# Black Caiman *Melanosuchus niger*

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**Common Names**: Black caiman, jacaré açu, jacaré negro, caimán negro, caimán, cocodrilo

**Range**: Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru


Figure 1. Distribution of *Melanosuchus niger.*

**Conservation Overview**

CITES: Appendix II in Ecuador (ranching) subject to quota from 1997 and Brazil (since 2007); Appendix I in all other countries.

CSG Action Plan:
Availability of survey data: Moderate
Need for wild population recovery: Low
Potential for sustainable management: Moderate

2009 IUCN Red List: LR/cd (Least Risk, conservation-dependent; reported to have undergone substantial recovery in several parts of its range. Recent surveys suggest that species remains widespread, locally abundant and extinction is unlikely; IUCN 2009) (last assessed in 2000).

Principal threats: Illegal hunting, habitat destruction

**Ecology and Natural History**

The Black caiman is the largest member of the Alligatoridae, with adult males surpassing 4-5 m in length. The species is widely distributed throughout the Amazon River basin, but populations are also known from areas outside the Amazon; the Rupununi and upper Essequibo River drainages in Guyana, the Kaw and Approuague region of French Guiana, and the lower Oiapoque River (Amapá, Brazil/French Guiana border), with populations at Pointe Behague (French Guiana) and Cabo Orange (Brazil).

Early ecological studies were conducted in Colombia throughout the 1950s, 1960s and 1970s (Medem 1981) and by Otte (1978) in Peru. During the 1980s and early 1990s research on wild and captive populations was carried out by; Herron and collaborators (1985, 1990, 1991, 1994) in southern Peru, Pacheco (1990a,b, 1993a,b, 1994) in Bolivia, and Asanza (1985, 1992), Ron (1995, 1998) and Vallejo (1996) in Ecuador. Subsequent ecological studies have included evaluations of nesting ecology (Villamarin and Suarez 2007; Marioni *et al*. 2007), feeding behavior (Marioni *et al*. 2008), diet (Da Silveira and Magnusson 1999; Horna *et al*. 2001) and factors that affect spotlight counts (Da Silveira *et al*. 1997, 2008). Analyses of regional genetic variation have been published by de Thoisy *et al*. (2006), Farias *et al*. (2004) and Vasconcelos *et al*. (2008).

The Black caiman occupies a variety of habitats, including large rivers and streams, oxbow lakes, and in some areas seasonally flooded savannas. Throughout most of the Amazon basin the preferred habitat type appears to be floodplain lakes. In the past, habitat relations among the Amazonian caiman species were blurred by the severe reduction in numbers of *M. niger* in most areas (Magnusson 1982). Herron (1994) found that Spectacled caiman (*Caiman crocodilus*) and Black caiman were spatially separated in a Peruvian oxbow lake, as did Aguilera *et al*. (2008) in Bolivia. Recovering populations of *M. niger* have displaced *C. crocodilus* from flooded forest

Thorbjarnarson, J.B. (2010). Black Caiman *Melanosuchus niger.* Pp. 29-39 *in* Crocodiles. Status Survey and Conservation Action Plan. Third Edition, ed. by S.C. Manolis and C. Stevenson. Crocodile Specialist Group: Darwin.

habitats such as the Mamirauá Sustainable Development Reserve (SDR) in Brazil. Peres and Carkeek (1993) provide an account of how large caiman populations in the Brazilian Amazon may protect fish stocks by destroying nets.

Like all alligatorids, *M. niger* is a mound-nesting species. Females reach sexual maturity at around 2.0 m total length. Mean adult female size is 2.8 m, and clutch size averages 39.3 eggs. Eggs are large, averaging 143.6 g (Thorbjarnarson 1996). Herron *et al.* (1990) report on a *M. niger* nest in Peru observed throughout the entire incubation period. Nesting ecology in Ecuador is reported by Villamarin and Suarez (2007). Pacheco (1990a,b) presents information on reproduction of captive *M. niger* in Bolivia.

Figure 2. Female *M niger* (approx. 2.8 m TL) guarding her nest, Mamirauá Sustainable Development Reserve, Brazil. Photograph: Francisco Villamarin.

**Conservation and Status**

Overall, *M. niger* populations have recovered dramatically from low levels in the 1970s when they were considered endangered. The IUCN Red List status of the species is now Lower Risk, and some countries, most notably Brazil, are developing plans for managed harvests. Commercial hunting of *M. niger* did not begin in earnest until the 1940s, when the South American crocodiles (*Crocodylus acutus, C. intermedius*) were becoming rare. Skins were exported to tanners in Europe and the United States and subsequently used to manufacture luxury items including belts, wallets, and shoes.

*Melanosuchus niger* was the preferred Amazonian species due to its larger size and the superior quality of its skin. Hunting peaked during the 1950s, and declined markedly through the 1960s, when trade in *C. crocodilus* began to increase. However, in some areas significant trade in Black caiman extended into the 1970s (Plotkin *et al.* 1983; Gorzula and Woolford 1990). In many parts of the species' range a period of recovery likely began with the demise of commercial skin hunting. In the 1970s, a major shift in caiman hunting occurred in the western Brazilian Amazon (Amazonas State) with hunters selling caiman meat instead of skins. By the early 1980s, a trade in salted meat from Amazonas State to Pará State in Brazil and to Colombia was reported by Best (1984). In the mid-1990s an estimated trade in excess of 100 tons of caiman meat per year was coming from the region of the Mamirauá Reserve (Da Silveira and Thorbjarnarson 1999). The trade has flourished and expanded in various areas as described in the Brazil and Peru country accounts. The biggest conservation challenge for the species now is not one of fostering population recovery, but rather developing science-based management programs that foster the sustainable use of caiman skins and meat and provide economic benefits for communities that share Amazon riparian habitats with both Black and Spectacled caiman.

Recent surveys have been conducted throughout most of the range of the *M. niger* (see country accounts), including some areas where spotlight counts and nest monitoring are being done as part of plans for sustainable harvest programs. (Ortiz van Halle 1995; Alvarez 1995).

Bolivia: Black caiman were historically widespread throughout northern and eastern Bolivia, in the Departments of La Paz, Pando, Santa Cruz, Beni and Cochabamaba, but were heavily impacted by skin hunting during the period 1942-1960 (Plotkin *et al.* 1983). Surveys in 1986-1987 found *M. niger* to still be distributed throughout most of its historical range, but in very low numbers (King and Videz Roca 1989). Of the very few individuals that were encountered, most were juveniles or sub-adults. Recent surveys in certain parts of the Beni and Santa Cruz lowlands indicate that populations in some areas are still locally abundant. The species was found to be relatively abundant within the Beni Biological Station protected area (Pacheco 1993a). Encounter rates in six lagoons ranged from 0.47 to 19.5 individuals/km. The numbers of *M. niger* in rivers were lower (to 1.4/km), but Pacheco (1993a) considered the Beni Biological Station to harbor an important population of this species.

Surveys conducted during the 1980s in rivers in the Rios Blanco y Negro Wildlife Reserve (Santa Cruz Department) reported encounter rates of 1.4/km in the Rio Negro (168 km surveyed) and 0.9/km in the Rio Blanco (A. Taber, pers. comm.). Surveys in lakes have not yet been conducted. Reports also suggest the presence of localized populations in floodplain lakes along the Rio Itenez within the Noel Kempff Mercado National Park (D. Rumiz, pers. comm.).

Surveys of caiman in 12 oxbow lakes in the floodplain of the Ichilo River (Aguilera *et al.* 2008) carried out in 1999 and 2000 found *C. yacare* to be the most abundant species (1999: 58 *M. niger* and 341 *C. yacare*; 2000: 34 *M. niger* and 297 *C. yacare*), with *M. niger* being found in only four of the 12 water bodies. The authors found an interesting environmental relationship with *M. niger* being found in waterbodies that were generally further from the river, with higher water transparency values, and greater coverage by macrophytes.

Recent surveys in Bolivia have been carried out principally to evaluate populations of *C. yacare* as part of a national

management program based on the harvest of adult males (Cisneros *et al*. 2006). Surveys reported *M. niger* present at 43% of the 324 sites visited. Over a total of 2369 km of surveys in the Beni Department, 3052 *M. niger* were counted (mean= 1.29/km), with maximum encounter rates of 64/km (Ten *et al*. 2008). Their conclusion was that populations were recovering slowly but that the species was still absent from parts of its historic range.

Prior to 1979, Bolivian laws permitted the legal cropping of wild *M. niger* populations (Decreto Supremo 08063 of 1967). Hunting was prohibited between 31 July and 1 January, and the minimum legal size was 2.5 m (Medem 1983). Nevertheless these regulations had little effect in controlling the widespread hunting. Presently, the species is fully protected under Decreto Supremo 16606 of 1979 (Klemm and Navid 1989). There are concerns about the numbers of *M. niger* being accidentally killed by hunters taking *C. yacare* as part of a managed harvest program (Cisneros *et al*. 2006). Pacheco (1990a,b, 1993a,b) presents information on captive breeding and rearing of *M. niger* in Bolivia.

In August 1990, 25 adult *M. niger* (>2.2 m TL) were released in the Laguna Normandia, located adjacent to the Beni Biological Station near San Borja. These animals originated from a group of approximately 150 captive individuals on the El Dorado Cattle Ranch. They had been brought there in the late 1970s for the establishment of a commercial farm. The release project was sponsored by PRODENA, a Bolivian conservation group, in association with the Beni Biological Station and the owners of El Dorado. Monitoring showed that only a small percentage of these animals remained in the lagoon (Vaca 1992). Pacheco (1995) reported that 8-10 of the group remain resident and reproduction was observed in 1995.

Brazil: As in other Amazonian nations, in Brazil the Black caiman was intensively hunted for its skin in the 20th century. Skin hunting was particularly intense in the early 1950s, and between 1950 and 1965 a total of 7.5 million caiman skins were exported from Amazonas State alone (Carvalho 1967). Commercial hunting of all wildlife, including caiman, was banned in 1967 (Federal Law 5.197), but reports suggest that some illegal skin hunting continued into the l970s and l980s (Medem 1983). By the late 1960s the caiman skin trade had shifted almost entirely to the less commercially valuable *C. crocodilus*, indicating that hunters were finding it difficult to locate *M. niger*. In the late 1970s and early 1980s, the scarcity of Black caiman was evident in the fact that only approximately 10% of the confiscated caiman skins in Brazil were of *M. niger* (Rebelo and Magnusson 1983).

While Black caiman were near commercial extinction, breeding populations of wary animals remained in isolated floodplain habitats throughout their historic distribution. While some reports in the 1980s suggested that Black caiman was a highly threatened species (Plotkin *et al*. 1983; Brazaitis *et al*. 1992), this was due in large part to the inaccessible nature of the areas where the breeding populations remained, and the wary nature of the surviving animals. In areas of prime habitat in the western Brazilian Amazon, the species recovered relatively quickly following the end of widespread commercial skin hunting, and by the early 1980s there was an emerging industry of hunting caiman for their meat (Best 1984). As populations of caiman grew so did meat hunting until by the 1990s in some areas (such as the Mamirauá SDR region) there was a large network of hunters and traders dealing in caiman meat (Da Silveira and Thorbjarnarson 1999).

Today, *M. niger* is common throughout much of the Brazilian Amazon, and there are no reports of populations being locally endangered in the last 15-20 years. In 2007, the population was transferred to CITES Appendix II (Brazil 2007), a move that will facilitate managed commercial use (Dacey 2007). Nevertheless, the abundance of Black caiman is not uniform throughout the Amazon Basin. The highest densities and largest populations occur in the nutrient-rich varzea habitat located along white water river systems with Andean origins, including the Solimoes, Juruá, Japura and Purus. Aside from the sediment-rich white water rivers, Amazonian rivers are classified as blackwater, such as the Rio Negro, or clearwater river systems, such as the Tapajos. These river systems tend to have lower levels of productivity and lack the productive varzea forest floodplains whose lakes are favored by Black caiman. While these types of river systems and their associated wetlands are also inhabited by Black caiman, the latter are typically found at much lower densities (Da Silveira 2002).

In most of the habitats used by *M. niger*, their abundance is poorly represented by spotlight counts because the species prefers heavily vegetated wetlands and locations relatively inaccessible for motorboats. Ecological studies in the Mamirauá SDR have shown that only once breeding populations in isolated floodplain lakes reach levels approaching carrying capacity do Black caiman start appearing in more accessible floodplain wetlands and rivers channels where spotlight counts are usually conducted.

However, in areas of varzea habitat in the western Brazilian Amazon, Black caiman can be seen in extremely high densities in the seasonal dry period when many of the temporary floodplain wetlands dry up and caiman move into areas of more permanent water. For instance in some sectors of the Mamirauá SDR, dry season densities in excess of one black caiman per meter of shoreline have been reported (>1000 caiman/km). However, it is unlikely that densities of Black caiman from areas like Mamirauá can be used for extrapolation to estimate the population for the entire Brazilian Amazon, as was done to derive population estimates of 8 million *M. niger* in Brazilian Amazon varzea habitats (300,000 km$^2$) and 16 million in the entire Brazilian Amazon (Brazil 2007).

Beginning in the 1980s, caiman were hunted for meat in the western Brazilian Amazon, particularly in the region near Tefé and the Mamirauá SDR. In the mid-1990s approximately 100 tons of dried-salted meat was sold in this area, mostly to buyers who in turn sold it in Colombia (Da Silveira and Thorbjarnarson 1999), as there was no local tradition for eating caiman meat. Over the last 10 years this market has

evolved considerably and now most of the caiman hunted in this area are instead being used as bait for the capture of a catfish (*Calophysus macropterus*) in the main river channels (Da Silveira and Viana 2003).

In the region between the Mamirauá SDR and Manaus, another major caiman hunting market has developed with the recovery of caiman populations, principally in the lower Purus River in the region around the town of Beruri. Here hunting of both Black and Spectacled caiman is carried out almost exclusively for the sale of salted meat to traders who in turn sell it to buyers in Pará State, near the mouth of the Amazon, where caiman meat is traditionally consumed in certain communities. Much of this area is now in the Piagaçu-Purus SDR. Little commerce for caiman skins has been registered in Brazil since Rebelo and Magnusson (1983); but see Da Silveira *et al*. (1998) for exceptions.

Brazilian environmental law has changed substantially over the last 10 years. Since 1967, Federal regulations in Brazil have prohibited all forms of commercial hunting of wildlife. However, a recent law regulating the establishment and management of protected areas (SNUC; Sistema Nacional de Unidades de Conservação Law 9.985 07/18/2000 and its respective Decree 4.314 08/22/2002) have opened the possibility of commercial management in specific protected areas (Sustainable Development Reserves and Extractive Reserves). Also, as a result of the recovery of wild populations, in 2003 IBAMA removed *M. niger* from the national list of endangered species (Brazil 2007). The ranching of *M. niger* was recently regulated under "Instrução Normativa" (IN 169 20 February 2008).

Managed commercial exploitation of *M. niger* has been slowed by a number of factors, including existing national legislation prohibiting commercial exploitation of wildlife, a lack of clear legal instruments for the sale of skins and meat (including sanitary regulations) derived from managed harvests, and the paucity of caiman population monitoring programs. One initial trial and two small-scale commercial experimental harvests have been carried out in the Mamirauá SDR between 2002 and 2008. The first commercial hunt in 2006 involved 260 *M. niger* and resulted in 249 skins and 4.5 tons of meat, the latter being sold locally in Manaus. A second commercial harvest of 253 *M. niger* was carried out in December 2008, and resulted in 226 skins and 5.05 tons of meat. Some skins were exported for trial tanning [France (4), Japan (6), Portugal (2), Germany (2); Valdécio Pittch, pers. comm. 2009].

Colombia: *Melanosuchus niger* was once abundant throughout the Colombian Amazon region in the upper Amazon River and its major affluents, the Putumayo and Caquetá, as well as in the Atacuari, the Loreto Yacu and the Apaporis Rivers, among others. According to Medem (1981) commercial hunting for *M. niger* skins began in the upper Amazon River around 1945 and spread to the rest of the country, causing a rapid decline in its populations. By the late 1950s Black caiman was rare, but it wasn't until 1968 that the Ministerio de Agricultura limited hunting and egg collection (Resolution 411); a complete ban was put in place in 1969 (Resolution 573) (Medem 1981; Brieva 2002). However, due to poor law enforcement, an estimated 61,116 skins and 259 live animals were exported through Leticia, Bogota, Barranquilla and Cali in 1970 and 1972 (Medem 1981). Medem (1981) concluded that *M. niger* had virtually disappeared from the Colombian territory.

Given the lack of information on caiman populations, CITES, the environmental government authority of the time (INDERENA) and a Colombian farming association (AZOOCOL), developed a project to evaluate the status, distribution, systematics and conservation of Colombian Crocodylia in 1992. Surveys by Barahona *et al*. (1996) in 14 localities of the Putumayo, upper Caqueta, Caguan, Apaporis and Amazon Rivers between 1994 and 1997, found the highest relative densities in La Paya (0.64 ind/ha), Sunicocha (0.32 ind/ha) and Yarinas (0.29 ind/ha) in the Putumayo River basin and in Garzacocha Lake (0.85 ind/ha) in the upper Amazon River. These results led Rodriguez (2000) to conclude that populations of *M. niger* in Colombia were recovering, especially in the Putumayo River basin. Surveys and interviews in the Colombian Amazon in 2005 were carried out by Government environmental institutions as part of a national program for *M. niger* conservation and sustainable use. Black caiman were found to be more abundant in the Putumayo and Caquetá River basins (a total of 11 and 64 caimans counted respectively at different sites) than in the Amazon River basin (no animals seen). Based on this study, an action plan for the species conservation was proposed (Alonso *et al*. 2006). No studies on either the structure or the level of isolation of Colombian *M. niger* populations have been made.

Reported threats include habitat degradation due to timber extraction, burning of vegetation - generally to facilitate access to areas with *Eritroxylon coca* plantations - and hunting to use as bait for catching "mota" (*Calophysus macropterus*), a fish in demand throughout Colombia (Naranjo in Rodriguez 2000; Flores *et al*. 2008). Occasional commerce is known to exist near the Putumayo River and in Leticia, where its meat is sold as *Pseudoplatystoma* and pirarucu (*Arapaima gigas*) respectively (Da Silveira and Thorbjarnarson 1999). Subsistence hunting by local indigenous communities is frequent, although apparently there is a preference for *C. crocodilus*.

Although the latest information available suggested *M. niger* was recovering, it is still considered an endangered species (Rodriguez 2002) and Colombian populations are currently listed in CITES Appendix I. Ongoing studies in the Caqueta (La Pedrera), Putumayo (Tarapaca and Pto. Leguizamo), Amazon and Loreto Yacu Rivers, and the lakes nearby, are supported by the Regional Environmental Corporation (Corpoamazonia), among other organizations, and are focusing on evaluating abundance and population structure (Corpoamazonia 2008).

Ecuador: Asanza (1992) reported that *M. niger* was heavily exploited in Ecuador between 1930 and 1970, with

approximately 500,000 skins being traded, mostly through Leticia and Manaus. In the 1970s, Medem (King 1973) believed that Ecuador was the only place where *M. niger* was not on the verge of extinction. In the late 1980s, an illegal trade in small (40-120 cm) live *M. niger* was reported. Although their final destination is unknown, numbers of these animals were reported to be exported illegally over the Colombian and Peruvian borders (Asanza, pers. comm.).

Populations are known to exist in several parts of the Ecuadorian Amazon, particularly in isolated oxbow lakes. Hines and Rice (1992, 1994) conducted surveys in Ecuador during the early 1990s along 18 survey routes (131.2 km total) of optimal habitat. Black caiman were observed at 16 of 17 locations and densities ranged from 0/km to 13.25/km, with a mean value of 4.65/km. The highest densities were found at Challuacocha (11-13/km), Imuya (<13.25/km), and Limoncocha (10.25/km). In a total of 28 surveys, 309 *M. niger* and 188 *C. crocodilus* were observed. The size class distribution reflected an abundance of juvenile animals. In Limoncocha, Asanza (1992) reported a decline in the population of *M. niger* between 1983 and 1990. Recent surveys in the same locality report densities of up to 8.27/km, suggesting that the population has been stable during the last few years (Villamarin 2006a).

Most of the information on the status of the Black caiman population in Ecuador comes from the Reserva de Producción Faunística Cuyabeno, a reserve that includes various river systems and igapo forest located in northeastern Ecuadorian Amazon. Asanza (1992) noted that significant populations were found in the Aguarico River system (Cuyabeno lakes and river, Imuya Pacuya and Zancudococha lakes), the Napo River system (Jivino, Indillama, Tiputini and Yasuni rivers, and Limoncocha, Taracoa, Añangu, Challuacocha, Pañacocha, Garzacocha and Jatuncocha lakes), the lower Nashiño and Cononaco Rivers, the lower and middle Curaray River, the lower Pindoyacu, the lower Yaupi and upper Morona, and the Pastaza River system (Bufeo, Capahuari, and lower Ishpingo rivers). Asanza (1992) reported high densities in Zancudococha (23.5/km) and Imuya (23.6/km) lakes based on five and two years of surveys respectively. However, during the mid-1990s a long-term monitoring effort reported relative abundances ranging from 0.13 to 3.41/km in several lakes within the reserve (Ron 1995; Vallejo 1995). More than 10 years later the monitoring continued in four of the same lakes (Canangueno, Mateococha, Zancudococha and Imuya), reporting higher relative abundances (<8.89/km) and species ratios favoring *M. niger* over *C. crocodilus*, suggesting that the Black caiman populations are increasing (Dueñas-Serrano *et al*. 2008). The Zancudococha Lake population appears to be one of the most abundant and stable within the reserve. Jahoda (1990) estimated a population of 100 to 150 individuals. During 1995 a mark-recapture experiment estimated a population of 107 to 187 individuals (Ron *et al*. 1998). And recently the population was estimated as 440 individuals (Dueñas-Serrano *et al*. 2008).

The Black caiman was not protected in Ecuador by the wildlife resolution of 1970, but was included in a total ban on export of commercial wildlife (Plotkin *et al*. 1983). Asanza (1992) reports that Decreto 487 (of 1980) and Ley No. 74 (1981) prohibit the commercial hunting of all reptiles and the export of indigenous species. The population in Limoncocha is protected as a result of the site being a research station. In this locality, hunting pressure for skins during the 1950s was not as heavy as in other localities throughout Ecuador due to protection by evangelic missionaries until the early 1980s (Villamarin 2006b).

At the 1994 CITES meeting, a ranching program for *M. niger* in Ecuador was approved. This program was managed by the Ecuadorian Ministry of Environment (Ministerio del Ambiente, former INEFAN). However, due to questions concerning the management program, a 2-year zero-export quota was voluntarily agreed to by the Ecuadorian authorities. Ecuador drafted a management plan for the ranching program, and assigned a Ministry of Environment representative to supervise it. A 3-year trial program was planned to collect a maximum of 1500 eggs and/or hatchlings per year, with only one company licensed to participate. The Ministry of Environment and the company agreed to jointly conduct population monitoring but unfortunately this was not accomplished. After more than 10 years, a total of 282 wild hatchlings were collected up to 2000, with a survival rate of 54% until 2004. No skins were commercialized during this period but a special license to export 15 live males was extended by the Ministry of Environment with the approval of the CSG and CITES Secretariat in 2004. In 2005, an additional mortality of 94 individuals was reported due to "nutritional deficiencies". The ranch was facing an uncertain situation, when during the same year Mr. Pablo Evans, who had been running the ranching operation, died and the program closed (Villamarin 2006b).

French Guiana: In French Guiana, *M. niger* is restricted to the coastal region in the northeast of the country. Habitats are the seasonally flooded grasslands of the Kaw River, Angélique and Pointe Béhague, and the mangroves of the lower parts of the Kaw and Approuague Rivers. Before extirpation by poaching during the 20th century, *M. niger* in French Guiana had a wider distribution, estimated to be two-fold larger than now.

Surveys in the central part of the Nature Reserve of Kaw, which is remote and inaccessible, showed high densities and age-structure compatible with a healthy population. In contrast, surveys in borders of the areas revealed absence of hatchlings and large animals, and dramatically decreased densities (B. de Thoisy, unpublished data). Analysis of both nuclear and mitochondrial DNA suggested a high genetic diversity and a significant recovering potential (Farias *et al*. 2004; de Thoisy *et al*. 2005; Vasconcelos *et al*. 2008). Nuclear markers suggested that gene flows are important between Angélique and Kaw River. On the other hand, animals from the Approuague would be related to breeders from Pointe Béhague, another large swamp inaccessible area located in the East of the river, close to the border with Brazil.

Black caiman are fully protected by Ministerial decree since

1986, and almost half of current distribution area has a nature reserve status, together with a RAMSAR classification. A large population of *M. niger* is still present in French Guiana, due to the remoteness of large swamps. Although the population is severely depleted in bordering areas, a potential recovery is expected, but strict management of the nature reserve is necessary, and is not yet sufficient. Considering surveys and genetic data together, we suggest that: (i) at the population level, the high diversity and absence of significant probability of consanguinity means an overall satisfactory status, with the evidence of gene flows between pristine areas that may act as sources, and depleted areas; (ii) on the Kaw River, the continuous decrease is worrying, and may be explained by disturbance by tourist boats, and continued hunting pressure. The remaining half of the distribution area, outside the Kaw Reserve, is not managed. Hunting may occur; to date pressures on habitats are limited, but could not be mitigated or regulated since these areas have no official protection status.

Guyana: Medem (1983) reported that *M. niger* was restricted to the upper and middle Essequibo, Rupununi, Rewa and Berbice Rivers, as well as to two Amazon basin rivers (the Takatu and the Ireng) in Guyana. Gorzula and Woolford (1990) noted a similar distribution but were unable to confirm the reports from the Berbice River. Medem's (1983) survey found Black caiman to be close to extinction in Guyana following a period of intensive skin hunting. During the period of peak hunting, Guyanese residents would apply for permits, then have Brazilian skin dealers from Boa Vista cross the border and organize hunting parties of local Amerindians (Plotkin *et al*. 1983). Gorzula and Woolford (1990) reported that large-scale commercial hunting took place from 1955 to 1965, and that most of the skins went out via Brazil. Some hunting was reported into the 1970s.

Gorzula and Woolford (1990) found that *M. niger* populations had apparently made a recovery in the northern Rupununi region, where they were locally abundant. The overall mean uncorrected population density was 7.4/km (41.2 km surveyed). They estimated the total population in the North Rupununi Savanna region to be 2000 to 4000 non-hatchlings. Anecdotal reports suggested that a similar population recovery was taking place downstream to the Tambio Inlet on the Essequibo River. Recent reports indicate that the species remains common in the Rupunnuni region but little information is available for other parts of the country. Watkins (2002) surveyed 275 km of lakes and 300 km of river shorelines and reported encounter rates of 4.18/km in lakes and 1.82/km in rivers. Taylor (2006) also suggests a very healthy population in the Rupunnuni with encounter rates up to 16.9/km during the low water period.

Following a period of intensive hunting, the Guyanese Government initiated a 5-year ban on caiman hunting in 1968 (Plotkin *et al*. 1983). As with *Caiman*, this species was classified as a game animal under the Fisheries Regulations of 1966 (Klemm and Navid 1989). No management program is currently in operation, but *M. niger* is a principal draw for ecotourism operations in the region.

Peru: Historically *M. niger* was common throughout the upper Amazon drainages in Peru, but was depleted by hunting which began around 1950 (Plotkin *et al*. 1983). Surveys by Otte (1974) found no *M. niger* along the Sotileja, Heath and Pariamanú Rivers, but some were observed in the upper Río de las Piedras. Based on information from caiman hunters and skin buyers, Otte (1974) concluded that exploitable populations were only found in the upper regions of the Tambopata, Manú, Piedras and Amigo Rivers. As in other parts of the species' range, Black caiman were rare in Peru in the 1970s and 1980s, and Plotkin *et al*. (1983) considered the species to be on the verge of extinction in Peru, but numbers of animals began rebounding soon thereafter. Population surveys were conducted in Cocha Cashu in Manú National Park beginning the early 1970s. Otte (1974) estimated a population size of 37 in 1971-1972. Similar counts carried out in 1978 suggested a 50-60% increase in population size. A census in 1982 estimated population size to be 213 (Vasquez 1982). During nocturnal counts in Cocha Cashu (4.0 km) by Herron (1985), 99-111 black caiman were sighted (uncorrected population estimate; density= 24.74-27.75/km shoreline), with a population heavily skewed towards juveniles.

In the Pacaya-Samiria National Reserve in northeastern Peru, nocturnal counts in the Samiria River found a mean *M. niger* abundance of 0.28/km (Verdi *et al*. 1980). During the early 1970s, Vasquez (1981) conducted nocturnal counts in the Jenaro Herrera region and found densities of 0.46/km in lake habitat to 3.11/ha in swamp areas (4.5 ha surveyed). By the early 1980s there were some signs of population recovery (Vasquez 1982), however, while Black caiman are widespread in this region today and have shown clear signs of recovery, in most areas they are not abundant. Survey results in many cases are hard to interpret as they have been conducted during periods when water levels, and caiman density, vary greatly. Also, most surveys appear to have been conducted in rivers or streams, whereas the preferred habitats of Black caiman are floodplain wetlands that are more difficult to access by motorboats. Another factor that is presumed important is hunting, as both *M. niger* and *C. crocodilus* are widely hunted in the Peruvian Amazon for food. Nevertheless, the preferred species is *C. crocodilus* because its meat it is widely acknowledged to taste "better".

In the Samiria River basin, overall encounter rates of 0.52 ind/km (Street 2003) and 1.14 ind/km (Bodmer *et al*. 2005) were reported. Bodmer *et al*. (2006b) examined the impact of hunting by monitoring caiman populations in the Samiria basin in areas of intensive hunting (Shiringal), moderate hunting (Tacshacocha) and an area of little hunting (Santa Elena). Encounter rates for *M. niger* were 1.6 ind/km, 1.41 ind/km, and 0.51 ind/km respectively, and in the same areas 0.98 ind/km, 0.68 ind/km and 0.67 ind/km for *C. crocodilus*. ProNaturaleza (2007) evaluated the population of caiman in the Pacaya and Yanayacu Pucate basin, Pacaya Samiria National Reserve, and found a mean *M. niger* abundance of 2.32 ind/km. The highest density was found in an area near Guard Post 2 Yarina with 5.38 *M. niger*/km and 2.65 *C. crocodilus*/km. In the Yanayacu Pucate basin *C. crocodilus* was more abundant (15.76/km) in some areas (Guard Post

Communal 2 Huarmi Isla) than *M. niger* (10.05/km), while in other areas (Guard Post Canta Gallo) *M. niger* was more common (17.19/km vs 9.9/km *C. crocodilus*) (ProNaturaleza 2007).

In the Yavarí River basin, along the border between Peru and Brazil, Newell (2001), evaluated the status of three species of caiman in the Yavarí River in an area of low human activity, high human activity and in the area of Lago Preto. Of 482 caimans observed along 51.6 km, *C. crocodilus* was by far the most abundant, with only 9 *M. niger* and 10 *Paleosuchus palpebrosus* observed. In the Lago Preto region, Swan (2005) observed a total of 540 caiman along a total of 75.7 km of river and lake transects, with 505 identified as *C. crocodilus*, 24 *M. niger* and 11 *P. trigonatus*. Freezer (2008) reported of a total of 720 caiman observed in Lake Preto with only 13 *M. niger* (0.18 ind/km). Bodmer *et al.* (2008), report that the caiman population in Lago Preto is dominated by *C. crocodilus*, and *M. niger,* which was exploited extensively from the 1950s to 1970s for skins, and between 2002 and 2004 for meat, has shown a slight non-significant increasing trend, but has not rebounded like those in the Saimiria River region.

Commercial hunting of *M. niger* is prohibited in Peru by Supreme Ordinance Nº 034-2004-AG. Ecological studies of *M. niger* in the Manu region have been conducted by Otte (1978), Herron (1985, 1991, 1994) and Herron *et al.* (1990).

Figure 3. *Melanosuchus niger.* Photograph: Marcos Coutinho.

Venezuela: The presence of *M. niger* in Venezuela has not been confirmed, and appears to be unlikely. The southernmost portion of Amazonas State in Venezuela includes part of the upper drainage of the Rio Negro, and *M. niger* is known from downstream sections of this river. However, the habitats along the upper Rio Negro do not appear to be favorable for *M. niger* (Da Silveira and Thorbjarnarson, pers. obs.). There are two reports that suggest there may be, at least periodically, some *M. niger* in this region of Venezuela. Donoso-Barros (1966a, 1996b) reported *M. niger* in Venezuela, citing a specimen from the Rio Negro originating from the region south of Cocuy. Gorzula and Paolillo (1986) noted the imprecise locality data, and cited Medem (1983) for a lack of confirmed specimens from Venezuela. Based on their observations in Bolivar and Amazonas States they concluded that there was no firm evidence indicating *M. niger* was found within Venezuela.

King (1991) reported a Black caiman killed just southeast of Puerto Ayacucho (presumably in or around the Rio Cataniapo) in 1967 by Jay Wilson, a caiman skin dealer. King (1991) suggested that this area and other sites in the upper Orinoco be revisited to confirm this record. The basis for some prior accounts of *M. niger* in Amazonas State may also originate in species lists compiled by anthropologists who erroneously considered the local name of "caiman negro" as referring to *M. niger* whereas it is typically used for *P. trigonatus*.

## Priority Projects

Medium priority

1. **Coordination of regional management**: Coordinated efforts between the Range States for this species to develop compatible sustainable use programs and to control illicit trade are needed. Efforts need to be directed at controlling the illegal sale of caiman meat (including international control of the trade in meat between Brazil, Colombia, and Peru, particularly in Leticia) as a first step towards evaluating the potential for controlled commercial management. Initiatives to achieve this are underway under the auspices of the Amazonian Treaty and under the leadership and coordination of Colombia.

2. **Population monitoring**: The lack of population status information throughout the species' range is a major limiting factor for the development of conservation and management programs. Countries such as Colombia are interested in developing management programs based on controlled commercial utilization, once adequate information has been obtained on the species' status in that country. Very little information is available from throughout most of Brazil, Bolivia, French Guiana and Peru. There is anecdotal evidence that population recovery is taking place in certain areas, and this needs to be documented through systematic survey work. Historically, Marajo Island at the mouth of the Amazon held huge populations of *M. niger* which were killed off by ranchers. Recent reports of a recovering population should be investigated. In Ecuador, basic surveys have been carried out, but need to be continued in the form of population monitoring.

3. **Management programs in Brazil**: Brazil has initiated efforts to harvest black caiman on a trial basis, but the implementation of this program has been slowed by a lack of a coordinated national effort to resolve the legal and logistical problems that have plagued the experimental harvests to date.

## Acknowledgements

Ronis Da Silveira, Boris Marioni, Juan Dueñas-Serrano, Francisco Villamarin, Silvana Bustillo, Magaly Rengifo

and Benoit de Thoisy contributed to the development of this plan.

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