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Status of Siamese Crocodile *Crocodylus siamensis* in Laos

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Introduction

Siamese crocodile *Crocodylus siamensis* historically occurred in Vietnam, Laos, Cambodia, Thailand, and parts of Malaysia and Indonesia, but has drastically declined throughout its range and is currently regarded as one of the most endangered crocodilians in the world (Ross 1998). Viable populations no longer exist in Thailand, although individuals persist at scattered localities (Kreetiyuntanont 1993, Ratanakorn et al. 1994, Suvanakorn and Youngprapakorn 1987). The results of a recent survey in Vietnam indicate that wild populations no longer occur (Platt 1999, Platt and Tri in press). There are no recent records of wild *C. siamensis* in Malaysia and Indonesia, although captive animals held in farms in Kalimantan, Indonesia were reported to have been captured locally (Ross 1998). Populations probably remain in Cambodia, but security concerns have hampered field investigations (Nao 1998). *Crocodylus siamensis* is listed as Critically Endangered on the IUCN Red List (IUCN 1996), and on Appendix I of CITES (Convention on International Trade in Endangered Species of Flora and Fauna; WCMC 1998).

In Laos *Crocodylus siamensis* has been reported to occur in a number of locations in the Mekong River basin, although by the early 1990s populations were considered reduced and even locally extirpated from some sites (Sawathvong 1994). However depleted, the Laos and Cambodia populations have been considered the only remaining large wild populations of *C. siamensis* in the world (Ross 1998). Although surveys designed specifically to find crocodiles have not yet been conducted in Laos, we herein summarize the current status of *C. siamensis* based on the findings of over seven years of general wildlife surveys conducted throughout the country. This paper is an expanded version of the *C. siamensis* account in Stuart (1999).

Status in Laos

Historically, *C. siamensis* was probably abundant in Laos in appropriate habitat. For example, Bassenne (1912) wrote (in translation) "...on the sandy river-banks [near Pakxan, northern Laos], crocodiles stretched their long, scaly bodies...One of the attractions of traveling up the Mekong was to shoot at these large

saurians." Likewise, Wharton (1966), writing on observations of hunting activities by local people along the Lao-Cambodian border in the 1950s and 60s, stated "Every permanent water hole...is repeatedly visited...Crocs (*C. siamensis*) are captured in drying up stream beds within heavy gallery forest such as along the Tonle Repou [Cambodian name of Nam Lepou River which forms part of the Lao-Cambodian border]."

From late 1992 - 1999, several non-governmental organizations carried out surveys in existing and proposed protected areas (called National Biodiversity Conservation Areas, or NBCAs) throughout Laos to determine the distribution and status of wildlife (Duckworth et al. 1999). From 1992 to 1998 these surveys focused mostly on birds, mammals, and habitat assessments, and the survey team composition reflected this; from 1998 to present the surveys focused on general amphibians and reptiles. No surveys that specifically employed methodologies for finding crocodiles (e.g. night spotlighting on large water bodies) were undertaken, except for a brief investigation by Davenport et al. (1997) that followed consistent reports of a local population of crocodiles, and in 1993 in Xe Pian NBCA by J. W. Duckworth (personal communication) who spotlighted for eyeshine at rivers and waterholes for a few hours on each of several nights. Despite the limitations, these general surveys represent at least 330 biologist-weeks of effort (Timmins and Duckworth 1999 + B. L. Stuart unpublished data) spent mostly in relatively remote, undisturbed areas of Laos. Although much of this time was spent in forest, many surveys required travelling by boats, following river courses on foot, or surveying for other species in riverine habitat, marshes, and other wetlands that were presumably suitable for crocodiles.

During the course of these recent surveys, the only evidence of crocodiles came from a single unprotected locality, Nong Khe wetland (= "crocodile wetland" in Lao language) in Sanamsai District, Attapu Province. In January 1997 at Nong Khe, night vocalizations of crocodiles were heard and fresh feces, slides and tracks were observed (Davenport et al. 1997). In February 1998 at Nong Khe, a 1.5 m crocodile was seen basking on a grassy bank and a fresh set of feces was found (S. Khounthikoumane, Division of Forest Resource Conservation, verbally 1999). Two sites, Xe Pian NBCA (approximately 2,375 km^2) and Dong Khanthung Proposed NBCA (approximately 2,230 km^2) appear the most likely to support remaining crocodiles in Laos, as they each contain large areas of low-lying wetlands (Figure 1). Also, Nong Khe lies near the northeastern border of Xe Pian, and the Nam Lepou River mentioned in (Wharton 1966) flows along the southern border of Dong Khanthung. However, a total of 65 biologist-weeks of survey effort in Xe Pian and 11 biologist-weeks in Dong Khanthung (Timmins and Duckworth 1999) resulted in no sightings or signs of crocodiles.

Salter (1993b) and Sawathvong (1994) reported the occurrence of crocodiles throughout Laos based on interviews of local people conducted from 1988 to 1993. However, it has since been learned that reports of crocodiles can be over-optimistic, as frequently villagers report crocodiles to be present, but after labored

interviewing it is found that perhaps only a few people had apparently seen a crocodile first hand and in recent years. Subsequent interviews at a number of these sites by one of us (BLS) have concluded that crocodiles are probably absent there (Stuart 1999). It remains unclear whether these discrepancies resulted from different interviewing techniques of the authors, or whether the initial reports referred to populations that people could remember but which had already been extirpated. Local reports of harvest and trade of crocodiles before 1993 are reviewed by Baird (1993) and from 1993-1995 by Stuart (1999). However, a skull and 2-meter skin in the Vientiane Morning Market in 1997 (R. J. Tizard, personal communication), remains the only observed, contemporary trade record of a potentially wild crocodile that can be traced. The vendor reported that the skull and skin came from an animal captured in the Nam Ngum River (northern Laos), downstream of the Nam Ngum Reservoir. As these parts were not carefully identified, the possibility remains that they belonged to a captive hybrid from the Ban Keun Zoo or a farm in Thailand.

The records and reports of wild crocodiles in Laos are confidently assumed to be *C. siamensis*. Although some authors claim that estuarine crocodile *C. porosus* occurs throughout Southeast Asia (e.g. Cox et al. 1998), it is doubtful that records in Laos refer to this species. *Crocodylus porosus* today seems limited on mainland Southeast Asia to coastal estuaries, as is the case in Cambodia (MRCS/UNDP 1998) and Thailand (Ross 1998).

Based on the extreme paucity of field and trade records, and widespread reports by villagers of decline and disappearance, it is concluded that *Crocodylus siamensis* remains in Laos only in small, remnant populations. In a recent review of the conservation status of wildlife in Laos, Stuart (1999) assigned *C. siamensis* to the category At Risk in Laos, which was the highest risk category possible for an extant species in the country.

Threats in Laos

The main threat to crocodiles in Laos is attributed to unsustainable harvesting by local people for consumption and the sale of skins, eggs, and live animals to Thailand (Baird 1993). Some villagers reported in interviews that they hunted crocodiles opportunistically or accidentally caught them in fishing nets (Sawathvong 1994), while others targeted crocodiles with set lines and perhaps night spotlighting (Claridge 1996). Unsustainable harvesting is a common problem shared by most megafauna in Laos; trade-driven hunting is the main factor pushing wildlife species in Laos to extirpation, followed closely by subsistence hunting. The species in Laos most sensitive to hunting are those such as *C. siamensis* which occur in edge habitats or open wetlands; species without large populations in remote dense forest where they can escape hunting are unlikely to remain viable under current harvesting pressure (Duckworth et al. 1999).

Crocodiles in Laos are also threatened by habitat loss through drainage and clearing of wetlands for conversion to agricultural lands. Nong Khe wetlands, the only known recent locality and perhaps last stronghold for crocodiles in Laos, is currently a site proposed for peat extraction (R. J. Timmins, in litt. 1999). However, the problem of habitat loss is closely linked with the main threat of harvesting, as increased use of wetlands exposes remaining crocodiles to higher risk of being killed. For example, the construction of hydropower dam reservoirs may flood breeding sites, but more seriously it allows hunters with boats easier access to crocodiles (Claridge 1996). If hunting were controlled, habitat loss would be only a cause of local extirpations, not a nationwide population collapse.

Conservation

At present, active conservation programs for crocodiles in Laos do not exist. Crocodiles are listed as a Prohibited Category I species and officially protected year-round from hunting and trading (LPDR Ministry of Agriculture and Forestry 1991). However, forestry officials usually lack the resources and often the incentive to effectively control hunting and trade of wildlife, although a gun-collecting campaign has been somewhat successful in certain parts of the country (Timmins and Duckworth 1999). Borders with neighboring countries remain porous and international wildlife trafficking is rampant. The designated and proposed National Biodiversity Conservation Areas in Laos are multiple-use areas that remain inhabited with people, and guidelines on the restrictions of wildlife use within them remain unclear. Rather, passive conservation efforts whereby large tracts of wetlands are maintained probably offers the most significant protection for Lao populations of *C. siamensis*. Although current harvesting pressures in Laos doom all but the most remote and inaccessible crocodiles, re-introducing captive stock can be an objective if tracts of suitable habitat remain when hunting pressure is reduced from current levels.

Despite a drastic decline of wild populations throughout its range, large numbers of *C. siamensis* are bred successfully in Thai and Cambodian crocodile farms, and to a lesser extent in Vietnam, Indonesia, and some European and American zoos (MRCS/UNDP 1998, Ross 1998). A large group of crocodiles is also maintained at the Ban Keun Zoo near Vientiane, and in July 1999 crocodile eggs and stuffed hatchlings were seen for sale outside the entrance to the zoo (H. Nooren and G. Claridge, in litt. 2000). According to zoo staff, two of the adult animals originated from southern Laos, while the rest came from Thai crocodile farms (R. J. Timmins, verbally 1999). Two crocodiles displayed in 1988 at a private zoo in Vientiane were reportedly captured from the Mekong River near Savannakhet (Salter 1993a). This private zoo no longer exists, but the possibility remains that these were transferred to Ban Keun Zoo and represent the two Lao animals remaining there. Unfortunately, in the 1960s many crocodile farms in Thailand began to hybridize C. *porosus* with *C. siamensis* for improved skin quality and growth rates (Cox et al. 1998), and therefore many of the Ban Keun Zoo animals are probably hybrids. At least one farm in Vietnam has also begun hybridizing the exotic Cuban crocodile *C. rhombifer* with *C. siamensis* (MRCS/UNDP 1998). Other farms

may begin hybridizing *C. rhombifer* with *C. siamensis* as well. For example, in December 1999 we observed at least five adult *C. rhombifer* at the largest commercial crocodile farm in Siem Reap, Cambodia, housed with *C. siamensis* in enclosures that contained nesting facilities. Hybridization of *C. siamensis* in commercial crocodile farms threatens the genetic integrity of captive stock and diminishes chances for supplementing wild populations in the future with reintroduced captive animals. Under the current situation, research efforts to genetically identify pure captive *C. siamensis*, and to maintain these animals in legitimate *ex-situ* breeding programs, are probably the most important short-term conservation measures for crocodiles in Laos.

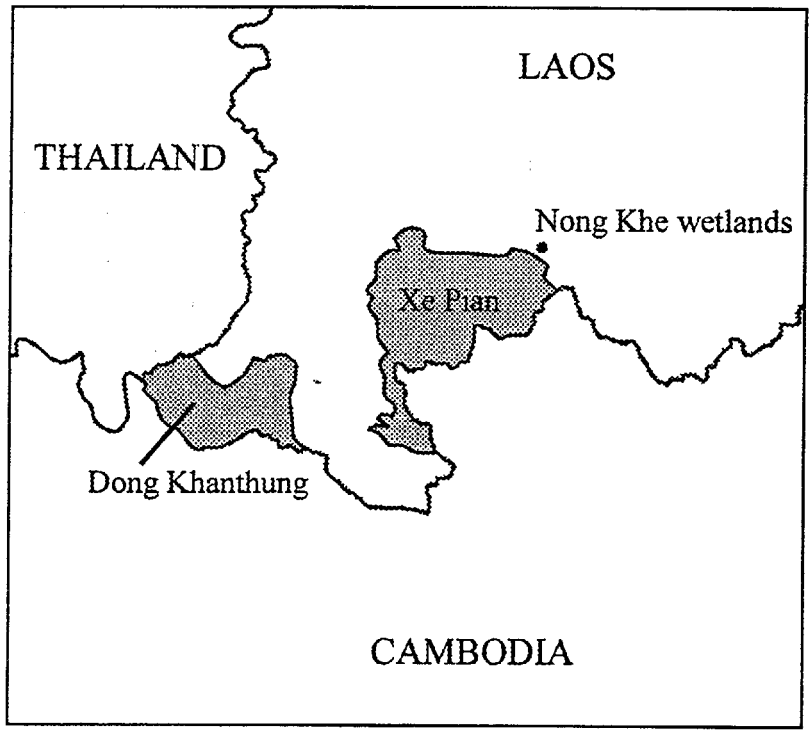

Fig. 1. Location Map. See text.

Updated Global Status

Based on what we know of the status of *C. siamensis* in Laos and elsewhere, it appears that most remaining and therefore most globally important populations of *C. siamensis* are in Cambodia. Field surveys have not yet been conducted in Cambodia, but preliminary data lead us to hope that wild populations still exist. Many residents of Prek Toal floating village on the Tonle Sap (=Great Lake) in Cambodia raise *C. siamensis* in floating pens, and these crocodile farmers told us in December 1999 that although very rare, wild stock could still be harvested in a few areas of Tonle Sap. Furthermore, these farmers reported that recent economic problems in Thailand had lessened the export demand crocodiles and that prices had fallen. At the time of interviewing the farmers had little incentive to harvest additional animals from the wild. Field surveys for crocodiles are planned by the Cambodian government and the Wildlife Conservation Society to begin later this year (2000).

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Figure 1. Significant areas mentioned in the text on the status of crocodiles in Laos. Map by Emma Jones.

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