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TRACKING *CUORA MCCORDI* ERNST, 1988: THE FIRST RECORD OF ITS NATURAL HABITAT; A RE-DESCRIPTION; WITH DATA ON CAPTIVE POPULATIONS AND ITS VULNERABILITY.

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(with 25 text-figures)

ABSTRACT.– **After an overall perspective supporting the validity of *Cuora mccordi* as a species, results of three partially successful Guangxi Province field trips by the authors, in search of the species are given. Surveys of turtle farms in five provinces and Shanghai uncovered many forms of hybrids, but only one non-breeding pair of *C. mccordi.* Habitat is hilly terrain at 50–150 m elevation, usually amongst bamboo in the vicnity of streams. Detailed morphological description of the species is presented, the known maximum carapace length being 18.4 cm. We also discuss ontogenetic changes in the keels and the unique colouration of the head, shell and soft parts, followed by the present status of *Cuora mccordi* both in captivity and in the wild, with recommendations for conserving the species.**

KEYWORDS.– **Testudines, Geoemydidae, *Cuora mccordi*, Guangxi, China.**

INTRODUCTION

Cuora mccordi was described by Ernst (1988), based on a series of 12 specimens collected in the early 1980's. All specimens were derived from the Hong Kong turtle dealer, Oscar Shiu. They were reported to have been purchased from locals near the city of Baise/Bose/ Paise in south-western Guangxi Province, China, close to the border of Yunnan Province, China. The locals claimed to have collected them in the surrounding "Highlands" of that city. Subsequent visits by non-Chinese-speaking turtle researchers (Artner, 1998, 2006; Auer, pers. comm.; Petras, pers. comm.; Hou, pers. comm.; Blanck, pers. obs.) to the area did not produce any specimens from the wild, nor where locals found in the city of Baise familiar with the species, leading these researchers to doubt the existence of the species in this area.

McCord and Iverson (1991) amended Ernst's locality of origin of the species to "in Yunnan Province, west of Paise, Guangxi Province", again according to Oscar Shiu; but field research in this vicinity has yet to confirm this, so the origin of the species remained a mystery since its first appearance a quarter of a century ago.

Speculation (e.g., Parham et al., 2001; Artner, 2003, 2006) arose during this time, that *C. mccordi* was possibly a hybrid between *Cuora trifasciata* (Bell, 1825) or *Cuora cyclornata* (Blanck et al., 2006; a name disputed in addendum by Spinks and Shaffer, 2007) and *Cuora flavomarginata* (Gray, 1863). Some felt that it

was just a colour-morph of *C. flavomarginata* (Asian Turtle Crisis Newsgroup). *C. mccordi* does share behavioural and morphologic features (compare Artner, 2006 with description below) with the three species mentioned, especially *C. cyclornata* and *C. trifasciata*, which led Yasukawa et al. (2001) to list *C. trifasciata* and *C. mccordi* in the same subgroup by morphology.

These speculations were strengthened by the discovery of many variations of both captive bred and wild hybrid turtles. Current genetic analyses (Stuart and Parham, 2004; Spinks et al., 2004; Parham et al., 2005; Stuart and Parham, 2006; Spinks and Shaffer, 2007) indicate that *C. mccordi* is not a hybrid, but a valid species with proof of wild origin still pending. Presumed natural hybrids such as *Cuora serrata* (Iverson and McCord, 1992; Shi et al., 2005), and perhaps *Mauremys pritchardi* (McCord, 1997) and *Sacalia pseudocellata* (Iverson and McCord, 1992) have sympatric parental lineages. *Cuora trifasciata*/*cyclornata* and *Cuora flavomarginata* are allopatric and do not have overlapping distributions, and thus have no chance of naturally hybridizing. This would leave Chinese turtle farms as the only possible source of a *C. trifasciata/cyclornata* x *C. flavomarginata* hybrid. At this time, both molecular studies and the consistent hatching of offspring identical to parental stock lead most to believe *C. mccordi* is a valid natural species.

Many regard *C. mccordi* as commercially or biologically extinct in the wild (Lau et al., 1995; CITES, 2000; Meier, 2000; McCord and Joseph-Ouni, 2002) but there are still rare specimens entering the pet trade (Shiu pers. comm.; the authors of this paper, pers. obs.) in China. The species has been listed as Critically Endangered in the IUCN Red List since 2000.

McCord and Joseph-Ouni (2002) listed the vicinity of Bose (following the original description) and added Hunnzhou (= Huangzhou, 25°33'55N; 110°19'27E; or should this be Hengzhou?), Guangxi; the latter locality for *C. mccordi* was yet again provided by Shiu.

In 2004, a Japanese tourist was rumoured to have found a specimen in a forest near the Chinese/Vietnamese border not far from the terra typica (Philippen, pers. comm.). Later that same year, rumours from China circulated that the species might originate from eastern rather than from western Guangxi Province (i.e., Bose).

In 2005, 2006 and 2007, these authors visited the type locality as well as other suspected localities along with many small and large turtle breeding farms in southern China to track down the true origin of *Cuora mccordi*. The following field data is the result of these efforts.

FIELD REPORTS

In late 2005, the IUCN Red List editor, van Dijk invited McCord to write the accounts for *Cuora mccordi* and *Cuora zhoui*. McCord invited Zhou to complete this assignment with him.

With prior collaboration and this new mission in mind, several field trips were undertaken; many difficulties had to be overcome. Our first objective was to confirm the distribution of *C. mccordi*, which has never been properly reported. We spent much time listening to animal traders about the source of *Cuora mccordi*. After analyzing information from many sources, we targeted western and south-eastern Guangxi Province.

In south-east Guangxi, we heard of and contacted a prominent turtle dealer by the name of Li. After some time, Li found a local turtle supplier, Yang who recognized *C. mccordi* from photos we provided. In late 2005, a flight was taken to Nanning with local transportation arranged to an undisclosed area "A".

The senior author arrived at Li's shop in a marketplace, where *Mauremys mutica* (Cantor, 1842), *Pelodiscus sinensis* (Wiegmann, 1835), *Platysternon megacephalum* (Gray, 1831) and *Sacalia quadriocellata* (Siebenrock, 1903) were being sold. Li introduced us to Yang and as there was no regular transportation to area "A" a flat boat was rented and both Li and Yang came as guides and translators. The river was approximately 300 m in width at that point, and Yang rowed against the current for about an hour to a destination on the south bank. The riverbank consisted of yellow sand and scattered rocks; the surrounding mountains were lush with trees. We struggled up steep hillsides to a small village of tiled houses. In the local dialect, Yang questioned a resident, using photos, about his knowledge of both *C. mccordi* and *C. trifasciata*. The man's answers convinced us that he was familiar with both

species. He said that he had caught *C. mccordi* among rocks on hillsides of mountain valleys, 10 minutes by boat on the north side of the river, and that they are much rarer now than just 10 years ago. He also mentioned *C. mccordi* comes out from hiding when it rains. Yang said he purchased a *C. mccordi* from this local in June, 2005, which he later provided photos of from the people he sold it to in Wuzhou, Guangxi Province.

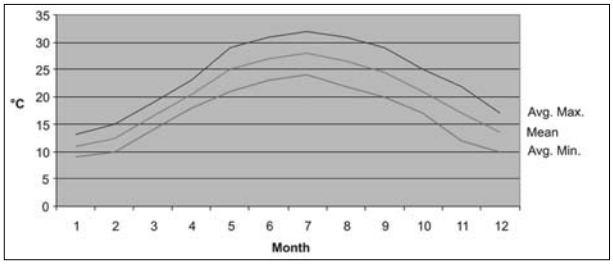

Figure 1. Average temperature for area "A".

Once at the given collection site (GPS coordinates to be given to IUCN), we searched among long-leaf forest foliage mixed with bamboo, *Camellia, Alocasia* and other plants. The site was at 50 m elevation. There was a winding, 1 m wide, permanent stream in the valley, flowing to the river. The major rivers of the area, namely the Qian and You/Yi/Yu rivers converge to become the Xun River, which flows through Zhujiang to the sea. The water in the stream was clear, 20–30 cm deep, 12.9°C, with a pH of 5.5. Yang said the locals often find *C. mccordi* where there are many bamboo and thus call it the "yellow bamboo turtle". Because the local economy is poor and the level of education is low, the people in area "A" are more concerned with survival than the affects of their activities on a turtle. They would catch and sell every last one if possible.

In January 2006, a field trip was made by the senior author to the You River basin in western Guangxi Province. Upon arrival at the Baise live animal market, questions were asked and photos of *C. mccordi* were shown, but only *Pelodiscus sinensis* and *Platysternom megacephalum* were present. Tiandong and Lingyun had equally disappointing results, but Pingguo gave some hope. After a number of people did not recognize *C. mccordi,* one elderly man said he had found the species eight years ago. Further questioning revealed that he did know differences between *C. mccordi* and *C. trifasciata*, giving his identification at least the possibility of having some merit, even if he was trying to please the senior author as is customary in China when dealing with a stranger.

In April 2007, Zhou, Blanck and Pi-Peng Li together with three Austrian turtle biologists undertook another journey to area "A". In this trip, more sites of suspected occurrence of *C. mccordi* were visited and more locals were interviewed to get further insight on the habitat and habits of *Cuora mccordi* in the wild. Due to the rarity of the species, we were unable to find a living specimen, but we continue to believe that the species exists in the vicinity. The data gathered (see below) further substantiates that *C. mccordi* has originated from this area.

More field research by these authors is planned in the spring of 2008.

TURTLE FARMS SURVEY

To end the speculation of farm origin of *Cuora mccordi* we visited many small and large turtle breeding farms in Hainan, Guangdong, Guangxi, Jiangsu and Zhejiang provinces, plus Shanghai City, China. We found only two specimens; one adult male and one adult female in a farm in Guangdong Province, without breeding success (Zhou and Gu, 2005, Zhou, 2006). *Cuora cyclornata*, *Cuora flavomarginata* and *Cuora trifasciata* are abundant in all sizes in these farms and are readily bred. Many hybrid-types were found in the farms, e.g. *Mauremys iversoni* (Pritchard and McCord, 1991), *Mauremys pritchardi* (McCord, 1997), *Ocadia sinensis* (Gray, 1834) x *Mauremys mutica, Chinemys nigricans* (Gray, 1834) x *Mauremys mutica*, *C. cyclornata* x *Cuora* (*Pyxidea*) *mouhotii, Mauremys annamensis* x *C. trifasciata*, etc. These hybrids were proudly shown to us by the farm owners, and no *Cuora mccordi*-like specimens were observed. No other surveys of Chinese turtle farms report finding *C. mccordi* (Shi and Parham, 2001; Parham and Shi, 2001; Shi and Fen, 2002; Shi et al., 2004; van Dijk, 2005; Zhou et al., 2005; Zhou et al., 2007; Auer, pers. comm.; Lau, pers. comm.; Shi, pers. comm.; van Dijk, pers. comm.). The above leads us to firmly believe that *Cuora mccordi* is not of hybrid origin.

Figure 2. View of river at area "A". Photo Li Pi-Peng

Figure 3. A Saipan boat; the only access to *Cuora mccordi* habitat. Photo Li Pi-Peng

Figure 4. Valley with stream; *Cuora mccordi* habitat. Photo Zhou Ting

Figure 5. Stream and heavy vegetation; *Cuora mccordi* habitat. Photo Torsten Blanck

Figure 6. Stream and vegetation; *Cuora mccordi* habitat. Photo Torsten Blanck

Figure 7. Typical vegetation; *Cuora mccordi* habitat. Photo Torsten Blanck

Figure 8. Mountain village near *Cuora mccordi* habitat. Photo Li Pi-Peng

HABITAT

The habitat preference of the species appears to be complex. On first appearance, *C. mccordi* inhabits broad-leafed forests interspersed with thicket, shrubs and bamboo stands, situated near small, slow moving, shallow streams, in hilly areas at 50–150 m elevation. Upon further evaluation, populations seem to occur in isolated areas. According to the mountain villagers interviewed in 2007, all *Cuora mccordi* encountered were captured in three iso-

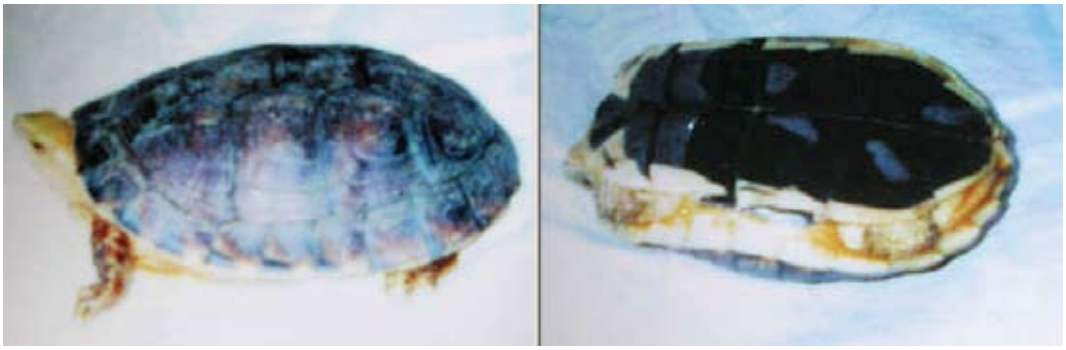

Figure 9. *Cuora mccordi* said to be collected by Mr. Yang in area "A". Photo from Mr. Yang

Figure 10. Bamboo leaf-litter; the most likely *Cuora mccordi* habitat. Photo Zhou Ting

Figure 11. Bamboo leaf-litter; the most likely *Cuora mccordi* habitat. Photo Torsten Blanck

Figure 12. Bamboo leaf-litter; the most likely *Cuora mccordi* habitat. Photo Zhou Ting

Figure 13. Close-up of bamboo leaf-litter; the most likely *Cuora mccordi* habitat. Photo Li Pi-Peng

Figure 14. Adult female *Cuora mccordi.* Photo W. P. McCord

Figure 15. Plastral pattern of *Cuora mccordi.* Photo Zhou Ting

Figure 16. Head of *Cuora mccordi.* Photo Torsten Blanck

lated areas of about 1 km² each, approximately 2–3 km from each other. No turtle was ever captured between these areas. All these areas contain bamboo stands, amongst which most specimens have been captured. There is usually a stream nearby, and sometimes the terrain is quite steep. According to the villagers, *Cuora mccordi* occurs syntopically with *Cuora trifasciata*, but *Cuora mccordi* rarely if ever enters the stream, while *Cuora trifasciata* is always found in or near the stream. Other local species according to the villagers are *Sacalia quadriocellata, Platysternon megacephalum* and rarely *Geoemyda spengleri* (Gmelin, 1789) which has not been found for a decade.

BEHAVIOUR

Based on data provided by the mountain villagers, *Cuora mccordi* is most active during heavy rains and/or in the afternoon, generally between 1600–2100 h, while *Cuora trifasciata* is usually nocturnal. *Cuora mccordi* often hides amongst bamboo roots, beneath bamboo foliage or under shrubs and in the thicket; it does not dig into the soil. *Cuora mccordi* feeds on earthworms which appear at the surface of the soil when it rains. Mating has been observed in March, egg deposition in April and May. Eggs seem to be buried by several females in close proximity, generally in forest clearings. No turtles have been found in the wild during the cooler winter season.

DISTRIBUTION

Due to the scarcity of the species and the current demand as demonstrated by the prices offered, we refrain from more accurately disclosing this data (i.e. area "A") until effective measures of protection have been taken to keep this species from commercial exploitation, as has happened recently with *Cuora pani aurocapitata* (Luo and Zong, 1988) after detailed distribution data was published (Blanck and Kremser, 2007). The IUCN and Markus Auer, who is presently undertaking a major *Cuora* conservation project for

Figure 17. Map of Guangxi Province, China, showing areas with an elevation between 45 m and 250 m (red).

Figure 18. Map of Guangxi Province, China, showing the remaining natural forest areas of the region (green).

Figure 19. Map of Guangxi Province, China, showing the suspected distribution of *Cuora mccordi* (yellow) created by showing where figures 16 & 17 overlap.

the EAZA, have been informed of the precise known distribution and will, in conjunction with other organizations attempt to enforce protection as soon as possible**.** For now, the published known and suspected distribution is restricted to the Qian, Xun and You/Yi/Yu river basins of Guangxi Province, China, and thus the species appears highly endemic.

GENERAL DESCRIPTION

According to Ernst (1988), also cited by Ernst and Barbour (1989), Zhou and Zhou (1992), Zhao and Adler (1993), Rogner (1995) and Ernst et al. (2000), a straight carapace length (SCL) of 13.4 cm (12.1 cm in males, 13.4 cm in females) is reached. McCord and Iverson (1992), also cited by Schilde (2004), reported an average

Figure 20. *Cuora* enclosures at Münster, Germany. Photo Torsten Blanck

Figure 21. *Cuora mccordi* depositing eggs in nest. Photo Dave Lee

Figure 22. *Cuora mccordi* emerging from egg. Photo W. P. McCord

Figure 23. *Cuora mccordi* hatchling. Photo W. P. McCord

Figure 24. *Cuora mccordi* hatchling – note keels. Photo W. P. McCord

Figure 25. Hatchling *Cuora mccordi* – note marginal scute variation. Photo Lu Wei

SCL of 11.76 cm (10.7–13.1 cm) in males and 13.71 cm (12.1–14.9 cm) in females; Schroller (2005) reported males being 13.1–13.2 cm and females reaching 10.2–14.3 cm; Vetter and van Dijk (2006) stated 12–15 cm for the species in general; Artner (2003; 2006) mentioned that his males measured 13.4–14.1 cm and the females 15.36–15.74 cm, being the greatest SCL yet known. CITES (1999) listed that the species can reach up to 16.5 cm SCL referring to data from Artner (1998). Blanck (unpublished.) found an adult female of 16.55 cm SCL in a Hong Kong collection and Zhou (2007) reported a 15.0 cm SCL male and an 18.4 cm SCL female specimen, a new size record, verified by Blanck (2007). In general, males reach about 14cm SCL and females 16–17 cm. This demonstrates that *C. mccordi* is not "small" for a *Cuora*, as believed by Fritz and Obst (1998), but rather similar in size to most (except large *Cuora amboinensis* and *Cuora cyclornata) Cuora* species (see McCord and Iverson, 1991; Schilde, 2004; Blanck and

Tang, 2005; Blanck, 2005; Blanck et al., 2006a; Blanck et al., 2006b; Zhou, 2007; Zhou et al., 2007; for size records of other *Cuora* species). Weight of adult males varies from 350–450 gm and in females from 441–960 gm at SCL between 13.1–15.0 cm and 14.3–18.4 cm, respectively (Artner, 2003; 2006; Schroller, 2005; Zhou, 2007).

The carapace is oval and slightly elongated, slightly more oval in females than in males; moderate-highly domed in females and slightly or moderately domed (flatter) in males. The carapace displays a strong median keel in young animals, which fades to being only present on V3-4, then just V4, before disappearing completely in mature animals. Lateral keels are barely present (seen only with a keen eye and some imagination) in hatchlings and soon disappear. The ground colour is reddish brown to chocolate brown, with black pigmentation in the form of blotches, varying lines or darkened seams. The marginals may exhibit black round-triangular blotches on the distal inter-marginal seams, but always have varying black markings of some sort; marginals usually with an interrupted thin yellow periphery of varying thickness, more prominent in younger animals, often involving only M1-M8. The plastron has a poorly developed anal notch and has cream-yellow ground coloration, with a central black pattern extending from the anal to the humeral scutes, covering 90–95% of the pectoral, abdominal, femoral and anal scutes. The humeral scutes have a horizontal black stripe/bar of varying thickness along the caudal aspect, sometimes covering only 10% of the scute, usually 30–50%, rarely up to 90% of the scute. The gulars are usually completely black. The ventral marginals are usually uniformly yellow or orange, often a blend of the two colours with more intense orange posterior to M4; black triangular blotches are usually absent on the ventral marginals of *C. mccordi*, while always present in *Cuora trifasciata* and *Cuora cyclornata*. Two elongated, often connected black blotches are present along the bridge. The head is intense yellow dorsally, yellow laterally, with a deep yellow to usually orange lateral stripe bordered by two varying thin black lines from nostrils to anterior orbit, then posterior orbit to the posterior of the head, not extending onto the neck. The upper eyelids and dorsal head medial to the orbits have a greenish tinge. Irregular black blotches can sometimes be seen on the dorsal head. The iris is bright yellow, with a black horizontal bar running through the pupil. The chin is cream yellow to orange

The scales of the extremities are orange ventrally, chocolate brown to black dorsally (similar to carapace); soft parts are yellow-brown. The tail is yellow-orange ventrally, orange dorsally, with a median dorsal black stripe.

CAPTIVE MANAGEMENT

With the exception of *Cuora amboinensis* and *C. flavomarginata, C. mccordi* and all other *Cuora*, whether due to unavailability, price or high mortality, are poorly represented in private captive populations.

Despite the initial low numbers of wild stock of *C. mccordi* and early problems developing breeding techniques (Artner, 1998) the species is now successfully bred in Austria, China, Germany, Japan, Switzerland and USA, with the numbers in captivity more than doubling in the last five years.

The current estimates on specimens in captivity are as follows:

Barzyk (1999) estimated ca. 350 specimens worldwide in captivity; Meier (2000) estimated 70 specimens in US collections and 40–45 specimens in Europe; Struijk et al. (2005) listed 15.21.26 specimens in the European studbook and estimated that more than 80 specimens exist in Europe. Meier (pers. comm.) estimates that about 100 specimens are currently kept in Europe. According to our data, present captive stock is ~ 110 specimens in the US, ~ 40 specimens in Hong Kong, ~ 30 specimens in Japan, ~ 41 in China and ~ 110 specimens in Europe, all with some degree of breeding success.

According to Pauler and Praedicow (in Fritz and Obst, 1998) and to Hennig and Schilde (2005), the species is primarily aquatic, but many other authors believe *C. mccordi* is primarily terrestrial (Praedicow in Schilde, 2004; Hertwig, 2005; Schroller, 2005; Artner, 2003, 2006; Meier, pers. comm.; Valentin, pers. comm.; Tang pers. comm.; Lu Wei, pers. comm.) and maintain the species in terrariums with 33% or more land area and water depth of between 5–15 cm. According to Rogner (1995), *C. mccordi* is a good swimmer and hides in water when disturbed, but

Artner (2006) reports a case of drowning of a specimen that was kept primarily aquatic in 35 cm deep water. We observe adults of the species to spend 60–65% of the time out of the water, the rest of the time wading or swimming, thus we prefer to designate *C. mccordi* as semi-terrestrial. Hatchlings and juveniles enjoy hiding under the surface of shallow water, camouflaged by plant material such as submerged sphagnum moss. Artner (2006) reported a rather nocturnal lifestyle, while Meier (pers. comm.) and our observations show a diurnal pattern, with the most activity at dawn. *C. mccordi* usually hides buried in damp soil with only its head periscoping out at times, or beneath sphagnum, leaves or bark during much of the day (Artner, pers. comm., Meier, pers. comm., these authors, pers. obs.).

The species is best maintained at temperatures of 20–28°C with maximum acceptable temperatures of 32–35°C (Schilde; 2004; Hertwig, 2005; Schroller, 2005; Artner, 2006).

Some breeders hibernate their specimens from November to March at temperatures between 4–15°C (Schilde, 2004; Hertwig, 2005; Schroller, 2005; Artner, 2006; Meier pers. comm.; these authors, pers. obs.) and some claim that only hibernated specimens will mate and produce fertile offspring, although one of us (WPM) has regularly produced offspring for almost 20 years without hibernation. Lu Wei (pers. comm.) reports that specimens kept outdoors in Shanghai enter hibernation at ca. 10°C and resume motor activity at 16°C, feeding again at 18°C.

Courtship and mating in captivity occurs soon after hibernation (Artner, 2006), i.e., March-April, which is likely also the mating season in the wild. As with most other turtles, breeding is also stimulated during and after "rainfall".

In hibernated animals, eggs are deposited from April to August in 1–3 clutches with 1–4 eggs per clutch (Schilde, 2004; Artner, 2006). Eggs vary in size from 37–42 x 22–24.5 cm (Fritz and Obst, 1998; Schilde, 2004; Artner, 2003; 2006) in Europe and 44.5– 58.1 x 20.6–23.6 cm in China (Zhou, 2007) and weigh 12–20 gm. Non-hibernated animals are known to lay 2–3 clutches per year throughout the year, usually 2 eggs, rarely 1 or 3 per clutch.

The eggs have been successfully incubated at temperatures between 26.5–30°C with and without night fluctuation (Hertwig, 2005; Artner, 2006). Juveniles usually hatch after 72–82 days incubation at these temperatures (Schilde, 2004; Schroller, 2005; Artner, 2006) and measure 35–40 cm SCL, weighing 12–15 gm (Artner, 2006; these author's pers. obs.). To this date only female offspring have been produced in captivity (Meier pers. comm.; these authors pers. obs.).

VULNERABILITY AND THREATS

As with all turtles in China, habitat destruction and the collection of turtles for food, TCM and the pet trade have not left this species untouched. According to locals, the species was found in small but sustaining numbers two decades ago, whereas in the last few years, even a single specimen is a rare find. Unfortunately, the locals in the range of *C. mccordi* are giving increased attention to catching this highly endemic species, which appears to be on the brink of extinction. Knowledge of its current value in the Chinese pet trade has reached even the most remote mountain villages.

In an interview in 2007, one of the mountain villagers claimed that 20 years ago, he got about 50 Yuan (about $/€ 5) per turtle, be it *C. mccordi* or *C. trifasciata*, but now, he is offered 20,000 Yuan (about $/€ 2,000) per specimen of either species. This does not include the commission of the mountain trader like Yang selling to the city trader like Li who again sells it to a pet trader in Wuzhou or Guangzhou which leads to a retail price of $/€ 3,000 or more, depending on size and sex. The villagers are always searching for the rare turtles these days, as one turtle fetches more than a year's wages for a mountain family. The adult mountain villagers say they collected dozens of *C. mccordi* and *C. trifasciata* annually 20–30 years ago but it is now more difficult with one to two specimens per year captured in recent years. The last reported *C. mccordi* caught was in 2005. Fortunately, the habitat visited remains mostly intact, with some wood gathering by the villagers only, suggesting that the release of captive bred animals would be plausible in the future.

We recommend the following conservation measures to be taken immediately to protect the species:

- Further field investigation to clarify the distribution and current population status.

- Improvement in captive breeding techniques. *C. mccordi* is known to acclimatize and breed well in captivity, however only female offspring have been produced. Thus, we suggest an in situ breeding project with the hope of hatching some males.
- Educate local citizens as to the plight of this national treasure.
- Creation of protected areas.
- Enforcement of existing protective measures since *C. mccordi* is presently on the Chinese Species Red Name List, is in the China Endangered Animal Red Book, is internationally regulated on Appendix II of CITES, and is indicated as Critically Endangered in the IUCN's Red List. The key measure that must be taken is to include *C. mccordi* in Chinese domestic legislation as a Class I protected species, similar to the Giant Panda.

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