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## Short Communication

# Protected on paper, hunted in wetlands: exploitation and trade of freshwater turtles (*Melanochelys trijuga coronata* and *Lissemys punctata punctata*) in Punnamada, Kerala, India

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### Abstract

Soft shell turtles are among the most threatened groups of freshwater animals that are in need of urgent conservation attention. In Kerala (South India), two species of freshwater turtles, the Indian black turtle or Indian pond terrapin, *Melanochelys trijuga coronata* (Schweigger, 1812) and the Indian Flap-shelled turtle *Lissemys punctata punctata* (Lacépède, 1788) are exploited from Vembanad lake and associated wetlands in Punnamada to meet the demand from local restaurants and toddy shops. Eight hundred and forty three individuals belonging to the two species (499 pond terrapins and 344 flap-shelled turtle) were observed during a field survey conducted in 2007 at Punnamada. Despite being listed at the highest level in the Indian wildlife protection act, very little law enforcement takes place and turtles are exploited and traded regularly. Collection and trade have also become an important component of the local livelihoods in Punnamada, with the involvement of around five full-time and 25 part-time collectors. Details of the collection, marketing, economics and management of the freshwater turtles in Punnamada are discussed.

**Keywords:** freshwater turtles, turtle trade, wetlands, Punnamada, India

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## Introduction

The international trade in wildlife, worth billions of dollars, is known to threaten around one-third of birds and mammals worldwide [1], making it the second-largest direct threat to many species after habitat loss. Much of the wildlife trade is illegal and unsustainable, driven by high profit margins and, in many cases, high prices paid for rare species [2].

Turtles are considered to be of particular conservation concern because their life history includes low reproductive output, late maturity, and habitat requirements of wetlands and terrestrial environments [3, 4]. Many turtle and tortoise species depend on high adult survival to offset high egg and juvenile mortality in the wild [5]. Removing even small fractions of adults from a population can cause declines or delay a population recovery [6-7]. Freshwater turtles around the world are threatened by increasing collection for food, perceived medical purposes, and the pet trade, with 159 species, or ca. 60%, of the group being more or less threatened [8]. For example, in Southeast and East Asia, more than half of all freshwater tortoises and turtles are listed as “critically endangered” or “endangered” [9-11]. Although tropical Asia supports the world’s richest assemblage of freshwater turtles and terrapins [12], it is also the region where exploitation and trade of the group are at their maxima. Over-exploitation has been observed to be the single most important threat to Asia’s freshwater turtles, with collections largely carried out to satisfy local markets in the Far East and also to support an extensive international trade for food, or as pets, or as ingredients in traditional Chinese medicine [13]. The trade nexus is China, the world’s largest consumer of turtles [11; 13-16], where the meat and shells are thought to have medicinal value [13]. The growing importance of China as the focal point for trade has resulted in an increased attention to the region in terms of research [17-18], and several publications have documented the collection and trade of turtles in the country. However, compared to China and the Far East, there is very little information available regarding exploitation and trade of freshwater turtles from other parts of Asia, especially India [19-21].

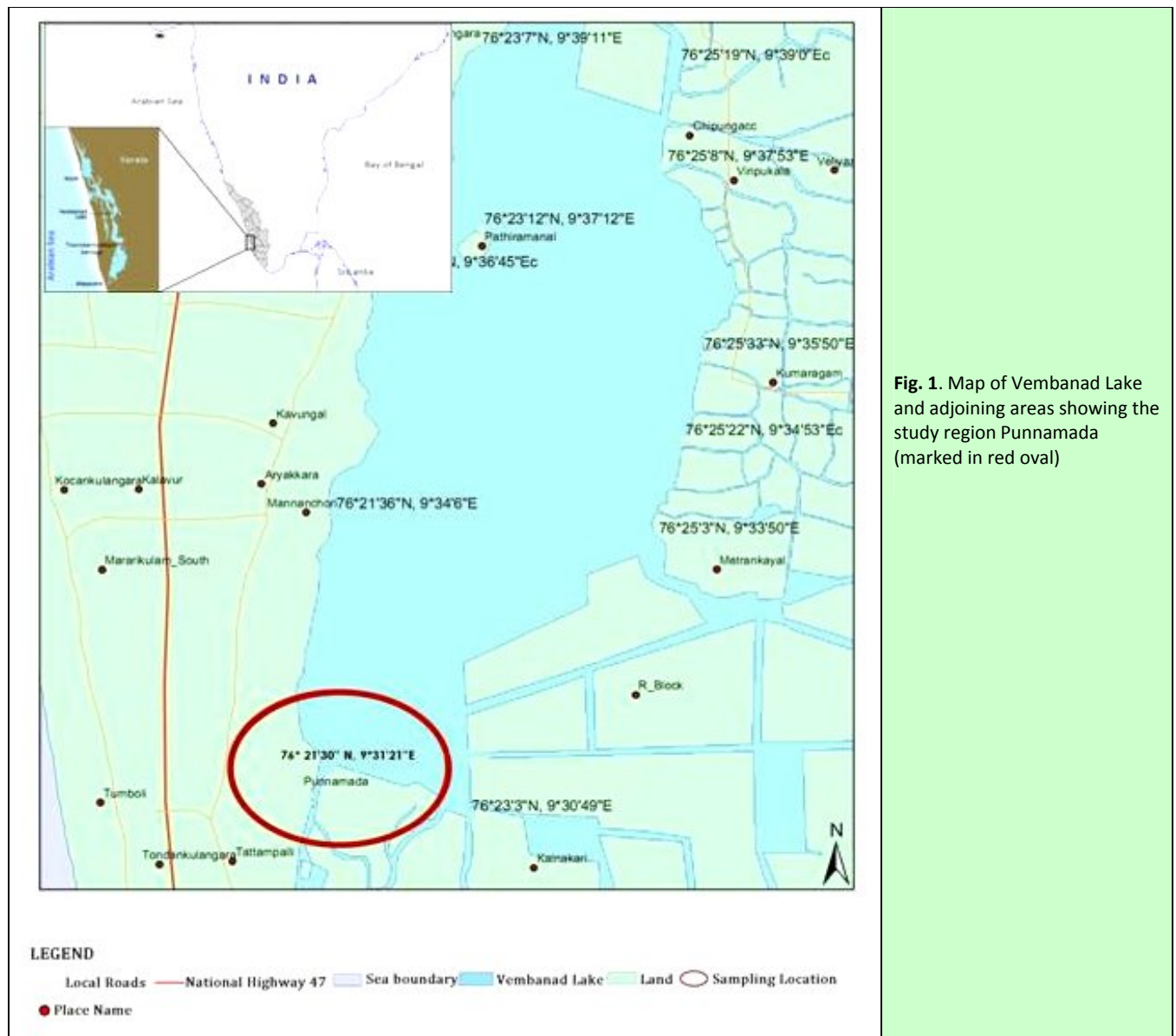
India has one of the most diverse chelonian faunas in the world with the presence of 28 species of tortoises and freshwater turtles [19]. However, 40% of this fauna is threatened [19], making India one of the top five Asian countries in terms of its importance for turtle conservation [22]. The most important driver of endangerment for India’s freshwater turtles is the thriving trade that exist in the northeastern and central regions [19]. In India, nine species of chelonians are known to be harvested on a commercial scale and several others on subsistence levels [23], leading to localized loss of species diversity and declining turtle populations [19]. Anecdotal reports point to the extinction of freshwater turtles from the state of West Bengal [24]. Mahanadi river basin in the Eastern Indian state of Orissa is currently the “hub” of freshwater turtle exploitation and trade in the country. It is estimated that around 200-300 kg of freshwater turtles are transported out of the area on an annual basis [24]. Excepting a few studies from Northeast India [21, 25], trade in freshwater turtles and tortoises has not been documented from other regions of the country, especially the south. In Kerala, the southernmost state of India, where large areas are under wetland ecosystems, no study has focused on the collection and trade of freshwater turtles. The present study was undertaken to assess the exploitation and marketing of freshwater turtles in the Punnamada region of Vembanad Lake—a large wetland ecosystem in Kerala.

## Methods

### Study Area

The Vembanad-Kol wetland system and its 10 associated drainage basins on the southwest coast of the Indian peninsula are characterized by a continuous chain of lagoons or backwaters—one of the largest estuarine systems in the region [26]. The wetland system covers an area of 1,512 sq km. and has been designated as a “Ramsar Site” (Wetlands of international importance) in view of the rich biodiversity and socio-economic profile

of local communities. Punnamada ( $76^{\circ}21'30''$  N,  $9^{\circ}31'21''$  E), with a population of 3,562 people comprising 953 households, is a low-lying area connected to several kilometers of extant paddy fields in the southern region of the Vembanad lake (Fig. 1). Two species of freshwater turtles are known to occur in Punnamada, the Indian black turtle or Indian pond terrapin, *Melanochelys trijuga coronata* (Schweigger, 1812) and the Indian Flap-shelled turtle *Lissemys punctata punctata* (Lacépède, 1788).



A scoping survey was carried out in Punnamada during October to December 2006 to gather preliminary information on the turtle trade and to design and formulate methodologies for the core study period/field research, which extended from January to December 2007. Information generated during the scoping survey revealed that the turtle trade in Punnamada is mainly local, targeted at shops selling toddy (local liquor made from coconut), where turtle meat is a much sought-after delicacy. The survey also found that turtles are seldom marketed outside the region. Also, only a very small share of the harvest was believed to be diverted for household consumption. As many as 30 individuals (mostly from the fisherman community) were found to be involved in turtle collection, with five working full-time and the rest operating part-time. Information provided by the toddy shop owners led us to the main turtle dealer in the region, who was then befriended, helping us to build up a relationship and thus penetrate into the trade chain.

At the beginning of the field research (January 2007), an inventory of the total standing stock in the house of the main turtle trader was undertaken by counting each of the individuals present after they were marked with white paint (using an alphanumeric code) on their carapaces. Subsequent weekly visits (February to December 2007) to the house were undertaken to count the animals that had been bought after the initial inventory (identified as unmarked individuals). These individuals were then marked and “turnover” (the difference in numbers of turtles between the current survey and the previous one) was estimated [27]. Confirmation of the numbers was also cross-checked by asking the turtle dealer. Visits were also undertaken to the biggest fish market in the region where turtles were known to be sold (information generated during the scoping study) and also to 30 toddy shops in the region on a monthly basis to procure information on turtles that were bought for sale. This information was generated by directly interviewing the fish vendors at the market, and the owner or the main fish/turtle procurer of the toddy shop. A member of the project team was allowed into the animal holding sheds in the toddy shops to observe and document individual turtles. The information on the actual numbers of turtles bought by the shops and the numbers marked at the house of the dealer was also cross-checked to confirm its accuracy.

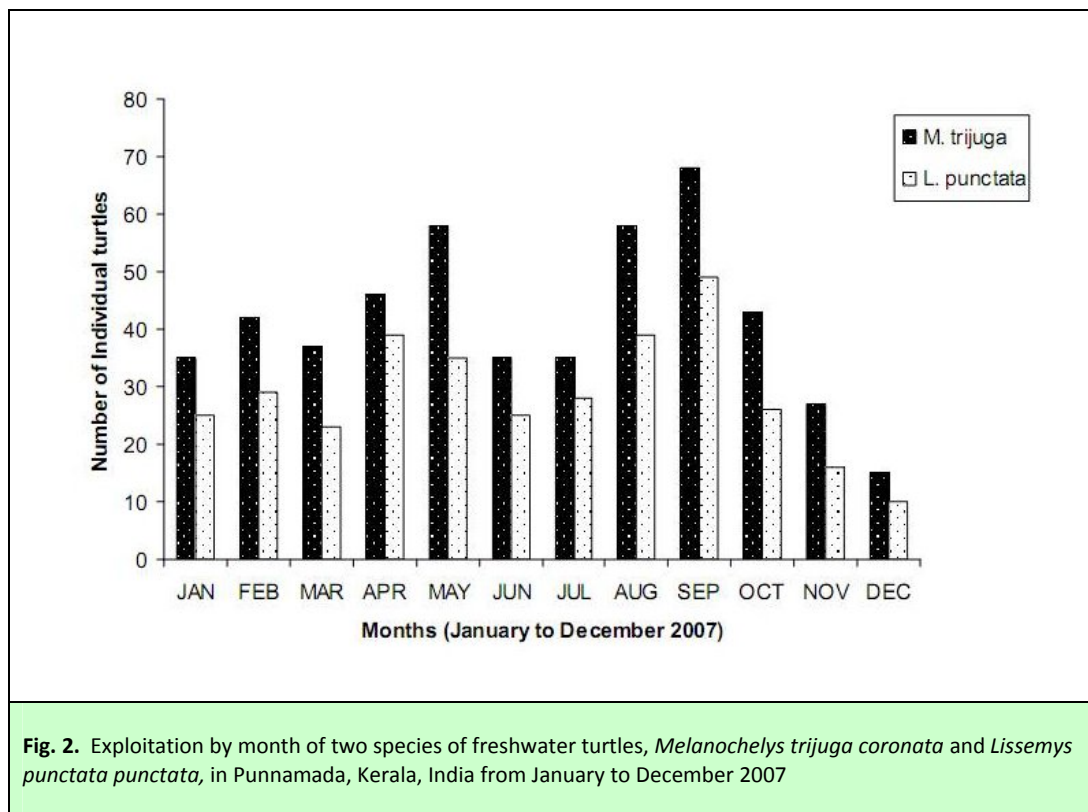
A questionnaire survey was also conducted of 35 respondents (30 turtle collectors and five locals having some experience and/or knowledge of turtles), which helped to gather information about trade and the opinions of local people on turtles. Interviews were conducted in Malayalam, the native language, without any formal structure. Each interview sought to obtain information on the use of turtles, collection techniques and areas, past and present trade volumes, prices, demand, supply, and availability. Where appropriate, discussions also addressed ecological and legal questions. All information was cross-checked by rephrasing the same question at different stages during the interview and by asking the same question to people at different levels of the trade.

In all, 52 visits, each lasting between 30 and 60 minutes, were made to the house of the main turtle dealer during January to December 2007. In addition, 12 trips each (1 trip/month) were made to the main fish landing center as well as to the toddy shops in the region during the one-year study period. Respondents (n=35) were interviewed for an average of 45 minutes, on separate days during June, July, and August.

## Results

Eight hundred and forty three individual turtles (Fig. 2) belonging to two species (Fig. 3), Indian black turtle or Indian pond terrapin *Melanochelys trijuga coronata* (Schweigger, 1812) - 499 individuals and flap-shelled turtle *Lissemys punctata punctata* (Lacépède, 1788) - 344 individuals, were observed to be exploited and traded during 2007 in Punnamada. All these turtles (n=843) were those that were marked by the project team at the house of the main turtle dealer during monthly visits. This indicated two things: 1) that the majority (if not all) of

the turtles traded in Punnamada originate from a single dealer and 2) marketing of turtles collected by this trader is restricted to the Punnamada area, and they are not traded outside.



Turtles in Punnamada are caught mainly by local fishers (males aged 30 to 47 years), who get them from the lower reaches of Vembanad Lake (Fig. 3) and adjoining paddy fields using a variety of gear including encircling nets, gill nets (as bycatch), and hand nets as well as by hook and line. These are sold to the main turtle dealer in the region. Although turtles are caught year around, highest catches are observed during the (pre-monsoon) months of March to May. Turtles are rarely traded during the monsoon (June to August) because of the difficulty in collection due to the heavy floods prevalent in the region, which cut off most of the collection areas.

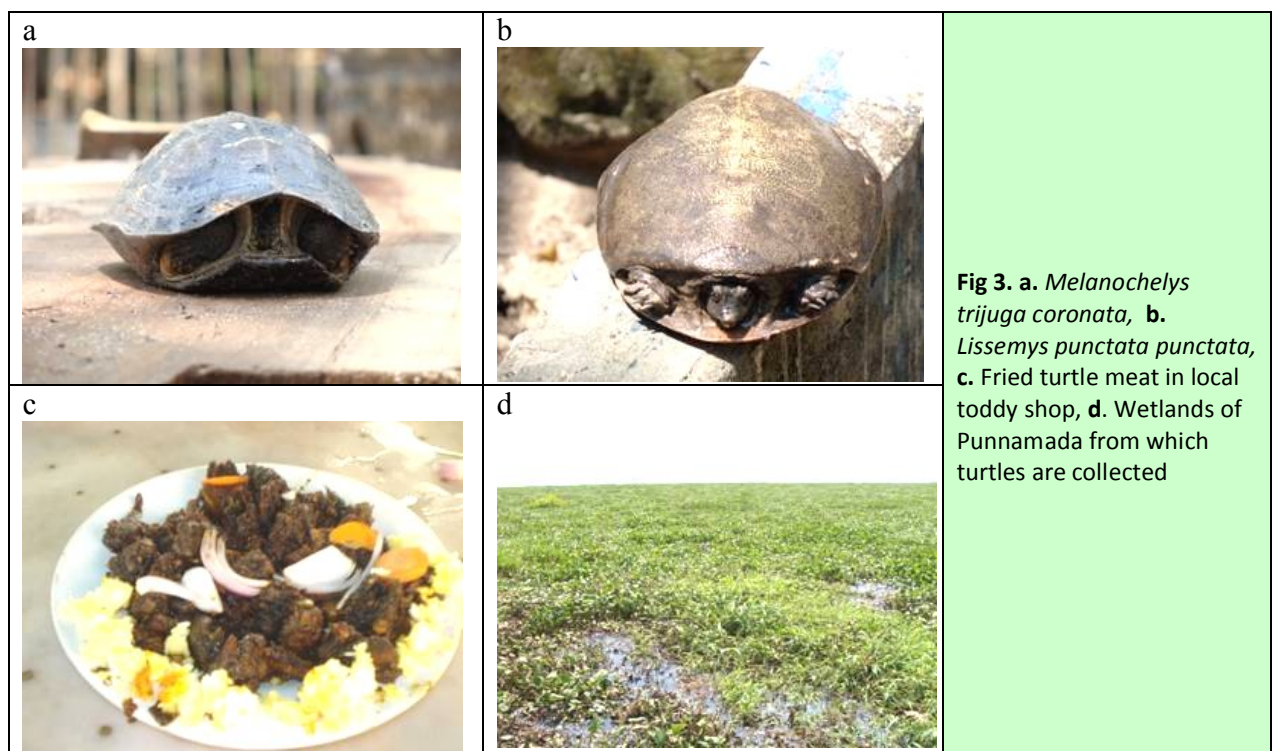
All turtles observed in the trade were larger than 15cm (total carapace length or TCL), with smaller individuals taken home for consumption by the fisher/collector. The main turtle dealer buys each medium-sized turtle (15-25cm TCL) from the fishers for 30 INR (Indian rupees), which is approximately 60-70cents US. This dealer sells them to the local toddy shops or restaurants for 50 INR, thereby earning a profit of 20 INR per individual turtle. The price for a turtle delicacy (Fig. 3) in toddy shops ranges between 35 and 50 INR, depending on availability and seasons.

The dealer collects the turtles from fishers, holds them for a week in ferro-cement rings, and subsequently supplies them to toddy shops and restaurants in the area by transporting them in gunny sacks. Rarely are the

turtles held for more than a week by the main dealer as the demand is always high. Interactions with collectors, the dealer and toddy shop owners revealed that there was a higher demand for the Indian Flap-shelled turtle *L. punctata punctata* than the Indian pond terrapin, *M. trijuga coronata* in Punnamada. Higher demand for white turtles (*L. punctata*) was explained by the respondents as due to their better appearance and their occurrence in cleaner areas of the wetlands as compared to the pond terrapin, which is known to exist in muddy ditches and polluted waterways.

Our questionnaire survey indicated that all collectors knew that exploiting turtles is illegal although they were not familiar with the specific laws and regulations. At least 20 of the 30 respondents we interviewed were caught by local police and forest officials at least once, but were released after paying petty fines ranging from 500 to 1,000 INR; subsequently they returned to the same business. Sixty percent (n= 18) of the collectors were involved in the collection of turtles for an average of 15 years. Many members of the younger generation (n = 12; 40 %) are known to continue the family business although others have diverted into tourism, agriculture, and related private jobs.

In Punnamada, people believed that consumption of turtle meat was effective in controlling arthritis and curing various ano-rectal disorders. 100% of the collectors we interviewed (n= 30) believed that declines in catches of both species have occurred over the last five years. The major reasons given for this decline were a combination of factors including over-harvesting, aquatic pollution, and large-scale reclamation of wetlands.



**Fig 3. a. *Melanochelys trijuga coronata*, b. *Lissemys punctata punctata*, c. Fried turtle meat in local toddy shop, d. Wetlands of Punnamada from which turtles are collected**

## Discussion

Of all the freshwater turtles that are consumed, softshells (Family Trionychidae) are considered the best, due to their low bone-to-body ratio and larger proportions of cartilage and gelatinous skin [28]. This demand has made softshells the most important component of the freshwater turtle trade in Asia. A total of 950,251 individuals of 157 turtle species were recorded during a 35-month survey of the turtle trade in Hong Kong and southern China [13], revealing the magnitude of collection and trade in the region.

The quantification of 843 individuals in 12 months, observed in the present study, is higher when compared to 245 freshwater turtles in eight months recorded from Nanmao, Hainan Province, China, during a survey in 2003 [17]. However, the number of species (n=8) recorded from Hainan was higher than that observed in Punnamada (n=2). Kerala has only five species of freshwater turtles [20] compared to 12 species in Hainan [18, 29].

The collection techniques for freshwater turtles in Punnamada are similar to those practiced elsewhere in India [21] as well as the rest of Asia. In the Malaysian island of Borneo, local fishermen are known to routinely set hooks and lines to catch turtles, whereas fish traps are known to be more common in Laos [28]. In Mahanadi basin on the east coast of India, freshwater turtles are caught with a variety of gear including floating hooks, harpoons, and baits [24].

All turtles observed in the trade at Punnamada were larger than 15cm TCL. This preference for medium- and larger-sized turtles is different from that seen in other parts of Asia. Turtles collected from parts of Southeast Asia are generally destined for two important markets—the growing pet trade based in Singapore [30] and the food market based all over Southeast and Far East Asia [13]. Most turtle dishes served in Southeast and East Asia use whole animals as compared to South India and Punnamada where an individual turtle is cut up and used to serve many. Since most dishes served in Southeast and Far East Asia use whole turtles, they require small or medium-sized individuals that can fit on such plates. The ever-growing pet trade in the region also requires smaller individuals for keeping in homes.

Young turtles that weigh less than 200g fetch a high price in the market of Assam, India [21]. The price of turtle meat/Kg in Assam is around US \$7.5 [21] which is higher than the market prices that we observed in Punnamada (4-6 US\$/Kg, given the fact that 200g to 400g of meat is obtained from an individual turtle). In many parts of India (e.g., in Assam), turtle blood is believed to be a cure for piles and fistulas. Contrary to this, consumers in Kerala dislike turtle blood and are never known to drink it. Large-scale cultural differences exist between people residing in different parts of India and are largely responsible for this difference. However, the perceived medicinal property of turtle meat as a remedy for gout, rectal disorders, and arthritis is known among people of all regions in the country [21, 31], including Punnamada as revealed in the present study.

The Indian Black Turtle or the Indian Pond Terrapin, *Melanochelys trijuga coronata* has been listed as near-threatened in the IUCN Red List [32], while the Indian Flap-shelled turtle *Lissemys punctata punctata* is protected at the highest level in India under Schedule 1 of the Wildlife Protection Act. There exists a contradiction in the level of protection extended to *L. punctata* on global and local scales. Although this species has been given the highest level of protection in India, it has been listed as a “Least Concern” species in the IUCN Red List and has been placed under Appendix 2 of CITES (Convention on International Trade in Endangered Species), allowing regulated commercial trade. A major concern here is the fact that since this species is largely exploited for local consumption in India and seldom traded outside its borders, the scale of

exploitation and threat is largely underestimated. Also, no serious population surveys on freshwater turtles of India have been undertaken in the last decade to critically assess the current status of the *L. punctata* populations in different regions. Notwithstanding the high level of governmental protection extended to *L. punctata*, exploitation and trade is still a day to day occurrence as observed in our present study at Punnamada. In India, several other traditionally exploited turtle species, including the large *Batagur baska* and *Aspideretes* spp., are known to be virtually extirpated in their native ranges, although they are protected under the Indian Wildlife Protection Act [33]. The Leith's softshell turtle, endemic to peninsular India, has shown severe declines in local populations due to indiscriminate harvests in Bharatapuzha, Kerala [34].

The quantification carried out in the present study (843 individuals in one year) may be an underestimate, as some catches for personal use also occur in these areas. Conservation concerns are more for these undocumented catches as they involve the removal of smaller individuals before they attain maturity and breeding size. Data pertaining to this practice is difficult to retrieve as the catchment area in Punnamada extends into several miles of wetlands and adjoining paddy fields, which are often difficult to approach. Also, collectors (taking turtles for household consumption) tend to change their locations every day or within the same day based on the availability of the turtles. Since most houses are located adjacent to or in the middle of paddy fields and wetland areas, locals collect turtles from their own fields for household consumption, making it difficult to assess the quantity harvested through this practice.

### Implications for conservation

Vembanad Lake and adjacent wetlands in Punnamada are an important area where turtles have been exploited and consumed from time immemorial. The main factor pushing the trade is the escalating demand from the local toddy shops and small restaurants, where turtle meat is one of the most important and expensive dishes. In addition, lack of conservation awareness, poaching of turtles as an income source and livelihood earner, and poor law enforcement make the turtle trade a complex issue to manage. The involvement of more than 50 people, including fishers, turtle collectors, and restaurant owners, makes the sector an important one that needs to be given urgent attention in the region.

The high rate of exploitation of a protected species like *L. punctata punctata* shows an urgent need for the initiation of awareness programs aimed at local fishers, turtle collectors, and restaurant owners to sensitize them on relevant wildlife laws as well as on the biological and socio-economic impacts of turtle exploitation and trade. We also strongly recommend that the state government and its concerned departments take immediate actions to totally ban collection and trade of threatened species of turtles such as *L. punctata punctata*, in Punnamada and elsewhere in Kerala. Also, since such regulations can adversely affect local livelihoods, alternate employment opportunities linked to the turtle trade should be planned and implemented by the government agencies. Captive breeding programs can be an ideal way of both protecting the region's freshwater turtles and providing livelihood alternatives to the displaced fishers and turtle collectors. Commercial-scale captive breeding and farming of softshell turtles can be a lucrative enterprise, which can contribute to local livelihoods through employment generation and foreign exchange, as seen in China [35]. Turtle farming is currently one of China's main industries with around 300 million turtles being sold every year; these are worth 750 million in U.S. dollars [35]. However, such mass-scale captive breeding programs should be undertaken carefully. Appropriate regulations need to be in place to monitor brood stock development so as to check the production of hybrid turtles as well as preventing escape of captive-bred turtles [36]. With proper monitoring and management, captive-bred individuals can also be used for re-introduction into natural habitats where populations have declined or been exterminated [37].

As a first step, the findings described here are being submitted to the government agencies to highlight the cause of freshwater turtles in Kerala, with suggestions on future research and outreach activities that need to be carried out to save these animals from extinction. Based on our study, we make the following recommendations for conserving the turtle population of Vembanad and similar sites across Kerala:

- 1) Extensive micro-geographic surveys need to be carried out throughout Kerala and particularly in Vembanad Lake to assess the demography and current conservation status of *M. trijuga* and *L. punctata*.
- 2) Baseline data on the life history and ecology of *M. trijuga* and *L. punctata* need to be generated.
- 3) There also need to be proper protection of turtle habitats in the Vembanad wetland, especially nesting sites of the two species
- 4) A community-based monitoring and conservation program needs to be implemented with the support of local fishers and turtle collectors after the above-mentioned baseline studies are completed.
- 5) Continuous monitoring of the local turtle trade should be carried out in conjunction with toddy shop owners, and there should be public awareness campaigns directed at fishers, turtle collectors, and toddy shop owners to sensitize them to the need for conserving turtles.
- 6) A cluster of turtle breeding and farming units should be developed to diminish the pressure on wild stocks as well as provide a livelihood opportunity for local communities. Programs should be initiated to organize turtle collectors in the region to take up breeding and culture of local species.

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