

# ***CROCODYLUS SIAMENSIS* ALONG THE SRE AMBEL RIVER, SOUTHERN CAMBODIA: HABITAT, NESTING, AND CONSERVATION**

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The Siamese crocodile (*Crocodylus siamensis*) (Fig. 1) is considered one of the least studied and most critically endangered crocodylians in the world (IUCN 2002; Ross 1998; Thorbjarnarson 1992). Virtually nothing is known concerning the ecology of *C. siamensis* in the wild, and populations throughout Southeast Asia have declined precipitously as a result of habitat destruction, collecting to stock crocodile farms, and illegal hunting (Ross 1998; Thorbjarnarson 1992). Extant wild populations no longer occur in Vietnam (Platt and Tri 2000), and there is little recent information from either Indonesia or Malaysia (Cox et al. 1993; Ross 1998). Remnant populations of questionable viability persist at several localities in Thailand (Kreetiyutanont 1993; Platt et al. 2002; Ratanakorn et al. 1994) and Laos (Mateus 2001; Sawathvong 1994; Stuart and Platt 2000).

Although historically widespread and abundant in Cambodia (Kimura 1969; Thuok 1998; Thuok and Tana 1994), the current distribution and status of *C. siamensis* in the country are poorly known. Surveys in Cambodia were accorded high priority by the IUCN Crocodile Specialist Group (Ross 1998; Thorbjarnarson 1992), but security concerns seriously limited field investigations until recently (Thuok 1998). An improved political situation now makes fieldwork possible and significant numbers of *C. siamensis* were recently found in several drainages of the Cardamom Mountains (Daltry and Chheang 2000). We herein present data on the occurrence and natural history of a hitherto unreported population of *C. siamensis* along the Sre Ambel River in southwestern Cambodia.

## **MATERIALS AND METHODS**

### **Study Area**

The Sre Ambel River (labeled “Kampong Saom” or “Kampong Som” River on some maps) drains much of Koh Kong, Kampot, and Kampong Speu Provinces in southwestern Cambodia before flowing into Kampong Saom Bay (Fig. 2). The floodplain extends 5–7 km on either side of the

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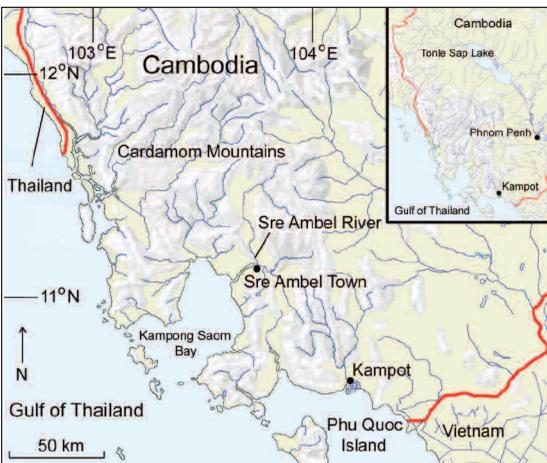
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**Figure 1.** Adult Siamese crocodile (*Crocodylus siamensis*) photographed in an oxbow lake along the Sre Ambel River in southern Cambodia. Photograph by Allan Michaud.

main river channel and is characterized by wetlands and evergreen riparian forest, except near the river mouth where extensive mangrove and *Melaleuca* forests occur. Numerous oxbow lakes occupy former river channels in the floodplain and are subject

to backwater flooding when water levels rise during the annual wet season (June–October). Upland areas adjacent to the floodplain are characterized by mixed deciduous forest and open savanna. The river is navigable for a distance of approximately 54 km from Sre Ambel Town (11°07.30' N; 103°44.73' E) to Chayreap Village (11°29.06' N; 103°47.00' E) where a series of rapids blocks further upstream passage. Until recently (ca. 1998) the region was controlled by Khmer Rouge insurgents and consequently remains sparsely populated, although immigration is now increasing. Located near the river mouth, Sre Ambel Town is an important regional trading center and conduit for wildlife products harvested from the upper reaches of the river.



**Figure 2.** Map of southern Cambodia showing location of Sre Ambel River and Sre Ambel Town. Inset shows position of study area in relation to the rest of Cambodia.

### Survey Methods

Fieldwork was conducted in 2000 (21–27 August), 2001 (6–12 January, 3–9 February, 5–12 May, 14–16 August), and 2002 (22–25 January). During the day we searched suitable habitat on foot and by boat for crocodiles, tracks, and scat. We conducted nocturnal spotlight surveys (Bayliss 1987) of

**TABLE 1.** Locations and coordinates along the Sre Ambel River in southern Cambodia where the occurrence of Siamese crocodiles (*Crocodylus siamensis*) was verified.

| Location                                      | Notes   |
|---|---|
| Chayreap Village<br>11°29.06' N, 103°47.00' E | Incomplete skeleton of subadult crocodile obtained in August 2000 from fisherman; accidentally captured on fishing line set in Sre Ambel River near village during July 2000. |
| Chor Tok Boeng<br>11°20.95' N, 103°43.54' E   | Juvenile crocodile (total length c. 1.0 m) observed at 1330 on 4 February 2001; feeding on small fish among floating vegetation.  |
| Maleik Kean Tok<br>11°21.41' N, 103°42.91' E  | Adult crocodile (total length c. 3.0 m) observed at 0910 on 24 January 2002; basking on surface with head and much of dorsum exposed.   |
| Pokareak Boeng<br>11°16.88' N, 103°45.50' E   | Numerous scats of 1 to 2 adult crocodiles found at basking sites along shoreline in February 2001.  |
| Puok Katum Boeng<br>11°16.52' N, 103°45.62' E | Old nest mound and eggshells found in January 2001.   |
| Trapeang Lopeing<br>11°27.13' N, 103°44.73' E | Tracks of adult crocodile found in May 2001.  |

the main channel of the Sre Ambel River on 23 August 2000 (3.3 km in the vicinity of Chayreap Village) and 15 August 2001 (40 km from Kampong Khloem village to Sre Ambel Town). Spotlight surveys near Chayreap Village were conducted using a wooden boat (9 m long) equipped with a long-shaft outboard diesel outboard motor, while a smaller (5 m long) fiberglass skiff with an outboard motor was employed for the longer survey. We used 12-V headlamps and 3-cell Maglite® flashlights to search for the reflective eyeshines of crocodiles along the river. The main river channel is approximately 25–50 m wide, and except near the river mouth both banks were visible from the boat. Lack of boat access and dense vegetation precluded the use of spotlight surveys in floodplain wetlands adjacent to the river. We also interviewed hunters and villagers to obtain information on local distribution and exploitation of crocodiles. The coordinates of all sites we visited were determined with a Garmin® GPS 48. Our research permit did not include provisions for the collection of samples for genetic analyses.

## RESULTS AND DISCUSSION

### Habitat

We verified the occurrence of *C. siamensis* at six sites along the Sre Ambel River based on observations of living crocodiles, the presence of tracks and scat, evidence of nesting, and a fresh skeleton obtained from a villager (Table 1). Four sites (Chor

Tok, Pokareak, and Puok Katum Boengs [= lakes], and Maleik Kean Tok) are oxbow lakes 30–50 m wide and up to 0.5 km long with extensive mats of water hyacinth (*Eichhornia crassipes*) and floating grasses (Poaceae), and surrounded by riparian evergreen forest (Fig. 2). Trapeang Lopeing is a permanent marsh in the uplands adjacent to the floodplain and not subject to riverine flooding (Fig. 2). The areal extent of Trapeang Lopeing is ill-defined on topographical maps and varies depending on rainfall, but during our visit at the end of the dry season (May 2001) it appeared to be at least 50 ha; however, our investigation was hampered by land mines reputed to be in the area. Trapeang Lopeing is dominated by sedges (Cyperaceae), emergent and floating grasses, and water hyacinth, with scattered tree cover along the periphery.

Crocodiles are apparently uncommon in the main channel of the Sre Ambel River. We encountered no crocodiles during spotlight surveys of the main river channel, but obtained the skeleton of a subadult that was accidentally captured on a fishing line set in the river near Chayreap Village (Table 1). Moreover, local villagers reported occasional sightings in the river, but considered crocodiles most abundant in oxbow lakes. Indeed, all of our observations of living crocodiles, scat, tracks, and nesting occurred at wetlands adjacent to the river (Table 1). Crocodiles undoubtedly occur in the river, but probably at densities much lower than in palustrine habitats. Similarly, Smith (1931) stated that *C. siamensis*



**Figure 3.** Siamese crocodile habitat along the Sre Ambel River in southern Cambodia. Puok Katum Boeng, an oxbow lake in the Sre Ambel River floodplain subject to backwater riverine flooding during the wet season (right). Trapeang Lopeing, a permanent marsh in the uplands adjacent to the floodplain, which is not subject to wet season riverine flooding (left).

“inhabits rivers and freshwater swamps, preferably the latter where water is still.” However, it should be noted that riverine habitats are easily accessible to hunters, which may partly explain the paucity of crocodiles in the main channel of the Sre Ambel.

### Nesting

The nest we examined at Puok Katum Boeng was originally found during March 2000 by a villager who collected 14 neonates upon hatching and sold them to a crocodile farm in Sre Ambel Town. The nest mound was composed of soil, leaves, and woody debris, and measured approximately 150 cm in diameter and 30 cm high. The nest was located 32 m from water and positioned in a distinct ecotone between closed-canopy riparian forest and open savanna. Canopy cover above the nest was approximately 20%. A well-worn trail leading from the water to the nest suggested frequent visitation by an attending female. Virtually nothing is known about reproduction among wild *C. siamensis*; Smith (1931) provides the only other account of nesting and merely states that eggs “are deposited in sandbanks at the beginning of the wet season.” However, our field observation and concurrent studies of reproductive phenology at crocodile farms in Cambodia (Platt et al., unpubl. data) indicate that most clutches are deposited during the late dry season (March–April) in nest mounds composed of soil and vegetation, and hatchlings emerge

at the beginning of the wet season (June–July).

### Conservation

Given the critically endangered status of *C. siamensis* (IUCN 2002), the population along the Sre Ambel is of global conservation significance. This is the only extant population of *C. siamensis* yet identified in Cambodia outside of the Cardamom Mountains, and may be the only potentially viable lowland population remaining anywhere in Southeast Asia. Of primary concern to the continued viability of this population is the threat posed by various forms of exploitation, especially the collection of living crocodiles to stock breeding farms. Although crocodile farming is an important economic activity in Cambodia, wild crocodiles are afforded complete protection under Cambodian law (Thuok 1998; Thuok and Tana 1994). However, the high prices paid by farmers (often the equivalent of several months income) provide a strong incentive for the illegal capture and sale of wild crocodiles by local villagers. This activity appears commonplace along the Sre Ambel River and villagers reported capturing crocodiles at every wetland we visited. Small crocodiles are especially vulnerable owing to the ease of capture and transport, but adults are harvested as well; at Trapeang Lopeing we were shown pieces of a snare used to capture larger crocodiles alive and 11 adult *C. siamensis* we examined at a crocodile farm in Sre Ambel Town were reportedly

purchased from upriver villages. Other captured crocodiles are sold to middlemen in Sre Ambel Town who in turn sell to crocodile farms elsewhere in Cambodia. Crocodiles are also taken incidental to fishing activities when they become entangled in nets or hooked on baited fishing lines. One adult was reportedly killed during April 2001 by villagers fishing with hand grenades. Together, the harvest of living crocodiles and the incidental take associated with fishing activities undoubtedly threatens the long-term viability of *C. siamensis* populations along the Sre Ambel River.

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