1	0.3	0.2
	Spiders and insects	0.2	-0.1	0	-0.2
	Reptiles	-1	-1	-1	1
	Fishes	-0.3	-0.6	0.4	0.6
	Birds	-1	-1	1	-1
Intake by accident	Plastic residues	-1	-0.3	0.8	0.3
	Leaves	-1	-0.6	-1	0.9
	Roots and steams	-0.3	-0.1	0.2	0.3
Intake for crushing	Stones/sand	-1	-1	-1	1
Ecological interactions	Parasites	-1	0	-1	0.6

Nuchal scutellation patterns. Twenty nuchal patterns were identified from 115 captured individuals (Figure 4). Three of these patterns coincide with the description of the subspecies (Bocourt, 1876) and nine patterns coincide with the analysis carried out by Busack & Pandya (2001) that includes other subspecies of Caiman but considers the distribution for C.c. chiapasius different from Escobedo-Galván et al. (2011) and few Mexican specimens, so the most abundant nuchal scutellation pattern does not coincide. We identified patterns that could not be analyzed and were placed as atypicall (Figure 5).

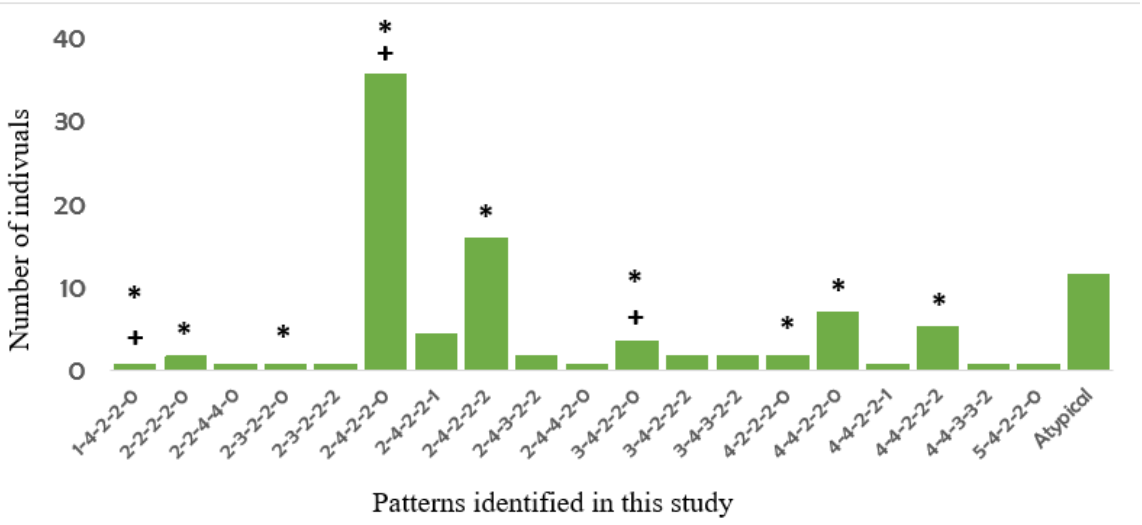


Figure 4. Nuchal scutellation patterns identified in the Mexican population of spectacled caiman evaluated + corresponds to the scutellation patterns mentioned by Boucort (1876) and * corresponds to those identified by Busack & Pandya (2001).



Figure 5. Atypical scutellation pattern observed in *Caiman crocodilus chiapasius*, the rows of nuchal scales have no apparent accommodation to describe a pattern.

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