

## Turtles at a Market in Western Yunnan: Possible Range Extensions for some Southern Asiatic Chelonians in China and Myanmar

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The Trans-Himalayan Mountainous Area represents a natural biological realm, including the hills of Assam east of the Brahmaputra, the whole of Myanmar (Burma) except the lowlands in the south, southern Chinese Yunnan, the northern part of Laos and Vietnam, and the northern part of Thailand (Smith, 1931). Smith concludes that the fauna of Thailand, Laos, Vietnam, and southern China "is so closely allied to that of Burma [Myanmar] that it would be scientifically incorrect to separate them from one another" (Smith, 1931:13). This close alliance of the faunas of southwestern Yunnan (China) and upper Burma (Myanmar), however, is not reflected in our present understanding of the Chinese chelonian fauna. None of the recent accounts and lists of Chinese freshwater turtle considers the possibility of the occurrence of Burmese freshwater turtle species on Chinese territory (see Zhao and Adler, 1993).

Few surveys or collections of chelonians were ever carried out in upper Myanmar and western Yunnan. The Yunnan Expeditions from 1868 and 1875 (Anderson, 1879) provided turtles from upper Myanmar, but none from the Province of China now known as Yunnan. The next survey of turtles in upper Myanmar took place in 1993 in the area of Mandalay (P.P. van Dijk, *in litt.*). Turtles were collected only incidentally in Yunnan by missionaries and a geologist, and more recently by Oscar Shiu's associates (O. Shiu, *pers. comm.*) and by zoologists of Yunnan University (Kou Zhi-Tong, *pers. comm.*). But these studies did not cover Chinese territory of the upper Irrawaddy river basin.

**Methods.** — From 24 to 26 May 1993 I visited the main market in Ruili, Longling County, Baoshan Prefecture, Yunnan Province, People's Republic of China (24°00'N, 97°53'E; Fig. 1). Ruili is a city in the valley of the river Longchuan Jiang close to the border with Myanmar. The Longchuan Jiang originates in the mountains of Tengchong County (Baoshan Prefecture) and flows to the southwest. The region is characterized by longitudinal mountain ridges, dissected plateaus, and broad valley topography. About 20 km northeast of Ruili the Longchuan Jiang leaves a fast-flowing section in a narrow valley with steep hill sides (Fig. 2). In the area of Ruili the valley is broad and has an elevation of less than 700 m. The river slows down and meanders in a wide bed through the floodplain, forming numerous sand banks (Fig. 3). For about 30 km the river or its former bed (the bed may change with floods) form the China-Myanmar border. About 25 km below Ruili the river completely enters

Myanmar where it is known as the Shweli, which eventually flows into the Irrawaddy. The climate in Ruili is tropical, dominated by maritime southwestern summer monsoons, with 85 to 90 percent of the annual precipitation concentrated from May to October. Numerous channels, ponds, and water ditches in the alluvial plain supply water to rice fields and tropical crops.

Near the fish market there were some stalls where live turtles and tortoises were offered for sale. Language barriers and the lack of an interpreter made communication difficult, but I observed delivery and sale of turtles and purchased some specimens. During the three days of my stay in Ruili I visited the market on 14 occasions in order to observe the turnover of turtles. I bought 18 turtles (small specimens of each species), most of which were donated to scientific collections: specifically, Department of Biology, Yunnan University; Naturhistorisches Museum Wien (NMW); collection of William P. McCord, New York; and collection of Walter Sachsse, Mainz.

**Results and Discussion.** — Turtle and tortoise species and numbers observed at the market were: *Morenia ocellata* ( $n = 81$ ; Fig. 4), *Lissemys scutata* ( $n = 32$ ; Fig. 5), *Indotestudo elongata* ( $n = 9$ ), *Amyda cartilaginea* ( $n = 5$ ;

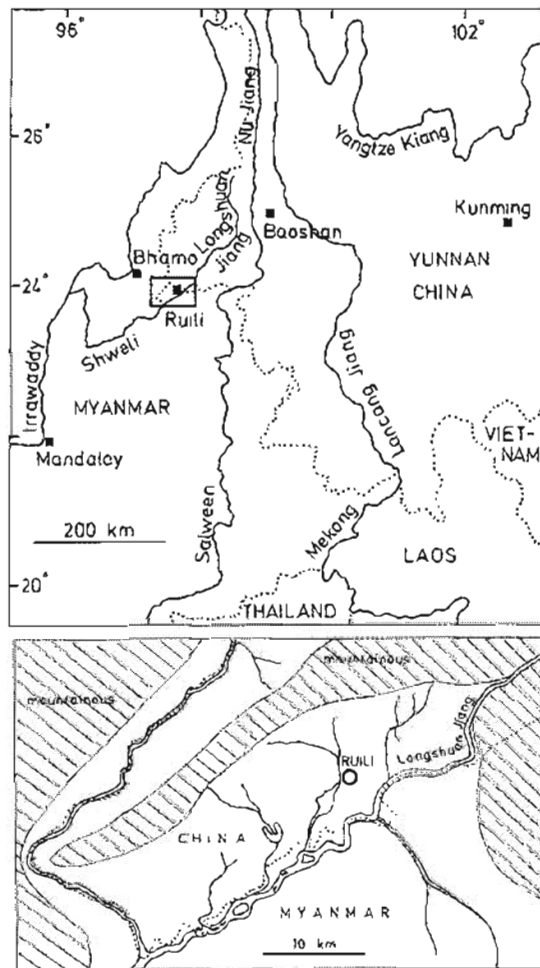


Figure 1. Upper: Map of southwestern Yunnan, China, and adjacent countries; area in box enlarged below. Lower: Enlargement of Ruili area. Stippled lines indicate political boundaries.

and there is constant traffic across the border. Some or many of the turtles may, therefore, have come from adjacent Myanmar with border people who cross regularly into China. The landscape, river, vegetation, and climate do not change at the political border. If these turtles occur close to Ruili in Myanmar, there is no biological reason why they should not also occur on adjacent Chinese territory.

According to Smith (1931) and Iverson (1992), *Cyclemys dentata*, *Melanochelys trijuga*, *Lissemys scutata*, and *Indotestudo elongata* are known from upper Myanmar and the Irrawaddy river basin (e.g., from Bhamo, 70 km northwest of Ruili), of which the Longchuan Jiang is a tributary. Their presence in the general area is not surprising. However, in addition to being possible new records from Chinese territory, *Morenia ocellata* and *Amyda cartilaginea* would also be new records for the whole of northeastern Myanmar. Existing records (Iverson, 1992) indicate restriction of these two species to southern Myanmar, including the lower part of the Irrawaddy, about 900 km southwest of Ruili.

The assumption that *Morenia ocellata* is native to the Longshuan Jiang is supported by anecdotal information from upper Myanmar: P.P. van Dijk (*in lit.*) encountered people in Mandalay who described turtles that are probably *Morenia*, and there are indications of the species as far upriver as Bhamo and beyond.

The occurrence of *Amyda cartilaginea* in the Shweli Longshuan Jiang is surprising, since the whole Irrawaddy, even further upriver than Bhamo, is known to harbor the large trionychine softshell *Nilssonina formosa* (Iverson, 1992). I compared one of the Ruili softshells (NMW 32943, 117

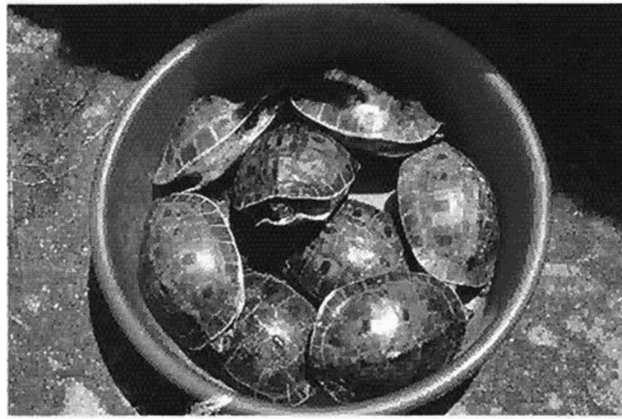


Figure 4. *Morenia ocellata* for sale at the food market in Ruili.

mm CL, Fig. 6) with a specimen of *N. formosa* (NMW 30234, 123 mm CL, from "Burma") and identified it as *Amyda cartilaginea*. However, large *Amyda* and *Nilssonina* are difficult to distinguish based on external characters and I do not have a positive identification for the other four trionychine specimens that I observed at the Ruili market. This finding suggests the need for further investigations of the identities, distribution, and systematics of softshell turtles in Myanmar and Yunnan.

This short survey of the market in Ruili cannot give a complete picture of the chelonian faunal assemblage in the area. The apparent absence of hill species like *Platysternon megacephalum* and *Manouria impressa* is intriguing. This could be due to seasonal activity patterns, or fishing and collecting of turtles in the area of Ruili may be limited to the

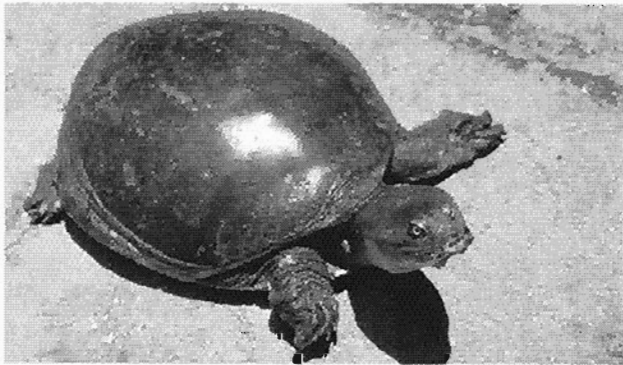


Figure 5. *Lissemys scutata* (212 mm CL) at the food market in Ruili.

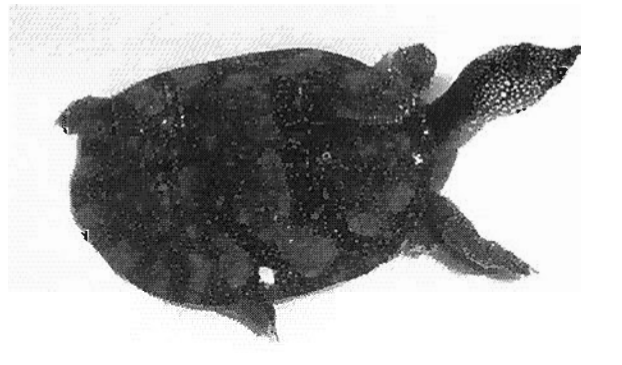


Figure 6. *Amyda cartilaginea* (117 mm CL; NMW 32943) from the food market in Ruili.

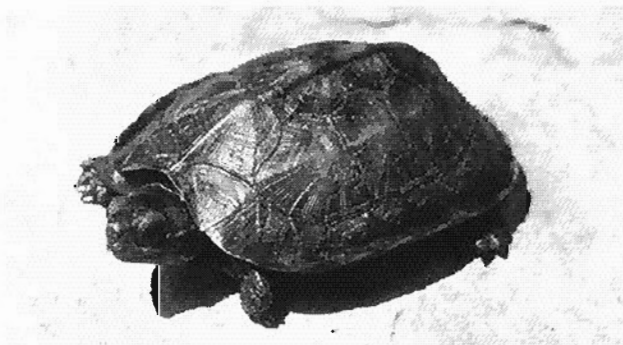


Figure 7A. *Melanochelys trijuga edemiana* (83 mm CL), at the food market in Ruili, dorsal view.

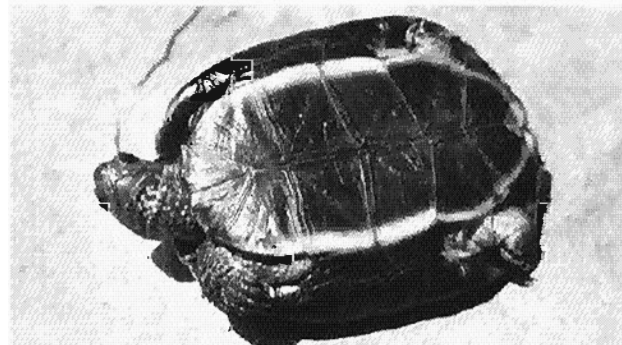


Figure 7B. *Melanochelys trijuga edemiana*, same animal, ventral view.

main river and its floodplain. A survey of the distribution and exploitation of turtles and tortoises in southwestern Yunnan and Myanmar is urgently needed. Knowledge of their present status is necessary to assess possible conservation needs.

**Acknowledgments.** — I thank Professor Kou Zhi-Tong, Yunnan University, for access to his turtle collection and for sharing his knowledge of local turtles with me. I thank Oscar Shiu for help in organizing my trip to China and for sharing his knowledge of turtles, and I thank him, his family, and his staff for their hospitality. Drs. Franz Tiedemann and Heinz Grillitsch kindly facilitated my study of turtles in the Vienna Museum of Natural History. Valuable comments by Peter Paul van Dijk and an anonymous reviewer improved the manuscript.

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Accepted: 16 October 1994

*Chelonian Conservation and Biology*, 1995, 1(3):226–227  
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### Reproductive Biology of the Indian Roofed Turtle, *Kachuga tecta*, in Bangladesh

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The Indian roofed turtle, *Kachuga tecta*, is a common species in Bangladesh, occurring in nearly all freshwater habitats, including the brackish waters of coastal areas, and excluded only from some hilly areas of Chittagong district. The roofed turtle plays an important role in the local ecology, feeding on a variety of aquatic vegetation, such as water hyacinth and other aquatic weeds, and aquatic animal pests like crabs, snails, etc. The turtles are also scavengers and feed on dead animals and sometimes human waste, thereby helping to reduce environmental pollution and infectious diseases. The turtles are consumed by Hindus and Tribals, thus helping to maintain a source of protein for these people. Turtle eggs, oil, and shell have a very high commercial value (Khan, 1982) and large numbers are exported from Bangladesh annually.

Preliminary studies have been done on the reproductive biology of *Kachuga tecta* in India, Pakistan, and elsewhere

by Chaudhuri (1912), Smith (1931), Minton (1966), Duda and Gupta (1982), Khan (1982), Daniel (1983), Moll (1987), and Fugler (1984). However, no detailed studies have yet been done in Bangladesh. The purpose of the present study was to collect data on the reproductive biology of *Kachuga tecta* in Bangladesh.

**Materials and Methods.** — A total of 212 adult female *Kachuga tecta* were examined for the annual cycle of gonadal development, egg formation and maturation, and the numbers of mature and immature eggs, dissecting six to seven animals per month for several years. Specimens were either collected by the authors in different parts of Bangladesh or dissected in export processing centers at Dhaka, Baidair Bazar, Chandpur, and Naraynganj.

Reproductive condition was determined by the presence or absence of mature or immature eggs in both oviducts. The first egg-laying period was defined by the presence of mature and immature eggs; the second egg-laying period was ascertained when only mature eggs were found in both oviducts. Observations were made both in nature and captivity.

Weight, length, and width of both eggs and turtles were measured by spring balance, metal tape, and slide calipers. Four living individuals were kept in four aquaria measuring 30 x 47 cm each. The eggs laid in the aquaria were measured, as were eggs collected from nature. On 5 February 1993, 142 shelled eggs were dissected out from the oviducts of 21 turtles. All were measured and 20 were buried in sandy soil in the bank of a well at the University of Dhaka, and 12 others were buried in sandy soil elsewhere.

**Results and Discussion.** — Shelled oviducal eggs were found in dissected specimens from December to March. An initial egg-laying period occurred between the beginning of December and the middle of January, and a second egg-laying period occurred between mid-February and the end of March.

In an aquarium a female of 780 g body weight laid 8 eggs from 14 to 17 March 1988. Another female laid 12 eggs in a sweet potato field on 24 December 1987, and 10 eggs were found in the bank of a pond on 15 March 1992 in the village of Dingabanga, Chandpur. On 11 February 1993 a female laid 10 eggs in loose soil near a bush. Still another turtle laid 12 eggs in fallow land near a bush on 22 March 1992 in the village of Kalady, Chandpur. Fugler (1984) reported that the nesting season of *K. tecta* was in the winter months and that single or multiple clutches were produced. He did not mention the number of eggs per clutch. Minton (1966) reported the nesting season to be early October in Pakistan, and Rao and Singh (1985) mentioned nesting from October to January in India.

Turtles use sweet potato fields, vegetable gardens, elevated land, banks of ponds, and mustard seed fields for nesting. Typically they select sites in undisturbed areas of loamy soil away from marshy areas. The depth of the flask-shaped nest did not exceed 4 to 6 cm.

Based on the presence of eggs, females become sexually mature at carapace lengths (CL) between 185 and 192