Broad-snouted Caiman *Caiman latirostris*

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Common Names: Broad-snouted caiman, Yacaré overo, Yacaré ñato, Jacaré-de-papo-amarelo, Caimán de hocico ancho, Ururan, Yacaré mariposa

Range: Argentina, Bolivia, Brazil, Paraguay, Uruguay

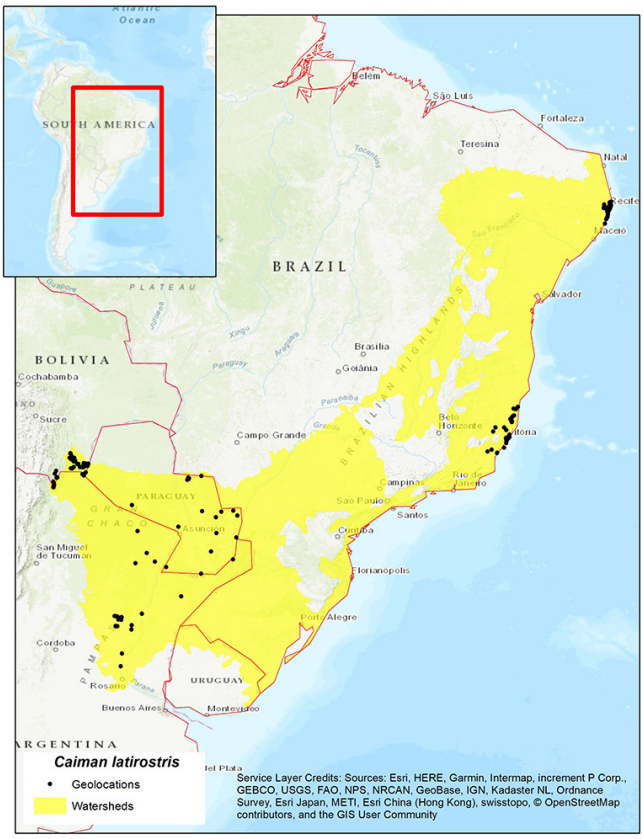

Figure 1. Distribution of *Caiman latirostris*.

Conservation Overview

CITES: Appendix II (ranching) in Argentina; Appendix I in other Range States

CSG Action Plan:

- Availability of survey data: Argentina, Brazil and Uruguay - good; Bolivia and Paraguay - poor
- Need for wild population recovery: Variable throughout distribution (low to high)
- Potential for sustainable management: Variable throughout distribution (low to high)

2018 IUCN Red List: Lower Risk/least concern (last assessed in 1996; CSG 1996).

Principal threats: Habitat loss, pollution, illegal hunting (in some States of Brazil, where population is low) and construction of large hydroelectric dams

Ecology and Natural History

The Broad-snouted caiman is a medium-sized crocodilian (Fig. 2), with maximum size reported as 3.16 m TL (D. Dutra-Araújo, pers. comm. 2018). The species' geographic distribution includes the drainages of the Paraná, Paraguay, Uruguay and São Francisco River systems, spreading over regions of northeast Argentina, southeast Bolivia, Paraguay and northern Uruguay. It also includes a large number of small Atlantic coast drainages from Natal, at the eastern tip of Brazil, to northeast Uruguay (Fig. 1).

Figure 2. Broad-snouted caiman. Photograph: Pablo Siroski.

Caiman latirostris populations in Argentina have low levels of genetic variability as analyzed with different molecular markers (Amavet *et al*. 2007, 2009, 2012, 2017), but using microsatellite data (2001-2011) there appears to be increased variability in Santa Fe Province. Considering the population genetic parameters, the studied populations appear to be part of the same Evolutionarily Significant Unit (ESU). Taking into account the excess of expected heterozygosity it can be assumed that bottleneck events existed in the past, probably in the last 70 years, due to poaching and illegal trade (Amavet *et al*. 2017). Similarly, *C. latirostris* populations in Brazil

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were closely associated with river basins, supporting the presence of three separated lineages within São Francisco and Jequitinhonha, Doce and Paraná River basins. They were probably separated during the Pleistocene, when sea levels were very low, and from that time, there was no genetic exchange (Villela *et al*. 2008). The use of mtDNA indicated that populations are ESUs highly associated with river basins (Borges *et al*. 2015).

In some Range States *C. latirostris* is sympatric with *C. yacare* over a large part of their distribution, but because of its more southern and more western distribution *C. latirostris* is allopatric in a larger area. The southernmost distribution of *C. latirostris* is due to its greater tolerance to low temperatures (Siroski 2011).

Caiman latirostris prefers densely vegetated environments and usually basks on floating vegetation, while *C. yacare* generally appears in environments free of floating vegetation and normally basks on beaches or coasts. The two species can be easily differentiated on the basis of cranial and nuchal structures, among others differences (Medem 1983) (Fig. 3). The presence of *C. latirostris* in the upper part of the Iguazú River (Fabri and Herrera 1998) is relevant due to its great flow. Occasionally, when both species appears together, *C. latirostris* would be displaced and search for other habitats (Micucci and Waller 1995); however, as it is common to find both species sharing the same water bodies, it suggests that ecological preferences may be incidental (Fig. 3; Siroski 2003).

Figure 3. *Caiman latirostris* (left) and *Caiman yacare* (right) living in sympatry in the Iberá Marshes, Corrientes Province, Argentina. Photograph: Pablo Siroski.

Crocodilians are integral components of wetlands all around the world. Various man-made habitats have been reported to be colonized by *C. latirostris* in Brazil (Verdade and Lavorenti 1990), Argentina (Venturino 1994; Simoncini *et al*. 2011) and Uruguay. *Caiman latirostris* populations have been favored by the construction of agriculture impoundments for irrigation of rice and sugar cane in northwestern Uruguay (Borteiro *et al*. 2008). The species has also been found in the mangroves of coastal islands of southeast Brazil (Moulton 1993), and it can be found at altitudes up to 800 m asl (Yanosky 1994).

Caiman latirostris is a mound nester, laying 18-50 eggs during the wet season, with a maximum of 129 eggs reported from in a nest from a multiple-laying event (Larriera 2002). Larger clutch sizes have been reported at higher latitudes (Simoncini *et al*. 2009), and annual nest production is correlated with rainfall (Simoncini *et al*. 2011). Reproductive behaviors such as nest construction, maintenance, vigilance and aggressive social behaviors were reported by Pierini *et al*. (2016).

As implied by its common name, *C. latirostris* has proportionally the broadest snout of any crocodilian. It has a generalized diet, with the most important food items being snails, shrimps, fish and birds (Diefenbach 1979; Melo 2002; Freitas-Filho 2007; Borteiro *et al*. 2009). Passive feeding behavior has been described (Piña and Larriera 2003), but as a single individual and not cooperatively feeding as described for *Alligator mississippiensis* (King *et al*. 1998) and *C. yacare* (Schaller and Crawshaw 1982).

Conservation and Status

Although adult *C. latirostris* have well-developed ventral osteoderms, the skin is still considered better than that of the other *Caiman* species for finished products (King and Brazaitis 1971; Brazaitis 1987). Commercial hunting of the species began in the 1940s and 1950s throughout most of the its range (except for Uruguay where there is no evidence of commercial hunting) until the mid-1980s (Medem 1983). These illegal activities resulted in significant reductions in the size of populations, to an "endangered" status. As with many crocodilian species, *C. latirostris* has recovered thanks to the incentives generated by sustainable use programs and improved local and international controls. Although illegal hunting still occurs in some isolated areas, it is no longer the major threat for the species - probably due to a combination of reduced density in some places, increased cost of illegal hunting, and legal skins being more attractive to traders. Some minor cases of hunting are reported, and these are invariably associated with subsistence use.

In northeastern Brazil, illegal hunting still supplies meat for local markets in small cities in the São Francisco River basin. The meat is sold as salted carcasses, like codfish. For this reason it is locally known as "São Francisco codfish" (Verdade 2001). In Argentina, illegal hunting occurs in isolated cases, largely because local rural people ("gauchos") are currently rewarded for locating nests for the ranching program (Larriera *et al*. 2008a).

Habitat destruction has increased significantly in recent years. The strong expansion of the agricultural frontiers has created proximity between the regions with intense agricultural activity and the areas of distribution of the species. In this respect, many *C. latirostris* populations live under heavy chemical pollutant pressure at all life stages (Siroski *et al*. 2016), and the species can be considered to be excellent model for environmental contamination by pesticides (Poletta *et al*. 2013). In addition, because *C. latirostris* occupies areas of high human activity, it is also under pressure from biological contaminants such as untreated sewage and improper disposal of hospital waste.

Urbanization is also a threat, especially in eastern Brazil, but the species can still be found in urban lakes of the southern region of Rio de Janeiro City (Freitas-Filho 2007). Other anthropogenic activities include small-scale fishing, one of the main sources of income for fishermen in traditional communities in Brazil. However, due to the type of fishing gear used, there can be a negative impact on the conservation of local caiman populations (Mascarenhas *et al*. 2016).

Most of the natural wetlands of the Paraná and São Francisco River systems in Brazil have been dammed for large hydroelectric stations. Vast areas have also been drained for agricultural purposes and pollution has been a considerable problem in rivers that flow through large cities in Brazil. Studies on the impact of large hydroelectric stations on the density and reproduction of *C. latirostris* populations have been conducted using aerial surveys (Campos and Mourão 1995; Mourão and Campos 1995), indicating that the major impact of these dams is the destruction of floating vegetation used for nesting.

The State of São Paulo, Brazil, is located in the central portion of the species distribution range. In this region there are no vast wetlands and the species inhabits small wetlands and artificial reservoirs (Marques *et al*. 2016). Although canals connect these patches of habitat, there seems to be some isolation at a meta-population level and even on a micro-geographic scale, possibly due to pressures such as poaching and urbanization (Verdade *et al*. 2002).

Strategies for conservation of wild *C. latirostris* populations will vary depending on the specific threats that they are facing. There are different levels of knowledge on populations in each range state, which is largely related to the level of research that has been carried out. Argentina has carried out extensive research on *C. latirostris*, which has been favored by a management program that was established about 25 years ago. Increased attention of wild *C. latirostris* populations has been seen in Brazil over the last few years, and to a lesser extent in Bolivia and Paraguay. In the case of Uruguay, attempts are being made to identify or create a working group.

Surveys for *C. latirostris* were recently conducted in Argentina (Siroski 2004; Piña *et al*. 2009; Ciocan *et al*. 2016), Bolivia (Aparicio and Ríos 2008; Rodriguez Cordero, unpublished data), Uruguay (Borteiro *et al*. 2006, 2008) and Paraguay (Bueno Villafañe *et al*. 2017; Motte *et al*. 2017). In Bolivia, *C. latirostris* populations are considered to be severely depleted, but some recent unpublished reports showed stable populations, and even increasing populations, in some areas, and over the last few years there is little evidence of illegal hunting for commercial and subsistence purposes.

The diversity and extent of habitats occupied by *C. latirostris* make it difficult to estimate population abundance accurately. Larriera *et al*. (2008b) proposed nest counts as a complementary variable to night-count monitoring to estimate the status of the caiman populations. Recent surveys in areas of swamp using drones demonstrated that the size of the populations in Argentina was previously underestimated (Piña 2017). Variation in nest counts is les likely due to environmental conditions at the time of survey, as nest production is related climatic conditions in the period before winter (6-8 months before the nesting period; Simoncini *et al*. 2011), while the results of night count surveys are influenced by the prevailing conditions at the time of survey.

The availability of habitats can vary substantially from one year to year, for example due to drought conditions. In such cases the dynamics of populations of wild species, especially *C. latirostris*, will be impacted.

The different economic, social, cultural and population situations that exist in different range states has a direct influence on the type of management program implemented. In Argentina, since the early 1990s the ranching of wild *C. latirostris* eggs (Fig. 5) has demonstrated the positive benefits of ranching (Larriera 1994), mainly due to the species' abundance and ecological characteristics. It provides incentives for protection of the species and the ecosystem in which it occurs, and benefits for local rural communities. There are currently three ranching programs operating in Argentina, producing around 12,000 *C. latirostris* skins per year.

As a precaution, and to ensure no negative impact on the wild population due to the harvest of eggs, the Argentine program includes the release of head-started *C. latirostris* back into the wild. Nesting females provide an index of the success of the release program, with more than 50% of nesting females identified in the wild in some places being previously released individuals (Larriera *et al*. 2006; Leiva *et al*. in press).

Where ranching is not feasible, captive breeding is an option for producing meat and skins. This is the case in Brazil, where there are currently 17 farms in 6 states (Alagoas, Minas Gerais, Río de Janeiro, São Paulo, Santa Catarina, Espírito Santo).

Figure 4. Farmed *Caiman latirostris*. Photograph: Pablo Siroski.

Knowledge about the biology and management of *C. latirostris* has improved consistently since the early 1990s, due in part to regional workshops (Verdade and Lavorenti 1990; Larriera and Verdade 1995) and multidisciplinary and

combined effort between ranges states (Larriera and Verdade 2002). As a consequence, the Argentine population of *C. latirostris* was transferred to Appendix II of CITES in 1997 (Larriera *et al*. 2008a) and the new classification of reptiles in Argentina lists *C. latirostris* as "not threatened" (Prado *et al*. 2012). The Brazilian population of *C. latirostris* is no longer considered as endangered (IBAMA 2003).

Based on the extent of recovery, the Argentine population of *Caiman latirostris* was reclassified on the US Endangered Species Act in 2013 (Federal Register/Vol. 78, No. 122/ Tuesday, June 25, 2013/Rules and Regulations). The downlisting opened new opportunities for trade, and further strengthening the positive incentives for conservation through sustainable use programs in Argentina (Larriera 2011).

Figure 5. Local Argentine people, called "gauchos", marking eggs for collection and subsequent transport to incubation facilities. Photograph: Pablo Siroski.

Priority Projects

High priority

1. **Assess population status in Brazil**. There is little information on the population status of *C. latirostris* in Brazil, which comprises a high proportion of the species' distribution (see Fig. 1).

2. **Population surveys in Bolivia, Paraguay and Uruguay**. Data on current population status and trends of wild *C. latirostris* are outdated, and should be updated.

3. **Assess threats and mitigating measures**. Investigate the impact of the hydroelectric dams, wetlands drainage for agriculture and pollution on the species, and assess ways in which these impacts may be mitigated. This may include climate change.

4. **Ranching**. Ranching has been demonstrated as an effective conservation tool for this species in Argentina, and for other crocodilian species elsewhere. The application of ranching programs in other Range States merits consideration, particularly where it may involve local communities.

Moderate priority

5. **Genetic studies**. With significant advances in recent years, genomic studies can help our understanding on how *C. latirosris* populations respond to environmental, ecological, and/or other threats..

6. **Regulation and enforcement**. Proposals for management programs have to consider an important discussion about how to improve law enforcement and enhance the controls in some areas to avoid illegal trade.

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