NAT. HIST. BULL. SIAM SOC. 50(1): 7–14, 2002

OCCURRENCE OF THE SIAMESE CROCODILE *(CROCODYLUS SIAMENSIS)* IN KAENG KRACHAN NATIONAL PARK, THAILAND

Steven G. Platt[1], Antony J. Lynam[2], Yosapong Temsiripong[3], and Manote Kampanakngarn[4]

ABSTRACT

Field surveys conducted during 2001 and 2002 confirmed the existence of Siamese crocodiles *(Crocodylus siamensis)* along the Petchburi River in Kaeng Krachan National Park, Thailand. An adult crocodile was photographed and tracks, drag marks, and other sign were also found, suggesting that a small number of crocodiles occur within the park. This population is threatened by illegal collecting and disturbance from commercial white-water tours. Additional surveys should be conducted to determine if crocodiles occur elsewhere in the Petchburi and adjacent Pranburi watersheds. A conservation plan should be developed to ensure their long-term viability.

Key words: Siamese crocodile, *Crocodylus siamensis*, conservation, camera-trapping, Kaeng Krachan National Park, Thailand.

INTRODUCTION

The Siamese crocodile *(Crocodylus siamensis)* formerly occurred in Thailand, Cambodia, Laos, Vietnam, Indonesia (Java and Kalimantan), and Malaysia (Sabah and Sarawak) (THORBJARNARSON, 1992; ROSS, 1998). Populations throughout this range have dramatically declined as a result of habitat destruction, collecting to stock crocodile farms, and illegal hunting (COX *ET AL.*, 1993; NAO, 1998; PLATT & TRI, 2000; STUART & PLATT, 2000), and *C. siamensis* is now regarded as one of the most endangered crocodilians in the world (THORBJARNARSON, 1992; ROSS, 1998). The Siamese crocodile is considered Critically Endangered ("facing an extremely high risk of extinction in the near future"; IUCN, 1994) by the World Conservation Union (IUCN, 2000), and listed on Appendix I of the Convention on International Trade in Endangered Species of Fauna and Flora (CITES).

[1]Wildlife Conservation Society, P.O. Box 1620, Phnom Penh, Cambodia. Current address: Department of Biology, University of the South, 735 University Avenue, Sewanee, Tennessee, 37383-1000 USA (Email: splatt225@aol.com)
[2]Wildlife Conservation Society, P.O. Box 170, Laksi, Bangkok 10210, Thailand (Email: tlynam@wcs.org)
[3]Crocodile Management Association of Thailand (CMAT), P.O. Box 16, Sriracha, Chonburi 20110, Thailand (Email: yosapong@crocodileuniverse.com)
[4]National Parks Division, Royal Forest Department, Phaholyothin Road, Bangkhen, Bangkok 10900, Thailand.
Received 1 August 2001; accepted 10 March 2002.

Historically, *C. siamensis* was abundant in wetlands throughout central and southern Thailand (MOUHOT, 1864; BOCK, 1884; SMITH, 1916; SMITH, 1919; SMITH, 1931). However, as early as 1919 declines had occurred in many areas as a result of widespread shooting (SMITH, 1919; SMITH, 1931), and by the late 1970's the only known wild population consisted of about 200 crocodiles near Bung Boraphet (GROOMBRIDGE, 1982). The population at Bung Boraphet was subsequently extirpated by illegal collecting to stock crocodile farms, deliberate destruction of nests and eggs, and accidental drowning in fishing nets (PENDLETON & KINGSBURY, 1962; ROSS, 1998), leading Suvanakorn & Youngprapakorn (1987) to conclude the Siamese crocodile was nearing extinction in Thailand.

Recent reports suggest that individuals or small populations of Siamese crocodiles still persist in some protected areas of Thailand (Fig. 1). A single crocodile was observed during a spotlight survey of Pang Sida National Park (RATANAKORN *ET AL.*, 1994), and another was photographed at Khao Ang Ru Nai Wildlife Sanctuary (KREETIYUTANONT, 1993; B. Kekule, personal communication). Additionally, a crocodile carcass was found in Yot Dom Wildlife Sanctuary, tracks and drag marks were observed in Phu Khieo Wildlife Sanctuary, and field observations indicate crocodiles may occur in Kaeng Krachan National Park (KREETIYUTANONT, 1993; GRAY *ET AL.*, 1994). We here report further evidence for the occurrence of a small population of Siamese crocodiles in Kaeng Krachan National Park.

STUDY AREA

Kaeng Krachan National Park (KKNP) is located in the Tenasserim Mountains along the Thai–Myanmar border in Petchburi and Prachuab Khiri Khan Provinces of southwestern Thailand (Fig. 1). Encompassing 291,500 ha, Kaeng Krachan is Thailand's largest national park (DOBIAS, 1982). The topography is characterized by steep mountain ridges with swift-flowing rivers in restricted valleys. Khao Phanoen Thung (1,207 m) is the highest point in the park. The steep topography and lack of roads make access to much of the park difficult. Semi-evergreen forest is the dominant vegetation with hill evergreen forest above 1,000 m (ROUND, 1985). Surrounding lands are largely deforested, and KKNP protects the Petchburi River watershed, which supplies Kaeng Krachan Reservoir (DOBIAS, 1982). The Petchburi River is swift-flowing with numerous rapids.

OBSERVATIONS

During a large mammal survey of KKNP in January 2001 (Wildlife Conservation Society, 2001), one of us (AJL) found crocodile tracks and drag marks on a sandbar (elevation *c.* 230 m) along the Petchburi River (Fig. 2). The sandbar was situated in a wide (*c.* 30 m) bend in the river adjacent to a deep (2 to 3 m) pool with minimal current. Rear-foot tracks (RFT) on the sandbar measured 17.5 cm from the posterior margin of the heel to the tip of the longest claw. A Camtrakker® camera-trap (Camtrack South, Inc., Georgia, USA) equipped with a passive infrared motion detector was placed at the site on 24 January and recovered on 2 March 2001; a single photorecord of an adult crocodile was obtained at 1435 hours on 1 March as it moved across the sandbar (Figure 3). Using a

Figure 1. Map of Thailand showing sites where Siamese crocodiles have been reported since 1990. 1, Kaeng Krachan National Park; 2, Pang Sida National Park; 3, Khao Ang Ru Nai Wildlife Sanctuary; 4, Yot Dom Wildlife Sanctuary; and 5, Phu Khieo Wildlife Sanctuary.

regression equation developed to predict total length (TL) of American crocodiles *(Crocodylus acutus)* from rear-foot track measurements (TL = 11.64RFT + 4.9; $r^2 = 0.87$; $P < 0.001$; PLATT & THORBJARNARSON, 2000), we estimated this crocodile to be approximately 200 cm long.

An additional survey was conducted from 4 to 7 April 2001 along 30 km of the Petchburi River in KKNP, beginning at the base of Khao Phanoen Thung and ending at Bong Leuk Ranger Station. Rapids and other navigational hazards precluded the use of standard nocturnal spotlight census techniques (BAYLISS, 1987); instead we searched sandbars, exposed riverbanks, and other suitable substrates for crocodile tracks and drag marks. Forefoot tracks, drag marks, and ventral scute impressions of a second crocodile were found on 5 April approximately 5 km upstream from where the first crocodile was camera-trapped. These tracks were on an exposed mudbank (elevation *c.* 245 m) along a section of river with minimal current. Measurable quality rear-foot tracks were not present, and thus the total length of this crocodile could not be accurately estimated; however, drag marks (25 to 30 cm wide) suggest it was probably a subadult (TL ≤ 180 cm).

On 8 January 2002 a wildlife photographer reported encountering two crocodiles on a sandy beach along the Petchburi River approximately 6.5 km upstream from K.U. Camp (UTM 47P 1420618N 0533305E) in KKNP. AJL and YT visited the location on 2 February

Figure 2. Site where Siamese crocodile tracks were found in January 2001 and position of camera-trap on the Petchburi River. Photo courtesy of Adam Oswell.

Figure 3. Siamese crocodile photographed at 1435 h on 1 March 2001 with a camera-trap set along the Petchburi River in Kaeng Krachan National Park, Thailand. Total length estimated to be about 200 cm.

2002 and confirmed the presence of at least one crocodile based on a 17.5 cm long rear-foot track found in moist sand at the rivers edge. On 4 February 2002 AJL returned to the site where a crocodile was photographed in 2001 (Fig. 3), but found no evidence of the animal. Given that track size at both locations was nearly identical, it is tempting to speculate that these represent the same crocodile. If this is the case, the crocodile had moved upstream a distance of at least 11.5 km.

DISCUSSION

Our findings and previous observations by Kreetiyutanont (1993) indicate that a small population of crocodiles, most likely *C. siamensis,* occurs within KKNP. The only other freshwater crocodilian found in Thailand is the false gharial *(Tomistoma schlegelii)* (THORBJARNARSON, 1992); however, this species is confined to extreme southern Thailand, was last reported in 1970, and is now believed extirpated from the country (TAYLOR, 1970; RATANAKORN *ET AL.*, 1994; SEBASTIAN, 1994). Furthermore, *T. schlegelii* is restricted to heavily vegetated peat swamps throughout most of its range (SEBASTIAN, 1994; ROSS, 1998; BEZUIJEN *ET AL.*, 2001), and therefore unlikely to occur in the fast-flowing Petchburi River. Nor does the crocodile we photographed appear to be a longirostrine species. We cannot rule out the possibility that the crocodiles in KKNP are escapees from crocodile farms, possibly hybrids between *C. siamensis* and Saltwater crocodiles *(Crocodylus porosus).* Thousands of crocodiles are held on farms in Thailand (LUXMOORE, 1992), hybridization is widespread (SUVANAKORN & YOUNGPRAPAKORN, 1987), and escapes, although infrequently reported, have occurred (P. P. van Dijk, personal communication). Future efforts should therefore be made to ascertain the genetic identity of crocodiles in KKNP.

While we confirmed the occurrence of only two individuals in KKNP, other crocodiles probably escaped detection because spotlight surveys, the most effective means of locating crocodiles, proved impractical and suitable tracking substrates along the river are limited. However, we consider the viability of this population tenuous at best. Historically, the highest crocodile densities in Thailand probably occurred in floodplain swamps and lowland rivers (SMITH, 1919; SMITH, 1931), but recent reports indicate that the few remaining *C. siamensis* are now confined to upland streams and rivers (KREETIYUTANONT, 1993; RATANAKORN *ET AL.*, 1994; B. Kekule, personal communication). RATANAKORN *ET AL.*, (1994) consider such habitat marginal, and speculate these areas never supported large numbers of crocodiles. Interestingly, crocodiles are not listed in detailed faunal accounts of the area now encompassed by KKNP (GAIRDNER, 1915a and b; SMITH, 1915), suggesting they were never common in the upper reaches of the Petchburi River. It is likely that crocodiles from downstream areas closer human settlements immigrated to the upper Petchburi River in response to chronic anthropogenic disturbance. Moreover, the lower reaches of the Petchburi River may now constitute a population sink if monsoonal floods, which occur during September and October, wash hatchlings and juveniles downstream.

Regardless, given the critically endangered status of *C. siamensis*, the population within KKNP is of global conservation significance. Of particular concern is the threat posed by the regional trade in living crocodiles to stock farms (THORBJARNARSON *ET AL.*, 2000a), as the loss of even a few reproductive individuals from the KKNP population could have disastrous demographic consequences. Although this population occurs within

a fully protected national park, the high price paid by crocodile farmers for breeding stock provides a strong incentive for poaching (PLATT *ET AL.*, unpublished). Fortunately, the limited accessibility of Petchburi River and the presence of downstream guard posts make the illegal capture and transport of living crocodiles a difficult proposition. Amending the Wild Animal Reservations and Protection Act of 1992 to include protection for wild crocodilians would provide additional safeguards against poaching and further enhance recovery efforts.

Tourism represents another potential threat to crocodiles along the Petchburi River. Commercial white-water rafting tours recently began between K.U. Camp and Bong Luek, an area now known to harbor crocodiles. However, following the discovery of crocodiles along this section of river, rafting tours were suspended pending a study of the impacts on crocodiles and other wildlife. These tours were conducted during the dry season, a period coinciding with peak nesting activity in *C. siamensis* (PLATT *ET AL.*, unpubl. data). Because human disturbance may result in nest abandonment by attending female crocodilians (PLATT, 1996), we recommend that the section of river between K.U. Camp and Bong Leuk remain closed to tourists and be designated a Strict Conservation Zone. Rafting tours should henceforth be relocated to sections of the Petchburi River downstream from Bong Luek.

In addition, surveys of other tributaries in the park should also be conducted to determine if crocodiles exist elsewhere in the Petchburi and adjacent Pranburi watersheds, and a conservation plan developed to ensure the survival of this small population. Finally, our experience further highlights the utility of camera-trapping as a tool for the study of rare crocodilians (THORBJARNARSON *ET AL.*, 2000b).

ACKNOWLEDGMENTS

Field assistance was provided by Tongbai Charoendong, Prawing Klinklay, Bruce Kekule, Jerry Harmer, Orlando Guzman, Adam Oswell, Mark O'Shea, and the rangers of Kaeng Krachan National Park. The photograph in Figure 2 was provided by Adam Oswell. These surveys were supported by Wildlife Conservation Society, Outward Bound School – Thailand, and "Save the Tiger Fund", a joint project of the National Fish and Wildlife Foundation and ExxonMobile Corporation. Dr. Plodprasop Suraswadi, Director-General of the Royal Forest Department, is thanked for granting us permission to conduct fieldwork. Bruce Kekule is especially thanked for providing information on the current status of crocodiles in Khao Ang Ru Nai Wildlife Sanctuary. Stephen Johnson (WCS), Thomas R. Rainwater, and Peter Paul van Dijk supplied critical references. Comments by Thomas R. Rainwater, Travis Crabtree, John Thorbjarnarson, and Peter Paul van Dijk greatly improved this manuscript.

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