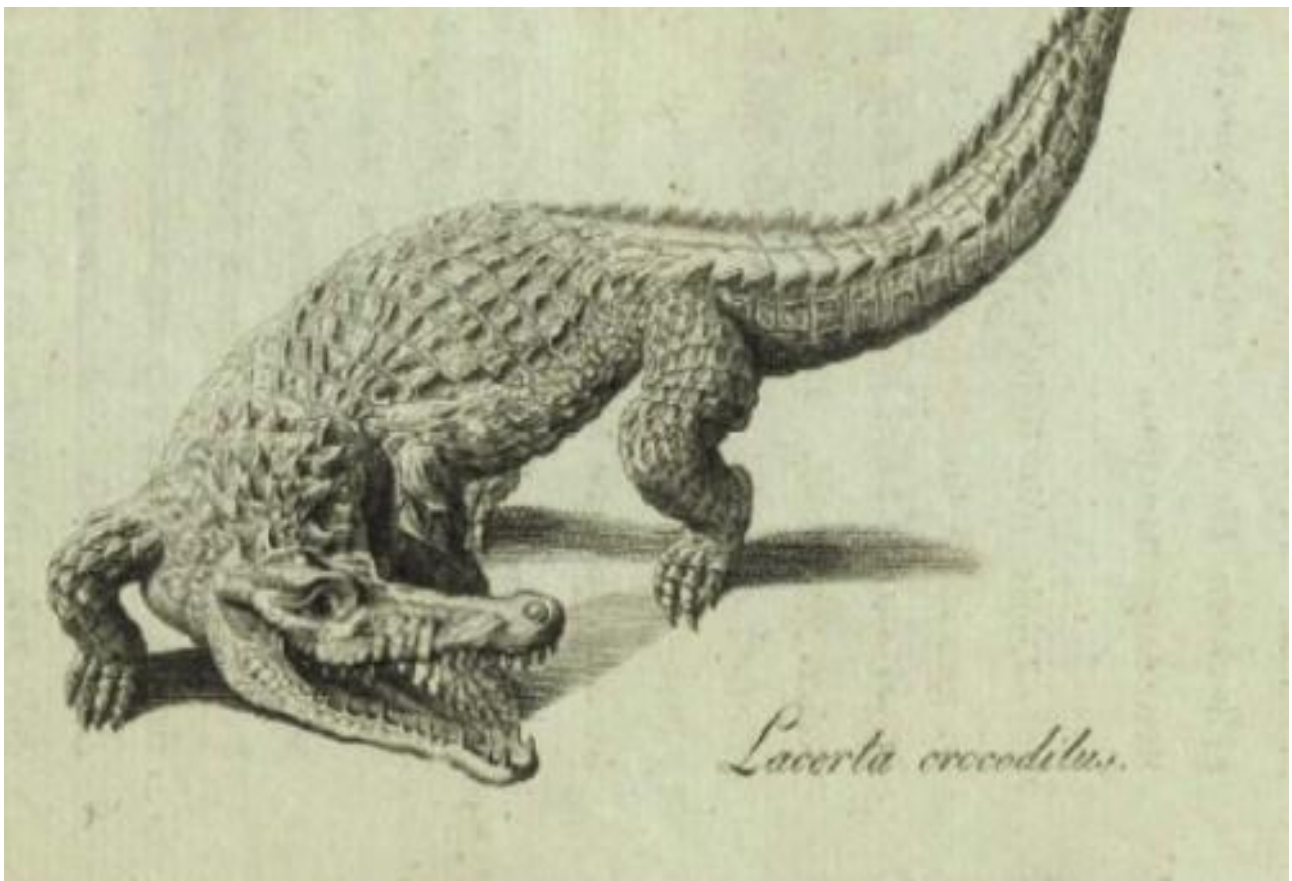


# CROCODILE SPECIALIST GROUP NEWSLETTER

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NEW RECORDS OF *CROCODYLUS ACUTUS* (CUVIER, 1807) ON ISLA DEL REY AND A REVIEW OF THE SPECIES' DISTRIBUTION IN LAS PERLAS ARCHIPELAGO, PANAMA. The biology of the American crocodile (*Crocodylus acutus*) has been extensively studied over the last two centuries. Due to its widespread occurrence throughout the Americas, its conspicuous size, and concerns about human-crocodile conflict, the species' distribution is particularly well documented. While populations throughout its distribution suffered from some 50 years of unregulated

hunting during the 20th Century, recovering populations now face severe challenges presented by habitat loss (Mazzotti and Cherkiss 2003; Ponce-Campos *et al.* 2012).

The biodiversity of Panama is well studied and populations of *C. acutus* thrive throughout the rivers and coastal mangroves of the country. The establishment of long-term research initiatives on Coiba Island has stimulated frequent biodiversity monitoring research and genetic analyses on American crocodiles that generate interest in conducting similar research on the population genetics of other islands (Garcia 2010; Bashyal 2012). One gap in current knowledge of Panamanian natural history is Las Perlas Archipelago, located in the Gulf of Panama (Fig. 1), where the flora and fauna remain poorly studied.



Figure 1. Isla del Rey (3) in relation to Panama (1) and Las Perlas Archipelago (2). A, B= sites where *C. acutus* were observed. Images courtesy of Google Earth (© Google 2013, U.S. Geological Survey, NASA, U.S. Dept. of State Geographer).

Isla del Rey, the largest island in Las Perlas and the second largest in Panama after Coiba, is a necessary location to initiate similar studies. Considering the island's more substantial isolation from the mainland, continuous conversion and extraction of mangroves, and the inevitable plans for tourism development, the status of Isla del Rey's American crocodiles is a severe conservation concern. Yet, until now, *C. acutus* has never been reported from Isla del Rey.

#### Past herpetological studies in Las Perlas

Cochran (1946) published herpetological records from the 1944 expedition led by A. Wetmore and J.P.E. Morrison to San José and Pedro González Islands of Las Perlas. This collection included three *C. acutus* specimens from San José Island, which according to E.R. Dunn were the first records of the species for Las Perlas Archipelago (Cochran 1946). Since then, reptile checklists for the islands of Las Perlas have included the American crocodile (citing Cochran 1946). One additional specimen was collected on the eastern coast of San José Island in 1962. Although the latter specimen has not been referenced in published literature, all four

specimens from San José are located in the Smithsonian National Museum of Natural History. Aside from these records, herpetology field surveys in Las Perlas have failed to report additional records of *C. acutus*.

Barbour (1906) reported on the herpetofauna recorded by W.W. Brown Jr. on Isla del Rey (then termed “San Miguel Island”) and Saboga Island in 1904. Despite its conspicuous appearance, the species was not observed during Brown’s excursions to either island. More than one century later, Neal (2007) conducted an assessment of the herpetological diversity on Isla del Rey in order to generate an updated species inventory for future biodiversity monitoring programs. Interestingly, records of American crocodiles were also absent from this study. While inland transects were primarily surveyed on the northern extent of the island, three diurnal and nocturnal mangrove swamp transects were also surveyed on the western coast of El Rey near the settlement of La Guinea (Neal 2007). Despite the absence of *C. acutus* in the study by Neal (2007) and the one previous known herpetology study on Isla del Rey (Barbour 1906), Neal compiled all known reptile and amphibian species lists throughout Las Perlas and inferred this compilation’s application as a list for Isla del Rey. Due to the poor documentation of the biodiversity of Las Perlas, generalized checklists for the entire archipelago are frequently utilized for policy (UNDP 2005), which has been referenced in the construction of current species distributions for the American crocodile (Britton 2009). Isla del Rey is larger in area than the approximately 200 other islands and islets in Las Perlas combined. Although at present it provides a tentative species list for the largest island in Las Perlas, the majority of past studies were conducted on other more frequently visited islands in the 1500 km<sup>2</sup> archipelago.

Considering the number of marine studies conducted throughout Las Perlas and the abundance of American crocodiles elsewhere in Panama, it is possible that observations of American crocodiles occur, but are perceived as ordinary occurrences and left unreported. However, the absence of *C. acutus* in herpetology assessments of Isla del Rey indicates that populations may be restricted to isolated areas of the island. Additionally, the lack of literature concerning *C. acutus* in Las Perlas has contributed to much confusion for the species’ distribution in the Gulf of Panama (Britton 2009). Crocodile tracks could provide greater insight into the locations of established breeding populations on the island, but given their mobility, individual tracks on beaches would be less informative to this end. Due to similarities in foot structure between crocodiles and iguanas (Brinkman 1980), tracks made by smaller crocodiles should be reliably identified. One would also suspect that *C. acutus* should be sighted on nearby islands and islets that are not large enough to sustain breeding populations. Thus, where breeding populations cannot be directly confirmed, they may be inferred in areas of high female abundances and/or their offspring.

### *Crocodylus acutus* on Isla del Rey

Neal worked with local assistants throughout the duration of his 2007 study, who provided information on prior knowledge of species not encountered during that study. Similar to my conversations with residents on Isla del Rey, crocodiles were not mentioned. In July 2010, I travelled to Isla del Rey for one month as a Visiting Research Scientist at the Smithsonian Tropical Research Institute (STRI) to investigate genetic variation and island biogeography of invertebrates. Observations presented here were recorded during this expedition.

In the town of San Miguel, residents informed me that Isla del Rey lacked any animals of concern to humans, specifically including crocodiles. After two weeks of trekking through the island’s interior, I ventured towards the western coast. After 2030 h, I observed in total 30 *C. acutus* in a 50 m (5 m wide) stretch of river flowing into the mangroves lining the coast (A on Fig. 1). From one vantage point near the river mouth, 20 individuals were easily seen. Crocodiles varied in size up to more than 2 m total length. One individual was captured and photographed, confirming the species (Fig. 2). Due to the depth of the water, limited visibility and the abundance of crocodiles, further investigation upriver was difficult. Accordingly, I suspect that additional individuals could be found further inland to the extent that favourable habitat permits. This population was observed every night for one week in similar numbers from the same point.



Figure 2. American crocodile captured for photographic documentation. Total length was approximately 1 m

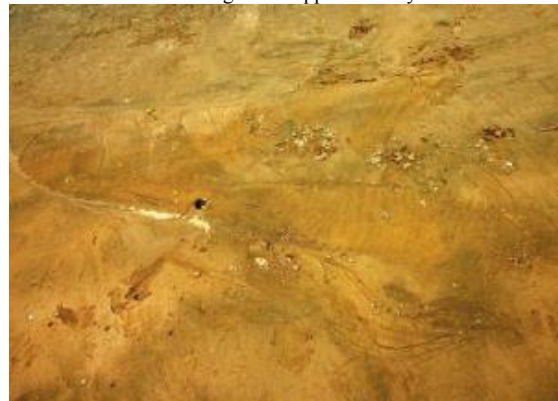


Figure 3. Imprint of *C. acutus* on a riverbank. Total length estimated to be 2-2.5 m.

At the end of the week, I relocated to a new campsite near a larger river, where *C. acutus* of greater size were sighted on the opposite riverbank (B on Fig. 1). Relative density was difficult to assess due to the width of the river (around 75 m), but more than 20 crocodiles greater than 2 m length were sighted within 200 m of the ocean. Imprints and tracks were recorded at low tide when traversing the river (Fig. 3).

Time was limited on this expedition, and thus additional coastal sites were not visited. Fortunately, assessments of land cover on Isla del Rey provide insight into areas of the island that contain potential habitat for *C. acutus* (see Guevara 2005; McGowan *et al.* 2010). McGowan *et al.* (2010) report a loss of 931.9 ha of mangrove cover between 1974 and 2000 from anthropogenic extraction and agricultural expansion on Isla del Rey. It is also possible that crocodiles once existed near human settlements and were eradicated because of conflicts, or hunted for their skins. However, this would have happened some time ago, as current residents do not have knowledge of crocodiles.

Much like the pearl industry for which the archipelago earned its name, market demand for crocodile skins could have driven the local *C. acutus* population to near extinction. However, it is also possible that Isla del Rey never had a large population of *C. acutus*, which is supported by the lack of observations by scientists visiting the island and by local residents. Notwithstanding the current lack of local knowledge of crocodiles on the island, crocodiles could have been more abundant historically throughout the entire archipelago.

#### Endemism, population genetics, and conservation

Though few studies have been conducted on the terrestrial fauna of Las Perlas, high levels of endemism have been reported. While genetic analyses are necessary to confirm the validity of some of the endemics, the following have been proposed: one frog species, one boa subspecies, six mammal subspecies, and at least 16 subspecies of birds (UNDP 2005). In addition, the archipelago is a critical nesting area for numerous species of aquatic birds and 5 species of endangered marine turtles (UNDP 2005).

Ongoing population genetics studies conducted by Texas Tech University and STRI have generated interesting results from *C. acutus* on Coiba Island that also should be investigated in Las Perlas. Although crocodiles are mobile across expanses of sea water, Coiba's separation from the mainland appears to have resulted in reduced gene flow and lower genetic variation in the island populations (Garcia 2010; Bashyal 2012). The shortest distance between Isla del Rey and the mainland is 35 km, 15 km farther than that of Coiba. Bashyal (2012) also indicates locations of dispersal corridors to the mainland as well as more isolated populations, all of which are useful in informing areas of conservation priority for this 'Vulnerable' species (Thorbjarnarson *et al.* 2006). While a hydrological reserve was recently gazetted on Isla del Rey, the area does not encompass coastal mangroves

vital to *C. acutus*. Combined with the potential for genetic isolation, plans to develop Isla del Rey for tourism necessitate the urgent documentation and prioritization of coastal areas of conservation importance for the American crocodile and other endangered and/or endemic taxa.

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## East and Southeast Asia

### Philippines

SOFT RELEASE INTRODUCTION OF THE PHILIPPINE CROCODILE (*CROCODYLUS MINDORENSIS* SCHMIDT 1935) IN Paghongawan Marsh, Siargao Island PROTECTED LANDSCAPE AND SEASCAPE, SOUTHERN PHILIPPINES. On 22 March 2013, 36 healthy juvenile Philippine Crocodiles (*Crocodylus mindorensis*) were introduced into freshwater marsh habitat on Siargao Island. The release site, Paghongawan Marsh, is located at Barangay Jaboy, Municipality of Pilar, Province of Surigao Del Norte at the north-central region of Siargao within the Siargao Island Protected Landscape and Seascape (SIPLAS). SIPLAS is one of the key biodiversity areas of the Philippines and was declared as a protected area by virtue of Presidential Proclamation 902 in October 1996.

Historically, the Philippine Crocodile is not known from Siargao Island, or any of the islands off eastern Mindanao. The released crocodiles were maintained under soft-release conditions for almost two years at Pagasa Farms (a JK Mercado-Protected Areas and Wildlife Bureau-Silliman University Project) in Kapalong, Davao Del Norte. They comprised the progeny of Philippine crocodiles that were held in semi-wild conditions without any supplementary feeding since they were transferred from Silliman University Crocodile Breeding Facility in Dumaguete, Negros Oriental, in 2006 and the Palawan Wildlife Conservation Center (PWRCC; formerly Crocodile Farming Institute) in Puerto Princesa, Palawan (Cruz *et al.* 2012) in 2007. Also part of this project, three captive-bred adult *C. mindorensis* had been acclimated to wild conditions prior to reintroduction into a large swamp area at New Katipunan, Sto. Tomas, Davao Del Norte, Mindanao (Van Weerd *et al.* 2011) in 2009.



Figure 1. Paghongawan Marsh, Bgy. Jaboy, Pilar, Siargao Island Protected Landscape and Seascape, Surigao del Norte.