CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA

Eighteenth meeting of the Conference of the Parties
Colombo (Sri Lanka), 23 May – 3 June 2019

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Transfer the Mexican populations of American crocodile (*Crocodylus acutus*) from Appendix I to Appendix II, in accordance with Article II paragraph 2a of the Convention Text, considering they do not meet the biological criteria for inclusion in Appendix I, according to Resolution Conf. 9.24 (Rev. CoP17).

B. Proponent

Mexico*:

C. Supporting statement

1. Taxonomy

1.1 Class: Reptilia

1.2 Order: Crocodylia

1.3 Family: Crocodylidae, subfamily Crocodylinae

1.4 Genus, species or subspecies, including author and year: *Crocodylus acutus (Cuvier, 1807).*

1.5 Scientific synonyms: *Crocodylus biscutatus (Cuvier, 1807), Alligator lacordairei (Borre, 1869), Crocodylus lewyanus (Dumeril and Bocourt, 1870), Crocodylus floridanus (Hornaday, 1875).*

1.6 Common names:
English: American Crocodile
French: Crocodile Americain, Crocodile d'Amérique
Spanish: Cocodrilo del río, Cocodrilo americano, Cocodrilo, Lagarto, Lagarto Real, Caimán de la costa, Caimán aguja

1.7 Code numbers: A-306.002.001.001.

2. Overview

The American crocodile (*Crocodylus acutus*), is distributed in different countries of the American continent. In Mexico it is found on both the Pacific slope and the Yucatan Peninsula (see section 3.1). It inhabits fresh water bodies as well as brackish water bodies and coastal environments (see section 3.2). The reproductive stage usually begins in the dry season (March-May), and hatchings occur at the beginning of the rainy season (June-July). *Crocodylus acutus* builds its nests in holes carved in the sand or soil, with clutches of

* *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

between 9 and 54 eggs. The hatchlings at birth can measure between 26 and 30 cm and weigh 46 to 70 g (see section 3.3).

Although the species can reach more than 6 m, it is rare to find organisms that exceed 4 m in length. *Crocodylus acutus* has a remarkably elongated snout, and in adults a median pre-orbital hump is accentuated. The colour is usually olive or olive-green, while juveniles have dark spots. The dorsal osteoderms are small and irregular, and the pattern of nuchal scales is variable (see section 3.4). *Crocodylus acutus* fulfils different ecological functions such as: influence on the nutrient cycle and regulation of the life cycle of many species since it is a top predator (see section 3.5).

Since 1870, the species of crocodiles in Mexico were subject to commercial overexploitation of their skins (whose maximum level occurred between the 30's and 60's). In 1970, a series of temporary bans restricted their use at the national level. In addition, the species was included in Appendix I of CITES in 1975 in the initial list of species regulated by the Convention. An analysis of bibliographic information indicates that, in the last 30 years, about 50% of the studies in Mexico report encounter rates (ER) greater than, or equal to, 5 ind / km; a value higher than that of *Crocodylus moreletii* in Mexico, whose rate is 3.23 ind / km, and which has healthy populations (see section 4.2).

Mexico has legal instruments that regulate the conservation and sustainable use of the American crocodile populations (see section 7). Currently, Mexico has 58 Management Units for the Conservation of Wildlife (UMA) and 24 Facilities that Manage Confined Wildlife (PIMVS) for the breeding of American crocodiles, as well as 47 Protected Natural Areas within its distribution area (see Annex 6). The legal exports of *C. acutus* that were recorded between 2000 and 2017 were mostly (93%) specimens traded for scientific purposes (blood samples, tissue, etc.), and in a much smaller proportion, pieces of bone, bodies, skulls, and skins for personal purposes (see section 6.1).

Additionally, since 2010, Mexico's Crocodilians Specialists Group (GEC-Mexico) was created. It is composed by experts from different sectors and is consulted periodically to support decision-making regarding the conservation and sustainable management of Mexican crocodilian species (see section 8.6).

When assessing the conservation status of the Mexican populations of *C. acutus* based on the criteria of Resolution Conf. 9.24 (Rev. CoP17), it is concluded that they are not in danger of extinction and, therefore, do not fulfil the criteria for inclusion in Appendix I of CITES:

a) The population is not small; Nearly half of the sites monitored from 1988 to 2018 report encounter rates greater than 5 ind/km throughout their distribution area, and in some sites, there are stable or increasing trends (see section 4.2). There is not a single area throughout its distribution in Mexico where all the juveniles of the population are concentrated.

b) They also do not have a restricted area of distribution. In Mexico, its populations occupy 10.2% of the national territory, around 199,765 km^2, and 39.4% of its coastline (approximately 4,566.32 km of coastline) in addition to inland water bodies (potential habitat for the species, see section 3.1).

The objective of transferring the species to Appendix II is to set the basis to replicate the successful management scheme implemented with *Crocodylus moreletii* (monitoring program and habitat conservation in combination with ranching of eggs from the wild for subsequent captive breeding) and sustain a trade that benefits local communities, the species and its habitat. Ranching will be limited to sites where monitoring indicates that there are healthy and stable populations, in local communities committed to the conservation and sustainable use of the species and its habitat; with the endorsement of the GEC-Mexico and the CITES Authorities of Mexico. Therefore, no hunting or trade of specimens other than high quality skins produced on farms will be authorized.

3. Species characteristics

3.1 Distribution

General*: Crocodylus acutus* is found in the coastal areas of 18 countries of the American continent: Belize, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Cayman Islands, Jamaica, Nicaragua, Mexico, Panama, Peru, Dominican Republic, United States and Venezuela (Ernst *et al.*, 1999, Thorbjarnarson, 2010).

Distribution in Mexico: It is found in the states of Sinaloa, Nayarit, Jalisco, Colima, Michoacán, Guerrero, Oaxaca and Chiapas on the Pacific slope, while in the Gulf of Mexico and the Caribbean, it is found in the states of Quintana Roo and Yucatán (Sonora and Campeche present isolated records; Álvarez del Toro, 1974, Thorbjarnarson, 2010). The global distribution area estimated by the IUCN is approximately 2,533,582.33 km^2, while for Mexico an area of 726,119.54 km^2 is estimated. For the present proposal, a re-estimation of the national distribution area was made based on bibliographic information and on the experience of the GEC-Mexico experts; the result was an estimated area of approximately 199,765 km^2, which is equivalent to 10.2% of the national territory, and is a more conservative estimate than that reported by the IUCN (**Annex 1**).

3.2 Habitat

Crocodylus acutus inhabits freshwater bodies such as rivers, lagoons and dams located inland, such as the Sumidero Canyon in Chiapas and the Santiago River basin in Nayarit, Mexico (Álvarez del Toro, 1974, Casas-Andreu, 1994). It is also found in brackish water bodies and coastal environments, such as lagoons and mangroves (Domínguez-Laso and García-Reyes, 2010, Thorbjarnarson, 2010). Some populations are found in hypersaline waters such as Lake Enriquillo in the Dominican Republic (Thorbjarnarson, 1989) or atolls such as Banco Chinchorro in Mexico and Turneffe in Belize (Platt and Thorbjarnarson, 2000, Charruau *et al*., 2005). The habitats of *C. acutus* present a communication between shallow and deep waters with access to dry areas for basking and places for nesting (Thorbjarnarson, 1989, Domínguez-Laso, 2006). They have been observed entering the sea and are present in coastal islands (Cupul-Magaña *et al*., 2005, Charruau *et al*., 2005, Platt, 2003).

3.3 Biological characteristics

The reproductive season of the species varies latitudinally; however, it is common for egg laying to begin in the dry season (March-May) and hatchings occur from the beginning of the rainy season (June-July, Thorbjarnarson, 1989, Casas-Andreu, 2003). There is no study that defines the age and size at sexual maturity; but in Mexico, nesting females sized between 2.25 m and 3 m in total length have been observed (Álvarez del Toro, 1974, Casas-Andreu, 2003). It has been calculated that, in Mexico, *C. acutus* reaches 1.2 m in length between 4.5 to 5 years (García-Grajales *et al*., 2012), so the age for females to reach 2.20 m in total length, is at least 10 years (Thorbjarnarson, 1989).

In general, *C. acutus* builds its nest in holes dug in the sand or soil. The size of the clutch varies between 9 and 54 eggs (average 27.9 ± 13.2). The viability of the average eggs is 80.7% ± 19.3, and the average number of incubation days is 83. There is a tendency for eggs with longer length and weight to show a higher birth rate and viability (Casas-Andreu, 2003).

Hatchlings measure between 26 and 30 cm and weigh between 46 and 70 g (Charruau *et.al.,* 2010). It is considered that mortality varies every year and depends on several factors, including the influence of environmental phenomena (floods and hurricanes as the most important), and predation of offspring in their areas of protection (understood as the areas that provide food, hiding places, and thermoregulation sites for small crocodile individuals). Based on observations made in some studies, the offspring can have a mortality of more than 50% in their first year of life (Ogden, 1978), and the probability that the offspring will die before the fourth year is 75 % (Thorbjarnarson, 1989).

Feeding varies throughout its development: when they are young, they feed mainly on invertebrates, in juvenile stages they add fish, frogs and birds to their diet, and in adult stages they are primarily piscivores, although their diet is also composed of small crocodiles, turtles and mammals (Thorbjarnarson, 1988, 1989, Casas-Andreu and Barrios-Quiroz, 2003).

3.4 Morphological characteristics

Crocodylus acutus presents a remarkably elongated snout, whose length is 1.8 to 2.5 times larger than the basal width; and in general, in adult organisms a median pre-orbital hump is accentuated (Álvarez del Toro, 1974). The coloration is usually olive or olive green, very bright for adult organisms, while juveniles have dark spots on their back and their belly has no markings (Kushlan and Mazzotti, 1989, Thorbjarnarson, 1989). In this species, the males can be differentiated from the females by their larger size, the muscular masses of the jaws are bulky and the frontal hump more conspicuous; in females, the tail is, in some cases, shorter and the snout less elongated, although these characteristics are not very apparent (Álvarez del Toro, 1974, Kushlan and Mazzotti, 1989, Thorbjarnarson, 1989).

Crocodylus acutus males can reach between 5 and 6 m in length, while females usually do not reach sizes greater than 3.5 m in length, although females of up to 4.4 m have been recorded (Domínguez-Laso, 2009). Although the species can reach more than 6 m in length, it is currently rare to find organisms in the wild that exceed 4 m (Thorbjarnarson, 1989, 2010, Domínguez-Laso, 2007).

The dorsal osteoderms are small and irregular, and the pattern of nuchal scales is variable (Thorbjarnarson, 1989, Seijas, 2002, García-Grajales et al., 2009). There is a median pre-orbital elevation (MPE) in the rostral extension of adults and sub-adults (Brazaitis, 1973, Álvarez del Toro, 1974, Medem, 1981). The size and shape of MPE varies among populations and has been associated as a characteristic of sexual dimorphism in adult specimens (Thorbjarnarson, 1989). Some authors suggest that the irregularity in the number of dorsal shields and MPE are sufficient characteristics to distinguish *C. acutus* from other species of the same genus, with the exception of *Crocodylus moreletii*; since the latter has both characteristics, but less developed (Ross, 1998).

3.5 Role of the species in its ecosystem

Crocodylus acutus has important ecological functions in the ecosystems where it lives. At the micro-environmental level, this species plays a very important role not only in the conservation of the energy balance and the sanitary state of the micro-habitat, but also in the conservation of water sources. The large, deep and clear pools built by *C. acutus* are a refuge during droughts for this and other animal species (Kushlan, 1974). In mangroves it has been observed that, with their constant transit, the crocodiles help to form small channels and maintain water flow in these ecosystems (Alonso-Tabet, 2009). They also have important functions in the cycle of nutrients within tropical wetlands, since they release nutrients to the ecosystem through faeces (Medem, 1983). Its role in regulating the life cycle of many fish of commercial importance has been demonstrated (Fittkau, 1970). As a top predator, it constitutes a superior link of the trophic levels of the ecosystems where they live.

4. Status and trends

4.1 Habitat trends

In 2002, critical habitats were identified for *C. acutus* throughout its distribution area in order to know the main threats to local and regional populations. As a result of the evaluation, it was determined that the species has faced a reduction of 8.9% in its total distribution area (Thorbjarnarson *et al*., 2006). Particularly in the bio-regions proposed for Mexico in said study, which correspond to Río Grijalva, the Northwest-Central Pacific of Mexico, the Yucatan Peninsula, and Mexico South-Pacific Central America, the loss of distribution area is 2.5% (Navarro- Serment, 2003a; Cupul-Magaña *et al*., 2017).

4.2 Population size

Since 1870, the crocodile species in Mexico were subject to commercial overexploitation of their skins (whose maximum level occurred between the 30's and 60's). In 1970, a series of temporary bans restricted their use at the national level (Casas-Andreu, 1995). In addition, the species was included in Appendix I of CITES in 1975 in the initial list of species regulated by the Convention.

An analysis was made for Mexico using reported samplings in bibliographic information (theses, reports, books and scientific research papers), and those works with comparable data quality were analysed (those that reported km travelled and / or observed individuals and / or ER and sampling sites). Based on this analysis, it was determined that from 1988 to 2018, about 50% of studies in Mexico reported ER greater than, or equal to, 5 ind / km (**Table 1**); a value higher than that of *Crocodylus moreletii* in Mexico, whose ER is 3.23 ind / km and has healthy populations (Rivera Tellez *et al.,* 2017).

In **Annex 2**, the ER is shown along with those reported for other locations in the countries of the species' range.

Table 1: ER (ind / km) reported for sites in Mexico according to 50 research papers from 1988 to 2018.

	Year of sampling			Mean
Period	1988-1997	1998-2007	2008-2018	

Km covered	239.41	738.78	518.65	498.9
Average km/trip	7.98	12.5	10.8	10.4
Number of trips	30	70	51	50.3
% of trips with ER>5ind/km	56.6	47.1	47.0	50
ER min-max	**0.35-73.4**	**0.1-51.25**	**0.3-163.3**	**0.1-163.3**
States covered	Chiapas Nayarit Colima Jalisco	Chiapas Nayarit Colima Jalisco Oaxaca Quintana Roo Michoacán Sinaloa	Chiapas Nayarit Colima Guerrero Oaxaca Quintana Roo	

4.3 Population structure

The population structure reports of *C. acutus* in Mexico, frequently record a greater abundance of younglings and juveniles than of subadult and adult individuals (García-Grajales and Buenrostro-Silva, 2017). This bias towards younglings and juveniles has also been observed in populations of Costa Rica, the United States, Haiti and Panama, and is considered to correspond to a balanced population or one in recovery (Thorbjarnarsson, 1988, Cherkiss *et.al*., 2011, Mauger *et.al*., 2012, Venegas *et. al*., 2015). The sex ratio of the Mexican populations is not well known, since most of the studies on the species' ecology use visual detection, and to identify the sex of the specimens, it is necessary to capture them (García-Grajales 2007a). **Table 2** presents available information on population structures by size class, expressed as a percentage, and sex ratio reported for the period between 2001 and 2017 in seven states corresponding to the distribution of *C. acutus* in Mexico.

Table 2.- Population structures reported in 12 research papers on *C. acutus* ecology, carried out in Mexico in the period 2001-2017.

Author	**State**	**Site**	**Year of monitoring**	**Class I**	**Class II**	**Class III**	**Class IV**	**Class V**	**ND**	**(M:F)**
Sarmiento Marina, 2018	Chiapas	Puerto Arista	2017	58.46 %	16.92 %	6.15%	10%	8.46 %	-	-
Gaviño et. al., 2011	Colima	Laguna Cuyutlán	2010	8%	18%	41%	29%	4%	-	1:1
García et.al., 2010	Jalisco	Cuixmala	2003	61%	10%	1.30%	20.70%	-	-	1:1
Cupul Magaña, 2002	Jalisco	Estero Boca Negra	2001	75%	11.36 %	3.41%	5.68%	4.55 %	-	-
Hernández-Hurtado, 2011	Nayarit	San Cristóbal- La Tobara	2007	44.50 %	11.65 %	5.02%	17.15%	13.43 %	8.25 %	-

Hernández-Hurtado, 2011	Nayarit	Rey Pozo Pericos	2007	6.10 %	45.50 %	27.30 %	12.10%	3%	6%	-
García-Grajales et. al., 2008	Oaxaca	Estero Vainilla	2008	31.46 %	30.33 %	16.85 %	8.98%	0	12.35 %	-
García-Grajales y Buenrostro, 2017	Oaxaca	Chacahua-Palmarito	2004	0	6.70%	21.40 %	15.20%	2.50 %	-	-
Espinosa-Reyes y García Grajales, 2001	Oaxaca	Estero La Vainilla	2001	55.88 %	19.60 %	5.88%	2.94%	15.68 %	-	1.7:1
Gutiérrez-Ramírez, 2016	Quintana Roo	Yum Balam	2015	7.14 %	14.29 %	3.06%	1.02%	2.04 %	72.45 %	0.8:1.2
González - Ávila, 2015	Quintana Roo	Arrecifes de Xcalak	2006	0%	0%	38.50 %	38.5%	23.1 %	-	2.75:3.75
González – Ávila, 2015	Quintana Roo	Arrecifes de Xcalak	2012	0%	0	61.10 %	22.20%	16.70 %	-	3.5:2
Charruau et.al.,2005	Quintana Roo	Banco Chinchorro	2003	25.70 %	26.50 %	27.40 %	20.40%	0%	-	6.8:1
Olvera – Morales, 2008	Yucatán	Laguna Chipeté	2005	23.68 %	50%	18.42 %	7.89%	-	-	1:1

4.4 Population trends

Global trends: At a global scale, *C. acutus* is classified as Vulnerable in the IUCN Red List, and it's estimated that its population trend is increasing (Ponce-Campos, *et al*., 2012).

Derived from the consultation issued by the CITES Management Authority of Mexico, on October 31st, 2018, information was received from Jamaica and the Cayman Islands. In Jamaica, the population trend is not confirmed, and based on small-scale samplings, the population seems to be decreasing in some places. In the Cayman Islands, the species is extirpated, with only fossil records and occasional sightings of specimens dispersed from Jamaica, Cuba and Central America (Consultation 2018, **Annex 3**).

Trends in Mexico: Within the periods analysed (three of 10 years each; 1988-1997, 1998-2007 and 2008-2018), information is available from 50 studies conducted in 86 different bodies of water, covering all the states of the species distribution area except for Yucatán. In each period, between 1 and 26 trips were made in different water bodies, with an average of 7.95 trips / period. There has been monitoring for 5 years or more in five locations: Jalisco (Cuitzmala), Chiapas (Coquitos, Encuentro and Panzacola) and Nayarit (Quelele lagoon), whose trends are stable or increasing. The ERs reported by State go from 0.35 to 73.4 ind / km (30 trips, 7.9km / trip) between 1988-1997, 0.01 to 51.25 ind / km (70 trips,

12.5km / trip) between 1998-2007, and 0.15 to 163.3 ind / km (51 trips, 10.8km / trip) between 2007 and 2018. **Annex 3** presents the ER reported for Mexico, as well as the graphs of the five locations previously mentioned and a brief summary of the data compiled by the State.

Additionally, there has been an increase in the number of human-crocodile interactions, rising from 34 incidents in the period of 2009-2013, to 54 incidents between 2014-2018 as reported in CrocBITE (increase of 65% in the last five years; CrocBITE, 2018).

4.5 Geographic trends

For 2002, based on the information presented by Thorbjarnarson *et al*. (2006), *C. acutus* maintained 97.5% of its historical distribution area in Mexico. The reduction reported in the Northwest-Pacific Central Mexican bioregion was attributed to the fact that the populations of the states of Sonora and Sinaloa are located in the latitudinal geographic limits (Navarro-Serment, 2003a), where conditions may be unfavourable for viable populations (Casas-Andreu and Reyna-Trujillo, 1994). The Northwest-Pacific Central Mexican bioregion was identified as one of the two priority bio-regions for the creation of new protected natural areas taking into account crocodile conservation (**Annex 1**).

5. Threats

Globally, poaching, fragmentation and habitat loss, climate change, land use change and human-crocodile interactions have been identified as the main threats to wild populations of the species (Thorbjarnarson, 2006, 2010; Ulloa -Delgado and Sierra, 2012, Serrano-Gómez *et al*., 2016, Pacheco-Sierra et al., 2018).

Particularly in Mexico, habitat modification, as the result of tourism developments (hotel complexes and real estate developments) in coastal areas, has been one of the main threats, since it has replaced or modified the sandy beaches where *C. acutus* normally nests (Sigler, 2000; Huerta-Ortega and Ponce-Campos, 2002, García-Grajales *et al*., 2008, Cupul-Magaña *et al*., 2010).

In the Pacific, cattle breeding near crocodile nesting areas has a negative impact on the viability of nests because cattle compact the soil with their constant trampling, reducing the hatching rate (Motte, 1994).

In the case of the interactions that trigger risky situations, the Protocol to Attend Human-Crocodilian Contingencies was recently published, under the coordination of the National Commission of Natural Protected Areas (CONANP), the General Directorate of Wildlife of the Ministry of Environment and Natural Resources (DGVS-SEMARNAT) and the Crocodilians Specialists Group of Mexico.

In addition, in the Yucatan Peninsula (Cozumel and Banco Chinchorro), the incidence of hurricanes is recorded (Machkour-M'rabet *et al*., 2009, Charruau *et al*., 2010, Pacheco-Sierra *et al*., 2018). In some coastal areas of Chiapas, crocodile hunting is conducted to sell skins clandestinely and use meat in dishes such as tamales and roasts, and in some communities, they keep them as pets (Martínez-Ibarra *et al.,* 1997a). In fishing with gillnets, some crocodiles with sizes close to 170 cm have been trapped in the nets (Martínez-Ibarra et al., 1997b). According to data provided by the Federal Attorney for Environmental Protection (PROFEPA), 49 confiscation events were recorded between 2012 and 2018.

A poorly evaluated threat in American crocodile populations has been the use of agrochemicals, and industrial and domestic water spills in the basin of rivers and coastal areas (Mandujano-Camacho and Rodas-Trejo, 2010, Sigler, 2010).

It is expected that future ranching activities to be carried out in Wildlife Conservation Management Unit (UMA) schemes at the local level, will promote the conservation of the habitat as an income for the communities and will mitigate land use change.

6. Utilization and trade

6.1 National utilization

According to information provided by the DGVS, in Mexico there are currently 15 *in-situ* UMA, 43 *ex-situ* UMAs and 24 PIMVS registered. In the period from 2000 to 2018, the harvest of eight specimens from *in-situ* UMA and 39 from hatcheries (intensive UMA and PIMVS) was authorized, with the production and trade of skins (clothing and accessories), meat, eggs, scales, skulls and some

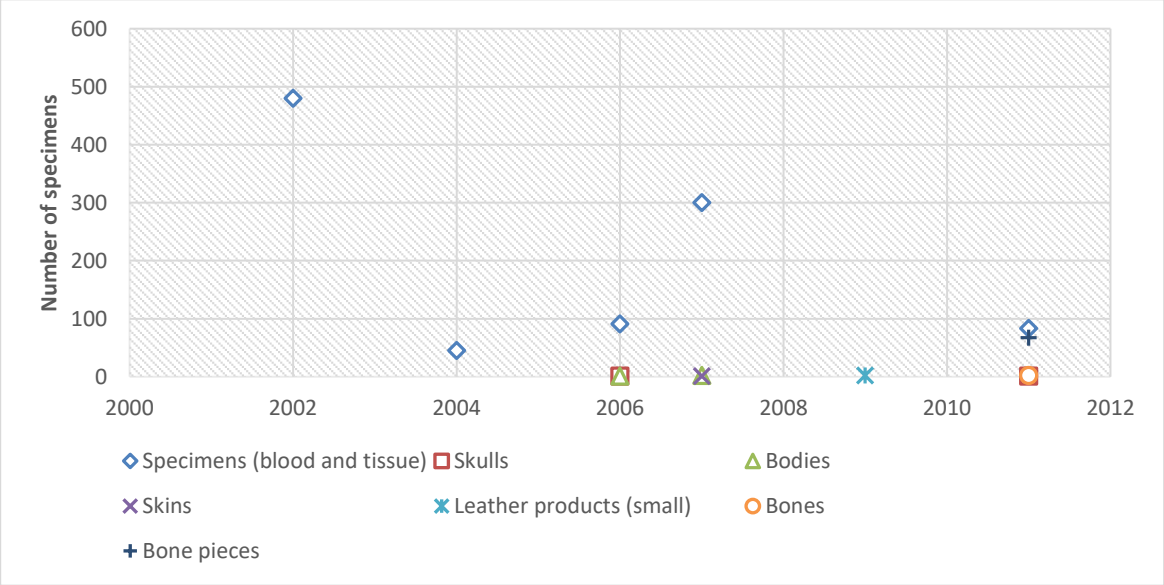
derivatives like oil. In recent years, its value as ecotourism, products and services has been highlighted (Thorbjarnarson and Velasco, 1999, García-Garduño *et al*., 2017, Sigler and Gallegos, 2017).

6.2 Legal trade

Since the species is included in Appendix I of CITES (1975), there are no exports for commercial purposes, so trade is mainly for scientific purposes. With respect to the period 2000-2017, the CITES Trade Database (UNEP-WCMC, 2018) indicates that specimens (blood, tissue, scales and cartilage samples) are the most exported from Mexico with 92.88%, being 54.6% of wild origin, all for scientific purposes (**Table 3**). Registered importing countries are: United States (73.7%), Panama (2%), Spain (2%) and France (1%). In lesser quantity, pieces of bone (6.2%) and others (skulls, bodies, skins, bone and bone products) have been exported from Mexico with 0.91%.

On the other hand, the reported imports, mostly pieces of bone (83.75%), are actually re-exports, since the pieces have Mexican origin, but purchased from the United States for educational purposes with a pre-convention code. This is followed by import of skins with 12.5% and skulls with 3.75% (**Table 3**).

Table 3. Exports reported for Mexico in the period 2000-2017 (from 2012 to 2017, no exports were reported). Source: CITES Trade Database (UNEP-WCMC, 2018).



6.3 Parts and derivatives in trade

See section 6.2.

6.4 Illegal trade

In the CITES trade database (UNEP-WCMC, 2013), for the period between 2000 and 2018, seven specimens exported to the United States were registered to have been illegally traded, mainly for scientific and personal use.

Within the national territory, in the period from 2005 to 2018, the Federal Attorney for Environmental Protection (PROFEPA) registered 54 seizures for a total of 186 specimens and 2 pieces, in 15 states of the Mexican Republic (**Annex 4**).

6.5 Actual or potential trade impacts

Considering that currently, and for more than 40 years, there hasn't been a significant trade in the species because it is in Appendix I, trade impacts in the country have not been measured. However, there is information on the exploitation of *C. acutus* in the past in the Mexican states of Colima, Jalisco, Nayarit, Guerrero and Sinaloa. There is a history of use in several countries of the Americas (Cuba and

Colombia), which indicates that, under legal conservation and responsible management schemes, the species can be subject to sustainable trade.

Considering some biological attributes, such as clutch sizes and growth rates, it can be an attractive species for the skin market, taking into account that the skin of medium-sized individuals is preferred over that of very large animals, in which the skin quality is reduced and is not as appreciated (Coral, pers. com., 2018).

7. Legal instruments

7.1 National

The first measure adopted in Mexico specifically for crocodile species in the country was a decree from 1934: a partial ban in some states of the Republic, allowing crocodile hunting only between March 1st and September 30th each year, and preventing the activity from taking place between October 1st and the last day of February. Subsequently, the total ban was decreed in the states of Tamaulipas (in 1954), Oaxaca (in 1955), Veracruz and Yucatán (in both in 1961; SEMARNAP / INE, 2000). In 1970, a permanent ban was agreed upon throughout the Mexican Republic, which is currently no longer in force. Other more general normative instruments that include the conservation and sustainable use of the American crocodile in Mexico are:

National Waters Law: Its purpose is to regulate the use or exploitation of said waters, their distribution and control, as well as the preservation of their quantity and quality.

General Law of Ecological Balance and Environmental Protection (LGEEPA): Mexico's flora and fauna is protected by said Law since 1988, which establishes the framework for the preservation and restoration of the ecological balance and for the protection of the environment, recognizing sustainable use as one of the mechanisms to achieve it.

General Wildlife Law and its Regulations: relating to the conservation and sustainable use of wildlife and its habitat in national territory. This Law regulates the UMA and PIMVS of *C. acutus*, as well as their management, harvest, and trade.

Official Mexican Standard NOM-059-SEMARNAT-2010: identifies (and classifies) the species or populations of wild flora and fauna that are at risk in the Mexican Republic, through the inclusion in the corresponding lists. Likewise, it establishes the inclusion criteria, exclusion or change of risk category for the species or populations, by means of an extinction risk assessment method. *Crocodylus acutus* was listed in the Official Mexican Standard NOM-059-ECOL-1994 as Rare. In 2001, it was re-categorized as a species subject to special protection (Pr), in which it has been maintained until the 2010 version of the Standard. This category is the one of lowest risk within the NOM-059-SEMARNAT-2010.

7.2 International

Crocodylus acutus was included in Appendix I of CITES in 1975 and since then, the Convention has proven its effectiveness in controlling international trade in the species and preventing illegal activities that could affect its wild populations. Resolutions Conf. 11.12 (Rev. CoP15) on the Universal Labelling System for identification of crocodile skins and 12.10 (Rev. CoP15) on the Guidelines for registering and monitoring establishments that breed Appendix I animal species for commercial purposes, have established mechanisms to ensure control of international crocodile trade. And indication of this is the recovery of the species and the few reports of illegal trade registered in the UNEP-WCMC database.

The Population of the Mangrove Integrated Management District of the Bay of Cispatá, Tinajones, La Balsa and nearby sectors, department of Córdoba, Republic of Colombia, and the population of Cuba, are currently included in Appendix II.

In addition to the above, at the international level, other range countries have their own legislation to regulate the management of the species locally.

8. Species management

8.1 Management measures

In Mexico, there are three legal schemes through which crocodiles are managed: Management Units for the Conservation of Wildlife (UMA) in their modalities 1) *in-situ* 2) and *ex-situ*, as well as the 3) Facilities that Manage Confined Wildlife (PIMVS). The UMAs' main objectives are the conservation of wild populations and habitats, while PIMVS exclusively have commercial purposes.

The Secretary of Environment and Natural Resources (SEMARNAT) is in charge of evaluating the management plans and registering the properties that have habitat and populations of American crocodile (*C. acutus*) as *in-situ* UMA. Likewise, it grants the records to the properties that are used for captive management (*ex-situ* UMA and PIMVS). It is also responsible for evaluating population studies and inventories (where appropriate) to meet the requests for use. After the harvesting takes place, the UMA and PIMVS must submit a report of their activities.

For exports, imports and re-exports of species included in CITES, DGVS-SEMARNAT, as the CITES Administrative Authority in Mexico, is in charge of granting the permits, with the advice of the CITES Scientific Authority in Mexico (CONABIO) through the Non-Detriment Findings (NDF).

8.2 Population monitoring

As a complementary part to the information of this proposal, the GEC-Mexico is preparing the "Monitoring Program of American Crocodile (*Crocodylus acutus*)", which aims to monitor the status and trends of the main wild populations of the species in the entire area of its distribution in Mexico. In order to facilitate the implementation of the mentioned program, it is modelled after the Monitoring Program of Morelet's Crocodile (*Crocodylus moreletii*) for Mexico, Guatemala and Belize, which is currently being implemented in the country. This program's implementation is intended to start in 2019 at the national level, with the support and collaboration of subnational governments, academia, private initiative and communities (**Annex 5**).

8.3 Control measures

8.3.1 International

C. acutus is listed in Appendix I of CITES (except for the Population of the Mangrove Integrated Management District of the Bay of Cispatá, Tinajones, La Balsa and nerby sectors, Department of Córdoba, Republic of Colombia; and the population of Cuba, which are included in Appendix II) that restricts international trade in an important way, and for specimens of wild origin, it is only allowed in exceptional circumstances (conservation, research). However, the exemptions allow international trade of specimens bred in captivity, as long as they comply with the provisions of the Convention in this regard (See section 7.2).

The species is listed in the Endangered Species Act of the United States, as "Endangered" throughout the territory since 2007 (except in Florida, where it has been listed as Threatened since 1975). This regulation does not allow the import of specimens of this species to said country.

8.3.2 Domestic

In Mexico's national list of species at risk (NOM-059-SEMARNAT-2010), *C. acutus* is included in the category of "Subject to Special Protection" (Pr) since 2001, which allows its use under certain conditions stipulated in the General Law of Wildlife and its Regulations (See section 7.1).

8.4 Captive breeding and artificial propagation

Section 6.2 presents the information provided by DGVS-SEMARNAT, regarding *C. acutus* specimens managed in captivity through intensive UMA and PIMVS that were registered in the period between 2000 and 2018.

8.5 Habitat conservation

The American crocodile habitat is protected throughout its range in various national protected areas established by the National Commission of Natural Protected Areas (CONANP). *C. acutus* is found in

47 protected areas that represent almost 10% of its total distribution range in the country (**Annex 1, Annex 6**).

The species habitat is also conserved through *in-situ* UMAs, through which the owners of the are committed to protect their habitat and populations, and in exchange they can sustainably harvest it. So far, UMAs have been registered mostly for ecotourism and scientific purposes (see section 6.2). It is expected that the ranching activities to be carried out under the UMA scheme at the local level, will promote the conservation of *C. acutus* and its habitat, and provide an income for the communities.

8.6 Safeguards

Regarding precautionary measures of Resolution Conf. 9.24 (Rev. CoP17) Annex 4, the species can be transferred to Appendix II in accordance with paragraph 2b, since it does not meet the Criteria in Annex 1 of the same Resolution, and, although there may be commercial demand, its management is such that the implementation of the Convention is assured and there are appropriate controls (see sections 7 and 8 for more information).

In 2018, SEMARNAT/CONANP published the "Program of Action for the Conservation of Species (PACE): Crocodylia (*Crocodylus acutus*, *Crocodylus moreletii* and *Caiman crocodilus chiapasius*)", which sets guidelines for the management and conservation of the three Mexican species.

Additionally, since 2010, the Crocodilians Specialists Group (GEC-Mexico), conformed by various sectors: government, academia, private companies, NGOs, producers and communities, has been advising decision-makers in crocodile related issues, and supporting and promoting their conservation and sustainable management throughout the country. This proposal was developed in collaboration with the GEC-Mexico members, and its submission to CITES CoP18 was agreed on during its last annual meeting held in 2018.

9. Information on similar species

Sánchez-Herrera *et al*. (2011) generated a graphic guide for morphological identification between *C. moreletii* and *C. acutus*. Additionally:

- *C. acutus* is distinguished from *Caiman crocodilus* for having the fourth mandibular tooth visible (hidden in *C. crocodilus*); ventral shields with integumentary sense organs or ISO (ISO absent in *C. crocodilus*); not presenting an interocular bridge (present in *C. crocodilus*); tongue and palate pale yellow or whitish (pale pink in *C. crocodilus*); dorsal shields of the skin usually arranged very irregularly and the keel of the osteoderms prominent (dorsal shields arranged and the keel slightly prominent on the back of *C. crocodilus*).

- It differs from *Crocodylus moreletii* by presenting the mandibular symphysis of equal length or longer than the distance between the 5th mandibular teeth (usually shorter in *Crocodylus moreletii*); generally the snout is 1.7 to 2 times longer than the face (in *C. moreletii* the snout is 1.5 to 1.7 times longer than the face); nuchal formula of irregular number (six usually arranged in 4-4-2 in *C. moreletii*); the lateral rows in the tail, usually without rows or verticillary scales (or verticiles), or when they are present, relatively scarce (large number of verticillary rows present in the tail, the dorsal rows with high keels in *C. moreletii* the keels are low or absent).

Based on the work of Pacheco-Sierra and collaborators (2018) and Cedeño-Vásquez *et al*. (2008), it is known that there is sympatry and historical natural genetic exchange between *C. moreletii* and *C. acutus* in the populations of the Yucatan Peninsula. This exchange dates from between 2.4 million years to 230,000 years ago. Therefore, according to Resolution Conf. 10.17 (Rev CoP14), these sympatric populations do not meet the definition of hybrid specimens, since it only applies to hybrids in a recent lineage (last 3 generations; for example, 120 years for *C. acutus*). Although there are papers that are evaluating the possibility of the Caribbean subpopulation of *C. acutus* in Mexico being a separate species (Pacheco-Sierra *et al.,* 2018), CITES currently only recognizes the existence of one species.

10. Consultations

This proposal has been consulted with other countries of the distribution area, and information was received from the Cayman Islands and Jamaica. In addition, inputs from the IUCN Crocodile Specialist Group (CSG-IUCN) were provided, and their recommendations were addressed throughout the proposal.

11. Additional remarks

12. References

Alonso-Tabet, M. 2009. Comportamiento del cocodrilo americano (*Crocodylus acutus*) en el Refugio de Fauna "Monte Cabaniguán", Cuba. Tesis Doctoral. Universidad de Alicante, España y Universidad de Pinar del Río, Cuba.

Álvarez del Toro, M. 1974. Los Crocodylia de México (estudio comparativo). Ciudad de México: Instituto Mexicano de Recursos Naturales Renovables.

Andrade Esquivel, A. 2012. Diagnostico poblacional del cocodrilo de río *(Crocodylus acutus*) en zonas de influencia de la UMA Cocodrilario el Cora, Municipio de Bahía de Banderas, Nayarit. Fomento a la conservación y aprovechamiento sustentable en UMAS o PIMS. 26p

Andrade Esquivel, A. 2011. Diagnóstico poblacional del cocodrilo de río en zonas aledañas al proyecto UMA Cocodrilos del Nayar. Compostela, Nayarit. Fomento a la conservación y aprovechamiento sustentable en UMAS o PIMS. 23p

Barrios-Quiroz, G. 2002. Estimación de la población de *Crocodylus acutus* en el parque Nacional Lagunas de Chacahua, en el estado de Oaxaca. Pp. 39-51. En: Memorias de la Reunión del Subcomité Técnico Consultivo para la Conservación, Manejo y Aprovechamiento Sustentable de los Crocodylia en México.

Brandon-Pliego, J.D. 2007. Estudio poblacional de *Crocodylus acutus* (Cuvier, 1807) (Reptilia: Crocodylia) en Jamiltepec, Oaxaca. Ciencia y Mar XI (33): 29-37.

Brazaitis, P. 1973. The identification of living crocodilians. Zoologica 56: 115-170.

Caldwell, J. 2011. World trade in crocodilian skins 2007-2009. UNEP-WCMC, Cambridge.

Casas-Andreu, G. 1990. *Crocodylus acutus* on the Coast of Jalisco. Crocodile Specialist Group Newsletter 9(4): 19-20.

Casas-Andreu, G. 1994. *Crocodylus acutus* survey on the Santiago River. Crocodile Specialist Group Newsletter 13: 13-14.

Casas -Andreu, G. 2003. Ecología de la anidación de *Crocodylus acutus* (Reptilia: Crocodylidae) en la desembocadura del río Cuitzmala, Jalisco, México. Acta Zoológica Mexicana (n.s.) 89: 111-128.

Casas-Andreu, G. 2010. Contribuciones para la historia del conocimiento de los cocodrilos en México. Rev. Lat. Cons. Vol. 1 (2): 17-24

Casas-Andreu, G. y G. Barrios Quiroz. 2003. Hábitos alimenticios de *Crocodylus acutus* (Reptilia: Crocodylidae) determinados por el análisis de sus excretas en la costa de Jalisco, México. Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología 74(1): 35-42.

Casas–Andreu, G. y M. Guzmán–Arroyo. 1970. Estado actual de las investigaciones sobre cocodrilos mexicanos. Secretaría de Industria y Comercio. Instituto Nacional de Investigaciones Biológico Pesqueras. Serie Divulgación, 3: 1–52.

Casas-Andreu, G., Méndez-De la Cruz, F. 1992. Observaciones sobre la ecología de Crocodylus acutus en el río Cuitzmala, Jalisco, México. Revista de la Sociedad Mexicana de Historia Natural, 43: 71-80.

Casas-Andreu, G. y T. Reyna-Trujillo. 1994. Climate and distribution of *Crocodylus acutus* in the Mexican pacific coast. Biogeoraphica 70(2): 69-75.

Casas-Andreu, G., T. Reyna-Trujillo. y F. Méndez de la Cruz. 1990. Estado actual de *Crocodylus acutus* en la costa del Pacífico de México. Rev. Soc. Mex. Hist. Nat. 41: 57-62.

Casas-Andreu, G. 1995. Los cocodrilos de México como recurso natural, presente, pasado y futuro. Revista Sociedad Mexicana de Historia Natural, 46, 153-162.

Carballar-Osorio, J., M. Lazcano-Barrero, y G. Merediz-Alonso. 2001a. En "Memorias de la 1era Reunión Regional COMACROM: Península de Yucatán Conservación del humedal de la Reserva de la Biosfera Banco Chinchorro". Programa de monitoreo de cocodrilos, Amigos de Sian Ka'an A.C.

Carballar-Osorio, J., M. Lazcano-Barrero, R. Ibarra, S. Olivares y G. Merediz. 2001b. Estudio de las Poblaciones de Cocodrilos en el Sistema Lagunar Nichupté, Cancún, Quintana Roo. Pp. 27. En: Memorias de la Reunión del Subcomité Técnico Consultivo para la Conservación, Manejo y Aprovechamiento Sustentable de los Crocodylia en México.

Castillo, F.A. 1997a. Propuesta para la conservación de los humedales en los que existan cocodrilos en México. pp. 58. En: 4ta Reunión Regional del Grupo de Especialistas de Cocodrilos de América Latina y el Caribe.

Castillo, F.A. 1997b. Observations on two American crocodile populations in Colima state, Mexico, with possible management implications. Pp. 59. En: 4ta Reunión Regional del Grupo de Especialistas de Cocodrilos de América Latina y el Caribe.

Castillo, F.A. 2001. Effects of a submerged on population size and structure of an American crocodile population (*Crocodylus acutus*) in lake Amela, Colima, Mexico. Crocodile Specialist Group Newsletter 20(4): 86-92.

Cedeño-Vázquez, J.R. 1995. Distribución y situación actual de *Crocodylus acutus* Cuvier (1807) (Reptilia: Crocodylidae), en la costa de Michoacán, México. Tesis de Licenciatura. Universidad Michoacana de San Nicolás de Hidalgo.

Cedeño-Vázquez, J.R. 2002. Estado de conservación de *Crocodylus acutus* y *Crocodylus moreletii* en el río Hondo, Bahía de Chetumal, y áreas anexas, Quintana Roo, México. Tesis de Maestría. El Colegio de la Frontera Sur.

Cedeño-Vázquez, J.R., D. Huacuz-Elias y G. Casas-Andreu. 1996. *Crocodylus acutus* on the coast of Michoacan. Crocodile Specialist Group Newsletter 15(1): 15-16.

Cedeño-Vázquez, J.R., D. Rodriguez, S. Calme, J.P. Ross, L.D. Densmore y J.B. Thorbjarnarson. 2008. Hybridization of *Crocodylus acutus* and *Crocodylus moreletii* in the Yucatan Peninsula: I. Evidence from mitochondrial DNA and morphology. Journal of Experimental Zoology, 309A: 661-673.

Cedeño-Vázquez, J.R., J. Perran-Ross y S. Calmé. 2006. Population status and distribution of *Crocodylus acutus* and *Crocodylus moreletii* in Southeastern Quintana Roo, México. Herpetological Natural History 10(1): 53-66.

Charruau, P. 2010. Ecología y etología de anidación del cocodrilo americano (*Crocodylus acutus*): un estudio para su conservación. Tesis Doctoral, El Colegio de la Frontera Sur, Chetumal, Quintana Roo, México.

Charruau, P., J.R. Cedeño-Vázquez y S. Calmé. 2005. Status and conservation of the American crocodile (*Crocodylus acutus*) in Banco Chinchorro Biosphere Reserve, Quintana Roo, Mexico. Herpetological Review 36(4): 390-395.

Charruau, P., J.R. Cedeño-Vázquez y R. Rojo. 2004. *Crocodylus acutus* in Banco Chinchorro. Biosphere Reserve, Quintana Roo. Crocodile Specialist Group Newsletter 23(1): 20-21.

Charruau, P., J.B. Thorbjarnarson y Y. Hénaut. 2010. Tropical cyclones and reproductive ecology of *Crocodylus acutus* Cuvier 1807(Reptilia: Crocodilia: Crocodylidae) on a Caribbean atoll in Mexico. Journal of Natural History 44: 741-761.

Cherkiss, M.; S. Romanach y F. Mazzotti. 2011. The American Crocodile in Biscayne Bay, Florida. Estuarine and Coasts (34):529-535

Colmenero, R.L.C. 1978. Rescate de fauna en el embalse de Chicoasén, Chiapas. (Cañón del Sumidero). Tesis Profesional. Facultad de Ciencias, Universidad Nacional Autónoma de México.

COMACROM, 2000. Proyecto conservación manejo y aprovechamiento sustentable de los Crocodylia en México. SEMARNAT: 1-93

CrocBITE. 2018. The Worldwide Crocodilian Attack Database. Big Gecko, Darwin. En: http://www.crocodile-attack.info. Consultado el 16 de diciembre de 2018.

Cupul- Magaña, F.G. 2003. Una Nueva, pero extinta, especie de cocodrilo. Elementos: Ciencia y Cultura 52: 57-58.

Cupul-Magaña, F.G. y H. Hernández-Hurtado. 2002. Notas sobre crecimiento de *Crocodylus acutus* en cautiverio. Revista Biomédica. (13):69-71

Cupul-Magaña, F.G. A. Rubio-Delgado y A. Reyes-Juárez. 2003. American crocodile in Puerto Vallarta, México. Crocodile Specialist Group Newsletter 22(2): 21-22.

Cupul-Magaña F. G., A, Rubio-Delgado y A. Reyes-Juárez. 2004. Crecimiento en talla y peso del cocodrilo americano (*Crocodylus acutus*) durante su primer año de vida. Revista Española de Herpetología. (18):55-61

Cupul-Magaña, F.G., A. Rubio-Delgado y A. Reyes Juárez. 2005. Observaciones sobre la incursión al ambiente marino y ocurrencia de un hábito alimenticio inusual del cocodrilo americano (*Crocodylus acutus*) en una playa del Pacífico centro-occidente de México. Nowet 3(3): 46-47.

Cupul-Magaña, F.G., A. Rubio Delgado, A. Reyes Juárez y H. Hernández Hurtado. 2002. Sondeo poblacional de *Crocodylus acutus* (Cuvier 1807) en el Estero Boca Negra, Jalisco. Ciencia y Mar 6(16): 45-50.

Cupul-Magaña, F.G., A. Rubio-Delgado, C. Reyes-Núñez, E. Torres-Campos y L.A. Solís-Pecero. 2010. Ataques de cocodrilo de río (*Crocodylus acutus*) en Puerto Vallarta, Jalisco, México: presentación de cinco casos. Cuadernos de Medicina Forense 16(3):153-160.

Cupul-Magaña, F.G., A.H. Escobedo-Galván, G. Casas-Andreu y P. Uriarte-Garzón. 2017. Hasta el Río Yaqui y más allá: localidades históricas y actuales de *Crocodylus acutus* (Cuvier, 1807) en la costa noroccidental del Pacífico mexicano. Quehacer Científico en Chiapas. Universidad Autónoma de Chiapas. Dirección General de Investigación Posgrado. 116.

De Luna-Cuevas L. O. 1996. Fluctuación anual de la densidad de una población de *Crocodylus acutus* en Cuitzmala, Jalisco, México. Boletín de la Sociedad Herpetológica Mexicana 7(4): 15-16.

DERMAC. 2013. Monitoreo biológico de crocodilianos *Crocodylus acutus* y *Caiman crocodilus chiapasius* en la Reserva de la Biosfera La Encrucijada, Chiapas. Informe Final. Desarrollo Rural y Medio Ambiente, A.C. 34p

DERMAC. 2014. Monitoreo Poblacional de Crocodilianos (*Crocodylus acutus* y *Caiman crocodilus fuscus*) en la Reserva de la Biósfera La Encrucijada, Chiapas. DERMAC, Desarrollo Rural y Medio Ambiente, A.C. 43p

Dirección de Evaluación y Seguimiento, CONANP. 2010. Monitoreo Poblacional de Cocodrilianos (*Crocodylus acutus* y *Caiman crocodilus fuscus*) en la Reserva de la Biosfera la Encrucijada. Informe Técnico Reserva de la Biosfera La Encrucijada, Chiapas. 11 pp.

Domínguez-Laso, J. 2002. Análisis poblacional de *Crocodylus acutus* (Cuvier 1807) y *Crocodylus moreletii* (Dúmeril 1851) en el Sistema Lagunar Norte de la Reserva de la Biósfera Sian ka'an, Quintana Roo. Tesis de Licenciatura. Universidad Autónoma Metropolitana.

Domínguez-Laso, J., 2005. Determinación de las densidades poblacionales del cocodrilo de río (*Crocodylus acutus*) en los cuerpos de agua de Ixtapa - Zihuatanejo, Guerrero, México. En memorias de la 6a Reunión COMACROM - Centro Universitario de la Costa, Jalisco, México. 31p.

Domínguez-Laso, J. 2006. Project “Sumidero Croc”, Anidation of the crocodile of River In The Canyon of the Sumidero, Chiapas. Crocodile Specialist Group Newsletter, Volume 25(4):6-8

Domínguez-Laso, J. 2007. A Giant of the Sumidero. Crocodile Specialist Group Newsletter, 26 (4):7-8

Domínguez-Laso, J. 2009. Record size for a female *Crocodylus acutus* in the Grijalva River, Chiapas, Mexico. Crocodile Specialist Group Newsletter 28: 14-15.

Domínguez-Laso, J. 2010a. Estatus del Cocodrilo de Río (*Crocodylus acutus*) y estrategias para su conservación en el río Grijalva, Cañón del Sumidero, Chiapas, México. En Memorias del Congreso Nacional de la Asociación para la Investigación y Conservación de Anfibios y Reptiles A. C. (AICAR); San Cristóbal de las Casas, Chiapas. México.

Domínguez-Laso, J. 2010b. Estado y estrategias de conservación de las poblaciones de cocodrilo de río (*Crocodylus acutus*) y caimán (*Caiman crocodilus*) en los humedales de Tonalá, costa de Chiapas, México. En Memorias de la Reunión Nacional de Herpetología, Toluca Estado de México. Sociedad Herpetológica Mexicana A. C.

Domínguez-Laso, J. y L.B. García-Reyes. 2010. Crocodiles in Ixtapa-Zihuatanejo, Guerrero, Mexico. Crocodile Specialist Group Newsletter 29(1): 13-14.

Ernst, C.H., F.D. Ross y C.A. Ross. 1999. *Crocodylus acutus* (Cuvier) American crocodile. Catalogue of American Amphibians and Reptiles 700: 1-17.

Escobedo-Galván, A.H., M.A. López Luna y A.H. Díaz de la Vega Pérez. 2011. Anfibios y Reptiles en las zonas costeras de México. Pp. 253-271. En: De la Lanza, G. y S. Hernández Pulido (eds.), Ambiente, biología, sociedad, manejo y legislación de la zona costera mexicana. Instituto de Investigaciones sobre Recursos Naturales de la Universidad Michoacana de San Nicolás de Hidalgo, WWF-Fundación Gonzalo Río Arronte, Plaza y Valdez Editores.

Escobedo-Galván, A.H. y C. González-Salazar. 2011. Aplicando modelos de nicho ecológico para predecir áreas potenciales de hibridación entre *Crocodylus acutus* y *C. moreletii*. Quehacer Científico en Chiapas 11: 27-35.

Espinal M y A.H. Escobedo-Galván. 2010. *Crocodylus acutus*: nesting ecology. Herpetological Review 41(2): 210-211.

Espinosa-Reyes, G. y J. García-Grajales. 2001. Estimación de la densidad del cocodrilo de río (*Crocodylus acutus*) en el estero La Ventanilla, Oaxaca, México. pp. 29-39. En: Memorias de la Reunión del Subcomité Técnico Consultivo para la Conservación, Manejo y Aprovechamiento Sustentable de los Crocodylia en México.

Fittkau, E.J. 1970. Role of caimans on the nutrient metabolism of mouth-lakes of Amazon affluents (A hypothesis). Biotropica 2(2): 132-142.

García, A., M. Valtierra-Azotla, A. Cuarón y G. Ceballos. 2010. Tendencias poblaciones de *Crocodylus acutus* en condiciones de protección en la Reserva de la Biosfera Chamela-Cuixmala, Jalisco, México. Revista Latinoamericana de Conservación 1(2): 52-62.

García-Cruz, E.G. 2006. Análisis Genético en poblaciones de cocodrilo de río (*Crocodylus acutus*) y cocodrilo de pantano (*Crocodylus moreletii*) de los estados de Chiapas y Quintana Roo. Tesis. UNICACH, Chiapas. 65pp.

García-Garduño M. E., O. Monroy-Vilchis y G. A. González-Desales. 2017. Retos de las comunidades locales en la conservación de los Crocodylia en México. Quehacer Científico en Chiapas 12(2): 99-107.

García-Grajales J., G. Aguirre-León y A. Contreras-Hernández. 2007a. Tamaño y estructura poblacional de *Crocodylus acutus* (Cuvier 1807) (Reptilia: Crocodylidae) en el estero La Ventanilla, Oaxaca, México. Acta Zoológica Mexicana (n.s.) 23(1): 53-71.

García-Grajales, J., y Buenrostro-Silva, A. 2017. Estimación poblacional del cocodrilo americano (*Crocodylus acutus*) en el Parque Nacional Lagunas de Chacahua, Oaxaca, México. Revista Mexicana de Biodiversidad, 88(4), 936-943.

García-Grajales, J., A. Buenrostro-Silva y A.H. Escobedo-Galván. 2007b. Análisis de los métodos usados para estimar la abundancia de las poblaciones silvestres de cocodrilianos (Crocodylia) en México. Ciencia y Mar XI (31): 23-32.

García-Grajales, J., A. Buenrostro-Silva y J.D. Brandon-Pliego. 2008. Negative fatal interaction of American crocodile in Oaxaca, Mexico. Crocodile Specialist Group Newsletter 27(3): 4-5.

García-Grajales, J., Buenrostro-Silva, A., y Charruau, P. 2012. Growth and Age of Juvenile American Crocodiles (*Crocodylus Acutus*) in La Ventanilla Estuary, Oaxaca, Mexico. Herpetological Conservation and Biology, 7(3), 330-338.

García-Grajales, J., A. Buenrostro-Silva y P.R. Téllez-Rodríguez. 2009. Variación del patrón de escutelación nucal del cocodrilo americano (*Crocodylus acutus*, Cuvier 1807) en el estero La Ventanilla, Oaxaca, México. Acta Zoológica Mexicana (n.s.) 25: 375–382.

García-Grajales, J. y G. Espinosa-Reyes. 2001. Variación de la población del cocodrilo de Río (*Crocodylus acutus*) uso y caracterización de su hábitat en el estero La Ventanilla, Oaxaca. Pp. 40-44. En: Memorias de la Reunión del Subcomité Técnico Consultivo para la Conservación, Manejo y Aprovechamiento Sustentable de los Crocodylia en México.

García-Grajales, J. y M. A. López-Luna. 2010. Análisis bibliográfico del conocimiento de los cocodrilianos en México. Revista Latinoamericana de Conservación 1(2):25-31.

García-Grajales J., Montoya-Márquez J. A., Buenrostro-Silva A., Rosales-Jaillet P. y L. Sánchez-Estudillo. 2008. Análisis de la abundancia y uso de hábitat del cocodrilo americano (*Crocodylus acutus*, Cuvier 1807) en dos lagunas de la costa central de Oaxaca, México. Pp. 69-81 En: Memorias en extenso del XXV Simposio sobre Fauna Silvestre, Facultad de Medicina Veterinaria y Zootecnia, Universidad Nacional Autónoma de México, México, D. F.

Gaviño Rodríguez, J.H., E.A. Reyes Herrera, A.H. Escobedo Galván, S.I. Quijano Scheggia, M. García García, A. Olivos Ortiz, M. Patiño Barragán, M.A. Galicia Pérez y B. Lara Chávez. 2011. La población de *Crocodylus acutus* en el Vaso III de la Laguna de Cuyutlán, Colima, México. Pp. 96-107. En: Chávez-Comparan, J.C. y J. Mimbela López (eds.), Avances Sobre Investigaciones Marinas y Acuícolas sobre el Pacífico Tropical Mexicano. Volumen 2, Universidad de Colima.

Gómez-Hernández, Y. 2005. Monitoreo de cocodrilos de la Reserva de la Biosfera Banco Chinchorro. Reporte Técnico. CONANP.

González Ávila F.2015. Condición corporal del cocodrilo americano (*Crocodylus acutus*) en el Parque Nacional Arrecifes de Xcalak, Quintana Roo, México. Tesis de Maestría. El Colegio de la Frontera Sur. México. 63 p.

González-Cortés, H. 2007. Estudio poblacional de *Crocodylus acutus* (Cuvier, 1807) en el Refugio Estatal de Flora y Fauna Laguna de Colombia, Cozumel, Quintana Roo, México. Tesis de Licenciatura, Universidad Veracruzana.

Gutiérrez-Ramírez, J. 2016. Estado de las poblaciones de *Crocodylus acutus* y *Crocodylus moreletii* en el Área de Protección de Flora y Fauna Yum Balam, Quintana Roo, México. Tesis de Licenciatura. Tecnológico de Estudios Superiores Huixquilucan. Estado de México, México 69 p.

Hernández-Hurtado, H., F.G. Cupul-Magaña, G. García y J.C. Rodríguez. 1998. Los cocodrilos del delta del Río Ameca. Revista Divulgare 22: 16-27.

Hernández-Hurtado, H., J.J. Romero-Villaruel y P.S. Hernández-Hurtado. 2011. Ecología poblacional de *Crocodylus acutus* en los sistemas estuarinos de San Blas, Nayarit, México. Revista Mexicana de Biodiversidad 82: 887-895.

Hernández-Santos, V.E. 2005. Diagnóstico de la Ecología de Poblaciones del Cocodrilo de Río (*Crocodylus acutus*) y su relación con el Hombre en el Sistema Estuarino El Chino-Laguna el Quelele, Municipio de Bahía de Banderas, Nayarit. Tesis de Licenciatura. Universidad Autónoma Metropolitana.

Huerta-Ortega, S.M. 2005. Dinámica poblacional del caimán (*Crocodylus acutus*, Cuvier 1807, Crocodylidae) en Jalisco, México. Tesis de Maestría. Universidad de Guadalajara.

Huerta-Ortega, S.M., Ponce-Campos, P. y J.P. Ross. 2002. Preliminary results of a population study of American crocodile (*Crocodylus acutus*) in Jalisco, Mexico. Pp. 231-238. En: Proceedings of the 16th Working Meeting of the Crocodile specialist Group of the Species Survival Commission of IUCN – The World Conservation Union.

Huerta-Ortega, S.M., Ponce-Campos, P. 2002. Interacción Hombre-Cocodrilo en la costa de Jalisco, México. Pp. 200-203. En: Proceedings of the 16th Working Meeting of the Crocodile specialist Group of the Species Survival Commission of IUCN – The World Conservation Union.

Kushlan, J.A y F. Mazzotti. 1989. Population biology of the American crocodile. Journal of Herpetology 23(1): 8-21.

Kushlan, J.A. 1974. Observations on the role of the American Alligator (*Alligator mississsipiensis*) in the southern Florida. Wetlands 4: 993-996.

Lazcano-Barrero, M.A. 1989. Report on the status and conservation of the American crocodile population in Cuixmala, Jalisco, Mexico. Reporte Técnico. CONANP.

Lazcano-Barrero, M.A. 1990. Conservación de Cocodrilos en Sian Ka'an. Boletín Amigos de Sian Ka'an N° 6.

Lazcano-Barrero, M.A. 1993. Plan de acción para la conservación del cocodrilo americano (*Crocodylus acutus*) en la Isla Contoy, Quintana Roo. Reporte Técnico. CONANP 9 p.

Lazcano-Barrero, M.A., A. Muñoz-Alonso y H. Núñez-Orantes. 1997. Censo preliminar para evaluar las poblaciones de cocodrilianos (*Crocodylus acutus y Caiman crocodilus*) en el Estero Palo Blanco y el Río Pijijiapan, en la Costa de Chiapas, México. En: 4ta Reunión Regional del Grupo de Especialistas de Cocodrilos de América Latina y el Caribe.

León-Ojeda, F., P. Bagazuma y P. Arredondo. 1997. Evaluación poblacional y algunos aspectos ecológicos de *Crocodylus acutus* en la laguna de Chiricahueto. Pp. 90-104. En: 4ta Reunión Regional del Grupo de Especialistas de Cocodrilos de América Latina y el Caribe.

López-Luna, M.A., G. Barrios-Quiroz, A.H. Escobedo-Galván. 2016. Acciones de Conservación y Manejo del Cocodrilo de Río y Caimán en Dos Humedales Prioritarios para la Costa de Chiapas. Informe Técnico. PROCER-CONANP-REBIEN 2016. 100 pp

López-Osuna, L. 2005. Ecología poblacional de *Crocodylus acutus* en la Laguna de Chiricahueto, Sinaloa. Tesis de Licenciatura. Universidad Autónoma de Sinaloa.

López R., Damarys, R. Rodríguez Soberón y V. Berovides Alvarez. 2000. Distribución y abundancia del cocodrilo americano (*Crocodylus acutus* Cuvier) en el sector costero Sur de la Isla de la Juventud, Cuba. Pp. 59 - 70. In: Crocodiles. Proceedings of the 15th Working Meeting of the Crocodile Specialist Group, IUCN – The World Conservation Union, Gland, Switzerland and Cambridge, UK: xvii + 541 p.

Machkour-M'Rabet, S., Y. Hénaut, P. Charruau, M. Gevrey, P. Winterton y L. Legal. 2009. Between introgression events and fragmentation, islands are the last refuge for the American crocodile in Caribbean Mexico. Marine Biology 156: 1321-1333.

Mandujano-Camacho, H.O. 2003. Estado de conservación del cocodrilo de río (*Crocodylus acutus*) en la Cuenca del Río Grijalva en Chiapas, México. Tesis de Maestría. Universidad Nacional, Heredia, Costa Rica.

Manolis, S.C. y Webb, G.J.W. (compiladores). 2016. Best Management Practices for Crocodilian. Farming. Version 1. IUCN-SSC Crocodile Specialist Group: Darwin, Australia.

Mandujano-Camacho, H.O. y J. Rodas-Trejo. 2010. Abundancia de *Crocodylus acutus* en sitios paradójicos por influencia de las hidroeléctricas que fragmentan el río Grijalva en Chiapas, México. Revista Latinoamericana de Conservación 1(2): 38-51.

Martínez-Ibarra, J.A. 1996. Las poblaciones de cocodrilos (*Crocodylus acutus*) y caimanes (*Caiman crocodilus*) en una zona pesquera de la Reserva de la Biosfera La Encrucijada, Chiapas. México. Tesis Maestría en Ciencias en Recursos Naturales y Desarrollo Rural--El Colegio de la Frontera Sur, San Cristóbal de las Casas, Chiapas, México. 33 pp.

Martínez-Ibarra, J.A., E. Naranjo y K.C. Nelson. 1997a. Relaciones existentes entre los cocodrilianos y los pescadores de la reserva de la biosfera "La Encrucijada", Chiapas, México. Pp. 113-116. En: Proceedings 4th Regional Meeting of IUCN/SSC Crocodile Specialist Group, Villahermosa, Mexico. IUCN Publ., Gland, Switzerland.

Martínez-Ibarra, J.A., E. Naranjo y K.C. Nelson. 1997b. Las poblaciones de cocodrilos (*Crocodylus acutus*) y caimanes (*Caiman crocodilus*) en una zona pesquera de la reserva de la biosfera "La Encrucijada", Chiapas, México. Vida Silvestre Neotropical 6(1-2): 21-28.

Mauger L., E. Velez, M. S. Cherkiss y M.L.Brien. 2012. Population assessment of the American crocodile *Crocodylus acutus* (Crocodilia: Crocodylidae) on the Pacific coast of Costa Rica. Rev. Biol. Trop. 60(4):1889-1901.

Mazzotti, F.J., L.A. Brandt, P. Moler y M.S. Cherkiss. 2007. American crocodile (*Crocodylus acutus*) in Florida: Recommendations for endangered species recovery and ecosystem restoration. Journal of Herpetology 41: 122-132.

Medem, F. 1981. Los Crocodylia de Sur América, Vol. I. Los Crocodylia de Colombia. Editorial Carrera. Bogotá, Colombia.

Medem, F. 1983. Los Crocodylia de Colombia. Vol. II. Venezuela-Trinidad-Tobago-Guyana-Suriname-GuayanaFrancesa-Ecuador-Perú-Bolivia-Brasil-Paraguay-Argentina-Uruguay. Editorial Carrera. Bogotá, Colombia.

Méndez-De la Cruz, F.R. y G. Casas-Andreu. 1992. Status y distribución de *Crocodylus acutus* en la Costa de Jalisco, México. Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología 63(1): 125-133.

Milián-García, Y., Venegas-Anaya, M., Frias-Soler, R., Crawford, A. J., Ramos-Targarona, R., Rodríguez-Soberón, R., Alonso-Tabet, M., Thorbjarnarson J., Sanjur O.I., Espinosa-López y Bermingham, E. 2011. Evolutionary history of Cuban crocodiles *Crocodylus rhombifer* and *Crocodylus acutus* inferred from multilocus markers. Journal of Experimental Zoology Part A: Ecological Genetics and Physiology, 315(6): 358-375.

Moralez Pérez, G.A. 2010. Monitoreo de la población de cocodrilo de río (*Crocodylus acutus*), en la laguna del Miniyoso en el Municipio de Huazolotitlán, Oaxaca. Informe Final de Servicio Social. Universidad Autónoma Metropolitana.

Motte, M. 1994. Abundancia, distribución e impacto de predación del cocodrilo (*Crocodylus acutus* Cuvier 1807) sobre el ganado vacuno en las fincas aledañas al Río Grande de Tárcoles, Costa Rica. Tesis de Maestría. Universidad Nacional, Heredia, Costa Rica.

Navarro-Serment, J.C. 2002. Abundancia, uso de hábitat y conservación del cocodrilo de río *Crocodylus acutus* Cuvier, 1807 (Reptilia: Crocodylia) en el Estero El Verde, Sinaloa, México. Tesis de Maestría. Centro de Investigación en Alimentación y Desarrollo A.C.

Navarro-Serment, J.C. 2003a. *Crocodylus acutus* in Sonora, México. Crocodile Specialist Group Newsletter 22(1): 21.

Navarro-Serment, J.C. 2003b. Abundance, habitat use and conservation of the American crocodile in Sinaloa. Crocodile Specialist Group Newsletter 22(2): 22-23.

Navarro-Serment, J.C. J.P. Gallo-Reynoso, A. Van Der Heiden, H. Plasencia y G. Merediz-Alonso. 2002. Abundancia, uso de hábitat y conservación del Cocodrilo de Río, *Crocodylus acutus* Cuvier 1807 (Reptilia: Crocodylia) en el Estero el Verde, Sinaloa, México. Boletín del Centro de Investigación en Alimentación y Desarrollo A.C. 11(16): 3.

Navarro-Vargas, M.P. 1999. Distribución, abundancia y caracterización de hábitat del cocodrilo de río (*Crocodylus acutus*) en la costa centro-sur de Michoacán. Pp. 30-38. En: Memorias de la Reunión del Subcomité Técnico Consultivo para la Conservación, Manejo y Aprovechamiento Sustentable de los Crocodylia en México.

Olvera-Morales, M. 2008. Estructura poblacional, distribución espacial, abundancia y crecimiento de *Crocodylus moreletii* (Dumeril y Bribon 1957) y *Crocodylus acutus* (Cuvier 1807) en la Reserva de la Biosfera Ría Lagartos. Yucatán. Tesis de Maestría. Universidad Autónoma de Yucatán. Yucatán, México. 63 p.

Ogden, J.C. 1978. Status and nesting biology of the American crocodile, *Crocodylus acutus* (Reptilia, Crocodilidae) in Florida. Journal of Herpetology 12: 183–196

Pacheco-Sierra G, Vázquez-Domínguez E, Pérez-Alquicira J, Suárez-Atilano M and Domínguez-Laso J (2018). Ancestral Hybridization Yields Evolutionary Distinct Hybrids Lineages and Species Boundaries in Crocodiles, Posing Unique Conservation Conundrums. Front. Ecol. Evol. 6:138. doi: 10.3389/fevo.2018.00138

Peña Martínez, E. 2011. Abundancia relativa de *Crocodylus acutus* y *Caiman crocodilus* en la Reserva de la Biosfera "La Encrucijada" en Chiapas, México. Tesis de Licenciatura. Universidad Autónoma de Chiapas.

Platt, S.G. y J.B. Thorbjarnarson. 2000. Status and conservation of the American crocodile, *Crocodylus acutus*, in Belize. Biological Conservation 96: 13-20.

Platt, S.G. 2003. A recent study of the American crocodile in the Turneffe Atoll, Belize. Crocodile Specialist Group Newsletter 22(2): 17-20.

Ponce-Campos P. y S. Huerta-Ortega. 1996. Contribution to the status of "Caiman" or river crocodile (*Crocodylus acutus*) in the Jalisco coast, Mexico. Crocodile Specialist Group Newsletter 15(2).

Ponce-Campos P. 2004. Influencia del ambiente en las hormonas sexuales y de estrés durante el ciclo reproductivo del "Caimán" *Crocodylus acutus* Cuvier, 1807. Tesis de Maestría. Universidad de Guadalajara.

Ponce-Campos, P., J. Thorbjarnarson y A. Velasco. (IUCN SSC Crocodile Specialist Group) 2012. *Crocodylus acutus*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. www.iucnredlist.org.

Ray, D. A., Dever, J. A., Platt, S. G., Rainwater, T. R., Finger, A. G., McMurry, S. T., Batzer, M. A., Barr B., Stafford P.J., Macknight J. y Densmore, L. D. (2004). Low levels of nucleotide diversity in *Crocodylus moreletii* and evidence of hybridization with *C. acutus*. Conservation Genetics, 5(4), 449-462.

Regalado Soriano, M. 2013. Ecología Poblacional del Cocodrilo de Río (Cuvier 1807) en humedales de Bahía de Banderas Nayarit. Tesis profesional. Instituto Tecnológico de Bahía de Banderas. 44p

Reyes Herrera EA, JH Gaviño Rodríguez, SI Quijano Scheggia, A Olivos Ortíz, M Patiño Barragán, MA Galicia Pérez, B Lara Chávez, AH Escobedo y HM García (2015) Seguimiento al estudio poblacional de *Crocodylus acutus* en el Vaso III de la Laguna de Cuyutlán, Colima, México. Pp. 233-249. En: Sosa Ávalos R y MG Verduzco Zapata (eds) Estudios Acuícolas y Marinos en el Pacífico Mexicano, Universidad de Colima.

Rivera-Téllez, E., G. López Segurajáuregui, L. A. Antaño Díaz y H. Benítez Díaz. 2017. Informe del Programa de Monitoreo del Cocodrilo de Pantano en México, temporadas 2014 a 2015 y análisis de tendencias del 2011 al 2015. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad. México 35.pp.

Rodríguez, D., J.R. Cedeño-Vázquez, M.R.J. Forstner y L.D. Densmore. 2008. Hybridization between *Crocodylus acutus* and *Crocodylus moreletii* in the Yucatan Peninsula: II. Evidence from microsatellites. Journal of Experimental Zoology 309A: 674-686.

Romero-Villarruel, J. de J., I. Martínez-Brown, A. Razo-Pérez y J.A. Cervantes-Romero. 2002. Estudio de población y distribución del cocodrilo de río (*Crocodylus acutus*) en el embalse de la Presa de Agua Milpa, Nayarit. Pp. 17-28. En: Memorias de la Reunión del Subcomité Técnico Consultivo para la Conservación, Manejo y Aprovechamiento Sustentable de los Crocodylia en México.

Ross, C.A. y F.D. Ross. 1974. Caudal scalation of Central American *Crocodylus*. Proceedings Biological Society of Washington 87: 231-234.

Ross, J.P. 1998. Crocodiles. Status Survey and Conservation Action Plan, Second ed. IUCN/SSC Crocodile Specialist Group, IUCN, Gland, Switzerland and Cambridge, UK.

Salomón-Soto, V.M. 2013. Patrones ecológicos y genéticos en poblaciones periféricas de *Crocodylus acutus* Cuvier (1807) en el noreste de México. Tesis Doctoral, Centro de Estudios Justo Sierra, Surutato, Badiraguato, Sinaloa, México.174 p.

Sánchez Herrera, O., G. López Segurajáuregui, A. García Naranjo Ortiz de la Huerta y H. Benítez Díaz. 2011. Programa de Monitoreo del Cocodrilo de Pantano (*Crocodylus moreletii*) México-Belice-Guatemala. México. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad. México. 270 pp.

Sanderson, E., Redford, K.H., Chetkiewicz, C-L.B., Medellin, R.A., Rabinowitz, A.R., Robinson, J.G., Taber, A.B., 2002. Planning to save a species, the jaguar as a model. Conservation Biology 16, 58–72.

Sarmiento-Marina Y. 2018. Ecología poblacional y apreciación social de cocodrilianos (Crocodylus acutus y Caiman crocodilus) en la porción oriente del Sistema Estuario Puerto Arista, Chiapas, México. Tesis de Maestría. Universidad de Ciencias y Arte de Chiapas. Chiapas, México. 105 p.

Sasa M. y Chaves G. 1992. Tamaño, estructura y distribución de una población de Crocodylus acutus (Crocodylia: Crocodylidae) en Costa Rica. Revista de Biología Tropical (40): 131 134.

Schmidt, K. P. 1953. A check list of North American Amphibians and Reptiles. 280p.

SECOCOM. 1999. Sociedad Para el Estudio y Conservación de los Cocodrilos en México. Boletín Informativo 1(4): 5-8.

Seijas, A.E. 2002. Scale patterns of American crocodiles (*Crocodylus acutus*) from Venezuelan localities. Revista Unellez de Ciencia y Tecnología 20: 118-134.

Semarnap/INE (2000), Proyecto para la conservación, manejo y aprovechamiento sustentable de los Crocodylia (Comacrom), México, Secretaría de Medio Ambiente, Recursos Naturales y Pesca/Instituto Nacional de Ecología.

Sigler, L. 1996. Situación del Caimán en Chiapas. Proceedings of the 13th working meeting of the Crocodile Specialist Group of the Species Survival Commission of IUCN – The world Conservation Union. Gland, Switzerland. Convenid at Santa Fe, Argentina

Sigler, L. 1997. Poblaciones silvestres de cocodrilianos en el estado de Chiapas. Pp. 189-192. En: 4ta Reunión Regional del Grupo de Especialistas de Cocodrilos de América Latina y el Caribe.

Sigler, L. 1999. Conservación del cocodrilo de río *Crocodylus acutus* en el Parque Nacional Cañón del Sumidero, Chiapas. Pp.39-47. En: Memorias de la Reunión del Subcomité Técnico Consultivo para la Conservación, Manejo y Aprovechamiento Sustentable de los Crocodylia en México.

Sigler, L. 2000. American crocodile attack in Chiapas. Crocodile Specialist Group Newsletter 19(2):17–18.

Sigler, L. 2010. La historia natural del Cocodrilo Americano *Crocodylus acutus* en el Parque Nacional Cañón del Sumidero, Chiapas, México. Revista Latinoamericana de Conservación 1(2): 73-83.

Sigler, L. 2013. Monitoreo biológico de crocodilianos *Crocodylus acutus y Caiman crocodilus chiapasius* en la Reserva de la Biosfera La Encrucijada, Chiapas. Informe Final. Desarrollo Rural y Medio Ambiente, A.C. 34p

Sigler, L. 2014. Monitoreo Poblacional de Crocodilianos (*Crocodylus acutus* y *Caiman crocodilus fuscus)* en la Reserva de la Biósfera La Encrucijada, Chiapas. DERMAC, Desarrollo Rural y Medio Ambiente, A.C. 43p

Sigler, L., y Gallegos, J. 2017. El conocimiento sobre el cocodrilo de Morelet *Crocodylus moreletii* (Duméril y Duméril 1851) en México, Belice y Guatemala. México, D.F. 216pp.

Sigler, L. y J. Martínez Ibarra.1998. Diagnóstico del estado actual de las poblaciones de de crocodilianos *Caiman crocodilus* y *Crocodylus acutus* en la Reserva de la Biosfera La Encrucijada Chiapas. Informe final del Proyecto RNMA-051-96 financiado por el Sistema de Investigación Benito Juárez (SIBEJ) del CONACYT y el Instituto de Historia Natural IHN. Realizado de Junio de 1997 a Mayo de 1998.

Serrano-Gómez, S. S., Guevara-Chumacero, L. M., Barriga-Sosa, I. D., Ullóa-Arvízu, R., González-Guzmán, S., y Vázquez-Peláez, C. G. 2016. Low levels of genetic diversity in *Crocodylus acutus* in Oaxaca and Guerrero, Mexico, and molecular-morphological evidence of the presence of *C. moreletii*. Biochemical Systematics and Ecology, 69, 51-59.

Smith, H. M. y R. B. Smith. 1977. Synopsis of the herpetofauna of Mexico, Vol. V. Guide to Mexican amphisbaenians and crocodilians. John Johnson. EUA. 187 p

Smith, H.M. y E.H. Taylor. 1950. An annotated checklist and key to the reptiles of Mexico exclusive of the snakes. Smithsonian Institution National Museum Bulletin. (199):1-253.

Tello Sahagun, L A. 2013. Ecología Poblacional del Cocodrilo de Río (*Crocodylus acutus*) en Bahía de Jaltemba, Nayarit. Instituto Tecnológico de Bahía de Banderas. 71p

Thorbjarnarson J.B. 1998. Crocodiles in the Chamela-Cuixmala Biosphere Reserve, Jalisco, México. Crocodile Specialist Group Newsletter 17(4).

Thorbjarnarson J.B. 1988. Status and ecology of American crocodile in Haiti. Bulletin of Florida State Museum 33(1): 1-86.

Thorbjarnarson, J.B. 1989. Ecology of the American crocodile (*Crocodylus acutus*). Pp. 228- 258. En: P. M. Hall (ed). Crocodiles: Their ecology, management and conservation. IUCN- The World Conservation Union Publications, Gland, Switzerland.

Thorbjarnarson, J.B. 1999. Crocodile Tears and Skins: International Trade, Economic Constraints, and Limits to the Sustainable Use of Crocodilians. Conservation Biology. 13(3):1523-1739

Thorbjarnarson, J.B. 2010. American crocodile *Crocodylus acutus*. Pp. 46-53. En: S.C. Manolis y C. Stevenson (Eds.), Crocodiles: Status Survey and Conservation Action Plan. CSG-SSC-UICN.

Thorbjarnarson, J.B. y A. Velasco. 1999. Economic incentives for management of Venezuelan caiman. Conservation Biology 13: 397–406.

Thorbjarnarson, J.B. (Comp.), H. Messel, F. Wayne King and J. Perran Ross (Eds.). 1991. Crocodiles. An Action Plan for their Conservation. IUCN/SSC Crocodile Specialist Group. Gland, Switzerland.

Thorbjarnarson, J.B., F. Mazzotti, E. Sanderson, F. Buitrago, M. Lazcano, K. Minkowski, M. Muñiz, P. Ponce, L. Sigler, R. Soberon, A.M. Trelancia y A. Velasco. 2006. Regional habitat conservation priorities for the American crocodile. Biological Conservation 128: 25-36.

Ulloa-Delgado, G.A. y Sierra-Diaz, C. 2012. Plan de Manejo para la Conservación de las poblaciones del Caimán Aguja *Crocodylus Acutus* (Cuvier, 1.807) de la Bahía de Cispatá departamento de Cordoba Caribe

de Colombia. Corporación Autónoma Regional de los Valles del Sinú y del San Jorge (CVS). Informe Interno, 79 pp.

UNEP-WCMC. 2018. Reports of the CITES Trade Database. En: https://trade.cites.org/. Consultado el 16 de noviembre de 2018.

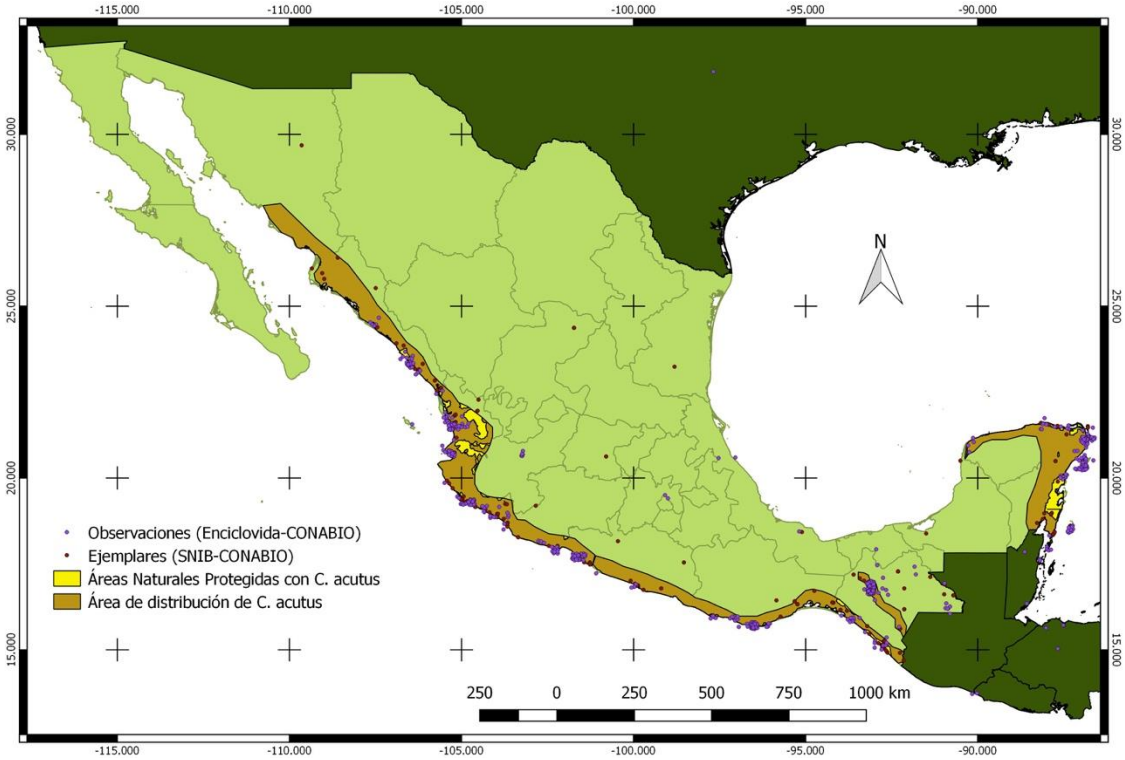
Valtierra-Azotla, M. 2007. Ecología poblacional y reproductiva del cocodrilo americano (*Crocodylus acutus*), en la Reserva de la Biosfera Chamela-Cuixmala. Tesis de Maestría. Universidad Michoacana de San Nicolás de Hidalgo.

Venegas-Anaya, M., A. H. Escobedo-Galván, S. A. Balaguera-Reina, F. L. Lowrance, O.I. Sanjur y L.D. Densmore. 2015. Population Ecology of American Crocodile (*Crocodylus acutus*) in Coiba National Park, Panama. Journal of Herpetology Vol. 49(3):349-357.

Vizcarra, M. 2018. “Beto” hace artesanías para juntar los 90 mil pesos que le cuesta salvar a los cocodrilos en Sinaloa. Sin embargo. Recuperado de: http://www.sinembargo.mx/11-03-2018/3395765

Weaver, J. P., D. Rodriguez, M. Venegas-Anaya , J.R.Cedeño-Vázquez, , M.R.Forstner y L.D. Densmore. 2008. Genetic characterization of captive Cuban crocodiles (*Crocodylus rhombifer*) and evidence of hybridization with the American crocodile (*Crocodylus acutus*). Journal of Experimental Zoology Part A: Ecological Genetics and Physiology 309(10), 649-660.

Map of the global distribution area of *Crocodylus acutus*, of approximately 2,533,582.33 km^2. The estimated distribution area for Mexico corresponds to approximately 726,119.54 km^2 (IUCN, 2012).



Re-evaluated map of the distribution area of C*rocodylus acutus* in Mexico (approximately 199,765 km^2). The points correspond to observations reported on the Enciclovida platform (CONABIO) and to specimens registered in the National Biological Information System (SNIB-CONABIO). The yellow polygons represent the Natural Protected Areas that are within the distribution area of *C. acutus*.

Annex 2.

Encounter rates (ER, ind/km) reported for Mexico per State from 1988 to 2018.

The information concentrate by State is presented, indicating the number of studies per period, kilometers traveled and encounter rates (maximum, minimum and average).

Sinaloa

Period	Km covered	average km/trip	# trips	ER Min	ER average	ER Max
1998-2007	3.10	3.10	1.00	8.40	8.40	8.40

Nayarit

Period	Km covered	average km/trip	# trips	ER Min	ER average	ER Max
1988-1997	95.00	95.00	1.00	0.35	0.35	0.35
1998-2007	110.25	12.25	9.00	0.01	2.49	7.50
2008-2018	68.77	8.60	8.00	1.63	7.54	31.58
Average	91.34	38.62	6.00	0.66	3.46	13.14

Jalisco

Period	Km covered	average km/trip	# trips	ER Min	ER average	ER Max
1988-1997	68.91	3.63	19.00	2.00	15.61	73.40
1998-2007	45.98	2.42	19.00	5.80	18.17	51.25
Average	57.45	3.02	19.00	3.90	16.89	62.33

Colima

Period	Km covered	average km/trip	# trips	ER Min	ER average	ER Max
1988-1997	21.00	7.00	3.00	10.80	33.27	45.50
1998-2007	7.00	7.00	1.00	10.80	10.80	10.80
2008-2018	0.00	0.00	2.00	3.90	4.70	5.50

Average	9.33	4.67	2.00	8.50	16.26	20.60

Michoacán

Period	Km covered	average km/trip	# trips	ER Min	ER average	ER Max
1998-2007	83.00	83.00	1.00	1.62	1.62	1.62

Guerrero

Period	Km covered	average km/trip	# trips	ER Min	ER average	ER Max
1998-2007	ND	ND	7.00	5.00	22.71	40.00
2008-2018	7.02	2.34	3.00	18.20	88.27	163.30
Average	ND	ND	5.00	11.60	55.49	101.65

Oaxaca

Period	Km covered	average km/trip	# trips	ER Min	ER average	ER Max
1998-2007	7.11	2.37	4.00	3.94	16.80	41.40
2008-2018	15.43	1.93	8.00	4.00	22.28	70.10
Average	11.27	2.15	6.00	3.97	19.54	55.75

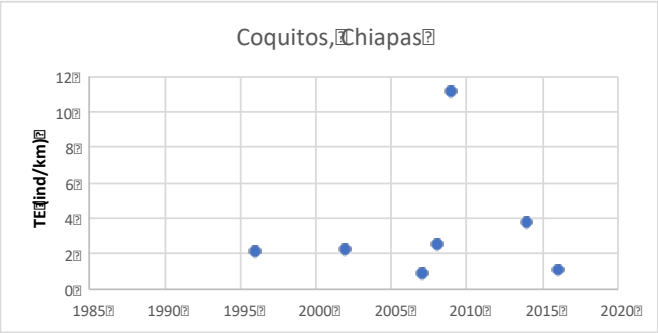
Chiapas

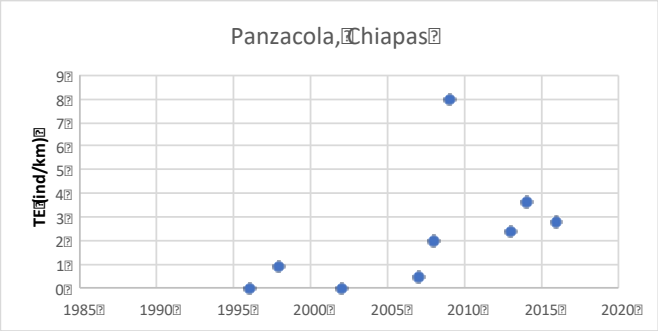
Period	Km covered	average km/trip	# trips	ER Min	ER average	ER Max
1988-1997	54.50	7.79	7.00	0.60	1.02	2.66
1998-2007	283.18	23.60	12.00	0.10	0.82	2.80
2008-2018	418.53	16.10	26.00	0.15	2.55	11.10
Average	252.07	15.83	15.00	0.28	1.47	5.52

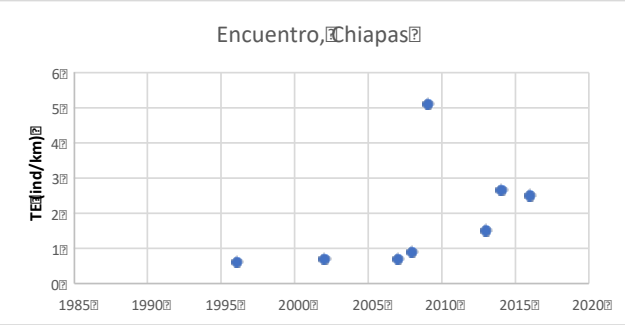
Quintana Roo

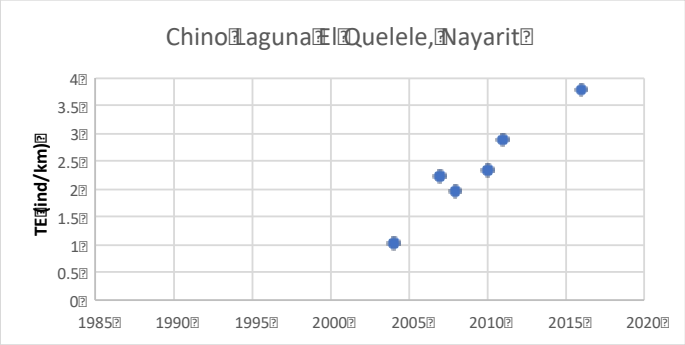
Period	Km covered	average km/trip	# trips	ER Min	ER average	ER Max
1998-2007	199.16	15.32	16.00	0.23	2.32	10.90
2008-2018	8.90	2.97	4.00	0.70	6.37	10.90
Average	104.03	9.14	10.00	0.47	4.34	10.90

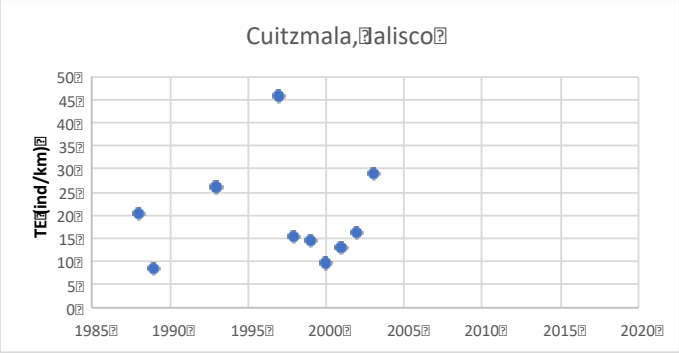
Data of encounter rates (ind / km) reported for five sites in Mexico with more than five years of sampling between 1998 and 2018. In general, trends to stability or increase are observed.











Information compiled from 50 studies conducted in 86 bodies of water of Mexico from 1988 to 2018 that present data of encounter rate for the species *C. Acutus*. In the column "Data" it is indicated if the author reported the figure directly in his publication (Reported) or, if it was estimated from the length of the body of water that was covered and the number of specimens observed (Estimated).

Author	Type of source	State	Year	Period	Site	Trip (km)	ER (ind/km)	Data	Notes
Navarro-Serment (2003)	Master's thesis/CSG Newsletter	Sinaloa	2000	1998-2007	Estero El Verde	3.1	8.4	Reported	
Hernández-Hurtado et al. (2011)	Research paper	Nayarit	2006	1998-2007	Transecto F- El Rey	18	0.014	Reported	
Hernández-Hurtado et al. (2011)	Research paper	Nayarit	2006	1998-2007	Transecto E- Pericos	14	0.17	Reported	
Hernández-Hurtado et al. (2011)	Research paper	Nayarit	2006	1998-2007	Transecto D- El Pozo	15	0.36	Reported	
Regalado-Soriano (2013)	Bachelor thesis	Nayarit	2008	2008-2018	Bahía Banderas	17.95	1.63	Reported	
Hernández-Hurtado et al. (2011)	Research paper	Nayarit	2006	1998-2007	Transecto B- San Cristóbal Singayta	15	2.68	Reported	
Andrade-Esquivel (2016)	Technical report	Nayarit	2016	2008-2018	Chino Laguna El Quelele	10	3.8	Estimated	
Hernández-Hurtado et al. (2011)	Research paper	Nayarit	2006	1998-2007	Transecto C- Los Negros-Zoquipan	15	4.16	Reported	
Hernández-Hurtado et al. (2011)	Research paper	Nayarit	2006	1998-2007	Transecto A- La Tobara	12	4.31	Reported	
Hernández-Santos (2005)	Technical report	Nayarit	2004	1998-2007	Delta del Río Ameca	1.35	7.5	Reported	
Tello-Sahagun (2013)	Bachelor thesis	Nayarit	2010	2008-2018	Bahía Jaltemba	5	9.44	Reported	
Casas-Andreu (1994)	Research paper	Nayarit	1994	1988-1997	Huaynamota- Río Santiago	95	0.35	Reported	
Hernández-Santos (2005)	Technical report	Nayarit	2004	1998-2007	Chino Laguna El Quelele	9.6	1.03	Reported	
Andrade-Esquivel (2011a)	Technical report	Nayarit	2008	2008-2018	Chino Laguna El Quelele	10.3	1.94	Estimated	
Andrade-Esquivel (2011a)	Technical report	Nayarit	2007	1998-2007	Chino Laguna El Quelele	10.3	2.23	Estimated	
Andrade-Esquivel (2011a)	Technical report	Nayarit	2010	2008-2018	Chino Laguna El Quelele	10.3	2.33	Estimated	
Andrade-Esquivel (2011a)	Technical report	Nayarit	2011	2008-2018	Chino Laguna El Quelele	10	2.9	Estimated	

Author	Type of source	State	Year	Period	Site	Trip (km)	ER (ind/km)	Data	Notes
Andrade-Esquivel (2011b)	Technical report	Nayarit	2011	2008-2018	Colonia Paraíso	1.8	6.67	Reported	
Andrade-Esquivel (2011b)	Technical report	Nayarit	2011	2008-2018	Estero los Becerros	3.42	31.58	Reported	
Méndez-De la Cruz y Casas-Andreu (1992)	Research paper	Jalisco	1989	1988-1997	Careyitos	0.5	2	Estimated	
Méndez-De la Cruz y Casas-Andreu (1992)	Research paper	Jalisco	1989	1988-1997	Loya	2	2.35	Estimated	
Méndez-De la Cruz y Casas-Andreu (1992)	Research paper	Jalisco	1989	1988-1997	El Chorro	3	2.35	Estimated	
Méndez-De la Cruz y Casas-Andreu (1992)	Research paper	Jalisco	1989	1988-1997	Majahuas	3.5	2.35	Estimated	
Méndez-De la Cruz y Casas-Andreu (1992)	Research paper	Jalisco	1989	1988-1997	La Manzanilla	1	4	Estimated	
Méndez-De la Cruz y Casas-Andreu (1992)	Research paper	Jalisco	1989	1988-1997	Melaque	0.7	5.7	Estimated	
García et al. (2010)	Research paper	Jalisco	2002	1998-2007	Cuitzmala	3.73	5.8	Reported	
García et al. (2010)	Research paper	Jalisco	2000	1998-2007	Cuitzmala	3.73	6.1	Reported	
García et al. (2010)	Research paper	Jalisco	2003	1998-2007	Cuitzmala	3.73	6.7	Reported	
García et al. (2010)	Research paper	Jalisco	2001	1998-2007	Cuitzmala	3.73	7.5	Reported	
García et al. (2010)	Research paper	Jalisco	1998	1998-2007	Cuitzmala	3.73	7.7	Reported	
Méndez-De la Cruz y Casas-Andreu (1992)	Research paper	Jalisco	1989	1988-1997	Cajones	0.5	8	Estimated	
Ponce-Campos y Huerta-Ortega (1996)	Research paper	Jalisco	1994	1988-1997	Majahuas	2.5	8	Reported	
Ponce-Campos y Huerta-Ortega (1996)	Research paper	Jalisco	1995	1988-1997	Majahuas	4	8.25	Reported	
García et al. (2010)	Research paper	Jalisco	1999	1998-2007	Cuitzmala	3.73	8.5	Reported	
Casas-Andreu (1990)	Research paper	Jalisco	1989	1988-1997	Cuitzmala	10	8.6	Estimated	
García et al. (2010)	Research paper	Jalisco	2002	1998-2007	Cuitzmala	2.5	8.9	Reported	
García et al. (2010)	Research paper	Jalisco	2000	1998-2007	Cuitzmala	1.3	9.3	Reported	

Author	Type of source	State	Year	Period	Site	Trip (km)	ER (ind/km)	Data	Notes
García et al. (2010)	Research paper	Jalisco	2001	1998-2007	Cuitzmala	2.5	9.6	Reported	
Ponce-Campos y Huerta-Ortega (1996)	Research paper	Jalisco	1994	1988-1997	Laguna del Tule	1	10	Reported	
Ponce-Campos y Huerta-Ortega (1996)	Research paper	Jalisco	1994	1988-1997	La Manzanilla	2.5	11.2	Reported	
Ponce-Campos y Huerta-Ortega (1996)	Research paper	Jalisco	1995	1988-1997	La Manzanilla	2.5	11.2	Reported	
García et al. (2010)	Research paper	Jalisco	2000	1998-2007	Cuitzmala	2.5	13.1	Reported	
García et al. (2010)	Research paper	Jalisco	1998	1998-2007	Cuitzmala	2.5	14.7	Reported	
García et al. (2010)	Research paper	Jalisco	1999	1998-2007	Cuitzmala	2.5	16.2	Reported	
García et al. (2010)	Research paper	Jalisco	1997	1988-1997	Cuitzmala	3.73	18.7	Reported	
García et al. (2010)	Research paper	Jalisco	1999	1998-2007	Cuitzmala	1.3	19.4	Reported	
Casas-Andreu (1990)	Research paper	Jalisco	1988	1988-1997	Cuitzmala	10	20.5	Estimated	
García et al. (2010)	Research paper	Jalisco	2001	1998-2007	Cuitzmala	1.3	22.3	Reported	
García et al. (2010)	Research paper	Jalisco	1998	1998-2007	Cuitzmala	1.3	23.5	Reported	
De Luna-Cuevas (1996)	Research paper	Jalisco	1993	1988-1997	Cuitzmala	10.68	26.18	Estimated	
Méndez-De la Cruz y Casas-Andreu (1992)	Research paper	Jalisco	1989	1988-1997	El Rodeo	7	28.5	Estimated	
García et al. (2010)	Research paper	Jalisco	2002	1998-2007	Cuitzmala	1.3	34.5	Reported	
García et al. (2010)	Research paper	Jalisco	2003	1998-2007	Cuitzmala	2.5	34.8	Reported	
García et al. (2010)	Research paper	Jalisco	2003	1998-2007	Cuitzmala	1.3	45.3	Reported	
García et al. (2010)	Research paper	Jalisco	1997	1988-1997	Cuitzmala	2.5	45.3	Reported	
Cupul-Magaña et al. (2002)	Research paper	Jalisco	2001	1998-2007	Boca Negra	0.8	51.25	Reported	
García et al. (2010)	Research paper	Jalisco	1997	1988-1997	Cuitzmala	1.3	73.4	Reported	

Author	Type of source	State	Year	Period	Site	Trip (km)	ER (ind/km)	Data	Notes
Gaviño Rodríguez et al. (2011)	Book	Colima	2010	2008-2018	Laguna Cuyutlán Vaso III	ND	3.9	Reported	No extension, with ER
Reyes-Herrera (2015)	Book	Colima	2012	2008-2018	Laguna Cuyutlán Vaso III	ND	5.5	Reported	No extension, with ER
Castillo (2001)	Research paper	Colima	1996	1988-1997	Laguna de Amela	7	10.8	Estimated	
Castillo (2001)	Research paper	Colima	2000	1998-2007	Laguna de Amela	7	10.8	Estimated	
Castillo (2001)	Research paper	Colima	1994	1988-1997	Laguna de Amela	7	43.5	Estimated	
Castillo (2001)	Research paper	Colima	1995	1988-1997	Laguna de Amela	7	45.5	Estimated	
Navarro-Vargas (1999)	Memoirs	Michoacán	1998	1998-2007	Tupitina y Mata de Carrizo	83	1.62	Estimated	
Domínguez-Laso et al. (2004)	Memoirs	Guerrero	2003	1998-2007	Campo de Golf 3	ND	5	Reported	No extension, with ER
Domínguez-Laso et al. (2004)	Memoirs	Guerrero	2003	1998-2007	La Marina	ND	12	Reported	No extension, with ER
Domínguez-Laso et al. (2004)	Memoirs	Guerrero	2003	1998-2007	Campo de Golf 1	ND	15	Reported	No extension, with ER
Domínguez-Laso (2009)	Technical report	Guerrero	2009	2008-2018	Zihuatanejo	6.42	18.2	Estimated	
Domínguez-Laso et al. (2004)	Memoirs	Guerrero	2003	1998-2007	Campo de Golf 2	ND	20	Reported	No extension, with ER
Domínguez-Laso et al. (2004)	Memoirs	Guerrero	2003	1998-2007	Las Salinas	ND	30	Reported	No extension, with ER
Domínguez-Laso et al. (2004)	Memoirs	Guerrero	2003	1998-2007	Playa de la Ropa	ND	37	Reported	No extension, with ER
Domínguez-Laso et al. (2004)	Memoirs	Guerrero	2003	1998-2007	Playa Linda	ND	40	Reported	No extension, with ER
Domínguez-Laso y García-Reyes (2010)	Research paper	Guerrero	2009	2008-2018	Palma Real Golf Course	0.3	83.3	Estimated	
Domínguez-Laso y García-Reyes (2010)	Research paper	Guerrero	2009	2008-2018	Playa Linda	0.3	163.3	Estimated	
Brandon-Pliego (2007)	Research paper	Oaxaca	2005	1998-2007	Laguna La Palmita	4.94	3.94	Estimated	Average for 9 months
García-Grajales y Buenrostro-Silva (2017)	Research paper	Oaxaca	2014	2008-2018	Zapotalito	0.9	4	Reported	
Morales Pérez (2010)	Bachelor thesis	Oaxaca	2010	2008-2018	Laguna del Miniyoso	8.16	6.6	Reported	

Author	Type of source	State	Year	Period	Site	Trip (km)	ER (ind/km)	Data	Notes
García-Grajales y Buenrostro-Silva (2017)	Research paper	Oaxaca	2014	2008-2018	El Grueso	1.1	7	Reported	
Espinosa-Reyes y García-Grajales (2001)	Memoirs	Oaxaca	2001	1998-2007	La Ventanilla	0.974	10.4	Estimated	Average for 10 months
García-Grajales et al. (2008)	Memoirs	Oaxaca	2007	1998-2007	Laguna Zapotengo	ND	11.44	Reported	No extension, with ER
García-Grajales y Buenrostro-Silva (2017)	Research paper	Oaxaca	2014	2008-2018	Vara Quebrada	0.8	12.5	Reported	
García-Grajales y Buenrostro-Silva (2017)	Research paper	Oaxaca	2014	2008-2018	Rancho Viejo	1	13	Reported	
García-Grajales y Buenrostro-Silva (2017)	Research paper	Oaxaca	2014	2008-2018	Agua Dulce	1.1	16	Reported	
García-Grajales et al. (2008)	Memoirs	Oaxaca	2007	1998-2007	Estero Vainilla	1.2	41.4	Estimated	
García-Grajales y Buenrostro-Silva (2017)	Research paper	Oaxaca	2014	2008-2018	Palmarito	1.7	49	Reported	
García-Grajales y Buenrostro-Silva (2014)	Research paper	Oaxaca	2012	2008-2018	Palma Sola	0.67	70.1	Reported	
Mandujano-Camacho y Rodas-Trejo (2010)	Research paper	Chiapas	2000	1998-2007	La Angostura	31	0.1	Reported	
Sarmineto-Marina (2018)	Master's thesis	Chiapas	2018	2008-2018	La Laguna	13.2	0.15	Reported	
López-Luna et al. (2016)	Technical report	Chiapas	2016	2008-2018	Cabeza de Toro	22.3	0.26	Reported	
Peña Martínez (2011)	Bachelor thesis	Chiapas	2007	1998-2007	Panzacola	14	0.42	Reported	
Sarmineto-Marina (2018)	Master's thesis	Chiapas	2018	2008-2018	Vuelta Rica	16	0.43	Reported	
Martinez-Ibarra (1996)	Master's thesis	Chiapas	1996	1988-1997	Encuentro	4.8	0.6	Reported	
Sarmineto-Marina (2018)	Master's thesis	Chiapas	2018	2008-2018	Cabeza de Toro	52.8	0.6	Reported	
Sigler (2014)	Technical report	Chiapas	2014	2008-2018	Catrín-Castaño	12	0.66	Estimated	
Peña Martínez (2011)	Bachelor thesis	Chiapas	2002	1998-2007	Encuentro	14	0.71	Reported	
Peña Martínez (2011)	Bachelor thesis	Chiapas	2007	1998-2007	Encuentro	14	0.71	Reported	
Sarmineto-Marina (2018)	Master's thesis	Chiapas	2018	2008-2018	Las Manzanas	22.4	0.76	Reported	

Author	Type of source	State	Year	Period	Site	Trip (km)	ER (ind/km)	Data	Notes
López-Luna et al. (2016)	Technical report	Chiapas	2016	2008-2018	Zacapulco-El Castaño	23	0.86	Reported	
Sigler y Martinez-Ibarra (1998)	Technical report	Chiapas	1998	1998-2007	Panzacola	47.05	0.89	Reported	
Peña Martínez (2011)	Bachelor thesis	Chiapas	2007	1998-2007	Coquitos	14	0.92	Reported	
Peña Martínez (2011)	Bachelor thesis	Chiapas	2008	2008-2018	Encuentro	14	0.92	Reported	
López-Luna et al. (2016)	Technical report	Chiapas	2016	2008-2018	Coquitos	14	1.07	Reported	
Mandujano-Camacho y Rodas-Trejo (2010)	Research paper	Chiapas	2000	1998-2007	Chicosaén	48.2	1.08	Reported	
Sigler (2013)	Technical report	Chiapas	2013	2008-2018	Encuentro	28	1.5	Estimated	
Sigler (2013)	Technical report	Chiapas	2013	2008-2018	Catrín-Castaño	12	1.6	Estimated	
Martinez-Ibarra (1996)	Master's thesis	Chiapas	1996	1988-1997	Brisas	9.5	1.8	Reported	
Peña Martínez (2011)	Bachelor thesis	Chiapas	2008	2008-2018	Panzacola	14	2	Reported	
Martinez-Ibarra (1996)	Master's thesis	Chiapas	1996	1988-1997	Coquitos	8.7	2.1	Reported	
Peña Martínez (2011)	Bachelor thesis	Chiapas	2002	1998-2007	Coquitos	14	2.24	Reported	
Sigler (2013)	Technical report	Chiapas	2013	2008-2018	Panzacola	14	2.35	Estimated	
López-Luna et al. (2016)	Technical report	Chiapas	2016	2008-2018	Encuentro	16	2.5	Reported	
Peña Martínez (2011)	Bachelor thesis	Chiapas	2008	2008-2018	Coquitos	14	2.57	Reported	
Sigler (2014)	Technical report	Chiapas	2014	2008-2018	Encuentro	14	2.64	Estimated	
Sigler (1999)	Memoirs	Chiapas	1996	1988-1997	Cañon del Sumidero	15	2.66	Reported	
López-Luna et al. (2016)	Technical report	Chiapas	2016	2008-2018	Panzacola	16	2.75	Reported	
Sigler (2010)	Research paper	Chiapas	2001	1998-2007	Cañon del Sumidero	15	2.8	Reported	
López-Luna et al. (2016)	Technical report	Chiapas	2016	2008-2018	Canal Boca del Cielo	4.83	3.31	Reported	

Author	Type of source	State	Year	Period	Site	Trip (km)	ER (ind/km)	Data	Notes
Sigler (2014)	Technical report	Chiapas	2014	2008-2018	Panzacola	14	3.64	Estimated	
Sigler (2014)	Technical report	Chiapas	2014	2008-2018	Coquitos	14	3.8	Estimated	
Peña Martínez (2011) y Dirección de Evaluación y Seguimiento. CONANP (2010)	Bachelor thesis	Chiapas	2009	2008-2018	Encuentro	14	5.1	Estimated	Average of two data
Sarmineto-Marina (2018)	Master's thesis	Chiapas	2018	2008-2018	Estero Prieto	16	7.87	Reported	
Peña Martínez (2011) y Dirección de Evaluación y Seguimiento. CONANP (2010)	Technical report	Chiapas	2009	2008-2018	Panzacola	14.5	7.94	Estimated	Average of two data
Peña Martínez (2011) y Dirección de Evaluación y Seguimiento. CONANP (2010)	Bachelor thesis	Chiapas	2009	2008-2018	Coquitos	14	11.1	Estimated	Average of two data
Lazcano-Barrero et al. (1997)	Memoirs	Chiapas	1992	1988-1997	Río Pijijiapan	0.5		Reported	
López-Luna et al. (2016)	Technical report	Chiapas	2016	2008-2018	Estero Prieto	1.5		Reported	
Lazcano-Barrero et al. (1997)	Memoirs	Chiapas	1992	1988-1997	Estero Palo Blanco	4.5		Reported	
López-Luna et al. (2016)	Technical report	Chiapas	2016	2008-2018	Cabeza de Toro	8		Reported	
Martinez-Ibarra (1996)	Master's thesis	Chiapas	1996	1988-1997	Panzacola	11.5		Reported	
Peña Martínez (2011)	Bachelor thesis	Chiapas	2002	1998-2007	Panzacola	14		Reported	
Sigler y Martinez-Ibarra (1998)	Technical report	Chiapas	1998	1998-2007	Pampas "La Cantileña"	22.19		Reported	
Sigler y Martinez-Ibarra (1998)	Technical report	Chiapas	1998	1998-2007	Sistema Lagunar "Carretas - Pereyra"	35.74		Reported	
Domínguez-Laso (2002)	Bachelor thesis	Quintana Roo	2001	1998-2007	Laguna Kapechén	18	0.23	Reported	
Domínguez-Laso (2002)	Bachelor thesis	Quintana Roo	2001	1998-2007	Canal de Pinos	8	0.3	Reported	
Carballar (2012-2017)	Unpublished	Quintana Roo	2017	2008-2018	Cancún	ND	0.7	Reported	No extension, with ER

Author	Type of source	State	Year	Period	Site	Trip (km)	ER (ind/km)	Data	Notes
Domínguez-Laso (2002)	Bachelor thesis	Quintana Roo	2001	1998-2007	Laguna Boca Paila	12	0.84	Reported	
Cedeño-Vázquez et al. (2006)	Research paper	Quintana Roo	2002	1998-2007	Río Hondo	5.26	0.97	Estimated	Average 12 trips
Domínguez-Laso (2002)	Bachelor thesis	Quintana Roo	2001	1998-2007	Canal Monjas	5	1.01	Reported	
Lazcano-Barrero et al. (2001)	Memoirs	Quintana Roo	2001	1998-2007	Laguna Nichupte	ND	1.08	Reported	No extension, with ER
Carballar (2000-2003)	Unpublished	Quintana Roo	2003	1998-2007	Cancún	ND	1.13	Reported	No extension, with ER
González-Cortés (2007)	Bachelor thesis	Quintana Roo	2003	1998-2007	Chunchaca'ab	3	6.09	Estimated	
Gutierrez- Ramirez (2016)	Bachelor thesis	Quintana Roo	2015	2008-2018	Canal Xuxu	3	6.09	Reported	
Charruau et al. (2005)	Research paper	Quintana Roo	2003	1998-2007	Banco Chinchorro	ND	6.8	Reported	No extension, with ER
González-Cortés (2007)	Bachelor thesis	Quintana Roo	2003	1998-2007	Xtakún	4.8	7.77	Estimated	
Gutierrez- Ramirez (2016)	Bachelor thesis	Quintana Roo	2015	2008-2018	Río Yalikín	4.8	7.77	Reported	
González-Cortés (2007)	Bachelor thesis	Quintana Roo	2003	1998-2007	Colombia	1.1	10.9	Estimated	
Gutierrez- Ramirez (2016)	Bachelor thesis	Quintana Roo	2015	2008-2018	Canal Chakaj	1.1	10.9	Reported	
Cedeño-Vázquez et al. (2006)	Research paper	Quintana Roo	2002	1998-2007	Punta Calentura	1		Estimated	
Cedeño-Vázquez et al. (2006)	Research paper	Quintana Roo	2002	1998-2007	Tres Ríos	1		Estimated	

Author	Type of source	State	Year	Period	Site	Trip (km)	ER (ind/km)	Data	Notes
Cedeño-Vázquez et al. (2006)	Research paper	Quintana Roo	2002	1998-2007	Chile Verde	13		Estimated	
Cedeño-Vázquez et al. (2006)	Research paper	Quintana Roo	2002	1998-2007	Río Cacayuc	15		Estimated	
Cedeño-Vázquez et al. (2006)	Research paper	Quintana Roo	2002	1998-2007	Río Hondo	112		Estimated	

Annex 3.

Encounter rates (ER, ind/km) reported for *C. acutus* in some countries of distribution of the species.

Country	Site	ER average (min-max)	Year	Reference
Dominican Republic	Lago Enriquillo	(18.9-25.7)	1989	Thorbjarnarson, 1989
Cuba	Isle of Youth	(1.1-33.8)	2000	CITES 2004 (Prop. 24)
Costa Rica	Río Grande de Tárcoles	19.11	1992	Sasa y Chávez, 1992
Costa Rica	Guanacaste	12	2001	Sánchez-Ramírez 2001
Mexico	Several sites	(0.3-163.3)	2008-2018	Esta propuesta
Honduras	El Cajón	9.93 (3.48-17.84)	2007	Espinal et al. 2011
Costa Rica	Tárcoles	(9.22-30.8)	2000, 2004	Piedra, 2000; Porras, 2004
Costa Rica	Tusubres	(5.58-8.14)	2000, 2004	Piedra, 2000; Porras, 2004
Haiti	Etang Saumatre	6.3	1988	Throbjarnarson, 1988
Venezuela	Turiamo	3.67	1986	Seijas, 1986
USA	Biscayne Bay	3.24	1996-2005	Cherkiss et al., 2011
Colombia	Bahía Cispata	2.52 (0.09-19)	1992-2012	CITES 2016 (Prop. 21)
Costa Rica	Río Jesús María	(1.35-2.39)	2000, 2004	Piedra, 2000; Porras, 2004
Belize	Caye Caulker	2.4	2016	Tellez et al., 2016
Ecuador	El Salado	0.45	2004	Carvajal et al., 2005
Honduras	Honduras pacific	0.34	1990	King, et al., 1990
Pery	Tumbes	0.18	2003	Escobedo y Mejía (2003)
Cayman Islands	-	Only fossil records and occasional sightings of individuals dispersed from Cuba, Jamaica or Central America	2018	Consult 2018
Jamaica	-	Population decreasing	2018	Consult 2018

Note: Marisa Tellez (pers, com. 2018) mentioned that the population trends in Dominican Republic and Haiti are decreasing, while in Belize its increasing. In Nicaragua and Guatemala, trends are unknown, and in Trinidad and Tobago no populations are known.

Annex 4.

Confiscations of *Crocodylus acutus* within Mexico between 2012 and 2018 (PROFEPA, 2018). Within the parentheses the number of specimens seized in each confiscation event is specified.

State	2012	2013	2014	2015	2016	2017	2018	Total of confiscation events (number of specimens) per state
Chiapas		(1) (8)	(14)	(1)		(1)		5 (25)
Mexico City and metropolitan area			(2)	(1) (1)	(1) (1)	(1)	(1)	7 (8)
Colima			(2)	(1) (6)				3 (9)
Guanajuato						(1)		1 (1)
Guerrero	(2) (2)	(1) (2)		(1) (1) (53)	(1)	(1)	(1)	10 (65)
Hidalgo	(2)							1 (2)
Jalisco	(1)		(1)			(1)	(1)	4 (4)
Michoacán	(1) (1)	(2)			(6)	(8)		5 (18)
Nayarit		(2) (2)				(1)		3 (5)
Oaxaca	(2) (1)	(1)	(1)				(1)	5 (6)
Quintana Roo			(3)					1 (3)
Sinaloa		(2)			(1)			2 (3)
Sonora				(1)				1 (1)
Veracruz	(1)							1 (1)
Total of confiscation events (number of specimens) per year	9 (13)	9 (21)	6 (23)	9 (66)	5 (10)	7 (14)	4 (4)	49 (151)

Letters from government and civil society institutions that reflect their interest and commitment to the monitoring program.

QUINTANA ROO
GOBIERNO DEL ESTADO

Pedro Enrique Pérez Díaz
Secretario

MÁS Y MEJORES OPORTUNIDADES

SEDARPE
SECRETARÍA DE DESARROLLO AGROPECUARIO, RURAL Y PESCA

Oficio No. SEDARPE/DS/ 000877 **/2018.**
Asunto: El que se indica.
Chetumal, Quintana Roo, a 18 de diciembre de 2018.
"2018, año por una Educación Inclusiva".

Biol. Hesiquio Benítez Díaz
Director General de Cooperación Internacional e Implementación
Comisión Nacional para el Conocimiento y uso de la Biodiversidad
Presente

El Gobierno del Estado a través de la Secretaria de Desarrollo Agropecuario, Rural y Pesca (SEDARPE), estamos interesados y nos comprometemos para que se inicie el **Proyecto Piloto del Cocodrilo de Agua Salada (*Crocodylus acutus*)** a partir de enero 2019. Con la participación de las cooperativas pesquera del estado, así como el apoyo fundamental de la UMA Cocodrilia.

Se planea una estrategia de mayores alcances que incluyen:

- Monitoreo y contacto con las comunidades pesqueras.
- Registro de Unidades de Manejo en vida libre de Crocodylus acutus
- Rancheo de nidos
- Conservación de recursos naturales
- Mejora de ingresos para las comunidades pesqueras.

Asimismo, le informo que los cuerpos de agua a monitorearse son: Bahía de Chetumal, Dos cocos, Chahuay, El placer, El cinco, Uvero, Puerto Chico, Punta Gruesa, La Cazona, Chacmochuch y laguna Manati, que comprenden los municipios de Othón P. Blanco e Isla Mujeres.

Sin otro particular, aprovecho la ocasión para enviarle un cordial saludo.

ATENTAMENTE

GOBIERNO DEL ESTADO DE QUINTANA ROO
ESTADOS UNIDOS MEXICANOS
SECRETARIA DE DESARROLLO AGROPECUARIO, RURAL Y PESCA

c.c.p. ING. JOSE FRANCISCO TEXOCOTITLA BELTRAN. ASESOR DEL DESPACHO DE LA SEDARPE
LIC. ROLANDO A. CORAL. HOIL. GERENTE GENERAL DE COCODRILA.
MINUTARIO

Av. Venustiano Carranza #201, Esquina Belice, Col Centro, CP. 77000 Chetumal, Q. Roo México.
Tel. (983) 8351630 Ext. 42302
pedro.perez@qroo.gob.mx http://sedarpe.qroo.gob.mx

FEDERACIÓN REGIONAL DE SOCIEDADES COOPERATIVAS DE LA INDUSTRIA PESQUERA DEL ESTADO DE QUINTANA ROO, S.C. DE R.L.
E-mail: federacionpesqueraqroo@hotmail.com

Chetumal Quintana Roo a 18 de diciembre de 2018

Biol. Hesiquio Benítez Díaz
Director General de Cooperación Internacional e Implementación
Comisión Nacional para el Conocimiento y uso de la Biodiversidad

Pedro Enrique Pérez Díaz
Secretario
Secretaria de Desarrollo Agropecuario. Rural y Pesca

Por este medio les hacemos constatar nuestro interés por participar en el proyecto piloto del cocodrilo de agua salada (*Crocodylus acutus*). en conjunto con la UMA Cocodrilia, en el estado de Quintana Roo; que contempla el monitoreo de las poblaciones.

Este proyecto de conservación nos ayudara en un futuro cercano a fortalecer nuestras comunidades pesqueras, a contribuir a la conservación de las poblaciones de cocodrilo. También generara nuevos empleos, obteniendo beneficios económicos para la mejora de nuestras familias.

Nos comprometemos a seguir todas las leyes y reglas que este proyecto conlleva, A sensibilizar a la población local y global acerca de la importancia de proteger el cocodrilo y los ecosistemas naturales de nuestro entorno.

Sin más por el momento les envió un cordial saludo.

QUINTANA ROO
GOBIERNO DEL ESTADO
2016 - 2022
SECRETARÍA DE DESARROLLO AGROPECUARIO, RURAL Y PESCA
19 DIC 2018
RECIBIDO
DESPACHO DEL SECRETARIO
HORA: 10:00 am

ATENTAMENTE.

FEDERACIÓN REGIONAL DE SOCIEDADES COOPERATIVAS DE LA INDUSTRIA PESQUERA DEL ESTADO DE QUINTANA ROO, S.C. DE R.L.
TEL.: (99 88) 80 17 94
R.F.C. FRS 670412 2R6

C. BALTAZAR GÓMEZ CATZIN
PRESIDENTE DEL CONSEJO DE ADMINISTRACIÓN.

SM. 84, M.7 LTE.3, PUERTO JUÁREZ, CANCUN, Q. ROO,
TEL: (998)880-17-94 Y 843-34-48
F.C.L. REGISTRO No. 68 F.P.

Annex 6.

Natural Protected Areas of Mexico that are within the distribution area of *Crocodylus acutus* (also see Annex 1).

	Name	State	Surface (Ha)	Category*
1	Río Celestún	Campeche/ Yucatán	81,482	R.B.
2	Montes Azules	Chiapas	331,200	R.B.
3	Lacan-Tum	Chiapas	61,873	R.B.
4	La Encrucijada	Chiapas	144,000	R.B.
5	La Sepultura	Chiapas	167,309	R.B.
6	Cañón del Sumidero	Chiapas	21, 789	P.N.
7	Yaxchilán	Chiapas	2621	M.N.
8	Playa de Puerto Aristas	Chiapas	212	SANT
9	Terrenos que se encuentran en los municipios de La Concordia, Ángel Albino Corzo, Villa Flores y Jiquipilas	Chiapas	177,546	A.P.R.N.
10	Las Huertas	Colima	167	A.P.R.N.
11	Playa de Tierra Colorada	Guerrero	138	SANT
12	El Veladero	Guerrero	3617	P.N.
13	Chamela-Cuixmala	Jalisco	13,142	R.B.
14	Playa de Mismaloya	Jalisco	628	SANT
15	Playa el Tecuán	Jalisco	36	SANT
16	Islas de la Bahía de Chamela	Jalisco	1,981	SANT
17	Cuenca Alimentadora del Distrito Nacional de Riego 043	Jalisco/ Nayarit	2,329,026	A.P.R.N.
18	Zicuirán-Infiernillo	Michoacán	265,117	R.B.
19	Playa Mexiquillo	Michoacán	73	SANT
20	Playa de Maruata y Colola	Michoacán	219	SANT
21	Marismas Nacionales	Nayarit	92,000	R.B.
22	Islas María	Nayarit	641,284	R.B.
23	San Blas	Nayarit	2,500	A.P.R.N
24	Lagunas de Chacahua	Oaxaca	14,187	P.N.

25	Huatulco	Oaxaca	11,890	P.N.
26	Playa de Escobilla	Oaxaca	146	SANT
27	Los Chimalapas	Oaxaca	800,000	R.B.
28	Sian Ka'an	Quintana Roo	528,147	R.B.
29	Banco Chinchorro	Quintana Roo	144,360	R.B.
30	Uaymil	Quintana Roo	89,000	A.P.F.F.
31	Isla Contoy	Quintana Roo	5,126	P.N.
32	Costa Occidental de Isla Mujeres, Punta Cancún y Punta Nizuc	Quintana Roo	8,673	P.N.
33	Manglares de Nichupté	Quintana Roo	4,257	A.P.F.F.
34	Otoch Ma'ax Yetel Kooh	Quintana Roo	5,367	A.P.F.F.
35	Tiburón Ballena	Quintana Roo	145,988	R.B.
36	Tulum	Quintana Roo	664	P.N.
37	Xcalak	Quintana Roo	17,949	P.N.
38	Arrecife de Puerto Morelos	Quintana Roo	9,066	P.N.
39	Cozumel	Quintana Roo	49,816	P.N.
40	Caribe Mexicano	Quintana Roo	5,754,055	R.B.
41	Yum Balam	Quintana Roo	154,052.25	A.P.F.F.
42	Río Lagartos	Quintana Roo/ Yucatán	60,347.00	R.B.
43	Laguna Chiricahueto	Sinaloa	6,000	R.E.
44	Meseta de Cacaxtla	Sinaloa	50,862	A.P.F.F.
45	Playa el Verde Camacho	Sinaloa	96	SANT
46	Playa Ceuta	Sinaloa	144	SANT
47	Islas del Golfo de California	Sinaloa/ Sonora	374,553	A.P.F.F.

A.P.F.F. = Protection Area for Flora and Fauna; R.B. = Biosphere Reserve; P.N. = National Park; A.P.R.N. = Natural Resources Protection Area; R.E. = State Reserve; SANT = Sanctuary; M.N. = National Monument.