

Spectacled Caiman *Caiman crocodilus*

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Common Names: Spectacled caiman, common caiman, baba (Venezuela), babilla (Colombia), guajipal (Nicaragua), jacare tinga (Brazil), jacare, lagarto blanco (Peru), cocodrilo, ocoroche, cascarudo, cachirre, tulisio, polulo (Mexico).

Important synonyms: *Caiman sclerops*

Range: Brazil, Colombia, Costa Rica, Ecuador, El Salvador, French Guiana, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Peru, Suriname, Trinidad and Tobago, Venezuela. Introduced populations in Cuba, Puerto Rico, USA, and Colombia (San Andres and Gorgona Islands). Presence in Belize unconfirmed (M. Tellez, pers. comm. 2017).

CSG Action Plan:

Availability of survey data: Adequate in Brazil, Costa Rica, Mexico and Venezuela. Other Range States have insufficient data to define conservation status.

Need for wild population recovery: Low

Potential for sustainable management: High

2018 IUCN Red List: Lower Risk/Least Concern. Probably numbers in the millions, widely distributed throughout its range, although locally depleted or extirpated in some localities (last assessed in February 2016; Balaguera-Reina and Velasco 2019).

Principal threats: Illegal hunting, habitat loss, hydroelectric dams, wetlands conversion

Introduction

Four subspecies of *Caiman crocodilus* are currently recognized (see above). Although *Caiman yacare* was previously considered to be a fifth subspecies (ie *C. c. yacare*), it is now generally accepted as a full species (King and Burke 1989), and is no longer treated as a subspecies (Escobedo-Galván *et al.* 2011). Busack and Pandya (2001), using morphological analysis, stated that there were no differences between subspecies. However, Venegas-Anaya *et al.* (2008), using mitochondrial DNA analysis, recognized these four subspecies and delimited geographically distributions within the *C. crocodilus* complex. DNA analyses also suggest a geographic divergence in two groups: the Mesoamerican group including *C. c. fuscus* and *C. c. chiapasius* and the South American group, which includes *C. c. crocodilus* and *C. yacare* (Amato and Gatesby 1994; Venegas-Anaya *et al.* 2008). Vasconcelos *et al.* (2006) quantified the variation of *C. crocodilus* across the Amazon basin based on samples collected from Peru, Brazil and French Guiana, finding significant divergence between the Amazon basin and extra-Amazon basin localities.

Recent morphological analysis of the Apaporis River caiman (*C. c. apaporiensis*), based on holotype and paratypes skulls from the Chicago Field Museum (USA), corroborates a significant morphological differentiation with the rest of the *C. crocodilus* subspecies (Escobedo-Galván *et al.* 2015a) as reported by Frederico Medem in 1952. However, DNA analysis conducted with additional paratypes from Colombian collections showed that several of those skulls identified as *C. c. apaporiensis* in the ICN (Instituto de Ciencias Naturales,



Figure 1. Distribution of *Caiman crocodilus* (Balaguera-Reina and Velasco 2019).

Conservation Overview

CITES: Appendix II, except *C. c. apaporiensis* (Appendix I)

National University of Colombia) collection fall into the *C. c. crocodilus* clade (Bloor 2013). Nevertheless, a more in-depth study is being initiated in late 2018, to collect less fragmented DNA (from live individuals rather than ancient bones) and larger sample sizes (for both morphological and genetic analyses), will hopefully provide the basis for drawing conclusions on the validity of this subspecies.

International trade in live specimens for pets between the 1950s and 1980s was one of the main causes of this species being introduced and becoming established as non-native fauna in the USA (Florida), Puerto Rico (Tortuguero Lagoon Natural Reserve), Cuba (Isla de la Juventud) (Hegan 2014; Somma and Fuller 2018) and Colombia (San Andres and Gorgona Islands; Forero-Medina *et al.* 2006).



Figure 2. Adult *Caiman crocodilus fuscus* from Tayrona National Natural Park, Colombian Caribbean. Photograph: David Vargas-Ortega.

Ecology and Natural History

The Spectacled caiman is one of the most widely distributed crocodylians of the New World, ranging from southern Mexico to Peru and Brazil. It is also the most geographically variable species in the Americas, with four subspecies generally being recognized (Medem 1981; King and Burke 1989). *Caiman c. crocodilus*, the nominate form, is distributed throughout the Orinoco basin across the Colombian and Venezuelan llanos, as well as the Amazon basin from Ecuador through Peru, Colombia, Venezuela, Brazil, Guyana, Suriname and French Guiana. *Caiman c. fuscus* is distributed from Nicaragua and south throughout Costa Rica, Panama, Colombia (both Pacific and Caribbean coasts) as well as the inter-Andean valleys, and western Venezuela and Ecuador (Venegas-Anaya *et al.* 2008).

In the case of *C. c. chiapasius*, Medem (1955, 1981, 1983) stated that this subspecies is distributed from Mexico to Pacific Colombia and possibly Ecuador. However, recent phylogenetic studies analyzing mtDNA limit its range to the Pacific coast from Chiapas in Mexico to El Salvador (Venegas-Anaya *et al.* 2008). Finally, *C. c. apaporiensis*, the most conspicuous of all subspecies due to its narrower snouted form, is restricted to the mid-Apaporis River basin

of Colombia (specific locality: Inaná Lagoon; Medem 1955, 1981). On this matter, authors such as Ayarzagüena (1984), Gorzula (1994) and Ayarzagüena and Castroviejo (2008) state that a cline of narrow-snouted caimans may be present across Colombia and the Venezuelan llanos. However, to date no morphometric studies addressing this hypothesis have been undertaken.

The Spectacled caiman is a medium-sized crocodylian (maximum TL in males 2.7 m; Ayarzagüena 1984), that is extremely adaptable in terms of habitat requirements, occupying rivers, creeks (caños), lagoons, lakes, borrow pits, swamps, wetlands, dams, and marshes (Medem 1981). Female Spectacled caimans reach sexual maturity at about 1.2 m TL and lay an average of 28-32 eggs in a mound nest, usually during the annual wet season (Thorbjarnarson 1994; Velasco *et al.* 1996). A close relationship between precipitation in certain months and the proportion of females that reproduce in that year has been reported (Ayarzagüena and Castroviejo 2008).

Ayarzagüena and Castroviejo (2008) summarize the species' ecology and behavior in detail. They comment that the genus *Caiman*, along with *Alligator*, shows the most elaborate behaviors known in crocodylians. Spectacled caiman behavior includes complex sound signals: "warning calls" emitted by female to the young; "distress calls" emitted by juveniles; and, "group cohesion calls" emitted by all individuals. Males display social behaviors: "vertical tail" and "arch tail" with sub-audible vibrations, barks, and visual displays. Another important characteristic described by these authors is that hatchling and juvenile groups remain together under female care for 12-18 months.

Initial studies on aspects of Spectacled caiman ecology were conducted in both the Venezuelan llanos and Colombian Caribbean (eg Chirivi 1973; Staton and Dixon 1975; Medem 1981; Seijas 1984, 1986). Subsequent studies allowed understanding of some life history aspects such as feeding habits (Thorbjarnarson 1993; Allsteadt and Vaughan 1994; Da Silveira and Magnusson 1999; Bontemps *et al.* 2016), nesting ecology (Chirivi 1971; Staton and Dixon 1977; Thorbjarnarson 1994; Escobedo-Galván 2006; González-Desales *et al.* 2016), morphology (Busack and Pandya 2001; Macip-Ríos *et al.* 2012; Okamoto *et al.* 2015), parasites (Magnusson 1985; Charruau *et al.* 2016), injuries (Magnusson 1985; Seijas *et al.* 2003), growth (Magnusson and Sanaiotii 1995; Pérez 2000), and some demographic parameters (eg Allsteadt and Vaughan 1992a; Bolaños *et al.* 1997; Cerrato 1991; Flores 2005; Escobedo-Galván and González-Maya 2006, 2008; Martínez-Ibarra *et al.* 1997; Ouboter and Nanho 1987, 1988; Pacheco 1990; Ron *et al.* 1998; Perez 2001; Balaguera-Reina *et al.* 2010; Balaguera-Reina 2012; Moreno-Arias *et al.* 2013; Barão-Nóbrega *et al.* 2018).

Conservation and Status

Sustainable use of Spectacled caimans has been one of the most relevant conservation actions in many countries where the species occurs (Thorbjarnarson 1999). During the 1950s

caiman skins were favored in trade due to the depletion in the wild of classic species (*Crocodylus acutus*, *C. intermedius*, *C. niloticus*, *C. porosus*, *A. mississippiensis*).

A high volume of caiman skins enters international trade each year, primarily *C. c. fuscus* and *C. c. crocodilus*, and represents the majority of crocodilian skins traded globally (Velasco 2008; Caldwell 2017). Currently, market demand for non-classic skins (*C. crocodilus*) has dropped considerably, reducing the number of skins exported from South America .

The Spectacled caiman appears to have been quite resilient to commercial hunting for several reasons, but particularly because it reproduces at a relatively small size, and hunting in many areas seems to have been concentrated on larger adult males. Additionally, Spectacled caimans can lay eggs on almost any type of substrate, and this lack of selectivity is advantageous over other more selective sympatric species (eg *C. acutus*, *C. intermedius*). Another important factor has been the near extirpation of larger, sympatric crocodilian species of greater commercial value. For example, Spectacled caimans in Brazilian Amazonia occupy habitats that were formerly dominated by *Melanosuchus niger* (Magnusson 1982). Furthermore, in areas such as the llanos of Venezuela and Colombia, the proliferation of man-made water bodies (eg borrow pits) has increased the carrying capacity for caiman populations in these habitats. The ecological adaptability of the Spectacled caiman is evidenced through its rapid population growth where it has been introduced, both accidentally and deliberately.

Introduced (feral) populations are established in the United States (especially Florida), Puerto Rico (Watlington 2002), Cuba (under harvest since 1995; Berovides *et al.* 2000) and Colombian islands [San Andres (Forero-Medina *et al.* 2006) and Gorgona Islands].

Over the last 8 years, various populations across the species' range have been evaluated.

- **Brazil:** Spectacled caiman populations, especially in the Amazon area, have been evaluated through several studies indicating wild populations are stable or continuing to grow (Marioni *et al.* 2008; Da Silveira *et al.* 1997, 2008; Vasconcelos *et al.* 2006; Rebelo and Lugli 2001). Campos *et al.* (2008) demonstrated that size distributions of breeding females in the Central Amazon vary greatly between populations and legal-size limits will be more effective if based on data from local populations. A captive breeding program is in place for *C. c. crocodilus* (Coutinho and Luz 2008).
- **Colombia:** This country is the largest producer of *C. c. fuscus* skins, exporting over 6 million between 1996 and 2015 (Caldwell 2017). Farms are based on closed-cycle captive breeding. However, this program is now under revision by CITES, and authorities are developing a ranching program that brings conservation and economic benefits to the species and local communities, along with the current closed-cycle breeding system. This initiative

has improved control of illegal harvesting and resulted in a >70% reduction in skin exported in the last three years (2015-2017) (A. Velasco, pers. comm. 2017).

Surveys of *C. c. fuscus* in Cispatá Bay (Ulloa and Cavanzo 2003; Cavanzo 2004) and Via Parque Isla de Salamanca (Balaguera-Reina and Gonzalez-Maya 2009) indicate that population size structure is dominated by hatchlings and juveniles, and that densities are lower than those reported previously by Rodriguez (2000). Moreno-Arias *et al.* (2013) assessed the population ecology of *C. c. fuscus* in 10 locations in the Magdalena River valley (Cundinamarca Department) in order to develop a conservation management plan for the species, and reported abundant individuals in lentic water bodies. Vilorio-Lagares *et al.* (2016) studied the population ecology of *C. c. fuscus* in the Manso and Tigre Rivers, Paramillo National Natural Park, finding a small population dwelling in these rivers in sympatry with *C. acutus*.



Figure 3. Tail arching and “flank vibrating” by *C. crocodilus*. Photograph: Andres Seijas.



Figure 4. Farmed *Caiman crocodilus fuscus* in Colombia. Photograph: Matt Brien.

Several conservation programs have been initiated, with the participation of communities, private enterprises and environmental authorities. From 2004 to 2006, a pilot program was developed for harvesting, egg incubation, and breeding of caimans by fishing communities. The hatched individuals were raised for a year and released into different swamps of the Canal del Dique (Bolívar Department), in the same areas where the eggs were originally harvested (Fundación Biodiversa 2004). Based on the successful experiences of the Canal del Dique program, a larger program was implemented in the Atlántico Department between 2005 and 2009, involving the reintroduction of

over 15,000 yearling and sub-adult individuals, which comprised the repopulation quotas of the closed-cycle breeding farms, into the wetlands where the species had been almost totally removed (Palencia *et al.* 2006; Rojano and Velasco 2006; Rueda *et al.* 2007; Medrano and Rojano 2009). Currently, studies are in place around the country to assess potential pilot areas to start ranching process under standardized conditions that allow locals use of caimans without affecting the conservation status of the species.

The distribution and status of *C. c. apaporiensis* is still unknown, and its evaluation through surveys and habitat characterization remains a high priority. Bloor (2013) and Escobedo-Galván *et al.* (2015a) carried out genetic and morphological assessments (see Introduction) and reignited discussion regarding the taxonomic validity of this subspecies. However, the lack of samples and data from the field keep this issue unresolved.

- Costa Rica: The population status of the Spectacled caiman has been reported as good for many years, with high abundance values reported and increasing in the Caribbean region, specifically Caño Negro Wildlife Refuge (Allsteadt and Vaughan 1992b; Cabrera *et al.* 2003; Escobedo-Galván 2008; Escobedo-Galván and González-Maya 2008). On the other hand, some studies conducted in the Sierpe-Terraba wetlands in the Pacific region (Bolaños *et al.* 1997; Escobedo Escobedo-Galván and González-Maya 2006) have shown a general population reduction in some areas due mainly to illegal consumption of meat and an illegal domestic market. Beginning in 2017, researchers began a survey in the Matina, Pacuare and Parismina-Reventazón Rivers in the central Caribbean region to determine the current population status of the species in those areas (J. Bolaños and J. Sánchez, pers. comm. 2017).
- Cuba: The Spectacled caiman was introduced into Ciénega de Lanier (Isla de la Juventud) in 1959, increasing by the 1990s to a population size between 25,000 and 40,000 individuals (Rodríguez-Soberón *et al.* 1996). Mendez and Berovides (2015) evaluated the potential of a ranching program for the species in this area. To date, no studies have been carried out to evaluate the interaction between Spectacled caimans, American crocodiles (*C. acutus*) and Cuban crocodiles (*C. rhombifer*) on the island. However, anecdotal records suggest that Spectacled caiman is predated by crocodiles. Information about this species in Cuba is available in “Los Crocodylia de Cuba” (Alonso-Tabet *et al.* 2014).
- Ecuador: Spectacled caiman populations remain poorly studied. Ron (1995), Vallejo (1995) and Ron *et al.* (1998) assessed the population ecology, habitat use and growth rates of *C. crocodilus* and *Melanosuchus niger* in six lagoons of the Equatorial Amazon as well as the effect of mark-recapture studies on wariness. However, detailed information on caiman population status for the country is currently not available.
- El Salvador: The latest information was produced by Escobedo-Galván *et al.* (2004), Martínez (2005) and Martínez and Dueñas (2007), describing small or depleted *C. crocodilus* populations across the country. Therefore, up-to-date studies remain a high priority to define the conservation status of the species as well as the clarification of subspecies inhabiting El Salvador. A group of researchers began surveys in the Gulf of Fonseca to determine the current population status of the species in this area (A. Escobedo-Galván, pers. comm. 2017).
- French Guiana: Detailed information on the status of caiman populations is not currently available.
- Guatemala: There are no studies over the last three decades on the status of wild populations or the exact distribution of the species. The species was used in two breeding farms, however they are no longer operating (C. Mansilla, pers. comm. 2017). A breeding project in the San Julian Farm, operated by San Carlos University, is also no longer operational. All caimans from the latter farm were donated to the Antigua Exotic Rescue Center (C. Mansilla, pers. comm. 2017). Up-to-date studies in the country remain a high priority to define the conservation status of the species.
- Guyana: No information on caimans has been published or reported in over 30 years. However, a population study was initiated at the end of 2017 to assess the populations. Nonetheless, the population is currently considered by authorities to be stable and abundant. Besides the proposed population study, no other research is currently being pursued. Regarding trade, there is current discussion on exporting meat and other parts in addition to the live and skin exports already occurring. Therefore, up-to-date studies in the country remain a high priority to define the conservation status of the species
- Honduras: In 1989 Honduras was the first country in Central America to be included in a regional crocodile study sponsored by CITES (King *et al.* 1990). The main objective was to provide information for developing a regional conservation program for crocodylians (*C. acutus* and *C. crocodilus*). The study provided a detailed assessment of the status and distribution of crocodylians in Honduras. They observed abundant populations in La Mosquitia region, estimating a *C. crocodilus* population of 3109 individuals (Cerrato 1991). However, up-to-date information on caiman population status for this country is not available.
- Mexico: *Caiman c. chiapasius* is thought to be restricted to Chiapas State (Escobedo-Galván *et al.* 2015b). The first studies regarding the species' ecology in this area were done by Flores (2002, 2005) and Aguilar-Galindo *et al.* (2005), reporting stable and healthy populations. In the last decade, studies concerning morphology (Macip-Ríos *et al.* 2012), nest predation (Vergara-García *et al.* 2016), nesting ecology (González-Desales *et al.* 2016), trophic ecology (Soria-Ortíz 2016), ectoparasites (Charruau *et al.* 2016) and demographics (Barrios-Quiroz *et al.* 2017) have

been carried out, increasing the knowledge on the biology of this subspecies.

- Nicaragua: Nicaragua is one of the few Central American countries where extensive population surveys on crocodylians have been conducted, providing data for assessing population fluctuations (Buitrago 2001). The abundance of *C. crocodilus* for this country was reported to have decreased at an annual rate of 9.6% due mainly to overhunting (over 44,000 skins harvested annually). Given this rate of decline, *C. crocodilus* hunting was considered unsustainable. Currently there is no research or any updated status of *C. crocodilus* besides a research note describing size distribution partitioning between habitats (Haghighi and Tellez 2017). However, there is discussion amongst conservation organizations and academic institutions on initiating studies in early 2018.
- Panama: There are no recent studies regarding the status of wild populations or the exact distribution of the species. However, Panamanian authorities are currently preparing the first national census of *C. crocodilus* and *C. acutus* to define clearly for the first time the conservation status of the species (M. Venegas-Anaya, pers. comm. 2017). The Panamanian Government, in collaboration with the Smithsonian Institute and Texas Tech University, is designing the Panama Canal Management Plan of Conservation and Sustainable Use of *C. acutus* and *C. crocodilus*.
- Peru: Current work regarding Spectacled caimans is scarce. Laverty and Dobson (2013) assessed the dietary overlap between Black caimans and Spectacled caimans in the Peruvian Amazon, finding intense competition for food resources between these two species. Nevertheless, the Peruvian Government is currently conducting an assessment of the population status of all crocodylians that occur in the country (Vázquez *et al.* 2017). Some of the areas where the study is taking place are Pacaya Samiria National Reserve, Alto Nanay Regional Conservation Area, and the Amazon River (Loreto Department).
- Puerto Rico: The Spectacled caiman was introduced in Puerto Rico in the 1960s, principally associated with the legal caiman pet trade at that time. The principal population is located at Tortuguero Lagoon (Rivero 1998). Recently, Bontemps *et al.* (2016) evaluated the trophic ecology of the Spectacled caiman in this area and its potential impact as a non-native top predator, providing novel information relevant to the design of management strategies.
- Suriname: Knowledge regarding Spectacled caimans in Suriname is outdated, and derived mainly from the work of Ouboter and Nanhoe (1987, 1988). These authors assessed the nesting and population ecology of the species, defining May-July as the nesting months with hatchlings and second-year juveniles staying together for up to 18 months. Even though hunters had killed between 1500 and 2000 individuals in the Coesewijne River during the dry seasons of 1978 and 1979, authors estimated a high population

density in the area compared with other river populations, estimating a population size of 4700 individuals in 1983. However, detailed information on the current caiman population status for the country is not available.

- Trinidad and Tobago: Medem (1983) provided information on the population status of the Spectacled caiman. However, no recent information on caiman populations is available.
- United States of America: An established feral population occurs in the vicinity of Homestead, Florida, where successful reproduction has occurred for many years. Additionally, reports of individuals (presumably released pets) in the wild are reported from Arizona (Somma and Fuller 2018), California (Somma and Fuller 2018), Connecticut (Altimari 1996), Iowa (Christiansen 2001), Indiana (Seng and White 2003), Kansas (Pearce 2012), Maryland (Roylance 2010), Massachusetts (Cardoza *et al.* 1993), Minnesota (Minnesota Department of Natural Resources 2005), Missouri (Somma and Fuller 2018), New York (Stewart 2001), Oklahoma (Webb 1970), Pennsylvania (Santoni 2011), Virginia (Ernst *et al.* 1997) and Washington (Roesler 2003). However, these records are considered to under-represent the number of *C. crocodilus* that show up across the USA (Somma and Fuller 2018).
- Venezuela: Since 1983 Venezuela has operated the largest wild harvest program for any species of crocodylian, based on controlled hunting by private landowners. The system allows private landowners to harvest up to 20% of caimans above 1.8 m TL each year, effectively restricting the harvest to adult males. Quotas were initially established based on census data from each property, provided by licensed surveyors engaged by the property owners. Annual exports average 50,000-60,000 skins. The program also includes a rigorous system of licensing of producers and processors, centralized inspection and storage of skins and careful monitoring of tanneries and exports.

Annual evaluations of the program and independent surveys in 1991-1992 suggested overexploitation in some areas (Velasco and Ayarzagüena 1995). In 1994, a new method of assigning harvest quotas was established, and the annual export quota was set at 70,000 skins. Currently, quotas are assigned based on regional surveys, ecological region, and the size of the property, and are restricted to 15% of Class IV (>1.8 m TL) individuals (Velasco *et al.* 1996). The values generated are compared with the regional average values derived independently by the CITES Management Authority, and adjustments to the estimated population and harvest quota are calculated (De Sola and Velasco 1994). The program offers an unparalleled opportunity to establish experimental harvesting regimes in conjunction with population studies.

In 1996 Venezuela implemented a complete halt to caiman harvesting to allow detailed analysis of the effect on populations (Quero and Velasco 1995). Harvest re-

opened in 1997 based on the results of an extensive re-evaluation of the wild populations. Evaluation of harvest effect determined which caiman populations would be harvested (Velasco *et al.* 2003). Caiman populations under wild harvest were continually evaluated (Velasco *et al.* 1997; Colomine *et al.* 2000; Villarroel *et al.* 2002), with generally healthy status reported (Velasco *et al.* 2003).

Historically, illegal trade in caiman skins has been an issue in Latin America, but in recent years there have been few reports of illegal trade. Legal production of caiman skins exceeds one million skins per year (A. Velasco, in press), and improved enforcement and CITES implementation appears to have reduced the flow of illegal skins.



Figure 5. Introduced (feral) *C. crocodilus* in Florida, USA. Photograph: Jemeema Brien.

Priority Projects

High priority

- 1. Taxonomic study of the *Caiman crocodilus* complex.** Despite recent efforts to clarify taxonomically the *C. crocodilus* complex, the relationships among subspecies are still poorly understood. This has created conservation problems due to the inability to recognize sub-species that may differ in trade restrictions. In the near future, research should include the use of new molecular and morphological tools to determine phylogenetic relationships within the *C. crocodilus* complex.
- 2. Survey of Apaporis River Caiman in Colombia.** *Caiman c. apaporiensis* is believed to be present only in the middle Apaporis River and some adjacent areas in southern Colombia (Medem 1981). No recent information on the status of these populations is available, and surveys are urgently needed to determine the subspecies' conservation status as well as define its taxonomical status.
- 3. Population surveys in Guyana and Nicaragua.** Wild *C. crocodilus* in Guyana and Nicaragua are harvested through annual quotas. However, no recent information regarding conservation status of the species has been collected.

Research on population status and the impact of the wild harvest is needed.

Moderate priority

- 4. Monitoring and sustainability.** Research into ecology, population dynamics, conservation, and population genetics in regions under commercial use regimes (eg wild harvesting, captive breeding, ranching) is needed to define the sustainability of populations and use programs over time. Evaluation of size classes, surveys, land occupation patterns and harvest effects are areas of interest. Long-term projects using molecular and geographic data on population dynamics and home range, integrating all small projects currently in progress, would establish the distribution boundaries and hybridization zones for the *C. crocodilus* lineage.
- 5. Population surveys in Ecuador, El Salvador, Honduras, French Guiana, Guatemala, Panama, Peru, Suriname and Trinidad-Tobago.** *Caiman crocodilus* populations in these countries remain poorly studied. Studies should be developed that allow determination of the conservation status of the species and reducing potential issues with local use.
- 6. Population surveys in Cuba, Puerto Rico and Colombia (San Andres and Gorgona Islands).** Spectacled caiman populations in these areas are introduced and currently defined as "established". However, knowledge regarding the impact of this non-indigenous species is needed. Sustainable use programs may provide incentives to control these Spectacled caiman populations.
- 7. Population surveys and establishment of ranching protocols in Colombia.** Surveys of wild *C. crocodilus* populations are required to assess conservation status, and to provide the basis of the proposed ranching program. The involvement of local communities in the ranching program should aim to provide incentives for conservation of the species.

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