

A survey of turtles along the Da River in Vietnam, with insights into the Critically Endangered *Rafetus swinhoei*

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ABSTRACT – Vietnam harbours one of Asia's richest turtle biodiversities, yet knowledge of the distribution and abundance of Vietnamese turtles remains sparse. This study focuses on the turtle community along the Da River in northern Vietnam. Using a combination of field surveys, interviews and floating camera traps, we recorded 44 individuals across four species, showing that *Pelodiscus* sp. is locally by far the most abundant species, but that the diversity of the turtle community is quite depleted. We found also the invasive *Trachemys scripta elegans* in the study area. Out of 90 interviewees, we obtained seven reliable reports of recent *Rafetus swinhoei* sightings, thus providing promising leads for conservation efforts.

INTRODUCTION

Vietnam is home to some of Asia's most diverse turtle communities (Buhlmann et al., 2009; Ennen et al., 2020), yet many species face significant threats due to habitat loss, hunting and insufficient conservation efforts (Rhodin et al., 2018; Stanford et al., 2020). Among these, the Yangtze giant softshell turtle *Rafetus swinhoei* stands out as one of the world's most endangered species (Le Duc et al., 2020a; Luiselli et al., 2024). Despite the threatened status of most Vietnamese chelonian species, scientific data on their ecology and distribution in Vietnam remains sparse (Ducotterd et al., 2022; Le et al., 2024).

The Da River, known locally as the Black River, offers a unique ecosystem that may harbour crucial populations of turtles, including *R. swinhoei* (Le Duc et al., 2020b; Van Pham et al., 2022). However, comprehensive studies on turtle diversity and abundance in this area are lacking. The current study, based on a short term survey along the Da River, helps to fill this knowledge gap by documenting turtle species and identifying areas of potential occurrence for *R. swinhoei*. By integrating field surveys and interviews with local communities, we contribute data that will guide future conservation efforts in the area.

MATERIALS & METHODS

Study area

The study lasted 24 days (16 September to 9 October 2024), in Son La Province, Vietnam, with a total field effort

of 576 man hours. Fieldwork consisted of a combination of direct observations, camera trapping and interviews with local residents and fishermen. The survey focused on a 65 km stretch of the Da River upstream from the Son La Dam and the Nam Mu River (Fig. 1A). The Da River originates in Yunnan Province, China, and flows through Vietnam before joining the Red River in Hanoi. This region features diverse aquatic habitats, including deep pools, sandy riverbanks and rocky waterfalls (Dao et al., 2010).

The study area is characterised by dramatic changes in the river bed width and depth by season, due to the effects of the dam control (Fig. 1B).

Field protocol

Camera trapping. Sixteen floating camera traps were deployed at two sites along the Da River. We assembled the camera traps which consisted of a camera trap (COOLIFE H881 – 21 MP 1080 HD [Coolife® Corporation] – 125° - 49 LEDs with a 32GB memory micro-SD card) placed on a floating structure and baited with a mixture of fish, squid, dry shrimp and bovine intestine.

Direct observation. To make direct turtle sightings and to check the camera traps, the research team covered approximately 380 km by boat along the 65 km of the Da and the Nam Mu Rivers. We inspected fishermens' catches and documented any individuals seen in the wild. Each turtle sighting was georeferenced, and the animal was identified to the lowest taxonomic level as possible. For *Pelodiscus*, we decided to avoid species identification as two closely related species may occur in Vietnam *Pelodiscus sinensis* and

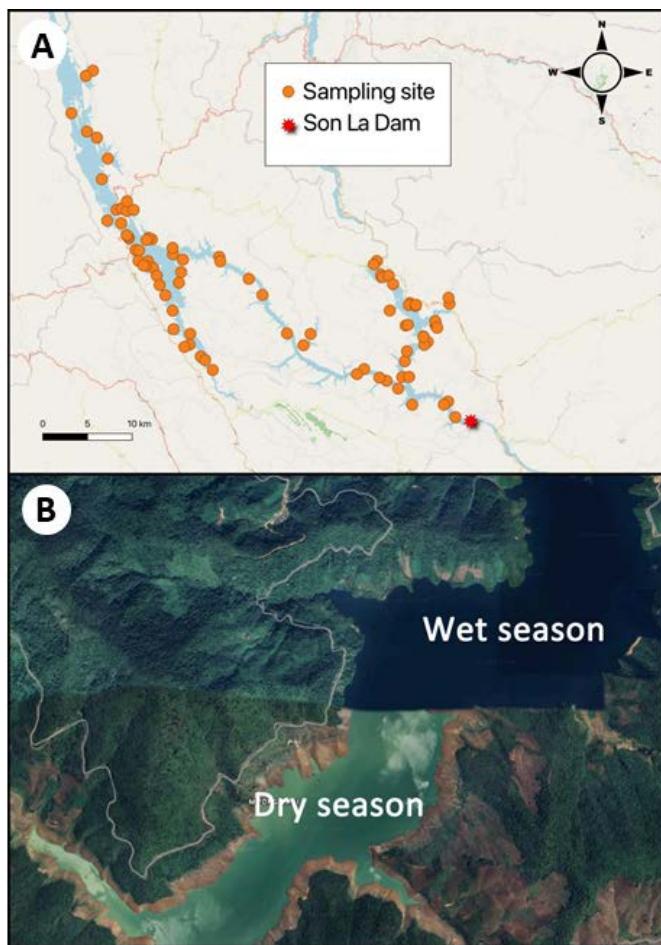


Figure 1. Map of the Da River system - **A.** The sampling sites used in the study, **B.** Detail of the dramatic changes in the banks and width of the river bed between dry and wet season (from Google Earth)

Pelodiscus variegatus (Farkas et al., 2019), but the species boundaries are so poorly known in these taxa that we prefered to avoid specific identification until there is more compelling evidence of the true species.

Face-to-face interviews. Ninety local residents and fishermen were interviewed using a standardised questionnaire (that can be found in the Supplementary Material of Le Duc et al., 2020b). We also interviewed a retired professional hunter of *R. swinhoei*, Mr. Đức, 75 years of age, to gather anecdotal evidence and historical insights into turtle populations along the Da River system.

RESULTS

During our survey, a total of 44 turtle individuals, representing four species, were recorded directly - *Pelodiscus* sp. (38 specimens), *Cuora mouhotii* (4 specimens), *Manouria impressa* (1 specimen) and the alien invasive *Trachemys scripta elegans* (1 specimen). Of our total sightings, 86.4% were *Pelodiscus* sp. The precise locations at which these species were recorded are presented in Figure 2.

Observations of *Pelodiscus* sp. included individuals with diverse colour patterns, consistent with the description of both *P. sinensis* and *P. variegatus* (Fig. 3), suggesting a wide phenotypic variability within the population and no support

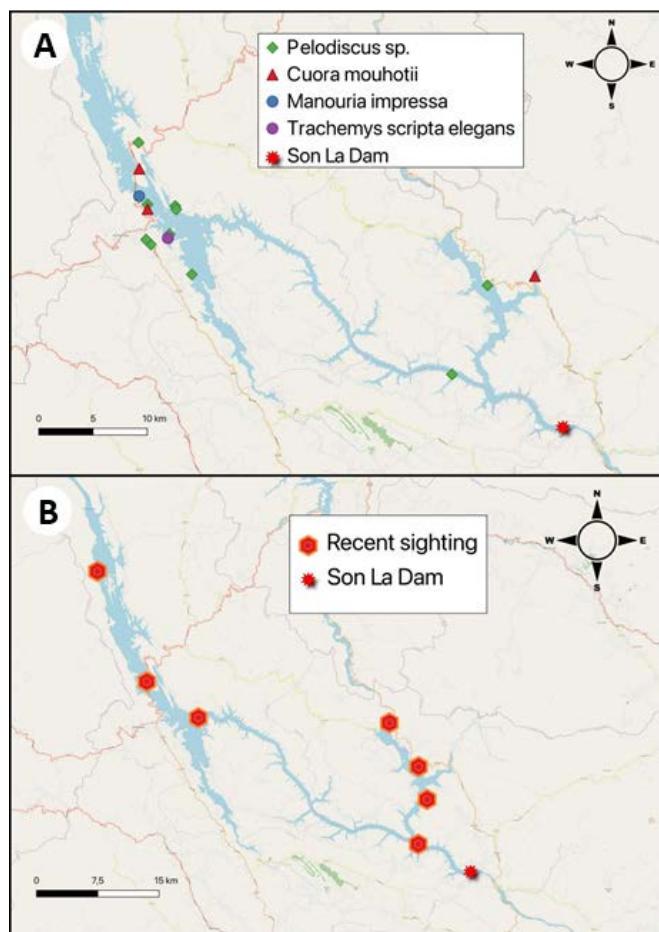


Figure 2. Records of turtles species along the Da River in Vietnam - **A.** Turtle species record by direct observation during the study, **B.** Records of *Rafetus swinhoei* according to reliable interviewees

for a clear morphological difference between the two supposed species.

Information obtained through the 90 face-to-face interviews provided some interesting details concerning the turtle communities in the study area. Our interviewees confirmed that *Pelodiscus* sp. is the most commonly encountered turtle in the area, accounting for about 90% of reported catches. This aligns well with our field observations and suggests that this species is not currently under significant threat in northern Vietnam. Additionally, reliable reports indicated the occasional presence of *Palea steindachneri* which was however not seen in our surveys. Indeed, most of the fishermen described clearly the two abundant species of the area as Ba ba gai *P. steindachneri* and Ba ba tron *Pelodiscus* sp. Of particular interest were seven independent reports of recent *R. swinhoei* sightings (Table 1 & Fig. 2B). Key findings for these latter interviews include:

1. Four sightings occurred during the dry season, and for the three others the interviewees were unable to remember the season.
2. A notable sighting in 2017–2018 involved a 50 kg individual in the Nậm Nhật River.
3. Nesting behaviour was described, with eggs laid in a sandy-grassed areas between March and May (dry season).



Figure 3. Phenotypic variability within *Pelodiscus* sp. in the study area, the turtles in the upper row are not the same individuals as in the lower row

Table 1. Synthesis of the face-to-face interviews reporting the recent sighting of *Rafetus swinhoei* at the study area

Date of last sighting	Season	Observation	Record co-ordinates	Interview number	Dimensions/ weight	Comment
March 2024	Dry season	Sighting	N 21.705445, E 103.613708	1	1.2 x 0.6 m	We had placed camera traps in this area
March-April 2021–2023	Dry season	Sighting	N 21.826282, E 103.555547	1, 15 & 61	60 cm	We had placed camera traps in this area
2020–2021	?	Sighting	N 21.660253, E 103.900175	34 & 58	70–80 kg	Seen by 3 people
9 June 2024	Dry season	Sighting	N 21.612277, E 103.934666	56	100 kg	Frequent sighting by the interviewee
2020	?	Sighting	N 21.576318, E 103.944730	55	30 kg	
2019	?	Sighting	N 21.527299, E 103.934280	48	50–60 kg	
2014	Dry season	Sighting	N 21.665853, E 103.674602	68	100 kg	

Historical accounts from a retired hunter

A retired hunter provided historical insights into *R. swinhoei* along the Da River system as follows:

1. He and his father (a professional *Rafetus* hunter himself) frequently caught *Rafetus* from 1970 to 1982, with the largest individual weighing about 80 kg.
2. Nesting sites were characterised by sandy-grassed riverbanks, with nests containing 100–130 eggs buried about 30 cm deep.
3. *Rafetus* exhibited specific nesting behaviours, such as creating a U-shaped path to conceal its nest. According

to his description, *Rafetus* females tried to hide the nest from potential predators by moving in different directions in the long grass, so the predator (whether an animal or a human) was often confused by following turtle's path.

He recounted detailed feeding habits and behavioural aspects for the species. The species shows a clear tendency to feed upon carrion. For instance, he had seen a *R. swinhoei* eating a dead buffalo in the river. The turtle also eats fish, shrimp and water plants but the interviewee did not remember clearly about food composition in the *Rafetus* stomach. According

to him, it is a calm animal, but moves very fast to water when disturbed by humans. Its favourite living area is the slow, deep running water after a rocky waterfall. The living area always has a sandy bank.

Many times he and his father killed these turtles on the sandy bank, where they bury themselves under the sand. In these cases, hunters often find *Rafetus* individuals by looking for their tracks along the sandy riverbank. They discriminate their tracks very easily from those of other sympatric turtles due to their much larger size. Once the signs are spotted, the hunters will search the spot where the turtle is hidden below the sand by slowly walking barefoot and also probing a thin stick into the sand to find the animal underground. If the stick bounced back, the signal of a softshell, hunters would quickly dig the animal out and turn it on its back to stop it from moving.

His last sighting of *R. swinhoei* was in 2017–2018 in the area of Nậm Nhât river, with an individual that was about 50 kg weight. He also suggested that the running river in Mường Tè district and Nậm Muc river have more *Rafetus* left than elsewhere in Vietnam.

DISCUSSION

Species diversity and abundance

Our study has shown that the Da River is inhabited by an extremely simplified community of turtle species (three or four species if we also consider *P. steindachneri* whose presence seems certain) compared to the potential high diversity that characterises the water basins of northern Vietnam (Ducotterd et al., 2022). Furthermore, only *Pelodiscus* sp. can be said to be widespread, abundant and dominant, further demonstrating the high ecological impairment with regard to the turtle communities in the study area. The presence of *C. mouhotii* and *M. impressa*, though less common, suggests that the terrestrial forested banks of the riverine system may guarantee appropriate habitats for these two Endangered species (IUCN, 2024).

The seven reported sightings of *R. swinhoei* suggest that this Critically Endangered species may still inhabit the Da River and its tributaries. Historical and anecdotal evidence from the former hunter provides a quite detailed description of the nesting, feeding and behavioural ecology of this species, offering crucial information for targeted conservation efforts. The dry season appears to be a critical period for *Rafetus* activity, potentially linked to nesting or feeding. This is also the season when field surveys should be concentrated to increase the probability of observing this species in the wild, since the dramatic lowering of the water level makes it relatively easy for the fishermen (and hence other observers) to spot these animals while basking, or while just resting motionless on the sandy bottom of the waterbodies.

Conservation implications

The Nậm Nhât, Mường Tè district and Nậm Muc Rivers emerge as priority areas for conservation action. These regions feature the slow, deep water and sandy banks preferred by *R. swinhoei*.

This study provides the first assessment of turtle diversity along the Da River, with a particular focus on the elusive *R. swinhoei*. While *Pelodiscus* sp. dominates the local turtle community, anecdotal reports and historical accounts offer some hope that *R. swinhoei* still persists in the region. Future research should prioritise systematic surveys of identified hotspots, combined with eDNA analyses to confirm species presence (Seimon et al., 2024).

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