CONSERVATION BIOLOGY OF FRESHWATER TURTLES AND TORTOISES

A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group

Edited by

Anders G.J. Rhodin, John B. Iverson, Peter Paul van Dijk,
Craig B. Stanford, Eric V. Goode, Kurt A. Buhlmann, and Russell A. Mittermeier

Cuora yunnanensis (Boulenger 1906) –
Yunnan Box Turtle

Torsten Blanck, John B. Iverson, Ting Zhou, and Fengting Zhou

Chelonian Research Monographs
Number 5 (Installment 19) 2025: Account 130

Published by
Chelonian Research Foundation and Turtle Conservancy

in association with
IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Re:wild,
Turtle Conservation Fund, and International Union for Conservation of Nature / Species Survival Commission

Chelonian Research Monographs
Contributions in Turtle and Tortoise Research

CHELONIAN RESEARCH MONOGRAPHS (CRM) (ISSN 1088-7105) is an international peer-reviewed scientific publication series for monograph-length manuscripts, collected proceedings of symposia, edited compilations, and other longer research documents focused on turtles and tortoises. The series accepts contributions dealing with any aspects of chelonian research, with a preference for conservation or biology of freshwater and terrestrial turtles and tortoises. Bibliographic and other reference materials are also of potential interest. Submit manuscripts directly to Anders Rhodin at the e-mail address above. The series is published on an occasional basis, from 1996–2016 by Chelonian Research Foundation, and from 2017 and on by Chelonian Research Foundation and Turtle Conservancy.

Published CRM Issues

CRM 1. The Galápagos Tortoises: Nomenclatural and Survival Status. 1996. By Peter C.H. Pritchard. 85 pp. Open-access pdf available here.

CRM 2. Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia. 2000. Edited by Peter Paul van Dijk, Bryan L. Stuart, and Anders G.J. Rhodin. 164 pp. Open-access pdf available here.

CRM 3. Biology and Conservation of Florida Turtles. 2006. Edited by Peter A. Meylan. 376 pp. Open-access pdf available here.

CRM 4. Defining Turtle Diversity: Proceedings of a Workshop on Genetics, Ethics, and Taxonomy of Freshwater Turtles and Tortoises. 2007. Edited by H. Bradley Shaffer, Nancy N. FitzSimmons, Arthur Georges, and Anders G.J. Rhodin. 200 pp. Open-access pdf available here.

CRM 5 (Installments 1–19, 130 accounts to date). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. 2008–2025. Edited variously by Anders G.J. Rhodin, John B. Iverson, Peter Paul van Dijk, Kurt A. Buhlmann, Peter C.H. Pritchard, Craig B. Stanford, Eric V. Goode, Raymond A. Saumure, and Russell A. Mittermeier. 1,408 pp. to date. All accounts available as open-access pdf downloads: follow links here.

CRM 6. Turtles on the Brink in Madagascar: Proceedings of Two Workshops on the Status, Conservation, and Biology of Malagasy Tortoises and Freshwater Turtles. 2013. Edited by Christina M. Castellano, Anders G.J. Rhodin, Michael Ogle, Russell A. Mittermeier, Herilala Randriamahazo, Rick Hudson, and Richard E. Lewis. 184 pp. Open-access pdf available here.

CRM 5 (Installment 8). Turtles and Tortoises of the World During the Rise and Global Spread of Humanity: First Checklist and Review of Extinct Pleistocene and Holocene Chelonians. 2015. TEWG [Turtle Extinctions Working Group: Anders G.J. Rhodin, Scott Thomson, Georgios L. Georgalis, Hans-Volker Karl, Igor G. Danilov, Akio Takahashi, Marcelo S. de la Fuente, Jason R. Bourque, Massimo Delfino, Roger Bour, John B. Iverson, H. Bradley Shaffer, and Peter Paul van Dijk]. 66 pp. Open-access pdf available here.

CRM 7. Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status (8th Ed.). 2017. TTWG [Turtle Taxonomy Working Group: Anders G.J. Rhodin, John B. Iverson, Roger Bour, Uwe Fritz, Arthur Georges, H. Bradley Shaffer, and Peter Paul van Dijk]. 292 pp. Open-access pdf available here.

CRM 8. Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status (9th Ed.). 2021. TTWG [Turtle Taxonomy Working Group: Anders G.J. Rhodin, John B. Iverson, Roger Bour, Uwe Fritz, Arthur Georges, H. Bradley Shaffer, and Peter Paul van Dijk]. 472 pp. Open-access pdf available here.

CRM 9. Range-Wide Demographic Collapse and Extinction Dynamics of the Endemic Burmese Roofed Turtle, *Batagur trivittata*, in Myanmar. 2024. Steven G. Platt, Win Ko Ko, Kalyar Platt, Tint Lwin, Swann Htet Naing Aung, Khin Myo Myo, Me Me Soe, Myo Min Win, Kyaw Thu Zaw Wint, Htun Thu, Shine Hsu Hsu Naing, Brian D. Horne, and Thomas R. Rainwater. 26 pp. Open-access pdf available here.

CRM 10. Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status (10th Ed.). 2025. TTWG [Turtle Taxonomy Working Group: Anders G.J. Rhodin, John B. Iverson, Uwe Fritz, Natalia Gallego-García, Arthur Georges, H. Bradley Shaffer, and Peter Paul van Dijk]. 575 pp. Open-access pdf available here.

Other Chelonian Research Foundation & Turtle Conservancy Publications

Turtles in Trouble: The World's Most Endangered Tortoises and Freshwater Turtles – 2025. TCC [Turtle Conservation Coalition: Craig B. Stanford, Anders G.J. Rhodin, Peter Paul van Dijk, Torsten Blanck, Eric V. Goode, Rick Hudson, Andrew D. Walde, Jordan Gray, Russell A. Mittermeier, and Vivian P. Páez. (Eds.)]. 2025. 77 pp. Open-access pdf available here.

Tortoises in the Mist: Turtle Poetry for Conservationists. Anders G.J. Rhodin and Eric V. Goode (Eds.)]. 2021. 106 pp. Open-access pdf available here.

CHELONIAN RESEARCH MONOGRAPHS (CRM) issues are variously available for purchase from Chelonian Research Foundation and Turtle Conservancy. Contact either Turtle Conservancy (www.turtleconservancy.org) or Chelonian Research Foundation (www.chelonian.org/crm; 564 Chittenden Dr., Arlington, VT 05250 USA; 978-807-2902; RhodinCRF@aol.com) for prices, titles, and to place orders for available print copies. Chelonian Research Foundation (founded in 1992) and Turtle Conservancy (founded in 2005 as Chelonian Conservation Center, renamed in 2010) are nonprofit tax-exempt organizations under section 501(c)(3) of the Internal Revenue Code.

Conservation Biology of Freshwater Turtles and Tortoises:
A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group
Rhodin, Iverson, van Dijk, Stanford, Goode, Buhlmann, and Mittermeier (Eds.)
Chelonian Research Monographs (ISSN 1088-7105) No. 5 (Installment 19), doi:10.3854/crm.5.130.yunnanensis.v1.2025

Cuora yunnanensis (Boulenger 1906) – Yunnan Box Turtle

Torsten Blanck[1], John B. Iverson[2], Ting Zhou[3], and Fengting Zhou[4]

[1]*Cuora Conservation Center of Turtle Island, 8530 Deutschlandsberg, Austria [info@cuora.org];*
[2]*Department of Biology, Earlham College, Richmond, Indiana 47374 USA [johni@earlham.edu];*
[3]*Hainan Academy of Forestry, Haikou 571100 China [zt63@263.net];*
[4]*Haikou Jiuzhou Turtle Research Center, Haikou 571100 China*

Summary. – The Yunnan Box Turtle, *Cuora yunnanensis* (family Geoemydidae), was described in 1906 and considered lost or extinct for nearly a century. The species reappeared in the Chinese trade in 2004 and was subsequently also recorded from the wild. It has been validated genetically, thereby negating any speculation of hybrid origin. This species likely represents, together with its genetic sister taxon *Cuora zhoui*, two of the rarest extant chelonian species. It is a medium-sized freshwater turtle (straight-line midline carapace length reaches 152 mm in males and 190 mm in females). Information on the biology of this species is mainly based on captive studies. Mating occurs in spring and fall, but usually only a single clutch of 4–8 eggs (8–13 g each) is laid each year, usually in April to May. Incubation takes 64–68 days. Due to rampant habitat destruction and the demand in the Chinese national pet trade, it is severely threatened by extinction.

Distribution. – China. Occurs in north-central Yunnan and possibly also in southern Sichuan.

Synonymy. – *Cyclemys yunnanensis* Boulenger 1906, *Cuora yunnanensis*, *Pyxiclemmys yunnanensis*.

Subspecies. – None recognized.

Status. – IUCN 2025 Red List: Critically Endangered (CR B2ab(ii,iii,v), D; assessed 2010), changed from prior status as Extinct (EX; assessed 2000); CITES Appendix II (since 2000); European Union Council Regulation 338/97 (EUCR) CR: Annex B (since 2000); China Red Data Book: Probably Extinct (assessed 1998); Class II of China's Nationally Protected animals since 1988 (as all *Cuora* species considered native to China); China Species Red List: Critically Endangered (2016), Extinct (2004).

Taxonomy. — *Cuora yunnanensis* (family Geoemydidae) was described as *Cyclemys yunnanensis* by Boulenger (1906), then curator of reptiles and amphibians at the British Museum of Natural History in London (BMNH, now the Natural History Museum). The description was primarily based on the morphology of a subadult female (138 mm straight-line carapace length (SCL); BMNH 1946.1.22.97), designated as lectotype by Blanck (2005). The specimen was received by Boulenger in 1905, collected by Father Dymond in "Tongchuan Fu" = Zhongping (Huize) City in Huize County, northeastern Yunnan Province, China (Blanck et al. 2006b), which Father Dymond transferred to Father Graham in Kunming, Yunnan, China, who donated it to the British Museum. Shortly before the description was published, in 1906, Boulenger received five further specimens from Father Graham from "Yunnan Fu" (= Kunming), forming the paralectotype series (Blanck 2005). These specimens are BMNH 1946.1.22.98–99 and 1946.1.23.1–3 (four are subadult to adult males, with BMNH 1946.1.23.2 being a juvenile). The juvenile is now in the Shanghai Science and Technology Museum in Shanghai (SSTM 87III013), and was apparently depicted in Zhang et al. (1998) as a "faked" living specimen) from "Yunnan Fu" (= Kunming). Father Graham was in the possession of three further specimens, all of them males from the same locality (Kunming) as the specimens he donated to the BMNH. These were sold by a broker named Mr. Rosenberg to two other European Museums in 1906 and 1907: one to the Muséum National d'Histoire Naturelle in Paris (MNHN 1907.10) and two to the Naturhistorisches Museum Wien [Vienna] (NHMW 29936.1–2).

Boulenger placed this species in the genus *Cyclemys* (Bell 1834), treating *Cuora* as a synonym of *Cyclemys*, possibly due to misunderstanding the degree of hinge mobility in the different genera involved, or because Boulenger received the specimens already preserved in formalin, which is known to decrease the mobility of the plastral hinge, as is also the situation with young specimens. Smith (1931) was the first to revalidate the genus *Cuora* (Gray 1856) and assign *Cuora yunnanensis* to that genus.

Many researchers, as noted by Blanck (2005), believed *Cuora yunnanensis* might be a hybrid, possibly between *Cuora pani* (Song 1984) and *Mauremys reevesi* (Gray 1831), or *Mauremys annamensis* (Siebenrock 1903), each

Figure 1. Adult male *Cuora yunnanensis* from Chuxiong prefecture, Yunnan, China. Photo by Torsten Blanck.

of which shares a number of morphological features with *Cuora yunnanensis* (Blanck et al. 2006b). Farm surveys in southern China (Blanck 2007; Zhou et al. 2008a; Zhou, Li, and Blanck, pers. obs.) found no *Cuora yunnanensis*-like specimens, while many other true hybrids between other taxa were found in abundance (Zhou et al. 2008a; Blanck and Zhou, pers. obs.). Furthermore, hybrids of *Mauremys reevesii* x *Cuora pani* have since been produced in captivity and do not look at all like *C. yunnanensis* and do not possess a plastral hinge (Blanck *in* Vetter and van Dijk 2006; Zhou et al. 2023; Blanck, McCord, and Zhou, pers. obs.). Most importantly, subsequent genetic analysis confidently indicated that *C. yunnanensis* does not represent a hybrid (Parham et al. 2004; He et al. 2007; Spinks and Shaffer 2007; Spinks et al. 2012; Thomson et al. 2021).

The phylogenetic placement of *C. yunnanensis* within the genus has varied across the genetic analyses cited above, depending on which markers were used. The most comprehensive analysis to date is that of Thomson et al. (2021), based on 15 nuclear genes. That analysis placed *C. yunnanensis* as sister to *C. zhoui* (see also Spinks et al. 2012), and that clade as sister to one including *C. trifasciata* (Bell 1825), *C. aurocapitata* (Luo and Zong 1988), *C. pani* (Song 1984), *C. mccordi* (Ernst 1988b), *C. flavomarginata* (Gray 1863), and likely also *C. cyclornata* (Blanck et al. 2006a), which Thomson et al. (2021) did not include in their study, considering it at that time as part of *Cuora trifasciata*, which was proven differently by Tiedemann et al. (2014).

No subspecies of *C. yunnanensis* are recognized, but He et al. (2007) showed that mitochondrial DNA divergence of up to 2% exists between the Museum specimen (MNHN 1907.10) used by Parham et al. (2004) and the three living specimens they sampled. They also substantiated morphological differences between the known living

Figure 2. Adult female *Cuora yunnanensis* in the wild in Chuxiong prefecture, Yunnan, China, May 2009. Photo by Michael Lau.

Figure 3. Adult female *Cuora yunnanensis* from Kunming, Yunnan, China; original trade specimen recorded in 2004. Photo by Ting Zhou, William P. McCord, and Torsten Blanck.

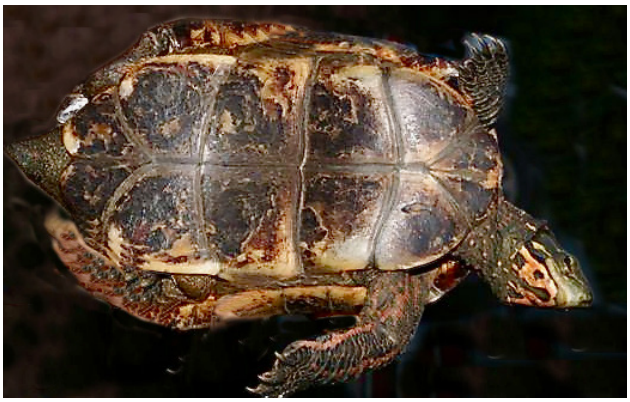

Figure 4. Adult male *Cuora yunnanensis*; same animal as in Figs. 1 and 5, when first collected in the wild in Chuxiong prefecture, Yunnan, China, May 2009. Photo by Michael Lau.

Figure 5. Adult male *Cuora yunnanensis* from Chuxiong prefecture, Yunnan, China; same animal as in Figs. 1 and 4, after several years in captivity. Photo by Torsten Blanck.

specimens in Chinese collections compared to museum specimens collected in the early 20th century, indicating that they might originate from different subpopulations.

The fossil species *Cuora pitheca*, described by Yeh (1981) from Lufeng, Chuxiong district, Yunnan, China, is based on four specimens (all in the collection of the Institute of Vertebrate Paleontology and Paleoanthropology of Beijing (V6178 and 6178.1–3). These specimens consist of a well-preserved carapace measuring 190 mm in carapace length (V6178); a very well-preserved plastron (V6178.1); the posterior lobe of a plastron (V6178.2); and a fragment of a plastron (V6178.3). Yeh (1985, 1994) added three more specimens (V6178.4–6), consisting of a well-preserved carapace (V6178.4) measuring 195 mm in length, the posterior lobe of a plastron (V6178.5) and a fragment of an anterior lobe (V6178.6).

These fossils were initially dated to be about 8–11 mya, but subsequently estimated at 7–9 mya, i.e., late Miocene to early Pliocene (Yeh 1981, 1985; Wang and Qi 2005; Deng 2006; Deng and Qi 2009; Naksri et al. 2013). It is intriguing that *C. pitheca* occurred within the known range of *C. yunnanensis*, but at the time of its description, Yeh had no access to a *C. yunnanensis* specimen for comparison. Naksri et al. (2013) in their description of fossil *Cuora chiangmuanensis*, stated that *C. yunnanensis* lacked an anal notch, but apparently, they only used a photo of an old female *C. yunnanensis* and had no access to more specimens for comparison, otherwise they would have noted that the anal notch is well developed in most specimens of *C. yunnanensis* (see Blanck 2005), and as such did not consider that these two species could be closely related.

We compared the available material of *C. pitheca* to the shell of a *C. yunnanensis* from the collection of Zhou and to photographic material of 60 live specimens plus the 12 known museum specimens to which we had access. The similarities are intriguing, especially since the very intact plastron of *C. pitheca* perfectly matches that of *C. yunnanensis*. The entoplastra of V6178.1 and V6178.6 are indistinguishable from those of *C. yunnanensis*, as are the sizes and proportions of the intergular, epiplastron, hyoplastron, and the scute sulci. The hypoplastron and especially the xiphiplastron of specimens V6178.1, 2, and 5 perfectly resemble that of *C. yunnanensis*, including the positions of the scute sulci. The posterior margin of the hypoplastron of *C. yunnanensis* is notched, as it is in all museum specimens of that species (except a very large old female at the Institute of Zoology of the Chinese

Figure 6. Adult female *Cuora yunnanensis* from Chuxiong prefecture, Yunnan, China. Photo by Torsten Blanck.

Figure 7. Adult female *Cuora yunnanensis* from Chuxiong prefecture, Yunnan, China. Photo by Torsten Blanck.

Figure 8. Adult female *Cuora yunnanensis* from Chuxiong prefecture, Yunnan, China. Photo by Haitao Shi.

Figure 9. Adult *Cuora yunnanensis* from Chuxiong prefecture, Yunnan, China. Photo by Haitao Shi.

Academy of Sciences in Beijing, IOZB00167) and all living specimens except four old females. The anal notch is especially well pronounced in males, indicating that V6178.1, which is also significantly smaller than V6178, could have been a male. The shape of the carapace and the topography of the carapacial scute sulci on V6178 and V6178.4 perfectly match that of *C. yunnanensis*, and the size of both specimens suggests they may have been females. Given the close morphological similarity of the two species, the overlapping distribution, and the age of the fossils of *C. pitheca*, we regard it as a chronospecies of *C. yunnanensis* until new fossil material becomes available and future genetic work sheds light on the potential geographic variability of the species.

Description. — This description follows Boulenger (1906), Smith (1931), Pope (1935), Ernst (1988b), McCord and Iverson (1991), Schilde (2004), Blanck (2005, 2006), Bour (2005), Zhou and Zhao (2004), Blanck et al. (2006b), and Zhou et al. (2008b), as well as Blanck and Zhou (pers. obs.) and D.-Q. Rao (pers. comm.).

The largest known male measures 152.2 mm straight-line midline carapace length (SCL) and the largest female 190 mm SCL. The species grows larger than recorded by Ernst (1988b), Pope (1935), Smith (1931), or Boulenger (1906), consistent with other similar *Cuora* species. Females weigh 800–1500 g and males 300–500 g (Blanck et al. 2006b; Blanck, pers. obs.).

The comparatively flatter male and moderately more domed female carapace both have an elongated oval shape, but more so in females. The background color of the carapace is chestnut to dark brown, with adult males darker than females, as seen in both living and preserved museum specimens, i.e., BMNH 1947.1.22.97 (a female) and 1947.1.22.98 (a male). Juveniles and subadults are intermediate between mature adult males vs. females in color intensity. The carapace of adult males is more flared posteriorly than in females, giving the male a pear-like shape from above. In juveniles, subadults, and young adults the carapace displays a distinct central keel flanked by less prominent lateral keels, one on each side. These keels, particularly the laterals, diminish greatly with age. The keels are a distinct light-brown to orange color in living specimens, and more intense in males, yet these colors are hardly visible in museum specimens (Blanck et al. 2006b).

While all museum specimens except NHMW 29936.1, and to a lesser extent NHMW 29936.2, show a rather uniform cream-yellow colored plastron (Blanck 2005, 2006),

Figure 10. Hatchling *Cuora yunnanensis* from Yunnan, China. *Top*: Photo by Ting Zhou, William P. McCord, and Torsten Blanck. *Bottom*: Photo by Torsten Blanck.

this feature is highly variable in living specimens. A wide array of plastral patterns, from nearly entirely uniformly yellow to mainly dark brown to black can be present and may be partially related to the purported geographic origin of the specimens, which requires further study. The seams between the plastral scutes are usually brown to black and the dark plastral pattern varies in width and shape. Most living females in the collections of private keepers show a dark brown to black central figure along the interhumeral to interfemoral scutes with darker seams, covering up to 75% of each scute, and exhibit dark seams on all scutes. Several males show a plastral pattern comparable to that of *C. mccordi* or *C. cyclornata cyclornata*; however, the central figure is not black but lighter, with most of the anal, femoral, and pectoral scutes being dark, except the outer margin, with a thickened black stripe along the humero-pectoral seam. Some specimens, such as NHMW 29936.1, are very similar to *C. pani* and *C. aurocapitata dabieshani*, where the seams are black and the black area covers 30–90% of each scute, often leaving a square shaped yellow area on the outer margin of the scutes. The ventral marginals are generally cream-yellow in color, with some fine blackish or dark brown spots in most specimens.

Hatchlings generally exhibit a dark, nearly black central pattern, that covers 60–90% of each scute, but this usually fades with age to a lighter brownish color to mainly or fully yellow as described. The carapacial keel coloration changes from yellow to orange in hatchlings, to brownish orange with growth and the yellow marginal wedges fade away.

The transverse plastral hinge is well developed between the pectoral and abdominal scutes in adults and the anterior plastral lobe can be completely closed as with other *Cuora*; hinge mobility starts at ca. 85 mm SCL. Boulenger (1906) and Pope (1935) claimed that the hinge of this species is weakly developed, due to only juvenile museum material being available to them. The plastral seam formula is variable, but in most specimens, it is Abd≥Pect≥An>Gul>Fem>Hum. A distinct anal notch is present in juveniles and subadults as well as in males, but can nearly disappear in mature females; however, it never shows fully fused anal scutes, as is the case in *Cuora flavomarginata,* for example.

The background color of the soft parts and head is predominantly brown. The head generally exhibits two dark-bordered yellow lateral stripes which turn from yellow to orange upon reaching the neck. The color intensity and thickness of these stripes is variable, as is the number of stripes present: several living specimens as well as BMNH 1947.1.22.98 have three lateral head stripes present, while in some specimens the head stripes are very thin, incomplete, or partially lacking. In general, the upper stripe begins at the nostril, narrows on the upper eyelid at the orbit, and continues from behind the eye over the tympanum and down the neck dorso-laterally. The lower stripe is often narrower, sometimes discontinuous, and passes along the upper jaw under the eye, under the tympanum, and down the neck ventro-laterally. The variable, diminished third lateral stripe also starts at the nostrils, is interrupted by the orbit, and ends at the tympanum. The jaws are bone-colored. The iris is predominantly yellowish to green, with a black bar running from the 2 to 8 o'clock position.

The throat in females and juveniles is whitish-yellow, but orange in some but not all males, and displays a mottled pattern of brown spots, shapes, or patches in most specimens, the exact pattern being unique to each specimen, making them easy to differentiate individually. However, specimens from the Kunming Institute of Zoology (KIZ) population show the reverse, with a brown chin with white spots on it.

The front limbs have five toes with claws, whereas there are four on the hind limbs. The legs are dark brown in color. The feet are webbed, suggesting an aquatic lifestyle. The lateral edge of the front and hind legs bear a yellow (female and juvenile) or orange (male) stripe. Furthermore, the front limbs have a bold dorsal yellow (female and juvenile) or orange (male) stripe extending from the upper leg to the second claw. Such a stripe is also present in *Mauremys rivulata* and *Mauremys annamensis*, where it extends to the first claw in both. This stripe is not known in other *Cuora* species (TCC 2011).

Leg stripes may vary, i.e., BMNH 1946.1.22.98 exhibits a second dorsal stripe on each front leg, branching off the previously mentioned stripe and ending at the first claw, which is also the case in several living specimens. The medial aspect of the limbs usually displays yellow (female) to orange (male and juveniles) reticulations, as do the soft tissues in the axillary and inguinal recesses. The brown tail has two light yellow dorso-lateral stripes, as is found in *C. pani, C. aurocapitata, C. trifasciata*, and *C. cyclornata*. The ventral tail shows orange spots and stripes in males, and yellow in females.

Cuora yunnanensis shares a tricarinate carapace, the same general carapace and soft tissue coloration, and similar leg, head, and throat patterns with *Mauremys annamensis*, perhaps suggesting convergent evolution.

It is clear that there is much phenotypic variability among the known specimens of *C. yunnanensis*, influenced by growth and possibly geography. Without further studies on the variability across its range, we conclude that there is a high incidence of individual phenotypic variation. Offspring hatched by Zhou and by other breeders in China share very similar patterns with their respective mothers.

Significant sexual dimorphism is present in *C. yunnanensis*. The male carapace is flatter, dorsally pear-shaped, and flared at the 8th to 9th marginal scutes, while the female carapace is higher domed and nearly rectangular

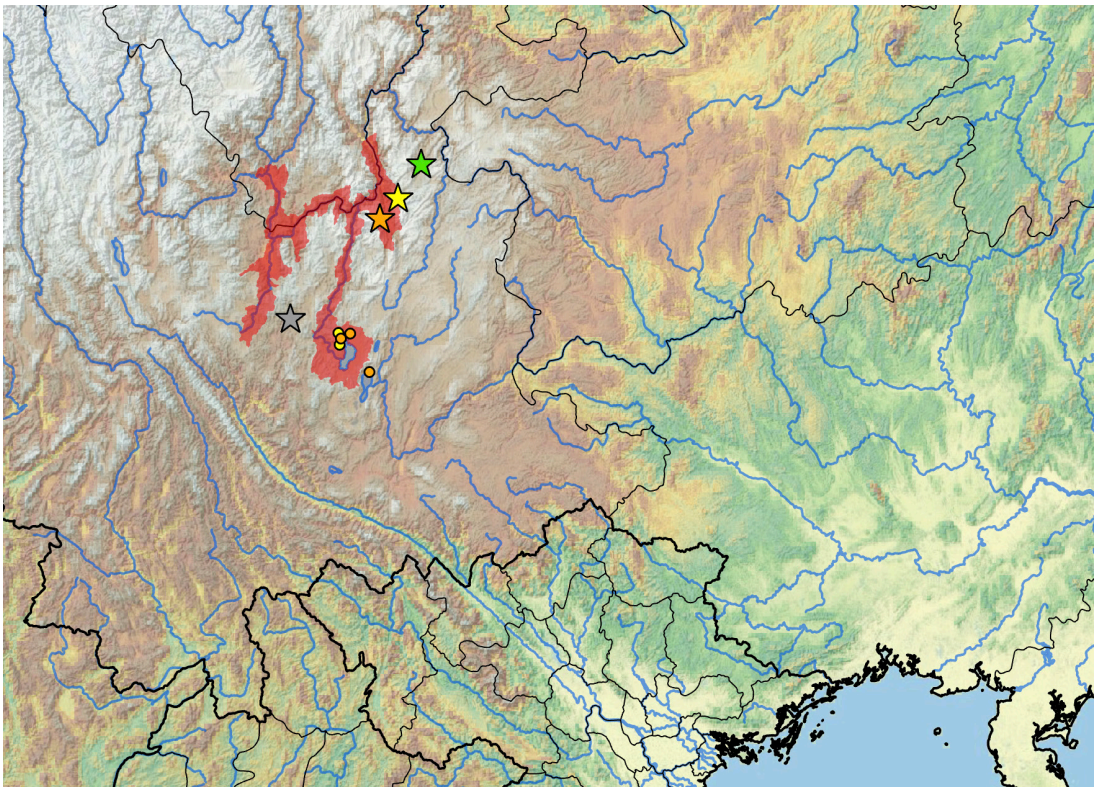

Figure 11. Distribution of *Cuora yunnanensis* in north-central Yunnan and (possibly) southern Sichuan, China. Colored shading = hypothesized historical indigenous range; yellow dots = museum and occurrence records of possibly native populations based on literature records (Iverson 1992; Blanck et al. 2006; TTWG 2021, 2025); orange dots = probable trade specimens; stars = type localities (orange star = restricted syntype locality (Iverson 1992); green star = restricted lectotype locality (Blanck et al. 2006), but with erroneous GPS coordinates; yellow star = restricted lectotype locality (Blanck et al. 2006) with corrected GPS coordinates; gray star = approximate type locality of *Cuora pitheca*, the early Pliocene fossil species). Distribution is based on fine-scaled GIS-defined level 12 HUCs (hydrologic unit compartments) constructed around localities and then adding HUCs that connect point localities in the same watershed or physiographic region, and similar habitats and elevations as verified HUCs, based on TTWG (2021, 2025) and adjusted based on data from the authors. Map by Chelonian Research Foundation.

dorsally; the coloring of the carapace is lighter brown in females than in males; the head of the male is longer in proportion to the carapace length and more pointed than in females; the tail is thicker at its base, and longer in relation to the length of the plastron; the cloaca is situated beyond the rear margin of the carapace in males; and the plastron is slightly concave in adult males, while flat in females.

The head coloration changes in intensity during the mating season: females develop orange-tinted stripes on the neck and limbs, while they are yellow during the rest of the year, and the stripes of males also intensify from yellow or orange to a more intense orange, in some the orange chin pattern turns very bright.

The species can be easily distinguished from its sister species *C. zhoui* by the distinct plastral pattern, the marbled chin pattern, and the darker head pattern.

Distribution. — The lectotype of *Cuora yunnanensis* was obtained from "Tongchuan Fu", which was suggested by Iverson (1992) to be an older synonym of Dongchuan Shi (26°11'N, 103°03'E, 1300 m elevation), which was followed by most authors. However, Blanck et al. (2006b:31) noted that Tongchuan Fu (= Tungchwan-Fu), was not the old name for Dongchuan Shi, but rather the old name for Zhongping (= Huize) City and therefore restricted the lectotype locality to the vicinity of Zhongping (Huize) City and reported GPS coordinates of 26°42′N, 103°30′E for this locality. These coordinates were copied at the time from a Chinese-language website, as modern global map services (e.g., Google Maps) were not yet widely available, and they were unfortunately erroneous. We here correct the GPS coordinates of the Zhongping (Huise) City restricted type locality to 26°24′N, 103°17′E (≈26.40°N, 103.28°E; ca. 2,130 m a.s.l.), which accords with current gazetteers and mapping platforms. This correction does not affect our conclusion that "Tongchuan Fu (Tungchwan-Fu)" refers to Huize (Zhongping) City, rather than Dongchuan Shi.

Of the 12 known museum specimens (Blanck 2005, 2006; Blanck et al. 2006b), 8 were purchased in "Yunnan Fu" (= Kunming; 25°02'N, 102°43'E, 1890 m elevation) (Iverson 1992; Blanck 2005, 2006), the capital of Yunnan province. Also, the first recent living specimen discovered (Zhou and Zhao 2004; Zhou 2005; Blanck 2005, 2006; Bour 2005; Zhou 2007; Zhou and Li 2007; Zhou et al. 2008b; van Dijk et. al. 2010) was purchased in Kunming,

Figure 12. Natural habitat previously occupied by *Cuora yunnanensis* in moderate to slow-moving streams in pine and evergreen broadleaf forests in the valleys of the mountainous highlands of central Yunnan, China, as described by Auer and Blanck (2019). Photos by Torsten Blanck.

the second one from Anning (Zhou 2005; Zhou, pers. obs.), a suburb of Kunming, and the third one again from a suburb of Kunming (van Dijk et al. 2010; Rao pers. comm.), followed by two more (Laufer 2018a,b; Yang and Rao 2008; Rao, pers. comm.). The latter three have been transferred to the KIZ. Clearly, Kunming is and has been an important trade hub for all kinds of goods within the province. Family members from surrounding villages and areas come to visit their relatives in the city, bringing along gifts and goods, sometimes including turtles (Auer and Blanck 2019).

Zhang (*in* Zhang and Cheng 1946) collected a female specimen (IOZB 00167; Blanck 2005, 2006; Blanck et al. 2006b; Fong and Qiao 2010) in April 1940 in the Xishan area of Kunming (= "Western Hill"), today the densely populated Xishan District with a native habitat fragment remaining as a forest mountain park and recreational area (Qipanshan National Forest Park; 24°57'N, 102°38'E, 2200 m elevation). Unfortunately, Zhang did not provide data on the other two specimens, two adult males (IOZB 00168 and 00169), which he also deposited in the IOZB. Recent surveys in the area (Blanck 2005; Rao, pers. comm.) have not provided any further data, but the area in the mountain park is difficult to access.

Li and Wang (1998) reported that *C. yunnanensis* was seen in a Yunnan market in 1997, but this was likely a misidentification of *C. amboinensis* (Daudin 1801).

An online newspaper report in China in 2007 (Anonymous 2007) claimed the finding of *C. yunnanensis* in the wild in Sungyang county, Zhejiang Province, China, unfortunately without any further evidence. As such we regard this record as a misidentification.

In the 2010 IUCN Red List assessment, van Dijk et al. (2010) summarized earlier suggestions that the geographic origin might be northwestern Yunnan and adjacent Sichuan (also Hou, pers. comm.), northeastern Yunnan, close to the Myanmar border, and southern Yunnan and northern Laos, following speculation in several previous papers (Blanck 2005; Blanck et al. 2006b; Zhou et al. 2008b; Yang and Rao 2008).

A local farmer collected an adult female *C. yunnanensis* in a field in Yousuozhen, Chengjiang, Yuxi (24°37'49.12"N 102°55'27.30"E; elevation 1721 m) in 2010 (Anonymous 2010; Auer and Blanck 2019) at the northern shore of Fuxian Lake. Surveys in the area and interviews with locals (Auer and Blanck 2019) yielded no results, and it is believed that this specimen did not originate from this area, but was a family gift (Auer and Blanck 2019; Blanck, pers. obs.).

Gang Chen (2018, pers. comm. to Blanck) conducted a survey along the Red River in Honghe and Lüchun counties, southern Yunnan Province, from where geologists previously claimed to have seen turtles resembling *C. yunnanensis*, but was unsuccessful in finding any trace of the species.

Rao and his team were the first to actually discover a wild population in Chuxiong prefecture, Yunnan, in 2008 (Yang and Rao 2008; Hagen et al. 2011; Laufer 2018a,b; Rao, pers. comm.). The locality is not shown on our map in order to keep it confidential. Lufeng, the type locality of the Pliocene fossil species *C. pitheca* (Yeh 1981) is also situated in this county, as are Yuanmou and Wuding, the alleged and likely inaccurate type localities of *C. pallidicephala* (McCord and Iverson 1991), a junior synonym of *Cuora zhoui* (Zhao 1990), the sister species of *C. yunnanensis*. According to data received by traders and private collectors (pers. comm. to Blanck and Zhou), as well as recent surveys (Auer and Blanck 2019; Blanck, pers. obs.), *C. yunnanensis* also occurs in certain areas of Yuxi prefecture. To our knowledge, the species is endemic to the prefectures of Chuxiong, Yuxi, and Kunming, and possibly also in Qujing, all in central Yunnan province, China. Sun et al. (2016, 2017) and Wang et al. (2022) also listed the species as occurring in central Yunnan. We refrain from providing more detailed locality data for conservation reasons, following Blanck et al. (2017).

Habitat and Ecology. — The natural habitat of *C. yunnanensis* consists of swamps and moderate to slow-flowing streams situated within pine and evergreen broadleaf forests in the valleys of the mountainous highlands of central Yunnan, China. Auer and Blanck (2019) provided some data from a slow-flowing stream, 2–5 m wide, knee deep, at 1700 m, with dense waterplant coverage along its sides, where according to locals, the species previously occurred. A similar habitat was also observed at the known population survey by KIZ. Observed potential prey included prawns, water insects, and small fish.

As suggested by Blanck (2005) and van Dijk et al. (2010), the estimated occupancy elevation of 2000–2260 m given by previous authors (Zong *in* Zhao 1998; Lau and Shi 2000) is probably too high; the species has only been recorded from elevations of 1200–1800 m.

Ecology, natural history, and reproduction of the species is unknown in the wild; all current data come from animals in captivity (see below under Captive Husbandry).

Population Status. — While it was previously considered extinct (ATTWG 2000; McCord and Joseph-Ouni 2002; Joseph-Ouni 2003; Parham et al. 2004), since it had not been recorded since the 1940s, a living female appeared in the Kunming trade in 2004 (see Fig. 3) (Zhou and Zhao 2004; Blanck 2005, 2006; Bour 2005; Blanck et al. 2006b; Zhou 2007; Zhou et al. 2008b; van Dijk et al. 2010). In 2008, after several years of surveys, Rao and his team succeeded in discovering a wild population (Hagen et al. 2011; Rao, pers. comm.). Since the discovery of this first wild population by Rao and his KIZ team, in cooperation with Kadoorie Farm and Botanical Garden, Hong Kong, multiple surveys by Rao (pers. comm. 2021) and others (Auer and Blanck 2019) have not found any

further populations, despite records provided by turtle hunters with photographic evidence showing a male specimen drowned in a trap (pers. comm. to Blanck and Zhou).

Collectors informed Blanck and Zhou that one area from which they received about 20 specimens in the past, has not yielded any new records since 2018. According to Rao, apart from the 10 specimens taken as founders of an assurance colony between 2008 and 2010 (Hagen et al. 2011; Laufer 2018a,b; Blanck, pers. obs.; Rao, pers. comm.), very few specimens were recorded in this area afterwards (2010–2014), indicating very low population density. In 2014, the KIZ team ended their study in this area and focused on locating new populations, but without any luck, despite positive identifications by locals that confirmed the former presence of the species (Rao, pers. comm.). As such, the status of this wild population is difficult to judge but has certainly decreased due to hunting pressure and demand by the Chinese pet trade, as well as severe habitat destruction, and may now be fully extirpated.

While it was estimated by the TCC (2018) that about 50 to 70 total specimens of *C. yunnanensis* were known at the time, a survey carried out by Blanck and Zhou within the Chinese herpetoculturist community in September 2024, including the group currently maintained by the KIZ, yielded a total number of ~50 wild-caught founders and ~70 captive-bred specimens in total, ~10 being male, and their presence in ~15 collections across China. The KIZ assurance colony has successfully hatched a small number of specimens (Rao, pers. comm.). Hong et al. (2022) claimed that 1,340 specimens existed in China, but these numbers were simply based on government declared permits and not on actual living specimens.

Threats to Survival. — The natural rarity and restricted distribution of *C. yunnanensis* render it highly vulnerable. As with all Southeast Asian turtle species, *C. yunnanensis* is threatened by habitat destruction and by the pet trade and potentially by local consumption. The species is apparently endemic to a rather small area and as such these threats are magnified when compared to most other species. While there is pressure from collectors, the small overall numbers in captivity (~50 wild-caught specimens), do not explain its ongoing disappearance from known sites by itself. Auer and Blanck (2019) observed severe detergent and fertilizer pollution of the streams and ponds in central Yunnan that this species requires for survival; in addition, there has been an increase of tobacco plantations in its suspected range. These factors may represent the biggest threats for the species' survival. It has been estimated that up to 98% of the habitat might already be destroyed (TCC 2018).

According to Blanck et al. (2006b), van Dijk et al. (2010) and TCC (2011), amounts of up to $15,000 to $50,000 USD were previously paid by Chinese collectors for this species. According to Laufer (2018a,b), Rao had observed specimens in the trade for $15,000 USD, but prices quoted in the US would be $200,000 USD (Rao, pers. comm.). We refrain from providing any further market prices at this time.

Conservation Measures Taken. — *Cuora yunnanensis* was classified as Class II of China's National Protected Animals in 1988 and has remained so since (2016, 2023). Unfortunately, this seems to have little effect on the poaching and regulation of captive specimens in China.The species has been listed in the Red Data Book of China as "Extinct in the Wild" (Zhao 1998), and reevaluated as "Critically Endangered" in 2016 (Wang et al. 2016). It is currently listed in Appendix II of CITES (1999, coming into effect in July 2000), and a zero export quota was imposed on wild specimens traded for primarily commercial purposes in 2013 (CITES 2013). It was assessed as Extinct in 2000 by the IUCN Red List (ATTWG 2000), with the speculation that it might be a hybrid and that genetic analysis was needed. Its genetic distinctiveness has since been validated, and living specimens were found, so the species was reassessed as Critically Endangered in 2010 by the IUCN (van Dijk et al. 2010). The one known native locality and population is kept strictly confidential by the KIZ team that discovered it, to protect it from poachers, as is the status of the captive assurance colony itself.

Conservation Measures Proposed. — As already recommended by Hagen and Blanck (2011), prohibitive measures against collecting *C. yunnanensis* for any purposes should be enacted and enforced, with exceptions made only for conservation or scientific purposes, i.e., elevating the species to National Protection Class I. Uplisting the species to CITES Appendix I is not needed or recommended, since the entire trade demand for it is restricted to China itself. Even if it would be upgraded to China National Protection Class 1, which is a side effect of uplisting it to CITES Appendix 1, little would be done by Chinese authorities. This is because an already decent captive assurance collection exists in China, tolerated and approved by Chinese authorities, and it is not controlled by the authorities if these keepers add further wild-caught stock to their collections. While the KIZ has maintained an in-situ assurance colony since 2010 (Hagen et al. 2011, pers. obs.), we recommend that further assurance colonies, both in-situ and ex-situ should be considered, since a single disaster could easily eliminate this single, critical colony.

The exact factors threatening the species need to be better evaluated, understood, and controlled. All living specimens should be kept under close control, and exchange between private collections within China should be encouraged to assure genetic diversity within the existing breeding groups. The current area where the species is known to exist should be actively protected by Yunnan and China, as should any new populations potentially located

in the future. A research, breeding, and education center should be established, and further field surveys should be conducted in and near the known area of occurrence, which has not been surveyed for nearly a decade.

Captive Husbandry. — The female obtained by Zhou in 2004 (Zhou and Zhou 2004; Zhou 2005; Blanck 2005, 2006; Bour 2005; Blanck et al. 2006b; Zhou and Li 2007; Zhou et al. 2008b) was omnivorous in captivity, feeding on earthworms, shrimp, fish, pork, strawberries, tomatoes, and carrots. The captive live male appeared to be more carnivorous, eating only the meats from the variety of foods offered. Both specimens were reported to eat only in water. They have been kept in water temperatures from 19 to 31°C, with no attempt to induce hibernation for the first years. The male was more timid than the female (Zhou, 2005; Blanck et al. 2006b; Zhou et al. 2008b).

According to Zhou et al. (2008a,b) and Zhou (pers. obs.), the pair has been kept at the same facility in central China since 2005 and reproduced in 2006 and 2008. In the cooler months the adult specimens were maintained indoors in separate aquariums measuring 94x52x40 cm, with a water depth of 12 to 15 cm. Submerged rocks and a basking site in each aquarium were provided. A separate nesting area with a 25 cm deep sand substrate was provided for the female when gravid. UVB illumination for 8 to 10 hrs daily and a full spectrum UV lamp 3 to 5 hrs once a week was used. The water temperatures reached up to 32°C in summer and as low as 8°C during winter. The adults were kept in separate small outdoor ponds during summer.

Both specimens entered hibernation at ~8°C. Hibernation does not seem necessary for breeding, since the specimens were maintained at 25 to 30°C and not hibernated in the winter of 2005–2006, yet fertile eggs were produced in April 2006 (Zhou et al. 2008b). The adult specimens were fed every other day, when water temperatures exceeded 22°C, on a primarily carnivorous diet consisting of beef, pork, shrimp, fish, and loaches. The female occasionally also consumed tomatoes (Zhou et al. 2008b).

The male and the female were placed together for courtship and mating, which was observed in March and December. The female was generally calm during mating, except when she was gravid, when some aggression toward the male was shown. The female became inactive two weeks before oviposition, increased her basking time, and decreased food consumption (Zhou et al. 2008b).

Oviposition was observed in late April to late May, during the night or in the early morning hours. Three clutches ranging from 4 to 8 eggs per clutch, with eggs measuring 32.9 to 44.0 mm x 20.1 to 29.2 mm, weighing 8.8 to 13 g, were deposited at these times (Zhou et al. 2008b). Incubation was carried out in a moist sand/earth mixture at 28 to 30°C. A central dorsal white patch appeared on the eggs 24 hrs after deposition. Three hatchlings emerged after 64 to 68 days (Zhou et al. 2008b). In the second year, the female double-clutched, with two clutches of 4 eggs each laid 20 days apart from each other.

The hatchlings measured from 34.1–34.8 mm SCL to 25.5–27.4 mm in maximum carapace width and weighed 6.5 to 8.3 g. Resorption of the yolk sac was complete upon hatching, while the umbilicus took 7 to 9 days to close. The egg tooth disappeared after 6–8 days (Zhou et al. 2008b).

The hatchlings were raised individually in shallow basins at water temperatures of 28–32°C. They were fed chopped meat, pork, fish, and shrimp daily and with age, chopped or small whole earthworms (Zhou et al. 2008b). All juveniles turned out to be female (Zhou, pers. obs.). In 2011, the group was moved to Hainan Island. In captivity, specimens need 5–8 years to mature (Zhou, pers. obs.).

Accidentally, a captive bred female *C. yunnanensis* was kept together with a male *C. zhoui* and another one with a male *Mauremys reevesii*, both subsequently produced fertile eggs, which resulted in hybrid offspring in both cases. Since then, several other hybrids (e.g., with *C. aurocapitata* and *Mauremys sinensis*) have been recorded. Intrageneric hybrids possess a hinge, while intergeneric ones lack the hinge (Zhou et al. 2023).

At the KIZ, specimens are maintained in medium-sized Waterland tubs (193x89x61 cm) outdoors all year round since 2011 (Hagen et al. 2011, pers. obs.). The land area is filled with natural soil, sand and bark, and plants. Specimens are kept in female-only groups or single males per enclosure. The water has water plants, logs, and artificial hiding places. A shading system was installed in 2011 to protect the tanks from overheating. The first successful reproduction occurred in 2010, with one hatchling emerging from an egg incubated at room temperature (Hagen et al. 2011; Rao, pers. comm.), further data are kept confidential to prevent thefts. The diet consists mainly of shrimp, commercial pellets, and fish. Most private collectors maintain the specimens in groups in indoor ponds (X. Yijun, pers. comm.; Blanck and Zhou, pers obs.).

Current Research. — Surveys to identify additional remaining populations are ongoing. A genetic study on the captive population is currently being evaluated.

Acknowledgments. — We thank Michael Tang, Michael Lau, Paul Crow, Elmar Meier, Peter Praschag, Rao Ding-Qi, Cris Hagen, Gerald Kuchling, Rick Hudson, Xia Yijun, Louis Liu, Bastian Esser, Daniel Gaillard, Tony Ngai, Jay Wang, Markus Auer, Li Pipeng, Oscar Shiu, Peter Valentin, Yan Jie, Wu Hui, and Mian Hou for interesting discussions and information, access to their animals and/or joint projects. Colin McCarthy (BMNH), Richard Gemel and Franz Tiedemann (NHMW), Qiao Ge Xia (IOZB), and the late Roger Bour (MNHN) and

Ermi Zhao are thanked for providing valuable data and access to specimens and information in their museum collections. We thank Michael Lau and Haitao Shi for the use of their photos. We also thank Anders Rhodin, Peter Paul van Dijk, and Craig Stanford for their helpful reviews and editing.

Literature Cited

Anonymous. 2007. Second Level protected Yunnan Box turtle discovered in Sungyang County, Zhejiang Province. Chinese Buddhism information network, FJNET, 27July2007, http.//news.fjnet.com/ryzy/ryzynr/t20070727_49821.htm.

Anonymous. 2010. Finding of a *Cuora yunnanensis* in Yousuozhen, Chengjiang, Yuxi, Yunnan, China. http.//www.yxdaily.com/2010yxnews/society/zxxx/2010/1084517.shtml.

ATTWG [Asian Turtle Trade Working Group]. 2000. *Cuora yunnanensis*. The IUCN Red List of Threatened Species 2000. e.T5957A11964344.

Auer, M. and Blanck, T. 2019. On the difficulties of finding rare chelonians in China with some notes on the natural habitat of *Cuora yunnanensis*. Radiata 28:4–20.

Bell, T. 1825. A monograph of the tortoises having a moveable sternum, with remarks on their arrangement and affinities. Zoological Journal, London 2:305–306.

Bell, T. 1834. Characters of a new genus of freshwater tortoise. Proceedings of the Zoological Society, London 1834:17.

Blanck, T. 2005. *Cuora yunnanensis* (Boulenger, 1906), the Yunnan Box turtle, rediscovered after one-hundred years? Radiata 14(2):10–33.

Blanck, T. 2006. The Yunnan Box Turtle, *Cuora yunnanensis* (Boulenger, 1906) – A life history and the finding of a 2nd living specimen. Sto let poté… *Cuora yunnanensis* (Boulenger, 1906) jeji zivotni osud a nalezeni druheho ziveho exemplare. Klub Chovatelu Zelv unor 2006, Zpravodaj rocnik 17(49):16–24.

Blanck, T., McCord, W.P., and Le, M. 2006a. On the variability of *Cuora trifasciata* Bell, 1825); the rediscovery of the type specimen, with descriptions of a new *Cuora* species and subspecies, and remarks on the distribution, habitat and vulnerability of these species (Reptilia. Testudines. Geoemydidae). Frankfurt am Main: Edition Chimaira – Frankfurt Contributions to Natural History 31, 155 pp.

Blanck, T., Zhou, T. and McCord, W.P. 2006b. The Yunnan Box Turtle, *Cuora yunnanensis* (Boulenger 1906); historical background and an update on the morphology, distribution and vulnerabilities of the only known living specimens. Die Yunnan-Dosenschildkröte, *Cuora yunnanensis* (Boulenger, 1906); Geschichte, neue Erkenntnisse zur Morphologie, Verbreitung und Gefährdung der einzigen bekannten lebenden Exemplar. Sacalia 13(4):14–35.

Blanck, T., Protiva, T., Zhou, T., Li, Y., Crow, P., and Tiedemann, R. 2017. New subspecies of *Cuora cyclornata* (Blanck, McCord & Le, 2006), *Cuora trifasciata* (Bell, 1825) and *Cuora aurocapitata* (Luo & Zong, 1988). Sichuan Journal of Zoology 36(4):368–385.

Boulenger, G.A. 1906. Descriptions of new reptiles from Yunnan. Annals of the Magazine Natural History, London 7(17):567–568.

Boulenger, G.A. 1907. Zoological Record Report 1906:35.

Bour, R. 2005. Redécouverte d'une tortue considérée comme éteinte, *Cuora yunnanensis* (Boulenger, 1906). Manouria 8(26):43–44.

Chen, G. 2007. A conservation study of the critically endangered *Cuora yunnanensis* in Yunnan, China. In: Rhodin, A.G.J., Quinn, H.R., Goode, E.V., Hudson, R., Mittermeier, R.A., and van Dijk, P.P. (Eds.). 2019. Turtle Conservation Fund – Summary Activity Report 2002–2018. Chelonian Research Foundation and Turtle Conservancy, Lunenburg, MA and Ojai, CA, USA. 51 pp.

CITES. 1999. Inclusion of all species of the genus *Cuora* s.l. in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Proposal CoP11 Prop. 36 by the Federal Republic of Germany and the United States of America. http.//www.cites.org/common/cop/11/prop/eng/E11-36.doc.

CITES. 2013. Inclusion of the following taxa of the Family Geoemydidae in Appendix II. *Cyclemys* spp., *Geoemyda japonica, G. spengleri, Hardella thurjii, Mauremys japonica, M. nigricans, Melanochelys trijuga, Morenia petersi, Sacalia bealei, S. quadriocellata*, and *Vijayachelys silvatica*. [….] This proposal seeks a zero quota on wild specimens for commercial purposes for the following taxa. *Batagur borneoensis, B. trivittata, Cuora aurocapitata, C. flavomarginata, C. galbinifrons, C. mccordi, C. mouhotii, C. pani, C. trifasciata, C. yunnanensis, C. zhoui, Heosemys annandalii, H. depressa, Mauremys annamensis*, and *Orlitia borneensis*. Proposal CoP16 Prop. 32 by the People's Republic of China and the United States of America. https.//cites.org/sites/default/files/eng/cop/16/prop/E-CoP16-Prop-32.pdf.

Daudin, F.M. 1801. Histoire Naturelle, Générale et Particulière des Reptiles. Tome Second. Paris: Imprimerie F. Dufart, 432 pp.

Deng, T. 2006. Chinese Neogene mammal biochronology. Vertebrata PalAsiatica 44:143–163.

Deng, T. and Qi, G.-Q. 2009. Rhinocerotids (Mammalia, Perissodactyla) from Lufengpithecus site, Lufeng, Yunnan. Vertebrata PalAsiatica 47:135–152.

Ernst, C.H. 1988a. Redescriptions of two Chinese *Cuora* (Reptilia. Testudines. Emydidae). Proceedings of the Biological Society of Washington 101:155–161.

Ernst, C.H. 1988b. *Cuora mccordi*, a new Chinese box turtle from Guangxi Province. Proceedings of the Biological Society of Washington 101:466–470.

Fong, J.J. and Qiao, G.X. 2010. New localities of endangered Chinese turtles from museum specimens and the practical and ethical challenges using and reporting natural history collection data. Zootaxa 2393:59–68.

Gray, J.E. 1831. Synopsis Reptilium or short descriptions of the species of reptiles. Part 1. Cataphracta, tortoises, crocodiles, and enaliosaurians. London. 85 pp.

Gray, J.E. 1856 ["1855"]. Catalogue of Shield Reptiles in the Collection of the British Museum. Part I. Testudinata (Tortoises). London: British Museum, 79 pp.

Gray, J.E. 1863. Observations on the box tortoises, with the descriptions of three new Asiatic species. Proceedings of the Zoological Society, London 1863:173–177.

Hagen, C. and Blanck, T. 2011. Workshops recommend intensified focus on imperiled Asian Box Turtles, genus *Cuora*. Turtle Survival 2011:15–17.

Hagen, C., Hudson, R., and Lau, M. 2011. Building an assurance colony for one of the world's rarest turtles, the Yunnan Box Turtle (*Cuora yunnanensis*). Turtle Survival 2011:8–10.

He, X.R. and Zhou, X.Q. 2002. Reptile fauna and zoogeographic division of Yunnan. Sichuan Journal of Zoology 21:161–169.

He, J., Zhou, T., Rao, D.-Q., and Zhang, Y.-P. 2007. Molecular identification and phylogenetic position of *Cuora yunnanensis*.

Chinese Science Bulletin 5217;2085–2088. [in Chinese]

Hong, X., Zhang, X., Liu, X., Wang, Y., Yu, L., Li, W., Chen, F., and Zhu, X. 2022. Status and analysis of artificial breeding and management of aquatic turtles in China. Biology 11(9):1368.

Iverson, J.B. 1992. A Revised Checklist with Distribution Maps of the Turtles of the World. Richmond, Indiana: Privately printed, 363 pp.

Joseph-Ouni, M. 2003. Profiles of extinction #3 - Yunnan Box Turtle - *Cuora yunnanensis*. Reptilia (GB) 27:3.

Lau, M. and Shi, H. 2000. Conservation and trade of terrestrial and freshwater turtles and tortoises in the People's Republic of China. In. van Dijk, P.P., Stuart, B., and Rhodin, A.G.J. (Eds.). Asian Turtle Trade: Proceedings of a Workshop on Conservation and Trade of Freshwater Turtles and Tortoises in Asia, Phnom Penh, Cambodia, December 1999. Lunenburg, MA: Chelonian Research Foundation, pp. 30–38.

Laufer, P. 2018a. Recovering History's Most Expensive Turtle. https.//www.thehistoryreader.com/cultural-history/recovering-historys-most-expensive-turtle/.

Laufer, P. 2018b. Dreaming in Turtle. A Journey Through the Passion, Profit, and Peril of our Most Coveted Prehistoric Creatures. New York: St. Martin's Press, 304 pp.

Li, W. and Wang, H. 1998. Wildlife trade in Yunnan Province, China, at the border with Vietnam. TRAFFIC Bulletin 18(1):21–30.

Luo, B. and Zong, Y. 1988. A new species of *Cuora* - *Cuora aurocapitata*. Acta Herpetologica Sinica, Beijing 3:13–16.

McCord, W.P. and Iverson, J.B. 1991. A new box turtle of the genus *Cuora* (Testudines. Emydidae) with taxonomic notes and a key to the species. Herpetologica 47:405–418.

McCord, W. P. and Joseph-Ouni, M. 2002. Chelonian Illustrations. Asian box turtles. Reptilia (GB), Barcelona 22:31–33.

Naksri, W., Tong, H., Lauprasert, K., Suteethorn, V., and Claude, J. 2013.A new species of *Cuora* (Testudines. Geoemydidae) from the Miocene of Thailand and its evolutionary significance. Geological Magazine 150 (5):908–922.

Parham, J.F., Stuart, B.L., Bour, R., and Fritz, U. 2004. Evolutionary distinctiveness of the extinct Yunnan Box Turtle (*Cuora yunnanensis*) revealed by DNA from an old museum specimen. Proceedings of the Royal Society of Biology (Supplement), Biology Letters 271:391–394.

Pope, C.H. 1935. The Reptiles of China. New York: American Museum of Natural History, Natural History of Central Asia, Vol. X, 604 pp.

Schilde, M. 2004. Asiatische Sumpfschildkröten. Die Familie Geoemydidae in Südostasien, China und Japan. Münster: Natur und Tier-Verlag, 192 pp.

Siebenrock, F. 1903. Schildkröten des östlichen Hinterindien. Sitzungsberichte der Akademie der Wissenschaften in Wien. Mathematisch-Naturwissenschaftliche Klasse 112(1):333–353.

Smith, M.A. 1931. The Fauna of British India, including Ceylon and Burma. Reptilia and Amphibia. Vol. 1. Loricata, Testudines. London: Taylor & Francis, 185 pp.

Song, M. 1984. A new species of the turtle genus *Cuora* (Testudoformes. Testudinidae). Acta Zootaxonomica Sinica, Xi'an. 9:330–332.

Spinks, P.Q. and Shaffer, H.B. 2007. Conservation phylogenetics of the Asian box turtles Geoemydidae, *Cuora*; mitochondrial introgression, numts, and inferences from multiple nuclear loci. Conservation Genetics 83:641–657.

Spinks, P.Q., Thomson, R.C., Zhang, Y., Che, J., Wu, Y., and Shaffer, H.B. 2012. Species boundaries and phylogenetic relationships in the critically endangered Asian box turtle genus *Cuora*. Molecular Phylogenetics and Evolution 63:656–667.

Sun, H. and Gao, Z.W. 2016. Biodiversity Checklist of Yunnan Province (2016 version). Kunming, Yunnan Science and Technology Press.

Sun, H. and Gao, Z.W. 2017. Species Red List of Yunnan Province (2017 version). Kunming, Yunnan Science and Technology Press.

TCC [Turtle Conservation Coalition: Rhodin, A.G.J., Walde, A.D., Horne, B.D., van Dijk, P.P., Blanck, T., and Hudson, R. (Eds.)]. 2011. Turtles in Trouble. The World's 25+ Most Endangered Tortoises and Freshwater Turtles—2011. Lunenburg, MA. IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Conservation Fund, Turtle Survival Alliance, Turtle Conservancy, Chelonian Research Foundation, Conservation International, Wildlife Conservation Society, and San Diego Zoo Global, 54 pp.

TCC [Turtle Conservation Coalition: Stanford, C.B., Rhodin, A.G.J., van Dijk, P.P., Horne, B.D., Blanck, T., Goode, E.V., Hudson, R., Mittermeier, R.A., Currylow, A., Eisemberg, C., Frankel, M., Georges, A., Gibbons, P.M., Juvik, J.O., Kuchling, G., Luiselli, L., Shi, H., Singh, S., and Walde, A. (Eds.)]. 2018. Turtles in Trouble. The World's 25+ Most Endangered Tortoises and Freshwater Turtles—2018. Ojai, CA. IUCN SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Conservancy, Turtle Survival Alliance, Turtle Conservation Fund, Chelonian Research Foundation, Conservation International, Wildlife Conservation Society, and Global Wildlife Conservation. 80 pp.

Thomson, R.C., Spinks, P.Q., and Shaffer, H.B. 2021. A global phylogeny of turtles reveals a burst of climate-associated diversification on continental margins. Proceedings of the National Academy of Sciences 1187:e2012215118.z.

Tiedemann, R., Schneider, A.R.R., Havenstein, K., Blanck, T., Meier, E., Raffel, M., Zwartepoorte, H., and Plath, M. 2014. New microsatellite markers allow high-resolution taxon delimitation in critically endangered Asian box turtles, genus *Cuora*. Salamandra 50:139–146.

TTWG [Turtle Taxonomy Working Group: Rhodin, A.G.J., Iverson, J.B., Bour, R., Fritz, U., Georges, A., Shaffer, H.B., and van Dijk, P.P.]. 2021. Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status (9th Ed.). In: Rhodin, A.G.J., Iverson, J.B., van Dijk, P.P., Stanford, C.B., Goode, E.V., Buhlmann, K.A., and Mittermeier, R.A. (Eds.). Chelonian Research Monographs 8.1–472.

TTWG [Turtle Taxonomy Working Group: Rhodin, A.G.J., Iverson, J.B., Gallego-García, N., Fritz, U., Georges, A., Shaffer, H.B., and van Dijk, P.P.]. 2025. Turtles of the World: Annotated Checklist and Atlas of Taxonomy, Synonymy, Distribution, and Conservation Status (10th Ed.). In: Rhodin, A.G.J., Iverson, J.B., van Dijk, P.P., Stanford, C.B., Goode, E.V., Buhlmann, K.A., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs 10:1–575.

Valenciennes, A. 1833. In: Bibron, G. and Bory de Saint-Vincent, J.B.G.M. Reptiles et Poissons. Expedition Scientifique de Morée, Paris et Strassbourg 3(1):1–209.

van Dijk, P.P., Blanck, T., and Lau, M. 2010. *Cuora yunnanensis* (errata version published in 2016). The IUCN Red List of

Threatened Species 2010. e.T5957A97360350.

Vetter, H and van Dijk, P.P. 2006. Turtles of the World. Vol. 4. East and South Asia; Schildkröten der Welt. Band 4. Ost- und Südasien. Frankfurt am Main: Edition Chimaira, 160 pp.

Wang, B.-Y. and Qi, G.-Q. 2005. A porcupine (Rodentia, Mammalia) from Lufengpithecus site, Lufeng, Yunnan. Vertebrata PalAsiatica 43:11–23.

Wang, K., Lyu, Z.T., Wang, J., Qi, S., and Che, J. 2022. Updated checklist and zoogeographic division of the reptilian fauna of Yunnan Province, China. Biodiversity Science 30(4):21326, 31 pp.

Wiegmann, A.F.A. 1835. Beiträge zur Zoologie, gesammelt auf einer Reise um die Erde von Dr. F.J.F. Meyen. Siebente Abhandlung. Amphibien. Nova Acta Physico-Medica Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum 17:183–268.

Yang, D. and Rao, D.-Q. 2008. Amphibia and Reptilia of Yunnan. Kunming: Yunnan Publishing Group Corporation. Yunnan Science and Technology Press, 409 pp.

Yeh, H.-K. 1981. New fossil *Cuora* (Emydidae) from early Pliocene of Yunnan. Vertebrata PalAsiatica 19:239–246.

Yeh, H.-K. 1985. New materials of *Cuora pitheca* and its generic history. Acta Anthropologica Sinica 6:113–117.

Yeh, H.-K. 1994. Fossil and Recent Turtles of China. Beijing: Science Press, 112 pp.

Zhang, X. and Cheng, Q. 1946. Records of reptiles in suburban Kunming. Sino France Culture, National Beiping (Beijing), Academic Publication (Institute of Zoology, Chinese Academy of Science), Fauna Research Center 1(8):2–8.

Zhang, M., Zong, Y., and Ma, J. 1998. Fauna Sinica, Reptilia Vol. 1. General Accounts of Reptilia, Testudoformes and Crocodiliformes. Beijing: Science Press, Vol. 1, 214 pp. [in Chinese]

Zhao, E. 1998. China Red Data Book of Endangered Animals. Vol. 3. Amphibia and Reptilia. Beijing: Science Press, 330 pp.

Zhao, E., Zhou, T., and Ye, P. 1990. A new Chinese Box turtle (Testudinata. Emydidae) – *Cuora zhoui*. In: Zhao E. (Ed). From Water onto Land. Beijing: Chinese Society of the Study of Amphibians and Reptiles, pp. 213–216.

Zhou, T. 2005. Discovery of a living male Yunnan Box Turtle, *Cuora yunnanensis* Boulenger, 1906. Sichuan Journal of Zoology, Chengdu 24(3):345–346.

Zhou, T. 2007. A survey of captive population dynamics for six endemic Chinese Box Turtle species (Testudines. Bataguridae. *Cuora*). Sichuan Journal of Zoology 26(2):448–451.

Zhou, T. and Li, P.P. 2007. Chelonian species diversity and current status in China. Sichuan Journal of Zoology 26 (2):463–467.

Zhou, T. and Zhao, E. 2004. On the occurrence of living *Cuora yunnanensis* since fifty-eight years and its description. Sichuan Journal of Zoology, Chengdu 23(4):325–327.

Zhou, T., Huang, C., McCord, W.P., and Blanck, T. 2008a. Captive breeding of hard-shelled chelonians in China. Reptilia (GB) 59:9–34.

Zhou, T., McCord, W.P., Blanck, T., and Sun, X.F. 2008b. Rediscovery and first breeding of the Yunnan Box Turtle, *Cuora yunnanensis*. Reptilia (GB) 59:37–42.

Zhou, T., Chen, R., and Han, K. 2023. Atlas of Freshwater turtles. Beijing: China Agricultural Press, 303 pp.

Zong, Y. 1998. *Cuora yunnanensis*. In: Zhao, E. (ed.), China Red Data Book of Endangered Animals. Vol. 3. Amphibia and Reptilia. Beijing: Science Press, pp. 110–111.

Citation Format for this Account:

Blanck, T., Iverson, J.B., Zhou, T., and Zhou, F. 2025. *Cuora yunnanensis* (Boulenger 1906) – Yunnan Box Turtle. In: Rhodin, A.G.J., Iverson, J.B., van Dijk, P.P., Stanford, C.B., Goode, E.V., Buhlmann, K.A., and Mittermeier, R.A. (Eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs 5(19):130.1–13. doi: 10.3854/crm.5.130.yunnanensis.v1.2025; www.iucn-tftsg.org/cbftt/.