

Ecological research and conservation status of turtles at the Tonlé Sap Biosphere Reserve in central Cambodia

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Introduction

The future survival of turtles is in severe jeopardy, with half of all extant species already facing extinction as a result of human activities (TTWG 2012). The situation is particularly dismal in south-east Asia, where nearly all species are considered to be in peril (TTWG 2012). Cambodia harbours twelve species of freshwater turtles and two species of tortoises – 79% of these species are presently considered to be threatened by extinction due to unsustainable harvest and trade (Stuart & Platt 2004; IUCN 2015) (Table 1). Intensive over-exploitation for food, traditional medicine and religious practices represent a major threat for south-east Asian turtles (van Dijk *et al.* 2000; Moll & Moll 2004; Emmett 2009). Habitat loss is another major driver of population decline; extensive rice and cassava cultivation degrades large areas of natural habitats into agricultural wastelands (Birdlife International 2003). The bleak outlook for Asian turtles has raised considerable alarm among conservationists. Numerous *in situ* and *ex situ* conservation projects have been initiated in response to the ‘Asian Turtle Crisis’ to pull species back from the brink of extinction. However, basic biological and ecological data are crucial for effective conservation measures (Klemens 2000; Platt *et al.* 2008).

In order to study various ecological aspects of the freshwater turtle community inhabiting the Tonlé Sap Biosphere Reserve (TSBR) in central Cambodia, field research was conducted at the Prek Toal Core Area during the rainy season of 2014. We used very high frequency (VHF) radio tracking to monitor the short-term movement patterns of snail-eating turtles (*Malayemys subtrijuga*). In addition, we conducted questionnaire-based interviews and directly monitored the harvest and trade of freshwater turtles in three villages (Prek Toal, Kampong Prahok and Anlong Ta Oor) bordering Prek Toal Core Area (Ihlow & Dawson 2016). Our observations allowed us to

quantify the harvest and trade of turtles in the vicinity of the Prek Toal Core Area and to subsequently evaluate the sustainability of exploitation in this portion of the TSBR.

Table 1. List of freshwater turtle species found in Cambodia.

Scientific name	Common name	IUCN status	Native to TSBR
<i>Amyda cartilaginea</i>	Asiatic softshell turtle	Vulnerable	yes
<i>Batagur affinis</i>	Four-toed terrapin	not assessed	no
<i>Cuora amboinensis</i>	Southeast Asian box turtle	Vulnerable	yes
<i>Cyclemys atripons</i>	Striped leaf turtle	not assessed	no
<i>Cyclemys dentata</i>	Asian leaf turtle	Near Threatened	no
<i>Cyclemys pulchristriata</i>	Eastern black-bridged leaf turtle	not assessed	no
<i>Heosemys annandalii</i>	Yellow-headed temple turtle	Endangered	yes
<i>Heosemys grandis</i>	Giant Asian pond turtle	Vulnerable	yes
<i>Malayemys subtrijuga</i>	Snail-eating turtle	Vulnerable	yes
<i>Pelochelys cantorii</i>	Giant soft-shelled turtle	Endangered	yes
<i>Platysternon megacephalum</i>	Big-headed turtle	Endangered	no
<i>Siebenrockiella crassicollis</i>	Black marsh turtle	Vulnerable	yes

Study area

The Tonlé Sap Biosphere Reserve (TSBR) in central Cambodia comprises 2,500km² of permanent freshwater wetlands. During the rainy season, this area expands to about 16,000km² due to seasonal flooding of the surrounding lowlands. The TSBR is home to at least seven freshwater turtle species (Table 1) and is considered of utmost importance for turtle conservation in the



Fig. 1. Map of the Prek Toal Core Area of the Tonlé Sap Biosphere Reserve (TSBR).

region (Platt *et al.* 2008; MRC 2010). The TSBR includes three designated protected core areas, situated in the provinces of Battambang and Kampong Thom. One of these areas, the Prek Toal Core Area, consists of seasonally flooded forest located at the north-western tip of the Tonlé Sap Lake (Fig. 1). During the dry season (January to May), the landscape consists of dry shrub forest, characterized by a dense understory of short bushes, with only a few small waterways and isolated pools of water. Scattered large trees are found mainly along permanent riparian areas and serve as nesting sites for large water birds. In the rainy season (mid-June to beginning of November), the water level of the Tonlé Sap Lake rises from floodwaters of the Mekong River.

During this time, the forest becomes fully inundated; the entire area may be covered by a water depth of roughly 10 metres at the height of the flood.

The Prek Toal Environmental Research Station, located in the village Prek Toal, served as a field camp and provided the required infrastructure for this study.

Ecological research at the Prek Toal Core Area

A freshwater turtle survey, using a combination of 25 baited funnel traps that were specifically designed to catch freshwater turtles (modified from Som *et al.* 2006) and two traditional Khmer bamboo traps ('Lorp Priang', Fig. 2), was conducted during the rainy season of 2014. Traps were placed in shallow water within the flooded forest along the Prek Da River (Fig. 3). The Prek Da River is situated at the edge of the Prek Toal Core area in close vicinity to the floating villages of Prek Toal (Fig. 4), Anlong Ta Oor and Kampong Prahok. As a tributary of the Sangkae River, the Prek Da is characterized by brownish sediment-rich waters between June and September (Figs 5a & b). All traps were either placed into narrow channels between thick vegetation or equipped with drift fences to guide turtles into the trap. The traps were either placed individually or connected in rows of two or three using a drift fence constructed from old fishing net and sticks (Fig.6). All traps were baited with a mixture of canned fish, fruits and crushed freshwater snails. They were also equipped with small labels in Khmer language identifying the traps as scientific research material and politely asking anyone who might encounter the traps to not disturb them. Due to the rapidly changing water level, traps had to be repositioned every couple of days.

Nine snail-eating turtles (*M. subtrijuga*) were obtained, partly from our traps and partly donated to the study by local fishermen. For all of the study animals (four males, five females), body masses (ranging from 100g to 251g) and straight carapace lengths were recorded. After an external health examination, all turtles were equipped with VHF radio tracking transmitters (SOPR-2070, Wildlife Materials Inc.) to study their short-term movements. Transmitters (with a mass of 5g = 5% of the body mass of the smallest study animal) were attached to the posterior carapace rim using Pattex Power Knete (Fig. 7). All turtles were released in shallow water along the edge of the Prek Da River and subsequently relocated on a daily basis, using a handheld radio tracking receiver (TRX-1000S, Wildlife Materials Inc.) and a 3-element Yagi antenna (Fig. 8). GPS locations were recorded over the course of ten consecutive days using a handheld GPS unit. Preliminary analyses have revealed that the studied turtles had highly variable daily movement patterns; the distances travelled ranged between a few metres and 1.8km per day (Fig. 9).



Fig. 2. Mr Sopean Ho (ranger) holding a traditional Khmer bamboo trap ('Lorp priang').

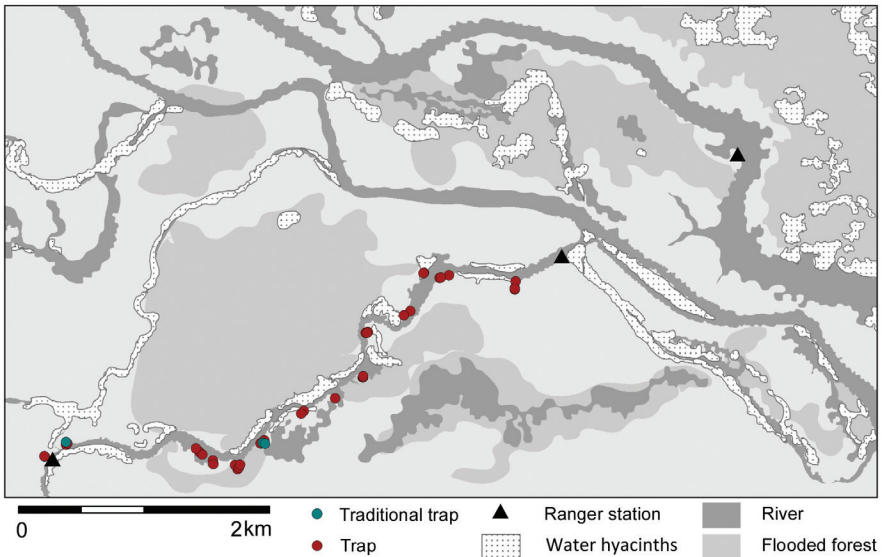


Fig. 3. Map of the study area along the Prek Da River.



Fig. 4. The floating village of Prek Toal.



Fig. 5a, b. Habitat along the Prek Da River.



Fig. 5b.



Fig. 6. Mr Sopean Ho (ranger) connecting a drift fence to a funnel trap.



Fig. 7. *M. subtrijuga* with VHF radio tracking transmitter attached to posterior carapace rim.



Fig. 8. Radio tracking freshwater turtles along the Prek Da River in central Cambodia.

Conservation status of freshwater turtles at the Prek Toal Core Area

In order to assess the conservation status of freshwater turtles in the area, interviews were conducted with local fishermen along the Sangkae and Prek Da rivers and with residents of the villages of Kampong Prahok, Anlong Ta Oor and Prek Toal (Fig. 10). During the interviews, locals reported that hunting specifically for turtles is considered unprofitable, so most turtles are caught incidentally while trapping fish. Residents stated that freshwater turtle abundances have noticeably decreased, while individuals caught in the past were of larger body size (Ihlow & Dawson 2016). Today, numbers seem to have decreased dramatically and, except for snail-eating turtles (*M. subtrijuga*) and Southeast Asian box turtles (*Cuora amboinensis*), freshwater turtles seem to have vanished completely from the surrounding area. Locals reported that currently, by using 60 local bamboo traps that are checked on a daily basis, up to four individual turtles may be caught per month (450 individual trapping events for a single turtle). Although no adult *M. subtrijuga* was offered for sale in any of the three villages during our stay, locals reported that adults are occasionally available but sell for much higher prices than juveniles. While juvenile *M. subtrijuga* were offered for 7.50 USD per kg, customers would be charged 15 USD per kg for adult turtles. According to local people, the endangered yellow-headed temple turtle (*Heosemys annandalii*) is still occasionally caught but only in the flooded forests several days away from Prek Toal. While several villagers were keeping subadult individuals of *H. annandalii* that they caught in previous years, none was offered for sale.

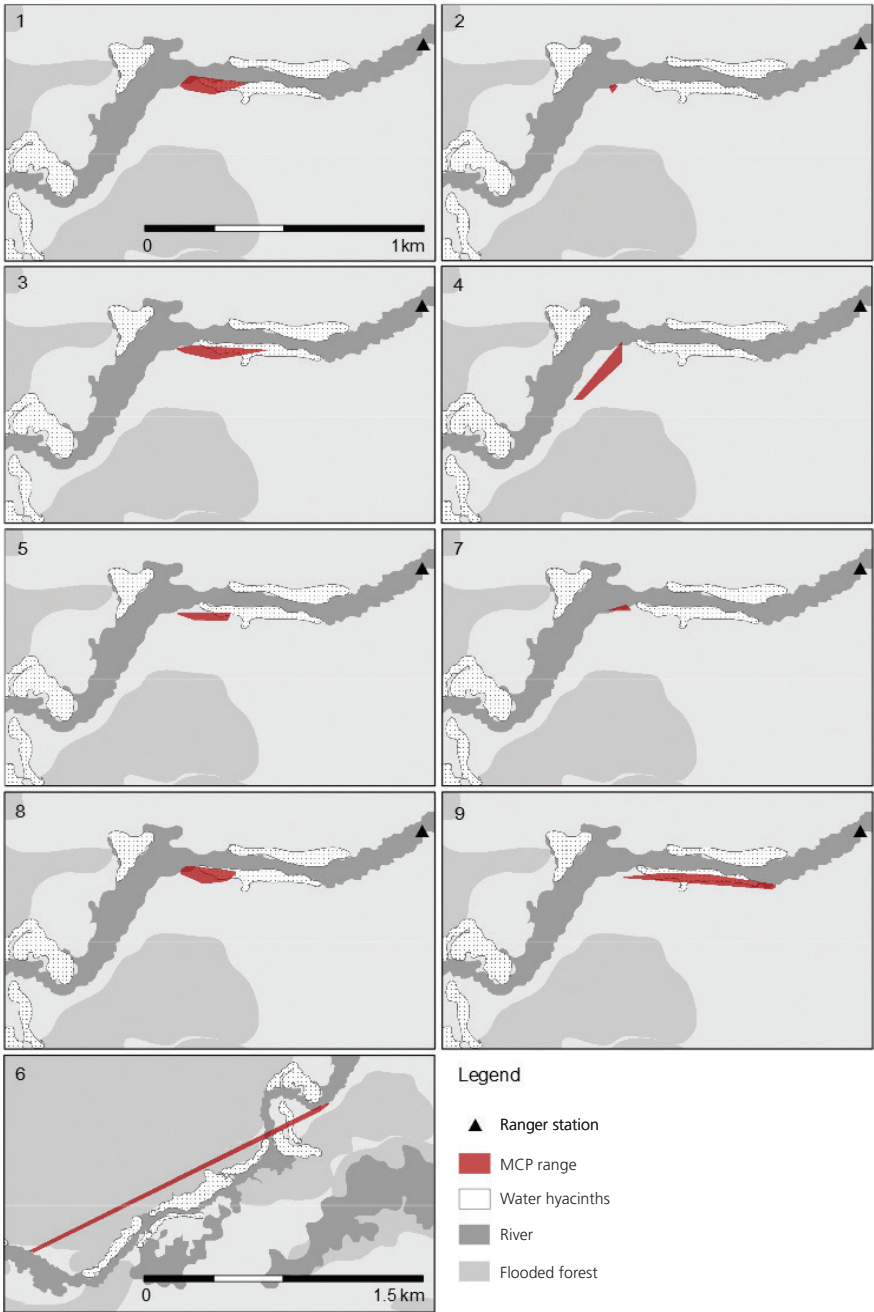


Fig. 9. Minimum convex polygon (mcp) ranges of nine radio tracked snail-eating turtles.



Fig. 10. Porn Sreymom (field assistant) and Sopean Ho (ranger) talking to a local fisherman from Prek Toal village who keeps two endangered yellow-headed temple turtles (*H. annandalii*) at his home.

We found that the turtles at the Prek Toal area are still heavily exploited. Turtles are being caught, housed and traded frequently in the villages adjacent to the Prek Toal Core Area. The current exploitation of freshwater turtles in this portion of the TSBR is alarming and appears to be unsustainable. We recommend that further conservation actions should be immediately undertaken.

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