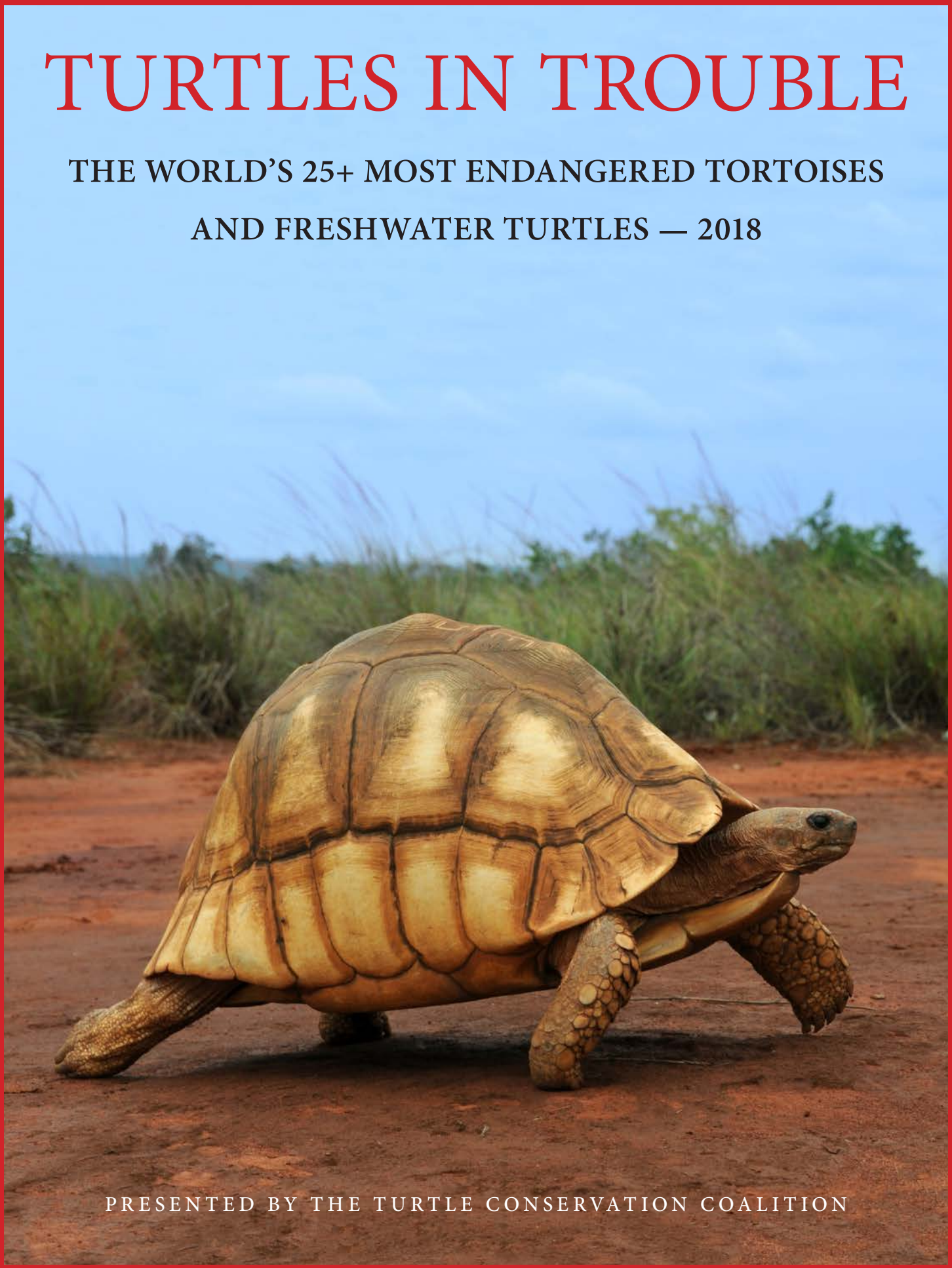
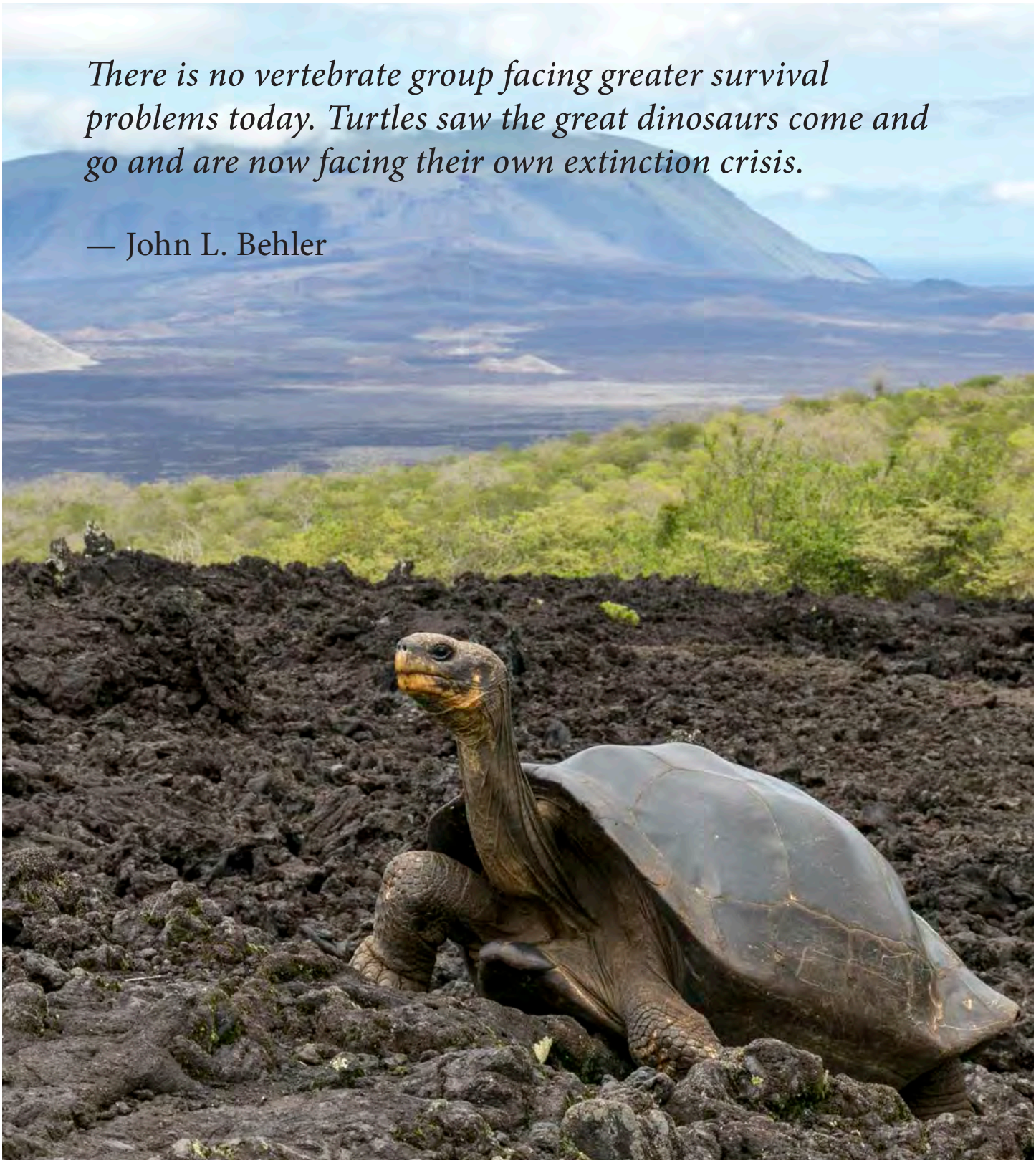
TURTLES IN TROUBLE

THE WORLD'S 25+ MOST ENDANGERED TORTOISES AND FRESHWATER TURTLES — 2018



PRESENTED BY THE TURTLE CONSERVATION COALITION



Above: Volcán Wolf Giant Tortoise by Turtle Conservancy/ Paul M. Gibbons
Front Cover: Ploughshare Tortoise by Turtle Conservancy/Eric V. Goode
Rear Cover: Indochinese Box Turtle by Turtle Conservancy/Maximilian S. Maurer

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Presented by the
Turtle Conservation Coalition

IUCN SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Conservancy, Turtle Survival Alliance, Turtle Conservation Fund, Conservation International, Chelonian Research Foundation, Wildlife Conservation Society, and Global Wildlife Conservation

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INTRODUCTION

Among all major vertebrate groups, turtles are among the most threatened with extinction. Of the currently recognized 356 modern species, 60 are split into narrower taxonomic units – subspecies – accounting for 122 additional taxa. The total number of tortoise and freshwater turtle recognized taxa is therefore 478 in 2017 (Turtle Taxonomy Working Group, 2017). This figure includes seven species of sea turtles, which have their separate conservation specialist group. Of the total of 356 species, 148 (60.4% of those species included in the IUCN 2017 Red List, and 41.6% of all turtle and tortoise species) are officially listed as Threatened by IUCN criteria (categorized as Vulnerable, Endangered, or Critically Endangered). Additionally, if one takes into account preliminary assessments by the IUCN Tortoise and Freshwater Turtle Specialist Group (TFTSG) of previously unevaluated species and updates in progress (Turtle Taxonomy Working Group, 2017), 114 (32.0%) of all species are severely Threatened (CR or EN), 179 (50.3%) are Vulnerable, Endangered, or Critically Endangered, and 186 (52.2%) are either Threatened or Extinct. Overall, 10 taxa – 7 species and 3 subspecies (2.1% of all taxa) – have gone extinct in recent human history. These percentages are more dire for turtles and tortoises than they are for the major vertebrate taxonomic groups. Only the nonhuman primates, with approximately 61% of species threatened with extinction, are in a more precarious state.

The imperiled state in which turtles and tortoises exist is a tragic irony considering the remarkable set of evolutionary adaptations they possess. The shell, evolved over two hundred million years ago, has served them well, along with their extreme longevity. Unfortunately, these traits do not protect them from human development or depredations. In fact, the slow maturation time of all turtle and tortoise species leaves them extremely vulnerable to human pressures.

Tortoises and freshwater turtles often play important roles in the ecosystems they inhabit. The larger species serve as ecological engineers, consuming plants, creating trackways, and mediating competition among plant species. The seeds and spores of many plants, trees, and fungi are dispersed and often germinate more reliably after ingestion by turtles, while their droppings provide instant fertilizer. In some tropical forests, tortoises are dispersers of the seeds of fallen fruit. The burrowing tortoises of North America provide habitat for myriad other species in their deep burrows. Diamondback terrapins keep populations of *Littorina* snails in check, which would otherwise overgraze and denude tidal salt marshes. Snapping and softshell turtles are important scavengers and contribute to maintaining clean aquatic ecosystems. Turtles and tortoises also play an important cultural role in human history, depicted in art and as icons of longevity and virility in many societies. Losing them would not only degrade ecosystems and contribute to the widespread loss of biodiversity; it would destroy an important piece of our culture.

Tortoise and freshwater turtle populations are today under intense pressure from humans. Their populations are being extirpated by development, agriculture, and land and water pollution. They are eaten along with their eggs, collected both by people whose societies have done so for centuries, and to feed current, larger scale tastes for turtle meat and eggs. In some parts of the world turtles are used in traditional medicines. And the pet trade, both legal and illegal, severely threatens many species. While there are a few success stories – outlined later – most chelonians are in terrible trouble, with a few at the very edge of extinction.

For example, a prominent and widely publicized example of the extinction crisis is the Ploughshare Tortoise (*Astrochelys yniphora*), which had been in gradual decline for decades. Then a spike in poaching occurred since our previous Top 25+ publication in 2011, with many of the remaining and reintroduced tortoises having been poached, smuggled and sold into the international market. Many Ploughshare Tortoises were intentionally defaced by conservationists under Malagasy government authority by carving deep identifying markings on their dorsal scutes, in hopes this would lower their black market value and therefore deter poachers. Due to the aggressive demand for this highly sought-after species in the international pet trade, however, these efforts have not deterred poaching.

KINOSTERNIDAE		
Viesca Mud Turtle	*Kinosternon hirtipes megacephalum*	ca. 1970s
TESTUDINIDAE		
Pinta Giant Tortoise	*Chelonoidis abingdonii*	2012
Floreana Giant Tortoise	*Chelonoidis niger*	ca. 1850
Daudin's Giant Tortoise	*Aldabrachelys gigantea daudinii*	ca. 1850
Reunion Giant Tortoise	*Cylindraspis indica*	ca. 1840
Mauritius Giant Domed Tortoise	*Cylindraspis inepta*	ca. 1735
Mauritius Giant Flat-shelled Tortoise	*Cylindraspis triserrata*	ca. 1735
Rodrigues Domed Tortoise	*Cylindraspis peltastes*	ca. 1795
Rodrigues Giant Saddle-backed Tortoise	*Cylindraspis vosmaeri*	ca. 1795
PELOMEDUSIDAE		
Seychelles Mud Turtle	*Pelusios castaneus seychellensis*	ca. 1950

Table 1. Tortoises and freshwater turtles that have gone extinct in recorded history, with approximate extinction dates.

This updated publication is an effort to publicize the plight of tortoises and freshwater turtles by highlighting those species that are at the highest risk of extinction. We hope that, by calling greater attention to these magnificent animals, we can help generate more international attention, more resources, and more conservation action to save them. Through the actions of conservationists around the globe, efforts have long been underway to protect threatened species of tortoises and freshwater turtles. Time will tell if our actions are enough to prevent these species from sliding into extinction. Humans are the cause of the extinction crisis, and only humans can provide the solutions. Those of us in the turtle conservation community believe that saving these jewels of evolution is a battle that can and must be won.

AN OBITUARY FOR *CHELONOIDIS ABINGDONII*, THE PINTA ISLAND GIANT TORTOISE

We are sad to report that since our 2011 publication of "Turtles in Trouble" Lonesome George, the last Pinta Giant Tortoise (*Chelonoidis abingdonii*) has passed away, and with this loss, the species is extinct. The tortoise population of the entire Galapagos archipelago before the whaling era is estimated to have been at least 250,000 tortoises. Perhaps 15,000 remain on the islands today, and at least three islands have lost their tortoises altogether (though reintroduction efforts are underway).

Lonesome George died on June 14, 2012, at the Darwin Research Station on Santa Cruz Island. He had lived there since 1972 when he was removed from Pinta Island in the hope of breeding him to females of the closely related *Chelonoidis becki*. Unfortunately, no fertile eggs were ever produced. It is always unconscio-



Rodrigo Buendia/AFP/Getty Images

nable when humans drive a species into extinction. In the case of the Pinta Giant Tortoise, one last surviving member lived on and on, reminding us of our past depredations against his species and beckoning us to try one more time to save it. In the case of Lonesome George, it may have been too little, too late, but new hope has recently arisen from finding hybrid animals alive on Volcán Wolf on Isabela Island. These are being brought back into a focused captive breeding program on Santa Cruz Island that may restore the species to the wild in coming generations.

THE TOP 25+ THREATENED TURTLES: HISTORY AND METHODS OF THE LISTING PROCESS

Every four years since 2003, a working group of tortoise and freshwater turtle conservationists has published a list of the Top 25 most threatened species. The first Top 25 list was produced by the Turtle Conservation Fund, entitled *Top 25 Turtles on Death Row*. The second edition was issued in 2007 by the Tortoise and Freshwater Turtle Specialist Group. It expanded the list to move beyond 25 species and arranged the species in rough order of extinction risk; it also presented regional lists. The third edition in 2011 was published by a working group of individuals representing a range of chelonian conservation organizations, who adopted the name Turtle Conservation Coalition to reflect the collaboration. This update continued to add species beyond the Top 25 (and was then branded the Top 25+), recognizing the growing list of species at imminent risk of extinction. While not rank ordered by extinction risk, the 2011 list was categorized into the Top 25, "the other Top 40" and "Others." In this 2018 update we review a total of 50 species.

Like previous editions of the Top 25+ endangered turtles, this document has selected the species for inclusion entirely based on the survival prospects and extinction risks of individual species, without regard to any possible prioritization based on phylogenetic uniqueness, lineage history, geographic or taxonomic priority, or ecosystem significance of the species in question. As much as possible, it reflects the estimated risk of extinction for each species, rather than any broader considerations.

PATTERNS OF THREAT TO TORTOISES AND FRESHWATER TURTLES

As a group, turtles and tortoises face a greater extinction risk than almost any other vertebrate group. It is remarkable that over the past 100 years only three or four taxa of turtles and tortoises have become extinct (*Chelonoidis abingdonii* and *Kinosternon hirtipes megacephalum*, *Pelusios castaneus seychellensis*, and possibly *Chelonoidis phantasticus*, Table 1). More than half the extant species are, however, under threat. The geographic distribution of the Top 25+ species comprises five continents but is heavily skewed to Asia, the continent with the greatest species richness: 17 of the most threatened 27 species (63.0%) are native there. The skew is also evident if we consider the entire list of 50 species, of which 29 (58.0%) are Asian (Table 2). This skewed representation applies to countries as well, with 11 species (22.0%) of the Top 50 coming from China and 9 (18.0%) from Vietnam. India and Indonesia are third and fourth on the list of countries with the largest number of threatened species, followed by Madagascar (Table 3). The turtle and tortoise extinction crisis has its epicenter squarely in Asia. This is in part because Asia's turtle richness is high, with more species to be impacted. The primary causes, however, are the intense levels of harvest of adults and eggs, the extensive habitat degradation and loss, and the international trade in turtles and turtle products.

Taxonomically, the Top 25+ comprise seven tortoise and freshwater turtle families. As one would expect from the geographic balance, the families and genera hit hardest are those with species inhabiting Asia. The largely Asian family Geoemydidae – the Old World Pond Turtles – includes 20 species of the Top 50 (40.0%); the tortoise family Testudinidae includes 13 species in the Top 50 (26.0%). The genus that has been hit hardest by extinction threats is *Cuora* – the Asian "box turtles" – accounting for five of the Top 25 species and 11 of the Top 50 species. The large river turtles of the genus *Batagur* also account for five of the Top 25

species. In other words, 10 of the 25 most threatened species of turtles on Earth are from just two genera, both of them Asian.

Nearly all threatened turtle species fall into one of three distinct, partially overlapping, clusters: 1) the prehistoric trend of widespread extinctions of large tortoises endemic to islands (*Cylindraspis*, *Chelonoidis*, etc.), which has continued into historic and present times (Turtle Extinctions Working Group, 2015); 2) large riverine and estuarine turtles with predictable nesting sites and times (*Batagur*, *Carettochelys*, *Podocnemis*) or easily recognized nesting tracks (*Chitra*, *Pelochelys*, *Rafetus*, *Cyclanorbis elegans*); and 3) restricted-range species that are very specifically targeted for exploitation because of the outstanding quality of their meat (*Dermatemys*), their perceived medicinal use (genera *Cuora* and *Mauremys*), and/or their desirability as pets (*Cuora* spp., *Chelodina mccordi*, *Astrochelys* spp., *Geochelone platynota*, *Pyxis* spp., *Testudo kleinmanni*).

Like previous versions of the Top 25+ endangered turtles list, this document has selected the species for inclusion entirely based on the survival prospects and extinction risks of individual species, without regard to priority for conservation efforts. It is also not explicitly based on phylogenetic uniqueness or lineage history of the species in question. The EDGE approach (Evolutionarily Distinct, Globally Endangered; see Isaac et al. 2007), developed for mammals, presents a possible prioritization method which weighs evolutionary uniqueness as well as threat. An EDGE analy-

REGION	NO. SPECIES IN TOP 25+ (%)	NO. SPECIES IN TOP 50 (%)
Asia	17 (63.0)	29 (58.0)
Africa	4 (14.8)	10 (20.0)
North America	0 (0.0)	5 (10.0)
Latin America	4 (14.8)	4 (8.0)
Australia	2 (7.4)	2 (4.0)

Table 2. Geographic distribution by continent of the Top 25+ and Top 50 species.

COUNTRY	NO. SPECIES IN TOP 25+ (%)	NO. SPECIES IN TOP 50 (%)
China	6 (22.2)	11 (22.0)
Vietnam	4 (14.8)	8 (16.0)
Indonesia	4 (14.8)	5 (10.0)
India	2 (7.4)	5 (10.0)
Madagascar	2 (7.4)	5 (10.0)

Table 3. Top countries with most endangered tortoises and freshwater species.

FAMILY	NO. SPECIES IN TOP 25+ (%)	NO. SPECIES IN TOP 50 (%)
Geoemydidae	13 (48.1)	20 (40.0)
Testudinidae	3 (11.1)	11 (22.0)
Chelidae	5 (18.8)	5 (10.0)
Trionychidae	3 (11.1)	8 (16.0)
Podocnemididae	2 (7.4)	2 (4.0)
Emydidae	0 (0.0)	2 (4.0)
Dermatemydidae	1 (3.7)	1 (2.0)
Kinosternidae	0 (0.0)	1 (2.0)

Table 4. Taxonomic distribution of the Top 25+ and Top 50 species.

SPECIES	FAMILY	DISTRIBUTION	RED LIST	TFTSG	TOP 25 2003	TOP 25 2007	TOP 25 2011	26-40 2011	40+ 2011	TOP 25+ 2018	28-50 2018
Rafetus swinhoei	Trionychidae	Asia	CR		X	X	X			X	
Astrochelys yniphora	Testudinidae	Africa	CR		X	X	X			X	
Cuora yunnanensis	Geoemydidae	Asia	CR		X	X	X			X	
Batagur baska	Geoemydidae	Asia	CR		X	X	X			X	
Batagur trivittata	Geoemydidae	Asia	EN	CR	X	X	X			X	
Cuora zhoui	Geoemydidae	Asia	CR				X			X	
Cuora mccordi	Geoemydidae	Asia	CR				X			X	
Psammobates geometricus	Testudinidae	Africa	CR		X	X	X			X	
Cuora aurocapitata	Geoemydidae	Asia	CR			X	X			X	
Mesoclemmys dahli	Chelidae	South America	CR							X	
Cyclanorbis elegans	Trionychidae	Africa	CR							X	
Cuora trifasciata	Geoemydidae	Asia	CR		X	X	X			X	
Geochelone platynota	Testudinidae	Asia	CR		X	X	X			X	
Chelodina mccordi	Chelidae	Asia	CR		X	X	X			X	
Chitra chitra	Trionychidae	Asia	CR		X	X	X			X	
Myuchelys georgesi	Chelidae	Australia	DD	CR						X	
Mauremys annamensis	Geoemydidae	Asia	CR		X	X	X			X	
Dermatemys mawii	Dermatemydidae	North /Central America	CR		X	X	X			X	
Erymnochelys madagascariensis	Podocnemididae	Africa	CR		X	X	X			X	
Batagur affinis	Geoemydidae	Asia	CR		X	X	X			X	
Batagur kachuga	Geoemydidae	Asia	CR				X			X	
Leucocephalon yuwonoi	Geoemydidae	Asia	CR		X	X	X			X	
Pseudemydura umbrina	Chelidae	Australia	CR		X	X	X			X	
Mesoclemmys hogei	Chelidae	South America	EN	CR			X			X	
Siebenrockiella leytensis	Geoemydidae	Asia	CR		X	X	X			X	
Podocnemis lewyana	Podocnemididae	South America	CR				X			X	
Batagur borneoensis	Geoemydidae	Asia	CR		X	X	X			X	
Sternotherus depressus	Kinosternidae	North America	CR						X		X
Cuora pani	Geoemydidae	Asia	CR					X			X
Testudo kleinmanni	Testudinidae	Africa/Middle East	CR		X	X		X			X
Heosemys depressa	Geoemydidae	Asia	CR		X	X		X			X
Cuora picturata	Geoemydidae	Asia	CR					X			X
Pyxis planicauda	Testudinidae	Africa	CR		X	X		X			X
Chitra vandijki	Trionychidae	Asia	NE	CR					X		X
Mauremys nigricans	Geoemydidae	Asia	EN	CR				X			X
Chitra indica	Trionychidae	Asia	EN					X			X
Terrapene coahuila	Emydidae	North America	EN			X		X			X
Astrochelys radiata	Testudinidae	Africa	CR					X			X
Cuora bourreti	Geoemydidae	Asia	CR					X			X
Cuora galbinifrons	Geoemydidae	Asia	CR					X			X
Pyxis arachnoides	Testudinidae	Africa	CR					X			X
Gopherus flavomarginatus	Testudinidae	North America	VU	CR				X			X
Glyptemys muhlenbergii	Emydidae	North America	CR		X			X			X
Chersobius solus	Testudinidae	Africa	VU	EN					X		X
Nilssonia formosa	Trionychidae	Asia	EN	CR					X		X
Nilssonia nigricans	Trionychidae	Asia	EW	CR					X		X
Pelochelys cantorii	Trionychidae	Asia	EN	CR					X		X
Malacochersus tornieri	Testudinidae	Africa	VU	CR							X
Gopherus agassizii	Testudinidae	North America	VU	CR							X
Cuora cyclornata	Geoemydidae	Asia	[CR]	CR	X	X	X				X

Table 5. All species included on the present 2018 Top 25+ list *and* their inclusion on past lists (2003, 2007, and 2011); IUCN threat categories: EW (Extinct in the Wild); CR (Critically Endangered); EN (Endangered); VU (Vulnerable); DD (Data Deficient).

sis for turtles would be very informative for conservation prioritization, but needs better resolution of turtle phylogeny and dating of the splits in turtle relationships; as such we cannot yet incorporate a formal EDGE analysis in the current document. Some generalities emerge, however, from a preliminary analysis, including the very high EDGE values for monotypic genera and families known to have deep phylogenetic ages (Joyce et al. 2013; Crawford et al. 2015; Shaffer et al. 2017) including *Dermatemys mawii*, *Carettochelys insculpta*, *Platysternon megacephalum*, and *Pseudemydura umbrina*. Meanwhile, EDGE values for relatively young genera with multiple highly threatened species such as *Cuora* or *Batagur* are significantly lower.

Asia is the epicenter of the chelonian extinction risk crisis. The historical desire in Asia for turtles as food, traditional medicines, and more recently as pets has been an important part of the increased global use of turtles and tortoises. Economic development in China and other Asian countries has elevated the use of chelonians to unsustainable, commercial levels. The impacts of the trade in Asia were detailed by van Dijk et al. (2000) and Horne et al. (2012); the threat has only grown more intense in the years since. Turtles and tortoises are often highly valued as symbols of good luck, virility, and longevity, and the pet trade in Asia has skyrocketed. Combined with the rapid decline of many Asian species, this has created a marketplace in which the value of an individual turtle may command an astronomical price, creating an economic incentive for intense collecting, poaching, and smuggling. This trend sadly extends globally; the Asian countries have joined Europe and North America as importers of turtles from other regions, and both protected and unprotected rare species from North America, Latin America, Africa, and elsewhere are being transported and smuggled to Asia.

RECENT PROGRESS AND SUCCESS IN CHELONIAN CONSERVATION

In the midst of a crisis of imminent extinction risk to so many species, there is also progress to report. *In-situ* conservation success is always the top priority; saving wild populations before they are extirpated is preferable to attempting large scale captive breeding projects followed by reintroductions. Reintroductions involve risks, including husbandry and breeding expertise, sometimes with species that are delicate in captivity and simply fail to breed. Other issues include the financial cost of human labor and physical space needed for captive rearing projects to head start juveniles prior to release, site fidelity of animals following their release, the risk of resumed poaching after release, and the possibility of pathogens acquired in captivity being transmitted to wild populations. Head starting and release of captive bred juveniles is a risky venture to be undertaken only when other strategies have failed.

Habitat protection via land acquisition is one key aspect of the conservation effort to protect turtles and tortoises. Ever since natural areas have been designated by governments as National Parks, Wildlife Refuges,



Turtle Conservancy/Eric V. Goode

The recently created 1,000-acre Geometric Tortoise Preserve holds the largest population of this species remaining in the wild.

Sanctuaries, Preserves, and more, many turtle populations have benefited from the resulting protection from habitat degradation and targeted exploitation. Although few protected areas have been designated primarily for tortoises and freshwater turtles, there are notable exceptions, such as the Galapagos Islands National Park where the giant tortoises (the *Chelonoidis niger* species complex) were part of the rationale for protection, and Huo Cheng nature reserve in Xinjiang, China, established in 1983 specifically for the protection of *Testudo horsfieldii*. Private purchase of land for conservation purposes has an equally long history, and in recent years has included privately-owned and managed protection areas established specifically for tortoises or freshwater turtles.

Land has been purchased to protect the best-known nesting habitat for Hoge's Sidenecked Turtle (*Mesoclemmys hogei*) in southeastern Brazil, and a key site for the Palawan Forest Turtle (*Siebenrockiella leytensis*) has been acquired in the Phillipines. Sizable amounts of the remaining known habitat for the Bolson Tortoise (*Gopherus flavomarginatus*) in Mexico and a key remaining habitat of the Geometric Tortoise (*Psammobates geometricus*) in South Africa have been purchased and are now being managed as strict nature preserves. Land purchase alone is of course not enough to safeguard the animals on it. Land management – including building infrastructure, fencing, creating protection from fire, water level changes, predators and invasive species, establishing anti-poaching patrols and monitoring biodiversity – is an essential follow-up to land acquisition. Working with local communities to build a cooperative, collaborative relationship is essential. For land acquisition to succeed, the investment of resources, time and funding in the site and species must be intensive and long term. Land stewardship, monitoring and evaluation, adaptive management, and enforcement are all necessary components of effective conservation programs.

Land acquisition must often be comprehensive to be effective. The Trombetas Biological Reserve in Brazil was established in 1979 primarily to acquire and protect the nesting beaches of *Podocnemis expansa*, which numbered 10,000 nesting females at that time. The number of nesting females had declined to 860 by 1989, and in 2017 fewer than 200 nested, showing that even though the species is fully protected within a biological reserve, access by poachers cannot necessarily be controlled. Effective reserves for freshwater river turtles may need to include the entire river basin. Most reserves throughout the world use rivers as the boundaries, which allows poachers to operate freely on the unprotected side of the river.

Legal protection of specific species is a cornerstone of conservation, and tortoises and freshwater turtles have been among the species prioritized for protection under legislation. A wide range of laws, regulations and conventions are in effect at local, national, and international scales concerning most turtle species, with effects ranging from the designation and protection of critical habitat, through restrictions on collection, possession, and local, national and international trade, to supporting research and trade monitoring. The effectiveness of laws and regulations is often difficult to judge, particularly as illegal activities may continue with little risk of effective prosecution. The freshwater turtles (and their eggs) of Neotropical Mexico were, for example, protected by law since 1975. *Dematemys mawii* has nevertheless been nearly exterminated in Mexico, including in protected areas. Many turtle species have, however, avoided excessive impacts from exploitation and trade, and for others those impacts have been restrained – threats and impacts could have been much worse without laws or regulations, particularly for Mediterranean tortoises (*Testudo* spp.), North American box turtles (*Terrapene* spp.), Alligator Snapping Turtles (*Macrochelys* spp.), Asian geoemydids and softshells, and many more.

When *in-situ* conservation efforts fail or are unsustainable, conservationists may turn to captive breeding with plans to reintroduce head-started juveniles into the wild. Whether this is feasible in the short term depends entirely on the local situation. Whether appropriate habitat still exists is a primary concern, as is whether the original cause of population extirpation is still in effect. Poaching must be mitigated and local communities must be educated about the value of having the animals living near them. Head starting

projects that succeed may require years of effort before positive results can be demonstrated.

Reintroductions of the Burmese Star Tortoise (*Geochelone platynota*) have begun in Myanmar. Recently considered ecologically extinct in the wild, more than 10,000 *G. platynota* hatchlings have been produced in assurance colonies in Myanmar. The current captive population is growing at a rate of 37% per year in three captive breeding centers. We expect the captive population to exceed 14,000 individuals by early 2018. Additionally, two experimental releases of 750 head-started tortoises into two protected areas have so far been successful. Intensive monitoring of released tortoises via radiotelemetry has documented high survivorship, and reintroduced tortoises have begun to reproduce in the wild. These are likely the first Burmese Star Tortoises hatched in the wild in over a decade. More reintroductions are planned, and the future of this species in the wild, if reintroduced animals can be protected from poachers, is more promising than it appeared just a few years ago.

The Western Swamp Turtle (*Pseudemydura umbrina*) was brought back from the brink of extinction through captive breeding, head starting, and reintroductions, to a still-precarious but ten-fold increase from 30 to 300 animals. Several species of Asian River turtles of the genus *Batagur* (*B. baska*, *B. affinis*, *B. kachuga*, *B. trivittata*, and *B. borneoensis*; see species accounts for each) have been bred in captivity or wild nests have been transferred to more secure locations for successful incubation, and some reintroductions have begun. The Madagascar Big-headed Turtle (*Erymnochelys madagascariensis*) has been successfully bred at a captive breeding center at Ampijoroa, Madagascar, and some limited reintroductions have occurred.

The Galapagos Islands, scene of our only tortoise or turtle extinction in the past forty years, is also the setting for dramatic successes. Captive breeding of the last 13 remaining *Chelonoidis hoodensis* – the saddle-backed Española Giant Tortoise – has led to reintroduction of their offspring and restoration of a breeding population on Española Island. More than two hundred have also been introduced to Santa Fé Island. A similar potential success is occurring on Pinzón Island, where after more than 100 years of no reproduction, clearing that island of rats has allowed reintroduction of juveniles of that species (*C. duncanensis*) to their native habitat, and successful growth and reproduction are occurring. In the Indian Ocean, Aldabra Giant Tortoises, whose numbers were decimated in the late 19th century, have rebounded on Aldabra atoll, and the species is abundant in captive and semi-captive settings across the islands of the Indian Ocean and around the world.



Gerald Kuchling

The Western Swamp Turtle (*Pseudemydura umbrina*) Nature Preserve was a critical step in preventing the extinction of this species.

DEFINING SUCCESS

An important metric of success in the turtle conservation world is the successful reproduction of a population of turtles, either persisting in or reintroduced into the wild, leading to a long term viable population. This alone, however, may not be enough to declare a program successful in the long term. We must also place our programs in a long-term ecological and evolutionary conservation context by combining information on demography, ecology, genetics, and management measures. This will require an understanding of the changing environment, including climate change and perturbations in land use, so that these can be factored into demographic projections. Resistance and resilience of a population to change are important considerations in assessing success of either *in-situ* protection or re-introduction programs. When all three metrics – demography, ecology, and genetics – are incorporated into monitoring, evaluating, and adapting a program, we can make specific determinations of success and also direct future efforts based on those data. Success is not just producing more juvenile turtles; instead we must recruit more turtles into habitats where they can fulfill all their life history stages and resume their ecological role within the ecosystem over many generations. This is a difficult task because reducing anthropogenic mortality must occur simultaneously with increases in recruitment and survivorship if we are to see population growth or recovery. As a conservation community, we must work together to define how these metrics of success should be prioritized.

For example, the Vietnamese Pond turtle (*Mauremys annamensis*) is functionally extinct in the wild, but is being bred in sizeable numbers in Europe, the United States, and Vietnam. Although the species has been removed from an extinction trajectory, suitable habitat has not been protected for this species and turtles have not been returned to the wild. Moreover, the species has yet to garner the turtle conservation community's attention in a manner that would allow for sufficient restoration efforts. Multiple generations have been raised in captivity. Unfortunately, large scale captive breeding often leads to artificially selecting for traits and/or individuals that survive better in captivity, which may not thrive when returned to the wild. *Ex-situ* turtle collections must be accompanied by proactive and innovative adaptive management *in-situ*.

THE FUTURE OF TORTOISE AND FRESHWATER TURTLE CONSERVATION

The mission of the individuals and groups working to protect turtles and tortoises is that none of the species on this list slides into extinction. We work toward the full ecological conservation or recovery of all these species in the wild. Such recovery must include genetically diverse and numerically robust populations combined with a functional restoration of each species' demography, life history, and ecology. These factors will guide us when it comes to determining conservation success. To better manage our remaining wild populations, we need to acquire more data on the current status of almost all species across their entire ranges, and not just at limited focal study areas for the most endangered species. This must also include species that are currently at low risk of extinction. In many ways, these species of less immediate concern provide a critical foundation to their ecosystems and to turtle conservation. Focusing all of our energy, money, and time on only the most threatened species can have the unintended result of an increase of threatened and near-threatened species. We need to try to keep our common species common, while working to prevent threatened species from going extinct.

Millions of dollars are justifiably spent annually on large mammals and birds such as elephants, rhinos, tigers, and waterfowl in need of large-scale conservation efforts. We should encourage funding organizations to include large-scale chelonian projects within their granting parameters. We would benefit from better baseline data to determine which turtle populations are decreasing broadly across their range, and how rapidly. We encourage academic scientists, conservation organizations, and governments to share information to combine broader/lengthier surveys of population demographics. Without such studies, we limit our ability to counter the effects of habitat loss and degradation,

hunting for eggs and meat, poaching for the pet trade, as well as incidental mortality from fishing, agriculture, motor vehicles, and other anthropogenic impacts.

For a few species, extinction risk has been averted through captive breeding, even though a safe habitat to reintroduce them into the wild may no longer exist. Other turtle species at present appear relatively secure from extinction because at least some of their populations are securely protected in optimal native habitat. For many others, their future hangs in the balance. Without further conservation action, many of the 50 species detailed in the accounts that follow will be extinct in the near future. A few may even disappear before the publication of the next edition of this list. Conservation monitoring and conservation action are constant; extinction is permanent. The Top 25+ list is therefore intended to raise awareness of the crisis, to inform the nature of the threats, and to summarize the species most at risk of disappearing before our eyes, forever. We hope that in the next edition of this list, we have more success stories to report, and not a single extinction.

The Yunnan Box Turtle (*Cuora yunnanensis*) was thought to be extinct for nearly a century and was only rediscovered in an isolated population in China in 2004. Turtles are in the unenviable position of being one of the most threatened vertebrate groups on Earth.



Torsten Blanck

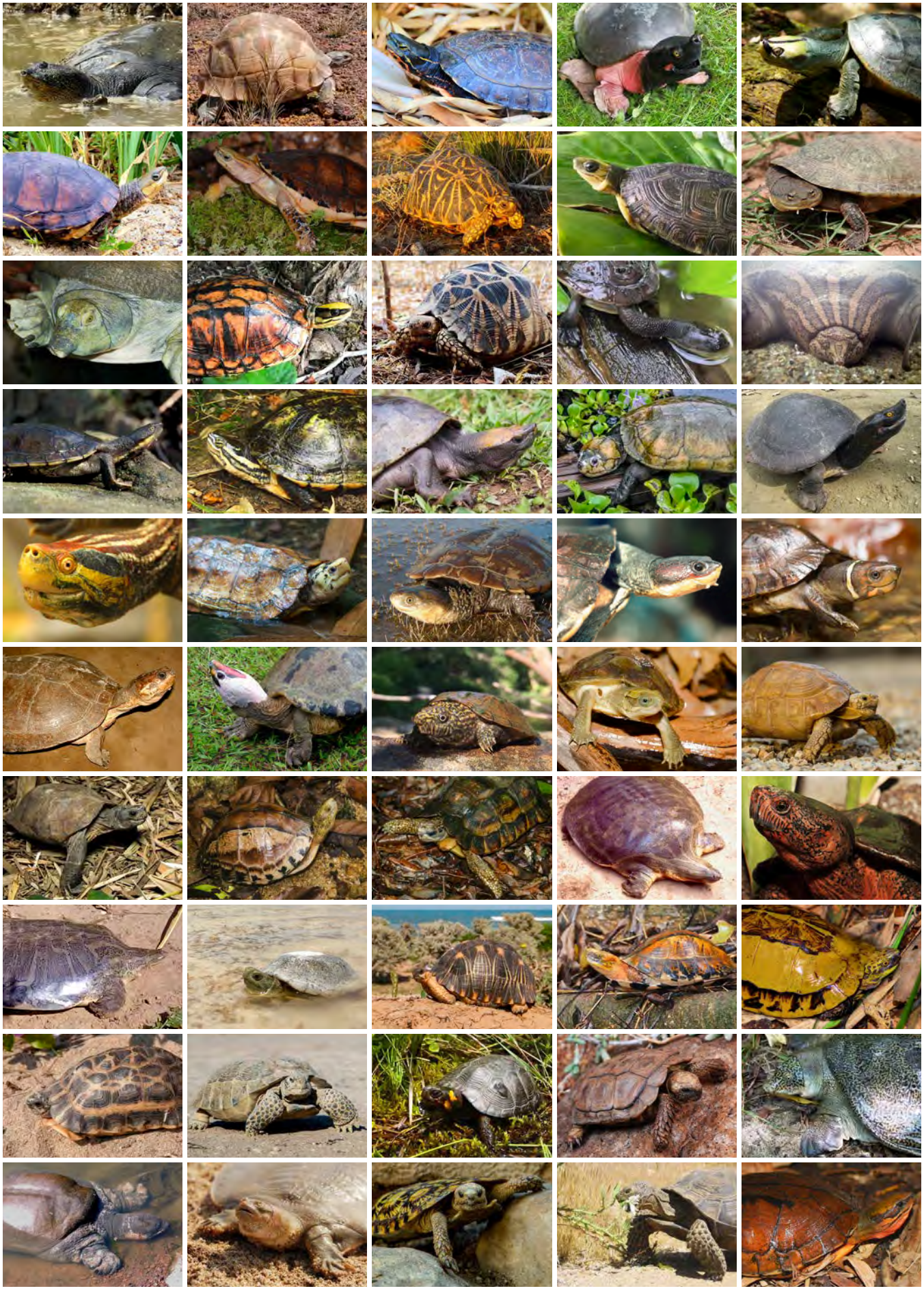
TURTLES IN TROUBLE:

The World's 25+ Most Endangered Tortoises and Freshwater Turtles — 2018

The last Pinta Island Tortoise (*Chelonoidis abingdonii*) went extinct on June 24, 2012. The Turtle Conservation Coalition is a group of organizations working to prevent any further extinctions.



Rodrigo Buendia/AFP/Getty Images

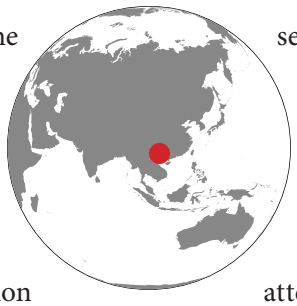




YANGTZE GIANT SOFTSHELL TURTLE

Rafetus swinhoei (Gray 1873)
China, Vietnam

IUCN Red List: Critically Endangered



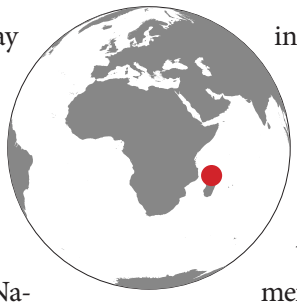
One of the largest freshwater turtles in the world, reaching 120 kg, *Rafetus swinhoei* is known from the Red River in China and Vietnam and from China's lower Yangtze River floodplain. Capture for consumption, river damming, wetland destruction, and water pollution reduced the global population to only three individuals, one in a reservoir west of Hanoi and a captive pair in China residing since 2008 in Suzhou Zoo. The female, with a minimum age of 80 years and owned by Changsha Zoo, has laid eggs each year since, but so far all have been infertile. Examination of the old male in 2015 revealed a severely damaged penis, reduced to a stump without seminal grooves, probably the result of a battle with another male decades ago. Since he is unable to inseminate the female, artificial insemination, so far largely untested and never successful in any turtle, remains the only hope to produce a new generation of this magnificent species. Electro-ejaculation confirmed motile sperm, but semen quality and quantity appear to be suboptimal. Three attempts at artificial insemination have so far not resulted in fertile eggs or hatchlings, but experience has been gained and techniques have improved with every attempt. In 2016/17 Suzhou Zoo moved to a new location and the *R. swinhoei* pair is currently in a temporary holding facility, a situation bringing new uncertainties to the conservation efforts. Recent intensive surveys in Yunnan, China, and in Vietnam have not yet confirmed additional wild specimens, although sightings were reported until a decade ago.



PLOUGHSHARE TORTOISE

Astrochelys yniphora (Vaillant 1885)
Madagascar

IUCN Red List: Critically Endangered



The beautiful Ploughshare Tortoise may be the most critically endangered tortoise in the world. Males have an elongated plough-shaped gular projection emerging from the plastron used in breeding jousts aimed at flipping over their opponents. The species is restricted to a single protected area, Baly Bay National Park, in northwestern Madagascar, created in 1998 with the tortoise as the primary conservation target. A captive breeding program was established in 1985 to increase numbers of Ploughshare Tortoises for release back into the wild. The initial release target of 100 captive-bred animals back in the wild was reached in 2015. The main pressure on wild animals, poaching for the illegal pet trade, has grown to such an extent that, despite concerted protection efforts in the field, the species is now near extinction. There are likely fewer than 100 animals remaining in the wild.

This illegal trade was enabled by the political unrest in 2009, after which there was an exponential increase in poaching activities. Collaborative efforts between NGOs and government partners in Madagascar and Southeast Asia have directly addressed the illegal trade chain, by targeting smugglers, working with law enforcement and supporting greater international collaboration. These efforts are beginning to gain some traction.

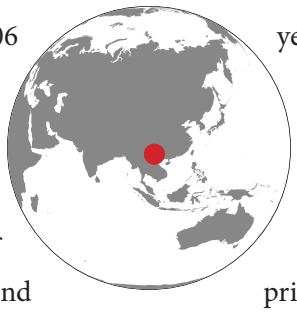
Current efforts to save the ploughshare tortoise have three core components: 1) secure the remaining wild animals and remove the threat from poaching, 2) ensure the continuation of a physically and genetically safe breeding program, and 3) support Madagascar to build the necessary capacity to arrest and prosecute smugglers caught illegally removing the country's natural heritage. The hundreds of animals now held illegally need to be moved into multiple secure captive breeding programs in order to prepare for eventual repatriation to the species' native habitat.



YUNNAN BOX TURTLE

Cuora yunnanensis (Boulenger 1906)
China

IUCN Red List: Critically Endangered



Cuora yunnanensis was described in 1906 from Yunnan Province in southern China. After its initial description, it all but vanished from scientific view for the next nearly 100 years. This predominantly brown colored turtle reaches carapace lengths of 12–19.5 cm, males being smaller, flatter and with a larger and thicker tail. It was the first freshwater turtle that was officially listed by IUCN as extinct in 2000. In 2004, however, photos of a female specimen appeared in China. Only a few months later, an adult male appeared in the local pet trade. This pair was the first to reproduce in captivity. In 2006 another female specimen was found in a local Yunnan market and after extensive searching, in 2008 the habitat of the species was finally found by a research team. This population has over the years largely been transferred into a local assurance colony, where about 50 specimens are maintained and some breeding success has been achieved. A few other populations have been found by hunters in recent years due to the increasing demand for this high-priced and sought-after species, with about 20 specimens having been sold to private Chinese turtle collectors. No living specimens of this species exist outside of China.

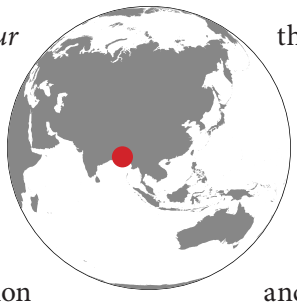
While the species was able to survive for nearly a century undisturbed, its recent discovery threatens the rather small and endemic population of this species; furthermore, human development in Yunnan combined with severe droughts and ongoing habitat destruction has led to a potential habitat decrease of more than 98%.



NORTHERN RIVER TERRAPIN

Batagur baska (Gray 1830)
Bangladesh, India & Myanmar

IUCN Red List: Critically Endangered



The Northern River Terrapin, *Batagur baska*, has declined largely due to over-collection of both adults and eggs for human consumption and is now rare in the rivers and deltas of India, Bangladesh, and Myanmar. Habitat loss and degradation due to sand mining, dam construction, and pollution have also contributed to this species' decline. To date no active nesting locations have been found in the wild, but the presence of the occasional juvenile in Bangladesh suggests that there some breeding still occurs in the wild.

The Northern River Terrapin was until recently considered to range from India to Indonesia, but a genetic analysis determined that what was previously considered one species was in fact two separate species; the Northern River Terrapin, *Batagur baska*, and the Southern River Terrapin, *Batagur affinis*.

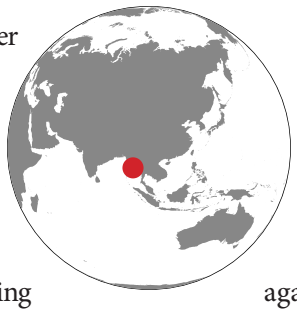
With most remaining *B. baska* in scattered locations and often in single sex groups, conservationists established assurance colonies in hopes of increasing breeding success. Currently there are four groups producing offspring: one in the Sundarbans of India, two in southern Bangladesh, and one in the Madras Crocodile Bank Trust. The two Bangladeshi groups produced 118 hatchlings in 2017. Ten head-started turtles have been released in India, but monitoring their release has proven difficult due to the size of the area to be covered. Satellite transmitters will hopefully aid in analyzing dispersal and survival after release into the wild.



MYANMAR ROOFED TURTLE

Batagur trivittata (Duméril & Bibron 1835)
Myanmar

IUCN Red List: Endangered
TFTSG: Critically Endangered



Once on the brink of extinction with fewer than a dozen individuals remaining, the Myanmar Roofed Turtle, *Batagur trivittata*, now numbers close to a thousand captive individuals. The majority of these are in four assurance colonies: three in Myanmar and one in Singapore. Efforts to supplement wild populations are ongoing with experimental releases of head-started turtles. Early results from the releases show that the turtles can disperse long distances and survive. Unfortunately, some were also killed either by drowning in fishing nets or by the concussive blast of dynamite fishing.

Once numbering in the hundreds of thousands, this large river turtle has undergone drastic declines due to many years of hunting and harvesting of eggs. Habitat destruction and degradation have contributed to its low population levels.

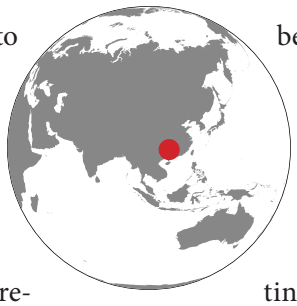
In 2005, the Myanmar Forest Department began protecting the nesting beaches on the upper Chindwin River, and to date (2006-2010) 376 hatchlings have been transferred to the head-starting facilities. With a robust captive population serving as a hedge against extinction, recovering the wild population to its former ecological role is the next goal. Coinciding with the release of 25 head started turtles, there was an increase in the rate of viable eggs hatching. Prior to this there were multiple years where there was very low hatching success, sometimes zero, which suggests that very few males remain in the wild. It is hoped that confirmation of the released turtles mating with wild females can be determined via paternity analysis.



ZHOU'S BOX TURTLE

Cuora zhoui Zhao, Zhou & Ye, 1990
China and/or Vietnam

IUCN Red List: Critically Endangered



This *Cuora* species only became known to science when it was described in 1990 based on a handful of specimens from two markets in southern China's Guangxi Province bordering with Vietnam. A year later, the species received a synonym, *Cuora pallidicephala*, by American scientists, having received specimens of this species in 1989 from a Hong Kong turtle trader. These specimens were said to have originated in southern China's Yunnan Province.

Cuora zhoui has a brownish to black carapace, a black plastron with a distinct yellow central figure and an olive colored head. Adults reach a carapace length of 15–22 cm and sexes can be differentiated by the larger tail and concave plastron present in males.

Despite intensive searches for nearly three decades both in China and Vietnam, this species has not yet been found in the wild. Based upon the low number of specimens (< 200) that have appeared in the trade between 1990 and 2010, this species probably has a highly restricted range. No new specimens are known since 2009, increasing the fear that it might be extinct in the wild already.

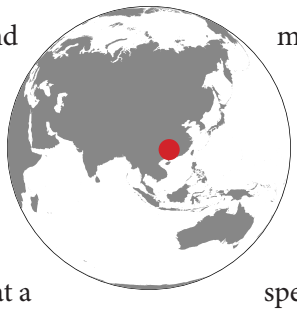
In captivity, about 200 wild caught founders existed, but this number has decreased to fewer than 30 in the last decade. A handful of breeders have been able to reproduce this species, the most successful being Elmar Meier in Germany, producing more than 80 hatchlings from three breeding pairs. The world captive population totals about 140 specimens. Without a known habitat, there is high potential of it being extirpated in the wild already. With a very small gene pool in captivity, its future is bleak.



MCCORD'S BOX TURTLE

Cuora mccordi Ernst 1988
China

IUCN Red List: Critically Endangered



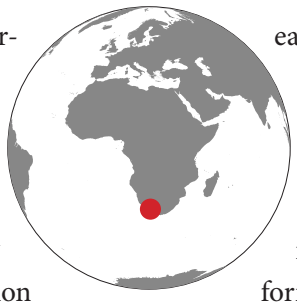
Cuora mccordi is a yellow-headed and chestnut-brown-shelled Asian box turtle. It reaches carapace lengths of 14–23 cm, and is sexually dimorphic, with males usually smaller than females, and possessing a thicker, longer tail and a more elongated and flatter carapace. It was not until 2005 that a team of scientists discovered the species' origin in the wild in Guangxi, at a time when the species was already nearly gone from the wild. In 2008, a detailed study of the habitat showed that the species is semiaquatic and inhabits bamboo patches in broad-leafed forests in an area of less than 50 sq. km. They were still locally common in the 1970s, when local villagers sometimes used them instead of stones to throw at their buffaloes; their decline started in the 1980s when the turtle trade reached the area. Since the species was easy to catch, the population collapsed soon after. No wild specimens have been observed since 2010, indicating that this species is likely extinct in the wild. The remaining habitat is at severe risk due to logging and non-native plant reforestation projects in the area. The species thrives in captivity and is being bred in increasing numbers, with a total worldwide estimate of 700–800 captive specimens.



GEOMETRIC TORTOISE

Psammobates geometricus (Linnaeus 1758)
South Africa

IUCN Red List: Critically Endangered



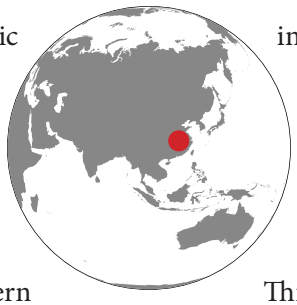
Psammobates geometricus is a small (carapace length 10–15 cm) non-burrowing tortoise closely associated with a unique native shrubland (Alluvium Fynbos) in the Mediterranean-climate zone of the Western Cape, South Africa. It is Critically Endangered, with a declining wild population estimated at fewer than 1,000 individuals. More than 90% of the species' low elevation (70–600 m) habitat has been lost to agricultural expansion and urbanization over the past two centuries. Most of the remaining tortoise habitat exists as very small, isolated fynbos patches on private farms that cannot support viable populations. Tortoises have disappeared in recent decades from several small, previously created preserves. The bulk of the surviving population is restricted to two protected areas totaling about 1,300 ha that continue to be compromised and threatened by wildfires and invasive alien plant species. Local predators of juvenile Geometric Tortoises, particularly crows and ravens, exhibit rapidly increasing populations in this human-transformed landscape and likely suppress natural recruitment in the remaining tortoise populations. Rapid global warming affecting South Africa is expected to magnify seasonal drought and wildfire risk. The species is a top conservation priority for the provincial government (CapeNature). As one mitigation measure a small semi-captive assurance colony (in native habitat) and head-starting program is now being implemented.



GOLDEN-HEADED BOX TURTLE

Cuora aurocapitata Luo & Zong 1988
China

IUCN Red List: Critically Endangered



Cuora aurocapitata is a highly aquatic Asian box turtle, reaching a carapace length of 10–19.5 cm. It is sexually dimorphic; males are smaller than females and have a flatter carapace and longer, thicker tail. In 2017, the species was split into two subspecies: the nominate subspecies from southern Anhui and the new subspecies *Cuora aurocapitata dabieshani* from central Anhui.

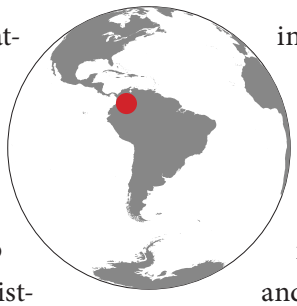
Like many of the recently described *Cuora*, its scientific description in 1988 triggered its demise. It took until 2004 for scientists to find the species in the wild for the first time since its description. While already collected and consumed by the local villagers for centuries, the pet and medicinal trades became interested in this bright yellow-headed species, leading quickly to unsustainably high levels of collection from the wild. By the late 1990s, the population of this endemic and rare species collapsed due to over-collecting, and also pollution and destruction of its habitat. This trend has been ongoing due to sand mining for China's ever growing building industry, river regulations, hydroelectric dams, poison and dynamite fishing techniques. No new specimens have been recorded in China since 2013 and it is feared to be extinct in the wild. Worldwide captive stock is estimated to have reached 600–800 specimens and breeding success is increasing. Potential future release projects are hindered by the lack of existing habitat.



DAHL'S TOAD-HEADED TURTLE

Mesoclemmys dahli (Zangerl & Medem 1958)
Colombia

IUCN Red List: Critically Endangered



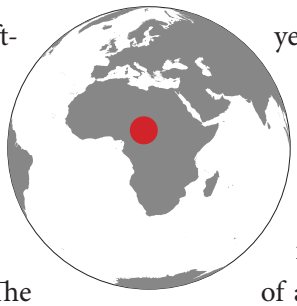
This medium sized (to 30 cm) semi-aquatic turtle is a rare and endemic species to northern Colombia, and the only member of the Chelidae family occurring northwest of the Andes. For several decades after its description, this species was only known to occur at its type locality, and thus it was listed as Critically Endangered and included in the list of the world's 25 most threatened turtles in 2003. More recently the species was found in other areas of Colombia, and for this reason its conservation status was lowered to Endangered and was removed from the top 25 list. It has recently been reassessed as Critically Endangered in Colombia; its greatest conservation threats are habitat loss and fragmentation. Dahl's Toad-headed Turtle occurs in tropical dry forest, where it inhabits streams, ponds and creeks. During the dry season (December to March), when most water bodies dry up, it estivates in the forest under the litter in holes or roots of trees. The tropical dry forest is the most heavily impacted biome in Colombia, and the least represented by the country's protected area network. It has been severely impacted by human uses, such as pastures and agriculture. Currently about 15% of its habitat remains. In addition, the population of Dahl's Toad-headed Turtle is now known to consist of only a few hundred mature individuals, and it is fragmented into highly inbred subpopulations. To reduce inbreeding a genetic rescue program within protected sites has been recommended, accompanied by habitat restoration and population monitoring to ensure that the combined effects of small, inbred, isolated populations and high habitat deterioration will not result in a more rapid population decline than what has been anticipated.



NUBIAN FLAPSHELL TURTLE

Cyclanorbis elegans (Gray 1869)
Sahel Region of Africa & White Nile Basin

IUCN Red List: Critically Endangered



The Nubian Flapshell Turtle is a large softshell species, with a carapace length up to 70 cm. It is the largest member of the subfamily Cyclanorbinae. *Cyclanorbis elegans* can be distinguished from its congener *C. senegalensis* by the presence of two, or less commonly, four plastral callosities in adults. The smaller *C. senegalensis* has up to nine callosities. This species is highly aquatic and carnivorous, and inhabits only the large water basins and wide river tracts in the Sahelian and Sudanian belt. Despite its potentially wide distribution (including Benin, Cameroon, Central African Republic, Chad, Ghana, Nigeria, South Sudan, Sudan, and Togo), this species has rarely been captured in the wild and very rarely recorded during the last 50 years; there is presently no single individual in captivity throughout the world. There is no evidence of any wild specimens recorded during the last 15 years, despite several long-term field surveys in the region. There is currently very little hope for the survival of any wild population of this species in Ghana, Togo, Benin, Nigeria, or Cameroon. It is possible that the species still survives in a few remote White Nile wetlands of South Sudan (nearby historic records from Mongalla, adjacent to Bandingilo National Park), where some interviews with local fishermen suggest that this species may still be found there. Indeed, field research has been started in 2017 by an international team in South Sudan.



THREE-STRIPED BOX TURTLE

Cuora trifasciata (Bell 1825)
China

IUCN Red List: Critically Endangered



Cuora trifasciata reaches 15–26 cm carapace length; males have a thicker and longer tail. The carapace is chestnut brown with three longitudinal stripes, giving the species its scientific name. The plastron is black and the head is yellow with black lines and a brown blotch behind the eye. In 2017, the species was split into two subspecies: the nominate subspecies endemic to the Chinese mainland provinces of Fujian, Guangdong, Hong Kong, and Guangxi, and a new subspecies, *Cuora trifasciata luteocephala*, on Hainan Island. This species has a long history in Chinese folklore and traditional Chinese medicine. In recent years, *C. trifasciata* has become a financial investment and status symbol in China, and is the most sought-after turtle in China. Its Chinese name translates as "Golden Coin Turtle" because of its value. It is being farmed by the thousands in China, but the demand for wild specimens is still high. The last three decades of intense collecting and massive habitat destruction and degradation have brought it to the brink of extinction in the wild. Estimates are as low as 500 specimens remaining in the wild.

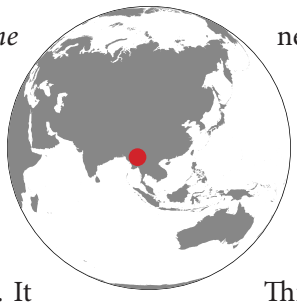
Fewer than twenty specimens per year are still reported by hunters, with a last potential stronghold in Hong Kong, though in recent years illegal trapping has led to an almost complete population collapse. On Hainan, the last strongholds are within well-protected military areas. Farmed *C. trifasciata* are of little conservation value due to hybridization with related species. Fewer than 350 specimens are in assurance colonies in Hong Kong, Europe, and the United States. Future release projects in well protected areas are currently being considered, but are hindered by the high value and demand for the species.



BURMESE STAR TORTOISE

Geochelone platynota (Blyth 1863)
Myanmar

IUCN Red List: Critically Endangered



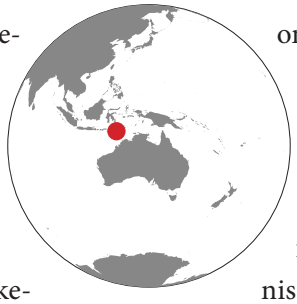
The Burmese Star Tortoise (*Geochelone platynota*) is one of the rarest tortoises in the world. It has been considered functionally extinct in the wild for more than a decade, and only in recent years have some captive bred animals been released in the wild. Little is known about this species in the wild. It once occurred across the dry zone of central Myanmar (Burma), where it inhabited dry scrub forests and deciduous forests as well as grasslands, scrub bamboo forests, and agricultural areas. *Geochelone platynota* has historically been collected by villagers; some were sold in Chinese food markets or used in traditional Asian medicine. More recently it has become highly prized in the international pet trade, resulting in the removal of nearly all animals from the wild. Destruction of its habitat continues as the dry zone is the most densely populated region of Myanmar. A National Action Plan developed in 2012 resolved to return *G. platynota* to every protected area within its former range. This habitat could in theory support hundreds of thousands of tortoises. Captive breeding in Myanmar has been highly successful, and the captive population is growing rapidly. Experimental releases of three-year-old head started animals, at a size large enough to avoid predation by rats, has demonstrated high survival rates, site fidelity, and eventual reproductive success. If further collecting can be controlled, the prospect of recovery for this species is bright.



ROTI ISLAND SNAKE-NECKED TURTLE

Chelodina mccordi Rhodin 1994
Indonesia, Timor-Leste

IUCN Red List: Critically Endangered



Chelodina mccordi is a medium-sized side-necked turtle (maximum carapace length 24 cm) found on the small Indonesian island of Roti (Rote) as well as in Timor-Leste. Three subspecies are currently recognized: *C. m. mccordi* (Western Roti Snake-necked Turtle), *C. m. roteensis* (Eastern Roti Snake-necked Turtle), and *C. m. timorensis* (Timor Snake-necked Turtle). The Timor-Leste taxon may be a separate species.

Chelodina mccordi has an extremely limited distribution. Its Roti population has been subjected to habitat loss, predation by invasive fish species, and extensive collection for the international pet trade; it became commercially extinct within 10 years of its description. It may be extinct in the wild, the last known record being in 2009, despite recent field surveys. Agriculture is the primary factor leading to land use change on Roti, with much of the historical habitat for *C. mccordi* now being used for farming, rendering previous habitats unsuitable for turtles. The population in Timor-Leste may be relatively stable, as most of its distribution falls within the protected boundaries of Conis Santana National Park.

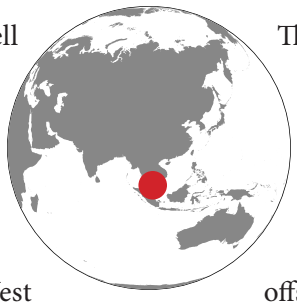
No formal government-designated protected areas exist on Roti that encompass *C. mccordi* habitat; however, traditional island leaders have now declared its habitat (local freshwater lakes) protected by traditional law. In addition, land owners of the best remaining lake habitats have announced that they will collaborate with conservation efforts. Captive breeding via *ex-situ* assurance colonies in North America, Europe, and Asia provide hope for eventual reintroduction of captive-bred individuals. Habitat restoration and removal of invasive species are needed.



SOUTHEAST ASIAN NARROW-HEADED SOFTSHELL TURTLE

Chitra chitra Nutaphand 1986
Indonesia, Malaysia, Thailand

IUCN Red List: Critically Endangered



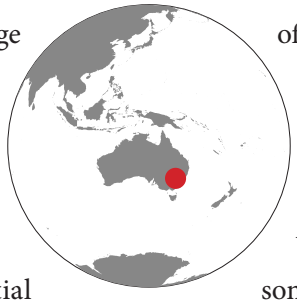
With a recorded maximum size of well over 120 cm (4 feet) carapace length and 254 kg weight, *Chitra chitra* is the largest known freshwater turtle. The Southeast Asian Narrow-headed Softshell turtle is an ambush fish-eater, hunting by sight and inhabiting clear-water rivers in Thailand, West Malaysia, Java, and possibly Sumatra. It has suffered extensively from deteriorating water quality and visibility resulting from deforestation, degradation, and erosion of adjoining lands, as well as from dam and reservoir construction and sand mining. In addition, the animals are directly targeted for local subsistence consumption, the food trade, as well as the pet trade. Conservation breeding and head starting have been tried in Thailand, where initial breeding success produced many hatchlings, but most juveniles subsequently were lost to disease while the adults ceased reproduction. Reviving the conservation breeding efforts with improved husbandry practices for adults and offspring is desirable; this should be accompanied by detailed surveys in all range countries to document the home ranges of the remaining wild animals, followed by safeguarding key foraging and breeding areas wherever possible. Increasing public awareness of the species' conservation situation will be needed to reduce the impacts of hunting, egg collection, and pet trade demand.



BELLINGER RIVER SNAPPING TURTLE

Myuchelys georgesi (Cann 1997)
Australia

IUCN Red List: Data Deficient
TFTSG: Critically Endangered



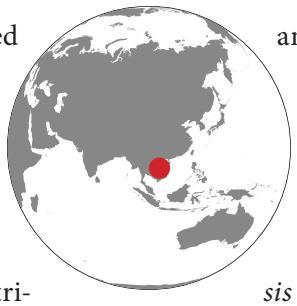
Myuchelys georgesi is a distinctive lineage of chelid turtle that is restricted to a small coastal drainage, the Bellinger River, in New South Wales, Australia. The species is threatened as a relictual lineage restricted to an exceptionally small range (35 km linear range). It is also threatened by substantial changes in land use and clearing in the Bellinger catchment, including the riparian zone, leading to instream changes that favor the establishment of an introduced competing species, *Emydura macquarii*. This species, recently introduced to the Bellinger, hybridizes with *M. georgesi*, with the risk of genetic pollution and loss of genetic identity. In 2015, a disease swept through the range of *M. georgesi* and killed all adult individuals in the population, but left the introduced *Emydura macquarii* unaffected. Known surviving adults of *M. georgesi* currently reside in an assurance colony maintained by Taronga Zoo, in Sydney, which has had some success in breeding. As a result, in 2016 *M. georgesi* was listed as Critically Endangered under the Australian Environment Protection and Biodiversity Conservation Act. With only juveniles remaining in the wild, and uncertainty as to how they will be affected by the disease when they reach adulthood, the species is considered under imminent threat of extinction.



VIETNAMESE POND TURTLE

Mauremys annamensis (Siebenrock 1903)
Vietnam

IUCN Red List: Critically Endangered



Mauremys annamensis is a medium-sized turtle (females to 29 cm, males to 23 cm) endemic to seven provinces of central Vietnam, where it appears to be largely restricted to lowland wetland areas below 200 m elevation. Geographic barriers further limit the species' range. The species occurs sympatrically with *M. sinensis*, with hybridization seen in both the wild and captivity. The closely related *M. mutica* is found in close proximity in Hue province, although no intergrade area is identified.

Historically abundant, *M. annamensis* is now extirpated throughout much of its former range. Habitat loss and degradation have been severe, in particular the agricultural conversion of wetlands for rice cultivation. As recently as 2013, animals reported as locally caught were appearing in the wildlife trade within its range. Collection for the Chinese market, for traditional food and medicine, in the 1980s and 1990s put intense pressure on the species. Wholesale wild collection has now largely ended due to the rarity of wild specimens. Increases in the economic value of the species have seen a focus on farming, with *M. annamensis* now bred in large numbers in commercial turtle farms in China and Vietnam. This breeding has mainly served to increase the demand for more breeding stock with a proliferation of farms in the region. This species lives and breeds well in captivity, and captive breeding has succeeded to the point that its value in the pet trade has dropped markedly. The survival of *M. annamensis* in captivity is therefore assured; the challenge will be successful reintroduction, considering there is no currently protected habitat where the species was previously found in the wild.



CENTRAL AMERICAN RIVER TURTLE

Dermatemys mawii (Gray 1847)
Belize, Guatemala, Mexico

IUCN Red List: Critically Endangered



The Central American River Turtle is the last remaining representative of a turtle family that dates back 65 million years. The species reaches 65 cm and can weigh up to 22 kg. Males can be distinguished by their golden-yellow heads. *Dermatemys mawii* is entirely aquatic, inhabiting rivers, lagoons, and other large wetlands in southern Mexico, Guatemala, and Belize. *Dermatemys mawii* is cryptic, spending most of its time on the bottom in deep well-oxygenated water. Strictly herbivorous, it consumes shoreline vegetation (grasses, leaves), fallen fruit, and detritus. Females lay multiple egg clutches per year at the water's edge; eggs remain underwater during the rainy season, beginning development only when the water level drops. This period of embryonic diapause or dormancy may explain the wide range in incubation periods (115–223 days) reported under captive conditions. Average clutch size in one study was 14.8.

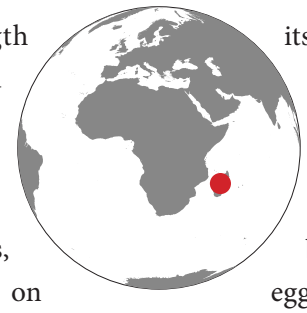
The Belize Foundation for Research and Environmental Education has established a captive facility to investigate the reproductive biology of this species with the goal of building large assurance colonies to aid in reintroductions. Priority actions include local enforcement of existing protective regulations in the range countries, developing, coordinating, and implementing a comprehensive conservation and recovery strategy for the species, and public education programs. Local consumption of this species has driven intensive collection, particularly for Easter festivals. A range of high priority conservation measures are urgently needed to preserve the future of this unique species. Conservation efforts and reintroductions are also underway in southern Mexico and Guatemala.



MADAGASCAR BIG-HEADED TURTLE

Erymnochelys madagascariensis (Grandidier 1867)
Madagascar

IUCN Red List: Critically Endangered



This turtle reaches 50 cm carapace length and 17 kg and is the only living Old World representative of the family Podocnemididae. Fully-grown adults have a large head with a strong temporal helmet, or casque. They are omnivorous, feeding on molluscs, fish, and amphibians, and seasonally also on fruits and seeds from broadleaf trees and palms, as well as on aquatic vegetation as water levels rise and fall. Formerly widely distributed in western Madagascar's west-flowing rivers and floodplain lakes, the current distribution of the species is extremely fragmented due to overexploitation. It can be found in seven protected areas in Madagascar: Ankarafantsika, Baly Bay, and Bemaraha National Parks, and the new reserves of Manambolamaty, Ambondrobe, Menabe-Antimena, and Mahavavy-Kinkony. The species is heavily collected for its much-desired meat, both for local subsistence and commercially. Increasing pressure from a rapidly growing human population and the trend in fishing habits towards the use of nets, which results in substantial bycatch of this species, as well as harvest of eggs and nesting females, is having dramatically deleterious effects on its populations.

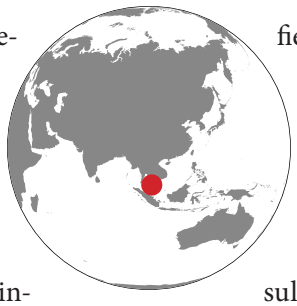
Survey data over the past three decades document an ongoing decline of the species. International conservation organizations, along with Madagascar authorities, manage a conservation program for the species, engaging local communities and reintroducing head started turtles at several sites. Close integration of local cultures and traditional natural resource management practices is a key to its success, and populations at Ankarafantsika are showing some increases.



SOUTHERN RIVER TERRAPIN

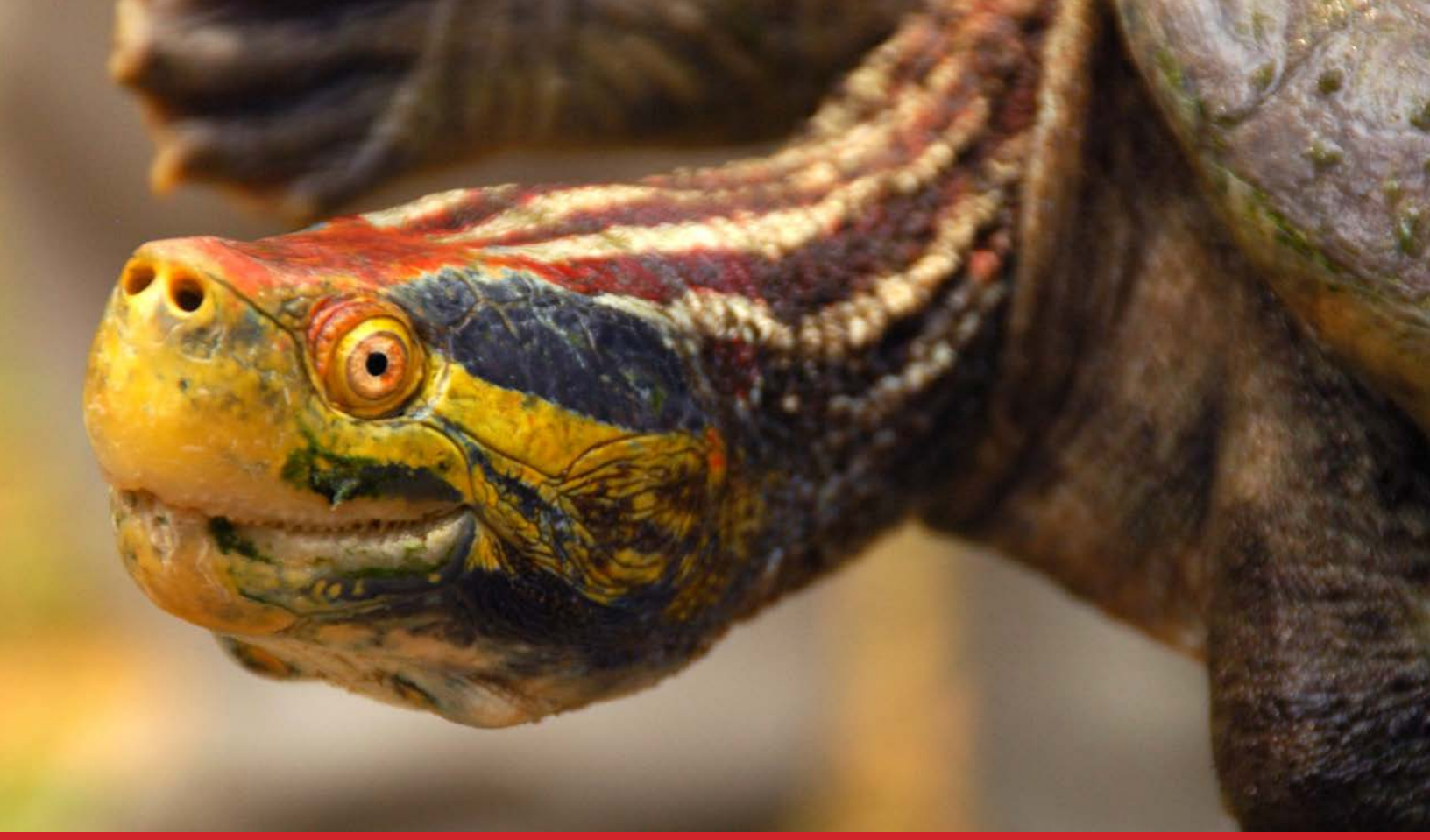
Batagur affinis (Cantor 1847)
Cambodia, Indonesia, Malaysia, Thailand, Vietnam

IUCN Red List: Critically Endangered



The Southern River Terrapin was until recently considered to be part of the wide-ranging species *Batagur baska* (from India to Indonesia). Genetic analysis determined that the species should be split into two; the Northern River Terrapin, *B. baska*, and the Southern River Terrapin, *B. affinis*, which includes the Western Malay River Terrapin, *B. a. affinis*, and the Eastern Malay River Terrapin, *B. a. edwardmolli*. This species has been heavily exploited for its flesh and eggs and only small isolated populations remain. These are likely below minimal viable population levels, thus they require intensive stewardship. Sand mining, dam construction, and pollution have also impacted this species by contributing to widespread habitat loss.

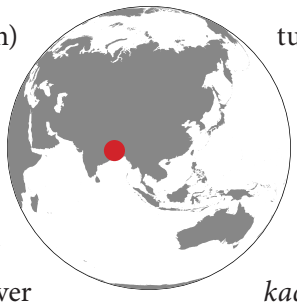
Programs protecting wild populations are active in eastern peninsular Malaysia and Cambodia. Recent field surveys in Sumatra have failed to detect any evidence of remaining wild *B. affinis*. Captive breeding colonies are maintained in Thailand, Malaysia, and Cambodia. Population supplementation by releasing head started turtles is occurring in peninsular Malaysia and southern Cambodia. Monitoring these released turtles has demonstrated the ability of the turtles to survive after being released, but whether they will survive long enough to reach sexual maturity and produce offspring is unknown. Additional conservation actions aimed at reducing human-induced turtle mortality are necessary for these supplementation programs to succeed over the long-term. Habitat management needs include the creation of protected areas, vital to the species' survival.



RED-CROWNED ROOF TURTLE

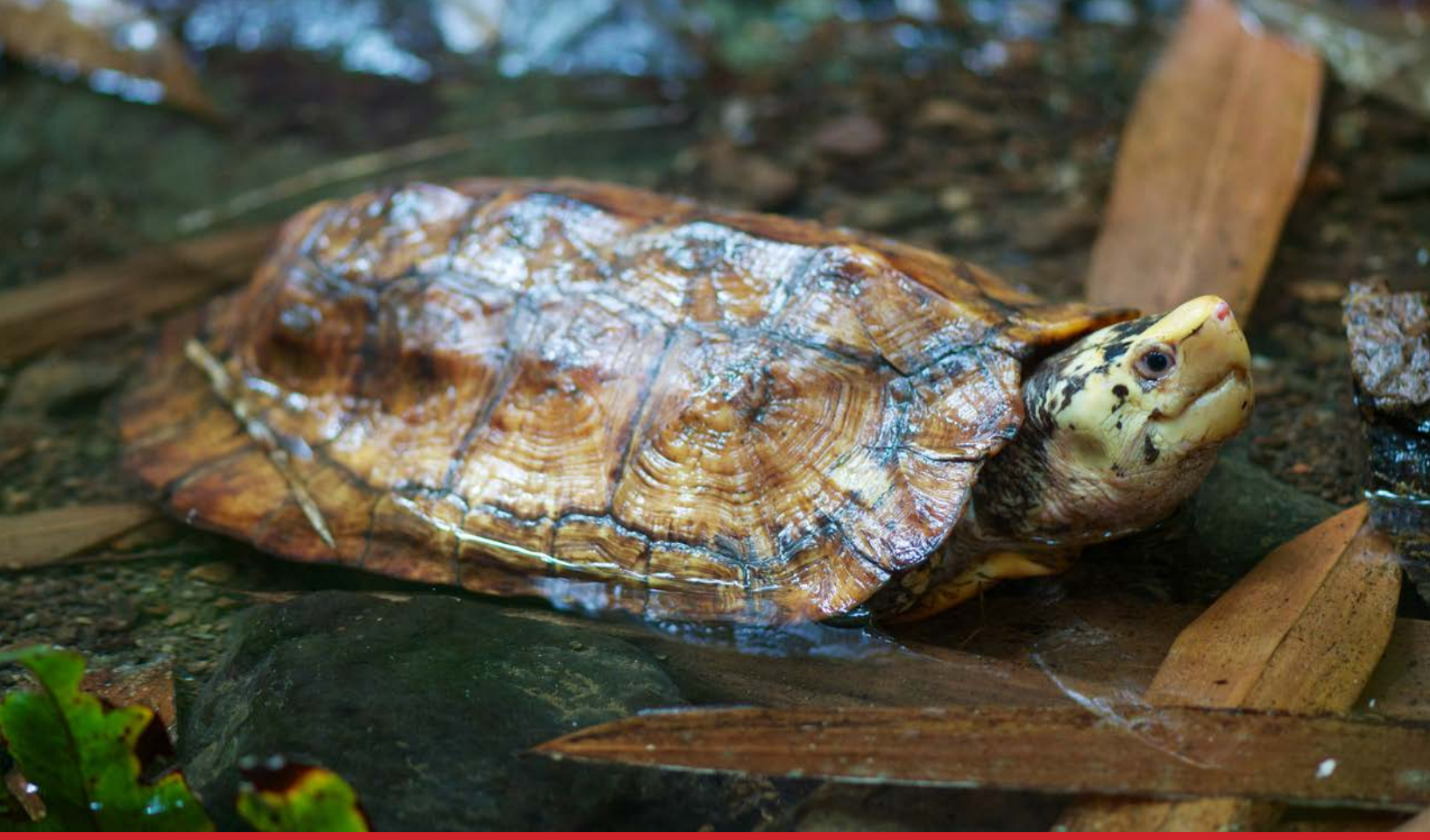
Batagur kachuga (Gray 1831)
Bangladesh, India, Nepal

IUCN Red List: Critically Endangered



The Red-crowned Roof Turtle (to 60 cm) has been decimated across its former range due to high levels of hunting and habitat degradation. Once found throughout the entire Gangetic River system, the last potentially long-term viable population is now found only within the National Chambal River Sanctuary. Based on over a decade of nest surveys, it is estimated that less than 500 adult females remain within the 400 km long sanctuary. However, the sanctuary is not immune to the impacts of large scale clandestine sand mining and illegal fishing.

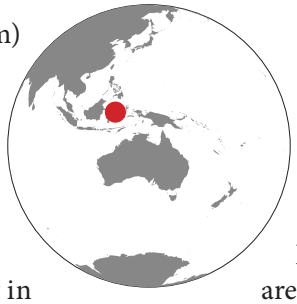
The loss of optimal nesting habitat increases the probability that nests are destroyed by predators and/or flooding events. Additional nesting areas are rendered unsuitable due to seasonal conversion to agricultural use. Illegal fishing causes the drowning of many turtles annually. The loss of adult turtles is particularly detrimental to population stability and is the leading cause of the species decline. Conservation organizations are engaged in the conservation of *B. kachuga* through nest protection, head-starting, assurance colonies, capacity building, and community level engagement in the National Chambal River Sanctuary. Over 20,000 *B. kachuga* hatchlings have been released from the riverine hatchery program during the last 11 years. The project aims to not only increase recruitment of juveniles into the population but also to reduce adult mortality. Working with local law enforcement to reduce illegal fishing in the sanctuary is also a high priority.



SULAWESI FOREST TURTLE

Leucocephalon yuwonoi (McCord, Iverson & Boeadi 1995)
Indonesia

IUCN Red List: Critically Endangered



This medium-sized (to 28 cm) semi-aquatic turtle is endemic to the Indonesian island of Sulawesi. Frank Yuwono, after whom the species is named, obtained the first specimen known to science from a market in Gorontalo; the species was formally described to science only in 1995. Males are much larger than females and distinguished by their whitish heads. No detailed field studies have been carried out, but the species' preferred habitat appears to be cool shallow streams that flow from the mountains. These streams are bordered by either forest or crop plantations. *Leucocephalon yuwonoi* appears to spend the daytime hidden under leaf litter or foraging near the stream bank, moving into the stream to forage at night. Females lay a single egg, or occasionally two eggs, while multiple clutches in a year are possible.

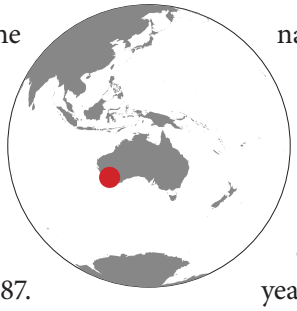
Habitat destruction from commercial logging, small-scale agriculture, and forest clearing for palm plantations has greatly reduced the species' habitat. This has been exacerbated by collection for the meat and pet markets; an unknown number of animals are consumed locally and exported illegally. The species' low reproductive output is also cause for concern. *Leucocephalon yuwonoi* has a very limited range on the Minahasa Peninsula of northern Sulawesi. Priorities for this species include detailed population surveys and field research into its biology so that effective conservation measures can be developed. Both *ex-situ* and *in-situ* captive breeding programs will be needed to supplement populations and act as assurance colonies. *In-situ* efforts should focus on protected areas, which could be release sites for captive raised young. Captive propagation has thus far proved difficult, with limited success.



WESTERN SWAMP TURTLE

Pseudemydura umbrina Siebenrock 1901
Australia

IUCN Red List: Critically Endangered



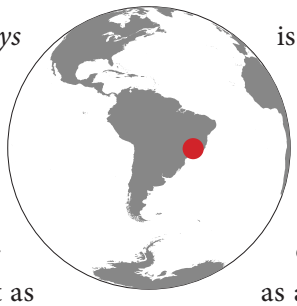
Due to massive habitat loss and despite the creation in 1962 of two small nature reserves encompassing all known habitat fragments, the wild population of *Pseudemydura umbrina*, a slowly reproducing ephemeral clay swamp specialist, dropped from over 200 in the 1960s to fewer than 30 individuals by 1987. Together with 17 captive individuals, which did not breed, the world population was below 50. A rescue operation begun in 1988 established a successful captive breeding project through an ecophysiological approach, taking into account the species' extreme seasonality. A recovery program over the last three decades allowed the last tiny self-sustaining wild population in one of the reserves to increase slowly through predator exclusion and acquisition and restoration of adjacent habitat. Through reintroduction of captive-bred juveniles and supplementation of some swamps with water during dry winters, the second natural population was also recovered. Together with conservation introductions of captive-bred juveniles at two additional protected sites north of its known range, the overall wild population increased by about ten-fold since the 1980s, but since juveniles take 8–15 years to reach maturity, the wild adult population still hovers around 50. Natural recruitment is now occurring in all populations. The species remains under severe threat from introduced predators (foxes, rats, pigs), poaching, incompatible surrounding land uses, as well as stochastic events related to climate change: drought, increasing aridity, drying swamps, and bushfires. Based on integrated biophysiological and hydrological modelling, colonization in two sites on Western Australia's wetter and cooler south coast commenced in 2016, making *P. umbrina* the first vertebrate species to be deliberately relocated to novel areas because of climate change.



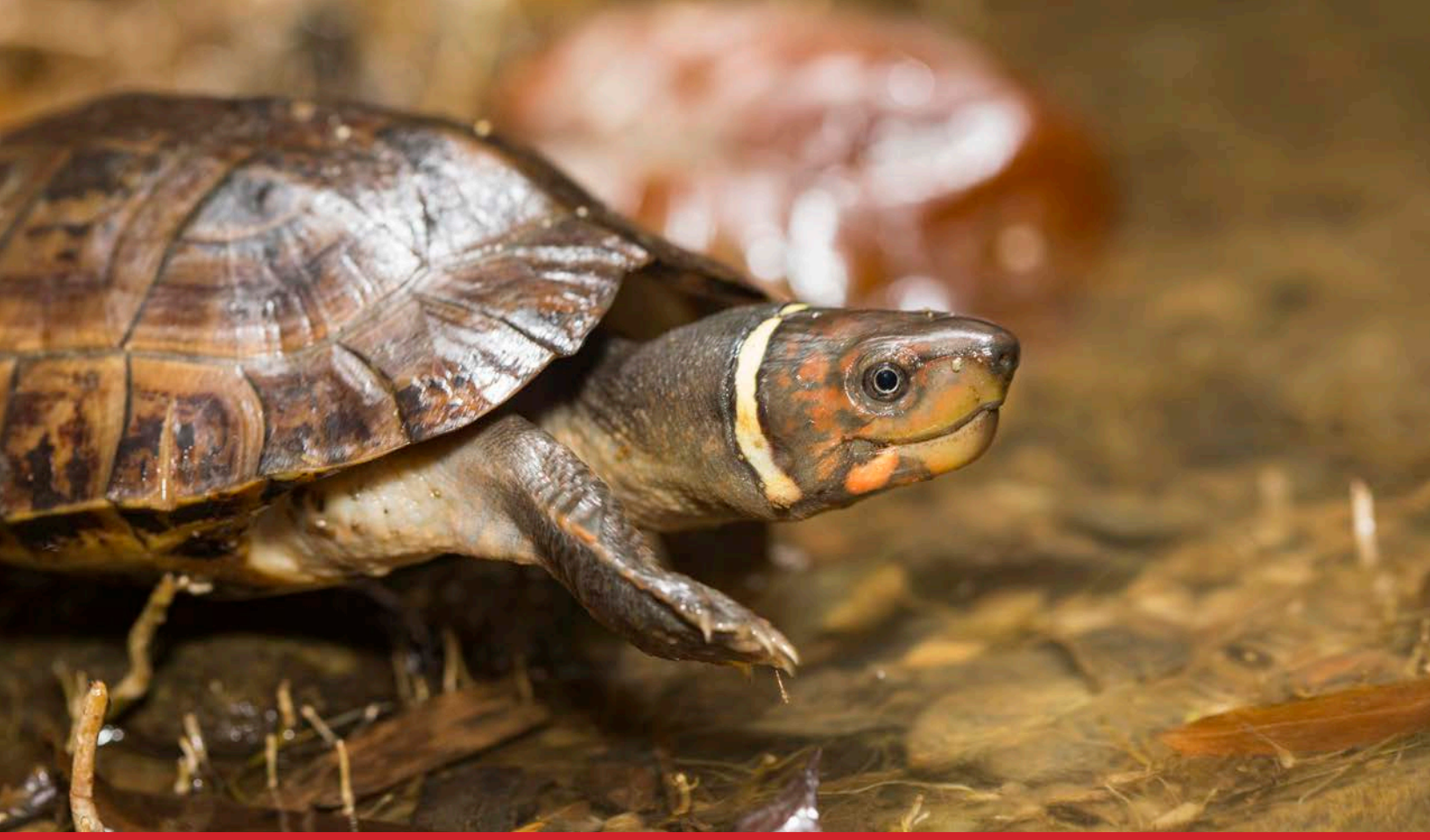
HOGE'S SIDE-NECKED TURTLE

Mesoclemmys hogei (Mertens 1967)
Brazil

IUCN Red List: Endangered
TFTSG: Critically Endangered



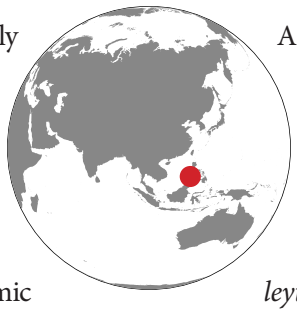
Hoge's Side-necked Turtle (*Mesoclemmys hogei*) is a Critically Endangered freshwater turtle with a restricted geographic range in the Brazilian southeastern Atlantic Forest, notably in the Carangola River of Minas Gerais and Paraíba do Sul River, Rio de Janeiro. The Brazilian official Red List notes it as the most endangered turtle of Brazil. The best-studied population is estimated to be less than 2,000 turtles (based on ongoing mark recapture studies since 2002) and is limited to the middle section of the Carangola River. Unfortunately, recent DNA studies have revealed that the Carangola population has very low genetic variability, probably due to a bottleneck event in the past. Habitat degradation, due to deforestation, urban and industrial sewage discharge, agriculture-related pollution, and dam-building, severely threatens the survival of *M. hogei*. Direct mortality caused by sport fishermen is also a major concern. Recently two areas along the Carangola River have been officially designated as no-fishing zones. The use of circle hooks with their lower rate of turtle capture compared to the more traditional j-hooks is being actively promoted as a means of reducing these mortality events. In 2015, 96 hectares of nesting habitat were secured as a permanent private protected area as outlined by the Brazilian National System of Conservation Units. The species utilizes intact closed canopy rainforest for nesting, hence the agricultural practice of clearing forests to the river's edge is very damaging to the species. The species has also been reported in the trade in Asia. In 2014, a systematic environmental education program was developed, complete with an educational video and a teachers' guide.



PALAWAN FOREST TURTLE

Siebenrockiella leytensis (Taylor 1920)
Philippines

IUCN Red List: Critically Endangered



The Palawan Forest Turtle was formerly known only from museum specimens allegedly collected on the island of Leyte in the 1920s. For almost 70 years, biologists were unable to locate additional specimens. Finally, in 1987 a specimen was purchased in a food market in northern Palawan. It is now known to be endemic to the Palawan island group, and does not occur on Leyte. *Siebenrockiella leytensis* is an aquatic species that prefers slow moving streams in well vegetated lowland forest and swamp forests, as well as wetlands, creeks, and rivers. It is nocturnal, hiding during the day in deep burrows in river banks or, during the dry season, under rocks. It is omnivorous and depends on an intact lowland forest ecosystem.

Its habitat is threatened by slash-and-burn farming, logging, and agricultural encroachment. The greatest threat to the Palawan Forest Turtle is the international pet trade, which surged when it was rediscovered. Demand for the Asian food and traditional medicine markets has added to this over-exploitation. Although the species is protected under Philippine law, and its trade is regulated by CITES, there continues to be an active illegal trade both for local consumption and export. In 2015 alone, 4,124 *S. leytensis* – 3,831 from a single seizure – were confiscated. Fortunately, 89% of them have been released back to the wild, and continuous monitoring shows high site fidelity and survival. *In-situ* conservation through habitat protection of vital populations under the involvement of local communities is considered the most effective conservation tool.

The Palawan Forest Turtle is the focal species of the Philippine Freshwater Turtle Conservation Program implemented by Katala Foundation Inc., with the overall goal to conserve and restore most viable populations of *S. leytensis* and its habitats.



MAGDALENA RIVER TURTLE

Podocnemis lewyana (Duméril 1852)
Colombia

IUCN Red List: Critically Endangered



This large herbivorous river turtle (to 50 cm) is the only member of the Family Podocnemididae to occur northwest of the Andes Mountains. Much of the land bordering the riverine habitat that this species occupies has been converted to pastures or plantations. The draining of wetlands for agriculture and irrigation also impacts this species. Deforestation in the head-waters of the rivers (and one hydro-electrical plant in the Sinú River) produces changes in the local hydrology, increased siltation of wetlands and altered natural river cycles, often leading to flooding of nesting areas, causing egg mortality. More critical is the intense subsistence hunting and commercial exploitation that occurs throughout this species' range, which has reduced or extirpated populations. Furthermore, the primary nesting season coincides with Lent, a period when there is a high demand for turtle meat. Other indirect human effects on populations include lower recruitment due to cattle trampling nests and domestic animals such as dogs and pigs excavating and consuming incubating eggs and destroying nests.

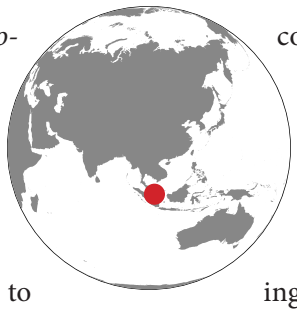
The geographic range of *Podocnemis lewyana* does not include any private or official protected areas. The species is thus exposed to direct and indirect threats. Colombian law prohibits commercial exploitation of the Magdalena River Turtle, but there is little implementation of this legislation, leaving the species largely unprotected. Efforts are underway to provide public education of the plight of this species and to improve awareness of the need to protect it. Environmental education projects directed towards *P. lewyana* include head-starting components that involve community participation.



PAINTED TERRAPIN

Batagur borneoensis (Schlegel & Müller 1845)
Brunei, Indonesia, Malaysia, Thailand

IUCN Red List: Critically Endangered



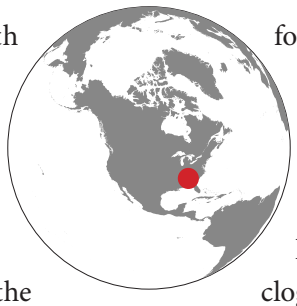
Male Painted Terrapins, *Batagur borneoensis*, in full breeding color are widely considered to be one of the most strikingly beautiful turtles. Yet, even the most beautiful turtles are not immune to the devastating impacts of rampant hunting and egg collection, nor are they any more resistant to habitat loss and degradation. Global population status for the species shows a marked decline from only 40–50 years ago, about one generation for the species. It is now believed to be restricted to small remnant populations in Malaysia and parts of northern Sumatra, Indonesia. Development of large-scale agro-based activities that discharge effluents into the rivers negatively impacts the riparian vegetation that *B. borneoensis* relies on for the majority of its diet. Additionally, this species is often collected from the wild for the pet trade due to its highly attractive coloration. Conservation measures accorded to the species have been limited. In Sumatra, directed by the Satucita Foundation, nests are protected annually and community outreach is working on decreasing the hunting of adults. In Malaysia, eggs from wild nests are incubated in several locations in Terengganu (east coast of West Malaysia) and in Sarawak. With decades of high egg collection, recruitment of juveniles into the population has been extremely limited. Many remaining wild adults are of advanced age, which could cause remaining adult populations to quickly decline as these individuals reach the end of their life span.



FLATTENED MUSK TURTLE

Sternotherus depressus Tinkle & Webb 1955
United States of America

IUCN Red List: Critically Endangered



The Flattened Musk Turtle is one of North America's smallest and rarest turtles. It grows to only 10–12 cm carapace length. Its entire geographic range is confined to the larger streams of the Black Warrior River drainage in northern Alabama. The occurrence of mollusks seems to predict the occurrence of the turtles, and they forage along the stream bottom both day and night. They occur in clear streams and rivers with abundant rocks and crevices, under which they lodge themselves, facilitated by their flattened shells. It is believed that *Sternotherus depressus* once occurred throughout the streams and rivers of the Black Warrior Basin. It is today limited only to areas in which human development has not destroyed its former habitats. It is estimated that less than 7% of the species' original habitat remains unaffected by habitat destruction, and the species' population has declined by more than 90% in the past 25 years. Runoff from local coal mining has led to silt and coal dust clogging stream bottoms and eliminating the species' food supply. Sewage runoff has also damaged their habitat and food supply. Poaching for the pet trade exists, at unknown levels.

While it is protected by federal and state law, there are currently few conservation measures being taken to protect *S. depressus*, and few assurance colonies exist. Their survival depends on steps being taken to protect the remaining habitat from further degradation.



PAN'S BOX TURTLE

Cuora pani Song 1984
China

IUCN Red List: Critically Endangered



Pan's Box Turtle is a brown-shelled, green-headed, streamlined, low-domed species of *Cuora*. The species measures 10.5–19.5 cm; males are usually smaller and less domed than females. The species inhabits fast-flowing streams in the northernmost range of this genus, with air temperatures as low as -20°C during winters, occurring along the Jangtse River in the Qinling Mountain range in the central Chinese provinces of Henan, Hubei, Shaanxi, Sichuan, Chongqing, and Gansu. While the overall range covers about 200,000 sq. km, it is restricted to streams in suitable mountain valleys within this area, making the actual range much smaller. This is reflected by its rarity in captivity. Its description as a new species led to intense trade which, as in several other *Cuora* species, led to its rapid decline. Previously considered poisonous by the local tribes and left untouched for centuries, three decades of overexploitation pushed it to the brink of extinction. Fewer than 10 wild caught specimens are recorded per year and it has not been found at its type locality for two decades.

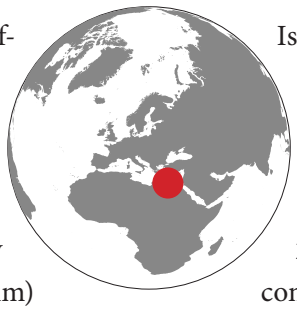
Observations by scientists have not been made since the 1990s, bringing estimates of the remaining populations to 100–1000 remaining animals. Captive populations are below 500 specimens, with less than 20% in proper assurance colonies. Breeding is occurring at an increasing rate in captivity. Field surveys are urgently needed for this species before it shares the presumed "extinct in the wild" designation with many other *Cuora* species.



EGYPTIAN TORTOISE

Testudo kleinmanni Lortet 1883
Egypt, Israel, Libya

IUCN Red List: Critically Endangered



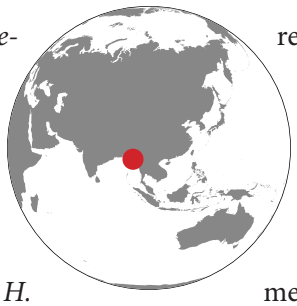
This tiny tortoise (to 12 cm) is one of Africa's smallest tortoise species. It inhabits a 30–50 km-wide coastal strip of desert habitat between the Mediterranean Sea and the northern Sahara Desert in Libya, Egypt, and Israel. Once found in relatively high densities (up to 41 tortoises per sq. km) in Egypt, *T. kleinmanni* is likely extirpated from that portion of its range due to collecting pressure for the pet trade. Poaching for the pet trade peaked in the mid-1990s, when Egypt requested the animal be upgraded from CITES Appendix II to Appendix I. Density was estimated to be as low as 4 tortoises per sq. km in the early 1980s and the species is now suspected to be isolated to a few pockets of habitat in the Negev Desert of Israel. Former habitats have been converted to large-scale agriculture and urbanization and much is used for grazing by local pastoralists. *Testudo kleinmanni* maintains large home ranges (15–35 ha) and lays only 2–6 eggs per year. The low reproductive rate, combined with heavy poaching for the pet trade and severe habitat destruction, have pushed the species to the brink in the wild. Conservationists have conducted grassroots efforts to work with local people to locate sustainable and alternative income sources to harvesting tortoises. Captive breeding populations are being successfully managed by the European Studbook Foundation.



ARAKAN FOREST TURTLE

Heosemys depressa (Anderson 1875)
Bangladesh, Myanmar

IUCN Red List: Critically Endangered



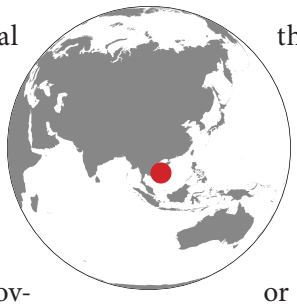
The Arakan Forest Turtle (*Heosemys depressa*) occurs in the Arakan and Chin Hills of western Myanmar, Chittagong Hill Tracts of neighboring Bangladesh, and possibly into Mizoram (India), along the Kaladan River drainage, although the latter has yet to be confirmed. Within this region, *H. depressa* is found in a variety of low and mid-elevation (to 700 m) habitat types, including primary evergreen forest, second-growth forest in abandoned swidden fields, deciduous forest, and bamboo brake. Very little is known concerning the natural history of this enigmatic turtle, although on-going radiotelemetry studies suggest *H. depressa* is largely terrestrial, active primarily during the wet season, spends much of the cool dry season in a state of semi-dormancy, and consumes a diet of vegetation and various fruits. *Heosemys depressa* is widely harvested for food by indigenous peoples in the region, but commercial hunting appears limited. Some populations are threatened by habitat destruction, although for the most part forests in much of western Myanmar remain intact; however, this situation could change as Myanmar opens to foreign investment. The Rakhine Yoma Elephant Sanctuary (RYES) harbors globally significant populations of *H. depressa* and expansion of this protected area would go far towards insuring the continued survival of this species. *Heosemys depressa* also occurs in the smaller Kyauk Pan Taung Wildlife Sanctuary of northern Rakhine State. A small assurance colony is established at RYES that regularly produces offspring, and *H. depressa* is also maintained at several institutions outside of Myanmar where reproduction has likewise been reported.



SOUTHERN VIETNAM BOX TURTLE

Cuora picturata Lehr, Fritz & Obst 1998
Vietnam

IUCN Red List: Critically Endangered



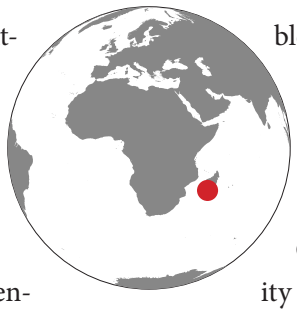
This recently described, highly terrestrial member of the genus *Cuora* inhabits the evergreen rain forests at elevations of 300 to 600 m on the Lang Bian Plateau in southern central Vietnam. It is currently known only from two provinces, Khanh Hoa and Phu Yen, and may also occur in Dac Lak province. It took scientists until 2010 to finally find this species in the wild. *Cuora picturata* is characterized by an orange-brown to dark brown carapace with a cream-colored band extending along the lateral side. It has a yellow head with fine grayish reticulations and a cream plastron with black spots on each scute. The species reaches 15–19 cm carapace length. Males usually have a slightly concave plastron, larger claws and a thicker and longer tail. The remaining suitable habitat of this species covers less than 3000 sq. km and it is estimated that at most 3,000-10,000 animals survive in the wild. The species was hunted for local consumption in historic times, but now all captured animals are smuggled to Chinese pet and food markets or sold as medicine. Along with high hunting pressure comes habitat destruction from logging and conversion of forest into farmland. This species is rather delicate to keep in captivity and easily stressed. Successful breeding is still uncommon but increasing; the small clutch size of 1–3 eggs makes reproduction slow. It is estimated that fewer than 500 specimens exist in captive collections, with only about 20% serving for assurance purposes.



FLAT-TAILED TORTOISE

Pyxis planicauda (Grandidier 1867)
Madagascar

IUCN Red List: Critically Endangered



Pyxis planicauda is found only in a limited area of dry deciduous forest in the coastal lowlands of western Madagascar. This species has a low reproductive rate and is severely threatened by habitat loss and previous over-collection for the international pet trade. Since being placed on CITES Appendix I in 2002, legal export for the pet trade has ceased and its severe population decline has been halted, but collection for the illegal pet trade still occurs. Local people do not consume or harm the tortoises which are only active during the hot wet season from November/December to March/April and remain hidden under leaf litter and dormant for the rest of the year. Noted for having a distinctly flat tail, this species has long been desired by pet keepers, although due to its life style it adapts poorly to captive conditions, is highly susceptible to bacterial and viral infections, and has generally poor survivorship. Only a few institutions and private breeders outside Madagascar manage to breed this species; it reproduces regularly at Durrell Wildlife Conservation Trust's tortoise breeding facility in Ampijoroa in northwestern Madagascar.

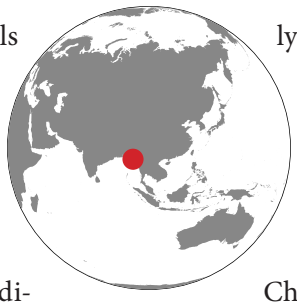
Conservation measures focus on protecting its native habitat, the dry deciduous forest which is threatened by slash and burn agriculture, and maintaining viable wild populations, as is currently the case in Kirindy Forest where the species remains locally abundant in a small population. The population of Andranomena Reserve, effectively extirpated two decades ago through collection for the pet trade, may eventually be repopulated with captive progeny from Ampijoroa.



MYANMAR NARROW-HEADED SOFTSHELL TURTLE

Chitra vandijki McCord & Pritchard 2003
Myanmar, Thailand

IUCN Red List: Not Evaluated
TFTSG: Critically Endangered



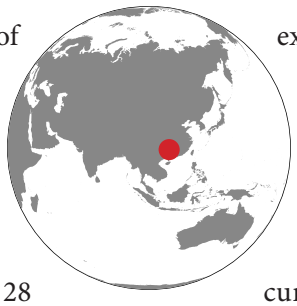
While the occurrence of *Chitra* softshells in Myanmar was long assumed, it was not until the 1990s that conclusive proof of their existence was found, and in 2003 the populations inhabiting the Ayeyarwady river system and lower Thanlwin (Salween) were described as a separate species. All indications from field surveys and market observations continue to indicate that the species is widespread, but populations are depleted. Remaining animals are at high risk of exploitation for local consumption or export trade, while its riverine habitat has been impacted by runoff from erosion, and the impacts of hydroelectric dam construction, with more dams being planned. Further status surveys and local conservation initiatives like nest protection and possibly head starting are highly recommended. Developing effective and equitable community-based fishing practices and regulations would greatly help this and other riverine species. The most promising long-term conservation measures would be to enact designation of the upper Chindwin and its surrounding forest areas as a strictly protected riverine sanctuary, and upgrade the Irrawaddy Dolphin Protected Area in central Myanmar to an effectively protected, enforced, and managed riverine wildlife sanctuary. This would secure this turtle as well as migratory waterfowl, fish, dolphins, and other biodiversity from the threats of exploitation and ecosystem degradation, and provide the downstream ecosystem benefits of clean freshwater and fish fingerlings, benefiting human communities as well.



CHINESE RED-NECKED TURTLE

Mauremys nigricans (Gray 1834)
China

IUCN Red List: Endangered
TFTSG: Critically Endangered



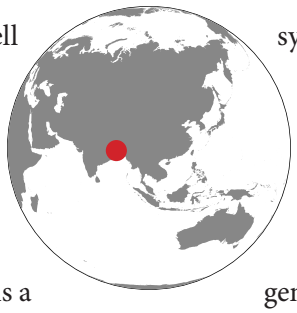
The Chinese Red-necked Turtle is one of the rarest aquatic turtles in China; its exact status in the wild is uncertain, but has reached critically low numbers, and it has not been seen in the wild in several years. *Mauremys nigricans* is sexually dimorphic, with the much larger females reaching over 28 cm and males remaining under 19 cm. The species occurs in streams of several river drainages in hilly forests of southern China at elevations of 300–700 m. Although it is not widely eaten compared to many other Asian turtles, or used in traditional Asian medicine, the species has been in demand in the Asian and international pet trade for many years. Heavy collection over the past 20 years has reduced the wild population to very near extinction. This species hybridizes quite freely with other members of the genus *Mauremys*, posing a potential genetic risk if pets are released into the wild. Habitat loss and degradation are also factors jeopardizing the species' survival, but its numbers are currently so low that captive breeding may be the only hope for the species. More field surveys are needed to determine how many, if any, *M. nigricans* remain in the wild. The species breeds well in captivity and captive populations have grown in recent years; its survival as a captive animal is therefore assured. The question is whether animals remain the wild, and what the fate of its habitat will be.



SOUTH ASIAN NARROW-HEADED SOFTSHELL TURTLE

Chitra indica (Gray 1830)
Bangladesh, India, Nepal, Pakistan

IUCN Red List: Endangered



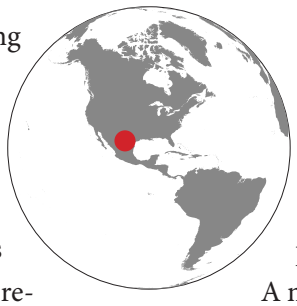
The South Asian Narrow-headed Softshell Turtle occurred widely throughout the rivers of the South Asian subcontinent, but a combination of habitat alteration and destruction, fisheries bycatch, and targeted exploitation has shrunk its current occurrence to just fragments of its former range. As a visual ambush predator focused on fish, the animals are dependent on shallow areas of clear flowing water to forage, as well as extensive sand banks for nesting. The population inhabiting the National Chambal River Gharial Sanctuary, a 400 km ribbon of protected river and riverbanks in the heart of India, should in theory be fully protected, thus allowing recruitment and dispersal of offspring to populate other parts of the Ganges river system. However, clandestine sand-mining, riverside agriculture impacts, plus entanglement and drowning in illegally set monofilament fishing nets, impact even this population and its ecosystem. The political will to enforce Sanctuary regulations is urgently needed, especially regulating the hydrological regimes. There are long-running conservation programs in India, involving former turtle poachers, to protect known nesting banks along the Ganga, Yamuna, and Chambal rivers, educate riverside villagers, as well as hatch-and-release initiatives. An assurance colony of *C. indica* was recently established at Kukrail Gharial Centre. These efforts should be continued and possibly replicated in other parts of the species' range.



COAHUILA BOX TURTLE

Terrapene coahuila Schmidt & Owens 1944
Mexico

IUCN Red List: Endangered



The Coahuila Box Turtle is unique among North American box turtles in its largely aquatic habits. The species has an unclear phylogenetic relationship to the other box turtles and may be a sister taxon to *Terrapene carolina*. It is one of the rarest turtles in North America, and has one of the most restricted distributions of any turtle in the western hemisphere. *Terrapene coahuila* is endemic to small spring-fed wetlands and pools in an intermontane valley near the town of Cuatro Cienegas in northern Mexico. The species averages 13-14 cm in carapace length; adults are a dull greenish brown color. They are found in the pools, foraging aquatically for animal and plant foods. They are also encountered on land, crossing between pools and hiding beneath grass tussocks. Coahuila Box Turtles have been found to migrate up to 10 km between wetlands.

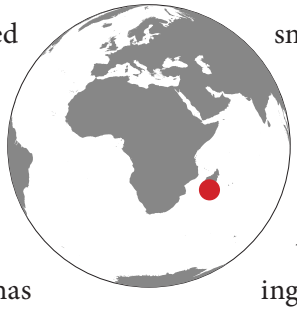
Terrapene coahuila is thought to be greatly reduced in most of the wetlands in which it formerly occurred. The population density in 1974 was estimated at 148 turtles per hectare in the proper habitat, and a total population of approximately 10,000 turtles. A more recent estimate in 2008 indicated a dramatic reduction to between 1 and 67 turtles per hectare. Current population numbers are unknown but are certainly lower; a new census is urgently needed. The primary threat appears to be habitat loss due to a lowering of the water table from encroaching agriculture, such that formerly prime wetland habitat is now too dry to support a turtle population. A lesser threat is collection for the pet trade. Although the species breeds well in captivity, there were as of 2012 only 54 adults assurance colonies, with few genetic lineages represented.



RADIATED TORTOISE

Astrochelys radiata (Shaw 1802)
Madagascar

IUCN Red List: Critically Endangered



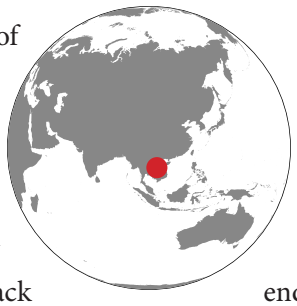
Endemic to Madagascar, the Radiated Tortoise is a particularly attractive animal that can have variable coloration, but generally has a dark brown-black carapace with striking yellow streaks radiating from each areola, hence its name. Once believed to be the world's most numerous tortoise, it has suffered more than a 65% reduction in its native range and its populations continue to be decimated by overexploitation. Major causes of decline include habitat destruction for agriculture, horticulture, and charcoal production. Adult animals are poached for the bushmeat trade, while juveniles are collected illegally for the pet trade. Thousands of adults are slaughtered annually for their meat, which is smoked and dried. Juveniles are smuggled out of Madagascar in suitcases by the hundreds. Widespread corruption and lack of enforcement under weak governmental control, along with extreme poverty and a breakdown of traditional local taboos against harming tortoises, are causing poaching to increase. Conservation organizations have been working with communities across southern Madagascar to restore displaced animals to protected wild areas. Recent work has suggested that these animals harbor much individual genetic variation that may be valuable in restoring populations. Despite the threats in the wild, this species does reproduce well in captivity, raising the possibility of future reintroductions.



BOURRET'S BOX TURTLE

Cuora bourreti Obst & Reimann 1994
Laos, Vietnam

IUCN Red List: Critically Endangered



The mountainous evergreen forests of Central Vietnam and adjacent eastern Laos are home to this highly terrestrial member of the genus *Cuora*. Its domed carapace is highly variable in color, well adapted to its surrounding habitat, and can be entirely black to chestnut brown with or without black stripes and radiations and a lighter colored lateral band. The plastron is cream colored with or without a varying degree of black blotches on each scute. The head coloration shows variably mixed black, red, orange, yellow, blueish, pink, or whitish patterns, patches, and spots, making it one of the most colorful Asian turtle species. The species reaches a carapace length of 15–20 cm. Males can have a slightly concave plastron, larger claws and a thicker and longer tail.

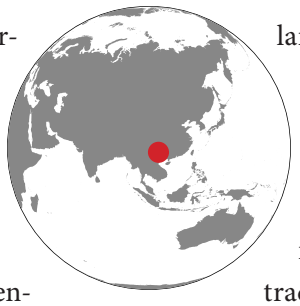
Despite ongoing rampant collection for more than three decades, mainly for the Chinese food and medicine markets, the species is still found in large parts of its range, but heavily poached and traded to China. An estimated 1500–2000 specimens ended up in the international pet trade in the 1980s and 1990s; this trend has ceased since the listing of this species on CITES Appendix II. Population estimates are in the 10,000–20,000 range at most due to its large geographic distribution. Habitat destruction from logging and the creation of new farmland threaten the remaining populations. This species is rather delicate in captivity and is easily stressed. Successful breeding is rare but increasing. Fewer than 1,000 specimens are believed to live in captivity.



INDOCHINESE BOX TURTLE

Cuora galbinifrons (Bourret 1940)
China, Laos, Vietnam

IUCN Red List: Critically Endangered



Cuora galbinifrons, a predominantly terrestrial species, inhabits evergreen rain forests at elevations of 500 to 1000 m in northern Vietnam, northeastern Laos, southernmost Guangxi Province, China, and Hainan Island, China. Its domed carapace is highly variable in color and can be entirely black to chestnut brown with or without black stripes and radiations and a yellow, orange, or mainly black lateral band. The plastron is usually black; some specimens, especially from Hainan, show a yellowish central pattern similar to its close relative *C. bourreti*. The Hainan population was once described as a subspecies, *C. g. hainanensis*, but is not currently regarded as valid. The head coloration shows variably mixed black, red, orange, yellow, blueish, pink, or whitish patterns, patches, and spots. The species reaches a carapace length of 15–20 cm. Males can have a slightly concave plastron, larger claws and a thicker and longer tail.

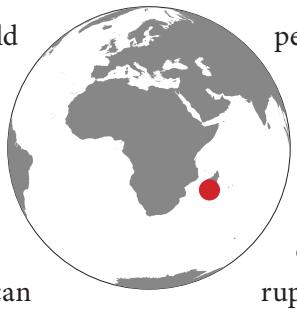
Despite ongoing rampant collection for more than three decades, mainly for the Chinese food and medicine markets, the species is still found in large parts of its range, where it is heavily poached and traded to and within China. An estimated 1500–2000 specimens ended up in the international pet trade in the 1980s and 1990s, but this has ceased since the listing of this species on CITES Appendix II. Population estimates are in the 10,000–40,000 range at most, due to its large distribution area. Habitat destruction, such as tree logging and the creation of new farmland, further threatens the remaining populations. This species is rather delicate to keep in captivity and is easily stressed. Successful breeding is rare but increasing. It is estimated that fewer than 1500 specimens exist in captive collections.



SPIDER TORTOISE

Pyxis arachnoides (Bell 1827)
Madagascar

IUCN Red List: Critically Endangered



One of the smallest tortoises in the world and the smallest endemic chelonian in Madagascar, the Spider Tortoise is classified as Critically Endangered. This species is historically sympatric with the larger Radiated Tortoise, sharing the threatened southern spiny forest. The Spider Tortoise can be highly variable in coloration, but is generally dark brown with connecting yellow streaks across its carapace, sometimes resembling a spider's web and giving the animal its English name. There are three subspecies across Madagascar's southwestern coastline, with probable intergrade zones at the population overlaps (as documented in the northwest). The subspecies' populations are highly fragmented and occur in low densities. All three subspecies have been discovered in the illicit pet trade. Threats range from crushing mortality from cattle and land conversion to occasional bushmeat victims and wild dog attacks. Those threats coupled with low fecundity are causing wild populations to disappear, while extreme poverty and corruption throughout Madagascar allow poaching to persist. Range-wide population surveys for this species are ongoing in the areas of recent occupancy to monitor declines and identify areas of relic populations to direct protection efforts. Recent work has shown that this species utilizes much larger home ranges than previously published estimates suggested. Working closely with individual communities may be the best path to conservation management of those areas.



BOLSON TORTOISE

Gopherus flavomarginatus Legler 1958
Mexico

IUCN Red List: Vulnerable
TFTSG: Critically Endangered



The Bolson Tortoise remained unknown to science until 1959, when John Legler described it. At the end of the Pleistocene it ranged throughout the Chihuahuan Desert from central Mexico to southern Texas, New Mexico, and Arizona. It now survives only in the Bolsón de Mapimí, an interior basin in northern Mexico. *Gopherus flavomarginatus* usually grows to about 34 cm in shell length, but can reach 40 cm. The scutes of its carapace are often dark with a contrasting yellow border, giving the species its scientific name. It has massive claws on its feet for digging large burrows that it uses to retreat from predators and to wait out drought or cold weather. It shares these burrows with a host of other animals, making it a keystone species for the Chihuahuan Desert. Animals take over 10 years to reach sexual maturity and females have a clutch size of only around five eggs, so its populations recover slowly from depredations.

The Red List status for this tortoise is currently being revised from Vulnerable to Critically Endangered. It is threatened most by agricultural development, but also by local use for food and pets. The Mapimí Biosphere Reserve was established to protect the tortoise and its ecosystem. Within the Reserve, the recently created 17,540-ha (43,400 acres) Bolson Tortoise Ecosystem Preserve has strengthened its protection. The Turner Endangered Species Fund has captive-bred more than 500 animals for a reintroduction program planned to include New Mexico, Texas and, eventually, Mexico.



BOG TURTLE

Glyptemys muhlenbergii (Schoepff 1801)
United States of America

IUCN Red List: Critically Endangered



The Bog Turtle is one of North America's smallest turtles, with a maximum size of 11.5 cm. The species has one of the most restricted habitat requirements of any turtle, living only in spring fed boggy areas, which are often widely dispersed. It has a low reproductive rate, each adult female laying fewer than four eggs per year, which are deposited just above the water line and are vulnerable to predation from raccoons and skunks and also subject the local changes in water levels.

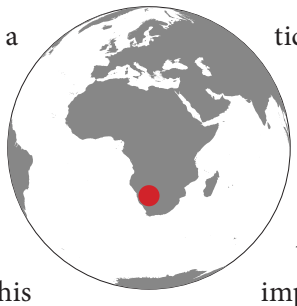
Although it is found in 12 U.S. states, its habitat is so widely dispersed and subject to human development that its future is precarious. Changes in land use near bogs harboring the species can lower or raise the water table, resulting in the destruction of the habitat and the extirpation of the population. There has also been much pressure from collecting for the pet trade in the past, as well as roadkill mortality as turtles migrate among dispersed bogs. State wildlife officials and local nature groups have worked to monitor Bog Turtle populations and protect habitat. There is also ongoing habitat restoration work on both public and private lands. The species is capable of surviving in close proximity to people, as long as its habitat is maintained.



NAMA PADLOPER

Chersobius (or *Homopus*) *solus* (Branch 2007)
Namibia

IUCN Red List: Vulnerable
TFTSG: Endangered



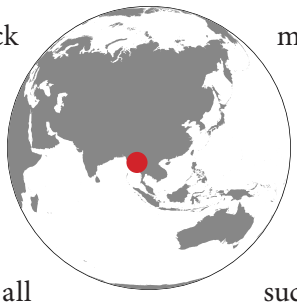
Chersobius solus (or *Homopus solus*) is a small (carapace length 80–100 mm), cryptic rock-dwelling tortoise restricted to hyper-arid (<50 mm annual rainfall and fog) desert areas of southwestern Namibia. It is the only tortoise species endemic to Namibia. The confusing taxonomic status of this species was only resolved in 2007. It is considered congeneric with two related small, rock-dwelling tortoises in adjacent South Africa: the Speckled Padloper (*C. signatus*) and Boulenger's Tortoise (*C. boulengeri*). The distribution of the Nama tortoise is poorly understood but appears to range in very low densities north of the Orange River toward the Tiras Mountains. Individuals have also been recorded from near the Atlantic Coast. Past overgrazing on large pastoral farms and the potential impact of climate change on drought frequency and intensity are thought to be impacting the habitat of this species. The small population at the type locality is subject to significant human impact (goat grazing, railway construction). The species appears to exhibit an extremely small home range of less than 1 ha, and only rarely ventures out from rocky retreats when infrequent rainfall or fog events promote ephemeral plant growth in the largely barren landscape. Hence the species has been described as an "ambush herbivore". A small captive, reproducing assurance population of the species has been maintained in Windhoek, Namibia, for several decades.



MYANMAR PEACOCK SOFTSHELL TURTLE

Nilssonia formosa (Gray 1869)
Myanmar

IUCN Red List: Endangered
TFTSG: Critically Endangered



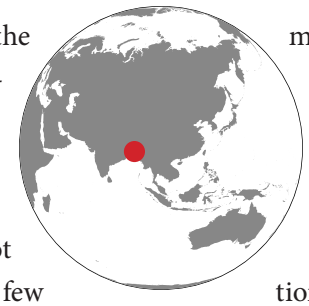
The poorly known Myanmar Peacock Softshell Turtle, characterized by its distinctive 'peacock eye' spots on its carapace, is thought to have occurred historically throughout the river systems of Myanmar, and while recent surveys indicate that the species remains widespread, most if not all populations have declined significantly. In addition to the impacts from targeted hunting for consumption and the food trade, the species is likely also impacted by habitat degradation resulting from dam and reservoir construction and formerly extensive riverside gold-mining. Priority conservation actions include minimizing further exploitation of the species, as well as further surveys to locate viable remaining populations and critical habitat areas. This should then be followed by protecting one or more riverine areas where such populations persist, such as the Irrawaddy Dolphin Protected Area in the middle Ayeyarwady, and portions of the Chindwin River. Population augmentation efforts, such as nest protection and/or head starting hatchlings from the small assurance colony at Yadanabon Zoo in Mandalay, may also be beneficial.



BLACK SOFTSHELL TURTLE

Nilssonia nigricans (Anderson 1875)
Bangladesh, India

IUCN Red List: Extinct in the Wild
TFTSG: Critically Endangered



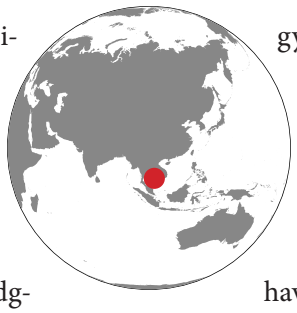
The Black Softshell Turtles inhabiting the pond at the Bostami shrine outside Chittagong, Bangladesh, were recognized as a unique species as long ago as 1872, and considered the last survivors of a species that had gone extinct in the wild. It was not until 1999 that softshell turtles living in a few temple ponds and in some riverine wetlands in Bangladesh and northeastern India were determined to be this species, instead of the similar, more widespread Indian Peacock Softshell Turtle (*Nilssonia hurum*). While the adult animals at the shrine and temple ponds are secure from capture, their nesting and recruitment opportunities are limited. *Nilssonia nigricans* in the Brahmaputra wetlands is, by contrast, subject to intensive exploitation for local consumption or regional trade, as well as the impacts of habitat degradation. Greater protection is needed for the remaining wild populations, including effectively enforced legal protection, nest protection and anti-poaching outreach programs and incentives, while living, nesting, and recruitment conditions at temple ponds can generally be improved so that these populations can potentially represent a source for reinforcement of the wild populations. A nest protection and head-starting project has begun in community ponds in Assam.



ASIAN GIANT SOFTSHELL TURTLE

Pelochelys cantorii (Gray 1864)
China, South Asia, Southeast Asia

IUCN Red List: Endangered
TFTSG: Critically Endangered



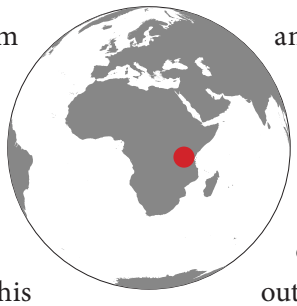
The Asian Giant Softshell Turtle historically ranged throughout the great lowland rivers, deltas and estuaries of tropical Asia, from India to southern China, the Philippines, Borneo and Sumatra. Unfortunately, that habitat preference put it in proximity to human settlements, agriculture, sand dredging, hydropower dams, industrial and port developments, and associated pollution. *Pelochelys cantorii* has therefore disappeared from most of its former range, with scattered individuals occasionally reported. An apparently viable population is known only in the lower Mekong River in Cambodia, where it has received extensive conservation attention. With a twin strategy of securing nests *in-situ* through a "guard and reward" nest protection program, and community awareness building, over 300 nests and 8,000 hatchlings and a few head started juveniles, as well as several animals that were accidentally caught in fishing nets, have been released into the river. Increasing numbers of nests protected each year hint at long-term success of this strategy. Surveys to identify other remaining populations are needed in Indonesia, Malaysia, and the Philippines, so that similar conservation measures may be implemented. Given its wide and potentially fragmented area of distribution, genetic evaluation of its taxonomic status is highly desirable.



PANCAKE TORTOISE

Malacochersus tornieri (Siebenrock 1903)
Kenya, Tanzania, Zambia

IUCN Red List: Vulnerable
TFTSG: Critically Endangered



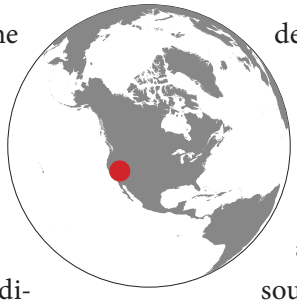
The Pancake Tortoise is a small (to 18 cm CL) tortoise species occurring localized in Kenya, Tanzania, and in extreme northeastern Zambia. The species' extremely flattened and pliable shell is an adaptation to a lifestyle focused on hiding deep in cracks and crevices in granite boulder areas. This unique appearance has also made the Pancake Tortoise valuable in the global pet trade, with over 66,000 live animals traded between 1975 and 2015. Concern over trade volumes in the 1990s led to a voluntary trade ban by Kenya and restrictions on exports from Tanzania, those being limited to a varying annual quota of several hundred to almost a thousand captive-produced animals under 8 cm CL. Since the discovery of the Zambian population, first reported in 2002, Zambia has declared exporting between 2,000 and 6,000 live pancake tortoises annually. Reports persist of ongoing collection of animals from the wild throughout its range, often involving the destruction of scarce rock crevice retreats, and concern exists about tortoises collected illegally from the wild being 'laundered' through alleged in-range captive breeding facilities. Detailed oversight of farms and trade is needed, as are the development of ecotourism opportunities to give the species an economic value in its native range and habitat.



MOJAVE DESERT TORTOISE

Gopherus agassizii (Cooper 1861)
United States of America

IUCN Red List: Vulnerable
TFTSG: Critically Endangered



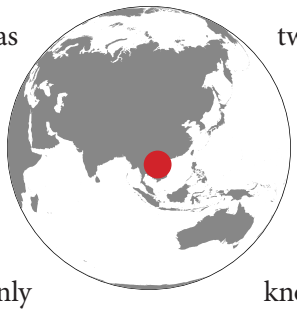
The Mojave Desert Tortoise is one of the most intensively studied and monitored reptiles in the world. Officially recognized as being in decline in the 1980s, the species came under U.S. federal protection in 1990. The rationale for listing the Mojave population of the Desert Tortoise was the loss of individuals to disease, severe climatic conditions, loss and degradation of habitat, increased levels of mortality associated with urban growth throughout the desert, and the inability of regulatory and management agencies to protect the Desert Tortoise and its habitat. Since then, however, it has continued to decline, with no abatement to the list of threats. Though listed as Vulnerable by the IUCN since 1996, the TFTSG has recently re-assessed the species' status and is elevating it to Critically Endangered. Part of that elevated status is due to the original definition of *G. agassizii* recently being split into three separate species (*G. agassizii*, *G. morafkai*, and *G. evgoodei*). The range of *G. agassizii* now encompasses only the Mojave Desert region of southern California and adjacent areas of southern Nevada, extreme southwestern Utah, and northwestern Arizona. This iconic inhabitant of the Mojave ecosystem is a medium-sized (25 cm) tortoise that is highly adapted to extreme temperatures by spending much of its time underground in burrows, with activity above ground peaking in the Spring and Fall. As an ecosystem engineer that creates essential shelter for numerous desert species, the decline of the Mojave Desert Tortoise will have far reaching implications for the greater desert fauna.



VIETNAMESE THREE-STRIPED BOX TURTLE

Cuora cyclornata Blanck, McCord & Le 2006
China, Laos, Vietnam

IUCN Red List: Critically Endangered
[as part of *C. trifasciata*]



Described in 2006, *Cuora cyclornata* was once considered a color morph of *C. trifasciata*, but has since been shown to be a distinct species. The species reaches 22–35 cm carapace length; males have a thicker and longer tail. The carapace is chestnut brown with three longitudinal black stripes; the plastron is mainly black and the head is olive-brownish. Three subspecies are recognized: the nominate one in southern central Vietnam, adjacent Laos, and possibly also in extreme eastern Cambodia, *C. c. annamitica* in central Vietnam and adjacent Laos (Annamite mountain range), and *C. c. meieri* in northern Vietnam and southern Guangxi Province, China. It once inhabited the hill streams and marshes in low- to mid- elevation forests in these areas.

Being faster-growing and considered the better-tasting variety of *C. trifasciata* by Chinese for decades, intense hunting of the species began with the border opening between China and Vietnam in 1991, leading to its rapid demise. Deforestation has done the rest, with fewer than 20 wild-collected specimens appearing in the trade per year in recent years. Fewer than 500 specimens may remain in the wild. No stronghold for the species is currently known and it seems to be extirpated from most of its range. It is currently being farmed by the thousands in China, but the demand for wild specimens is still high and the conservation value of the farm-produced turtles is low due to uncontrolled hybridization and the commercial rather than conservation orientation of most of the farmers. Fewer than 100 specimens are in assurance colonies in Europe and the United States, where captive breeding of genetically pure lineages occurs in increasing numbers. Future release projects in protected areas are currently being considered but are hindered by the high value and demand for the species.

OTHER SPECIES OUTSIDE THE TOP 50 ASSESSED AS CRITICALLY ENDANGERED

These are 15 more species assessed as Critically Endangered by either the IUCN or the TFTSG that are also at high risk of extinction, but not quite as high as those listed above in the Top 25+ or Top 50. They include species that have either improved with conservation efforts since 2011 (*Chelonoidis hoodensis*), or been replaced by more threatened species and moved down the list (*Manouria emys*), or previously thought to be extinct, but now of uncertain status (*Chelonoidis phantasticus*), and one new species described since 2011 (*Chelonoidis donfaustoi*). The species here are listed alphabetically by family, not by any relative order of extinction risk.


Peter Paul van Dijk

PLATYSTERNIDAE
Platysternon megacephalum Gray 1831 – Big-headed Turtle
Cambodia, China, Laos, Myanmar, Thailand, Vietnam
IUCN: Endangered; TFTSG: Critically Endangered


Tien-Hsi Chen

GEOEMYDIDAE
Cuora flavomarginata (Gray 1863e) – Yellow-margined Box Turtle
China, Japan, Taiwan
IUCN: Endangered; TFTSG: Critically Endangered


Turtle Conservancy/Eric V. Goode

Cuora mouhotii (Gray 1862) – Keeled Box Turtle
Bangladesh, Bhutan, China, India, Laos, Myanmar, Vietnam
IUCN: Endangered ; TFTSG: Critically Endangered


Tien-Hsi Chen

Mauremys mutica (Cantor 1842) – Yellow Pond Turtle
China, Japan, Taiwan, Vietnam
IUCN: Endangered; TFTSG: Critically Endangered


Turtle Conservancy/Eric V. Goode

Orlitia borneensis Gray 1873 – Malaysian Giant Turtle
Indonesia, Malaysia
IUCN: Endangered; TFTSG: Critically Endangered


John B. Iverson

Sacalia bealei (Gray 1831) – Beale's Eyed Turtle
China
IUCN: Endangered; TFTSG: Critically Endangered


Tui De Roy/Roving Tortoise Photos

TESTUDINIDAE
Chelonoidis darwini (Van Denburgh 1907) – Santiago Giant Tortoise
Ecuador (Galapagos)
IUCN: Critically Endangered


Peter Paul van Dijk

Chelonoidis donfaustoi Poulakakis et al. 2015 – Eastern Santa Cruz Giant Tortoise
Ecuador (Galapagos)
IUCN: Critically Endangered


Peter C.H. Pritchard

Chelonoidis hoodensis (Van Denburgh 1907) – Española Giant Tortoise
Ecuador (Galapagos)
IUCN: Critically Endangered


Peter C.H. Pritchard

Chelonoidis phantasticus (Van Denburgh 1907) – Fernandina Giant Tortoise
Ecuador (Galapagos)
IUCN: Critically Endangered (Possibly Extinct)


Anders G.J. Rhodin

Chelonoidis porteri (Rothschild 1903) – Western Santa Cruz Giant Tortoise
Ecuador (Galapagos)
IUCN: Critically Endangered


David Mifsud

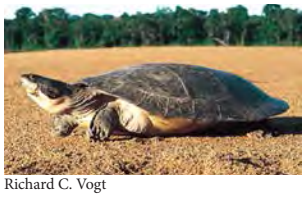
Kinixys homeana Bell 1827 – Home's Hinge-back Tortoise
Benin, Cameroon, Central African Republic, Equatorial Guinea, Ghana, Ivory Coast, Liberia, Nigeria, Togo
IUCN: Vulnerable; TFTSG: Critically Endangered


Chuck Schaffer

Manouria emys (Schlegel and Müller 1840) – Asian Giant Tortoise
Bangladesh, Brunei, India, Indonesia, Malaysia, Myanmar, Thailand
IUCN: Endangered; TFTSG: Critically Endangered


Rahul Naik

TRIONYCHIDAE
Nilssonia leithii (Gray 1872) – Leith's Softshell Turtle
India
IUCN: Vulnerable; TFTSG: Critically Endangered


Richard C. Vogt

PODOCNEMIDIDAE
Podocnemis expansa (Schweigger 1812) – Giant South American River Turtle
Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Venezuela
IUCN: Lower Risk/conservation dependent; TFTSG: Critically Endangered

A SELECTED SUMMARY OF TORTOISE AND FRESHWATER TURTLE CONSERVATION MILESTONES

January 2018. The Creative Conservation Alliance, with support from Turtle Survival Alliance, established the first in-country breeding center in Bangladesh for the turtle and tortoise species in the Chittagong Hill Tracts, including the Arakan Forest Turtle (*Heosemys depressa*) and the Asian Giant Tortoise (*Manouria emys*), as well as creating 10 Indigenous Community Conservation Areas covering 500 hectares (1,236 acres).



Palawan Forest Turtle

November 2017. Wildlife Conservation Society's Koh Kong Reptile Conservation Center (KKRCC) opens, providing a major facility for head-starting Southern River Terrapins (*Batagur affinis*). This new center is crucial to reintroduction of this species in Cambodia.

September 2017. Turtle Conservancy (TC), Katala Foundation, Rainforest Trust, and Global Wildlife Conservation (GWC) purchase 25.95 acres and help protect 7,363 acres of habitat on Palawan in the Phillippines for the Palawan Forest Turtle (*Siebenrockiella leytensis*).

August 2017. Turtle Conservation Fund (TCF) reaches the $1 million milestone in total grants awarded since 2002 for work on endangered tortoises and freshwater turtles.



Bolson Tortoise

June 2017. Chelonian Research Foundation (CRF) forms a partnership with Turtle Conservancy to co-publish the established scientific journals *Chelonian Conservation and Biology* and *Chelonian Research Monographs*.

April 2017. Turtle Conservancy forms a partnership with Turner Endangered Species Fund to promote restoring the Bolson Tortoise (*Gopherus flavomarginatus*) to its former range in the United States.

April 2017. Craig B. Stanford appointed Chair of the IUCN SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG).

February 2017. Conservation Action Plan for Endangered Freshwater Turtles and Tortoises in India, third strategic workshop and IUCN Red Listing meeting, New Delhi, India, organized and sponsored by Turtle Survival Alliance (TSA) and TFTSG.



TSA/Utah Hogle Zoo Tortoise Conservation Center, Madagascar

December 2016. Turtle Conservancy, with support from Leonardo DiCaprio Foundation, Andrew Sabin Family Foundation, Global Wildlife Conservation, and Rainforest Trust, purchases 17,540 hectares (43,540 acres) of Chihuahuan Desert in Durango, Mexico, to create the Bolson Tortoise Ecosystem Preserve for the endemic Bolson Tortoise.

October 2016. Opening ceremony and dedication of the joint Turtle Survival Alliance / Utah's Hogle Zoo Tortoise Conservation Center for Madagascar tortoises in Tsihombe, southern Madagascar.

September 2016. 17th Conference of the Parties to CITES in Johannesburg, South Africa, adopts a proposal by Burkina Faso, Chad, Gabon, Guinea, Liberia, Mauritania, Nigeria, Togo, and United States of America to include *Cyclanorbis elegans*, *C. senegalensis*, *Cycloderma aubryi*, *C. frenatum*, *Rafetus euphraticus*, and *Trionyx triunguis* in Appendix II.



Hoge's Side-necked Turtle

May 2016. Turtle Conservancy, Global Wildlife Conservation, Rainforest Trust, and Andrew Sabin Family Foundation acquire 405 ha (1001 acres) of Goode's Thornscrub Tortoise (*Gopherus evgoodei*) habitat, expanding a Nature and Culture International reserve in Sonora, Mexico.

May 2016. Fundaçao Biodiversitas, Rainforest Trust, and Wildlife Conservation Society (WCS) purchase 95 hectares (236 acres) of riverside land in Minas Gerais, Brazil to secure critical habitat for Hoge's Side-necked Turtle (*Mesoclemmys hogei*).



Geometric Tortoise Preserve, South Africa

February 2016. Turtle Survival Alliance co-sponsors 2nd Hicatee (*Dermatemys mawii*) Conservation Forum and Workshop, including an IUCN Red List meeting at BFREE Field Station, Belize.

September 2015. Wildlife Conservation Society purchases 9.5 ha (23 acres) adjacent to the Peam Krasaop Wildlife Sanctuary in southern Cambodia for the construction of the Koh Kong Reptile Conservation Center for the Southern River Terrapin (*Batagur affinis*).

August 2015. Turtle Conservancy purchases an additional 600 acres for the Geometric Tortoise Preserve in South Africa, bringing the total to 810 acres.

June 2015. Palawan Forest Turtle confiscation, Phillippines. One of the largest confiscations of critically endangered freshwater turtles on record, which was met with an immediate response. Led by Katala Foundation, the entire turtle conservation community (TSA, TC, TCF, TFTSG, WRS, WCS, and many others) mobilized to repatriate over 3,000 turtles back into the wild.



Palawan Forest Turtle Confiscation, Palawan

July 2014. Turtle Conservancy, with support from Rainforest Trust and Andrew Sabin Family Foundation and others, purchases 210 acres of of some of the last habitat for Geometric Tortoise (*Psammobates geometricus*) to create the Geometric Tortoise Preserve in South Africa.

April 2014. Turtle Survival Alliance, Wildlife Conservation Society, and TFTSG lead a workshop in Balbina, Brazil, to assess the global status and protection of the Giant Amazon River turtle (*Podocnemis expansa*).

December 2013. Katala Foundation establishes a protected area to safeguard and restore critical habitat for the Palawan Forest Turtle in the Phillippines.

August 2013. IUCN Red Listing Workshop and Conservation Planning for the Tortoises and Freshwater Turtles of Sub-Saharan Africa, held in Lomé, Togo, organized by TFTSG with support from Mohamed bin Zayed Species Conservation Fund and others.



Golden Coin Turtle Repatriation to range country

March 2013. 16th Conference of the Parties to CITES in Bangkok, Thailand, adopts 7 turtle proposals by China, the United States, and Vietnam, adding a suite of Asian geoemydid and trionychid turtle species as well as the North American *Clemmys guttata*, *Emydoidea blandingii*, and *Malaclemys terrapin* to Appendix II, and transferred *Platysternon megacephalum*, *Geochelone platynota*, *Chitra chitra*, and *C. vandijki* to Appendix I.

February 2013. Turtle Conservancy sends five Critically Endangered Golden Coin Turtles (*Cuora trifasciata*) to the species' native Hong Kong through a collaboration between the Turtle Conservancy, Kadoorie Farm & Botanic Garden (KFBG), and the Agriculture, Fisheries and Conservation Department of the Hong Kong Special Administrative Region Government. These are the first United States captive-bred turtles to be returned to their home range country for release into the wild.



Turtle Survival Center, 2013

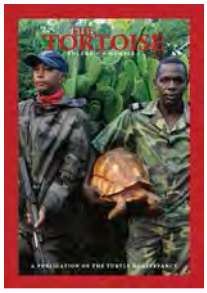
January 2013. Turtle Survival Alliance purchases a 20 ha (50 acres) property in Cross, South Carolina, to establish the Turtle Survival Center, an essential *ex-situ* conservation breeding facility for species facing a high risk of extinction in the wild.

December 2012. Turtle Survival Alliance and Wildlife Conservation Society hold an opening ceremony and dedication of the Turtle Rescue Center in May Myo, Myanmar, and turn the facility over to the Myanmar Forest Department for management.

October 2012. Peter Paul van Dijk and Brian D. Horne appointed Co-Chairs of the TFTSG.

September 2012. Conservation Planning meeting for Galapagos tortoises, held in Puerto Ayora, Galápagos, Ecuador, organized by the Galapagos Conservancy, including an IUCN Red Listing workshop organized by TFTSG.

August 2012. Turtle Conservancy launches *The Tortoise*, a high-end magazine about turtle and tortoise conservation and natural history, environmental current events, travel, science, and art.



The Tortoise Magazine, 2012

April 2012. IUCN Red Listing workshop on Conservation Action Planning for the tortoises and freshwater turtles of the Southern Cone region, held in Paraguay, organized by Paraguay Salvaje and TFTSG.

October 2011. Turtle Conservation Society of Malaysia founded by Eng Heng Chan to recover depleted wild populations of freshwater, terrestrial, and marine turtles in Malaysia through partnerships with like-minded organizations and individuals, as well as through its own programs.

October 2011. Turtle Conservancy assembles the largest assurance colony of Ploughshare Tortoises outside of Madagascar (in Ojai, California) from 20 animals confiscated in Hong Kong and Taiwan and one loaned by the San Antonio Zoo.


Turtle Conservancy assembles assurance colony of Ploughshare Tortoises

September 2011. Turtle Conservancy, Durrell Wildlife Conservation Trust, and Madagascar National Parks host a workshop in Madagascar on turtles and tortoise conservation, bringing together the Minister of the Environment, Malagasy media, and local environmental leaders.

July 2011. Strategic Plan for the Conservation of Colombian Continental Turtles, organized by the Colombian Herpetological Association (ACH) with support from Conservation International (CI) and Turtle Survival Alliance, held in Medellin, Colombia.



Turtles in Trouble, 2011

May 2011. 2nd Turtle Survival Alliance / IUCN *Cuora* workshop, Prioritizing conservation actions for the genus *Cuora*, held in Gangkou, Guangdong, China.

February 2011. Conservation of Asian Tortoises and Freshwater Turtles: Setting Priorities for the Next Ten Years. Workshop held at Singapore Zoo, hosted by Wildlife Reserves Singapore and Wildlife Conservation Society, in collaboration with TFTSG, KFBG, San Diego Zoo Global (SDZG), and Turtle Survial Alliance.

February 2011. *Turtles in Trouble: The World's 25+ Most Endangered Tortoises and Freshwater Turtles – 2011*. Publication by the Turtle Conservation Coalition (TFTSG, TCF, TSA, TC, CRF, CI, WCS, and SDZG) launched as part of the Singapore workshop.

February 2011. Conservation Strategy for the genus *Batagur*, workshop held at Singapore Zoo, hosted by Wildlife Reserves Singapore and WCS.


TSA sponosors first Hicatee Conservation Workshop

2011. SatuCita Foundation (Yayasan Satucita Lestari Indonesia) founded by Joko Guntoro to conserve freshwater turtles and tortoises and their habitats in Indonesia, particularly in northern Sumatra. The foundation focuses on research, conservation education, head-starting, and community-based activities.



Conservation action plan for endangered freshwater turtles and tortoises in Inda

December 2010. Turtle Survival Alliance sponsored First Hicatee Conservation Forum and Workshop, University of Belize; led to formation of National Hicatee Conservation and Monitoring Network.

October 2010. IUCN Red Listing workshop, Turtle Conservation in South America: A Workshop on IUCN Red Listing, Current Status, Conservation Prioritization, and Strategic Action Planning for South American Tortoises and Freshwater Turtles, organized by TFTSG and held at Rio Trombetas, Brazil.

September 2010. Conservation and Trade Management of Freshwater and Terrestrial Turtles in the United States. Workshop held in St. Louis, USA, hosted by the US Fish and Wildlife Service, with TFTSG participation, to evaluate status and threats to native turtle species and make recommendations.


Turtle Conservancy and Durrell form partnership to save the Ploughshare Tortoise.

August 2010. Follow-up workshop on Madagascar tortoise and freshwater turtle status and conservation strategy held as part of the 8th TSA/TFTSG Symposium, Orlando, Florida.

August 2010. 1st TSA/IUCN *Cuora* workshop held in Orlando, Florida, USA; compiled conservation recommendations.

2010. Conservation Action Plan for Endangered Freshwater Turtles and Tortoises in India, second strategic workshop held in Kukrail, India; expanded the TSA program to five turtle priority regions. Sponsored by TSA and Madras Crocodile Bank Trust (MCBT).

February 2009. IUCN Red Listing workshop for Australian and New Guinean turtles held in Brisbane, Australia, organized by TFTSG.

January 2009. Workshops in Mandalay, Myanmar, on Species Recovery Plans for Myanmar Roofed Turtle (*Batagur trivittata*) and Burmese Star Tortoise (*Geochelone platynota*), organized by TSA.



African Chelonian Institute founded by Tomas Diagne, Senegal.

2009. Turtle Conservancy and Durrell Wildlife Conservation Trust form a partnership to save the Ploughshare Tortoise (*Astrochelys yniphora*) from extinction through captive breeding, protection in the wild, and combating the illegal trade, with support from Andrew Sabin Family Foundation and U.S. Fish and Wildlife Service.

2009. Turtle conservation workshop hosted by the Taipei Zoo and Forestry Bureau brought together the Turtle Conservancy and Kadoorie Farm and Botanic Garden to address *in-situ* and *ex-situ* conservation for endangered turtles and tortoises.

2009. Founding of African Chelonian Institute in Senegal, by Tomas Diagne; establishment of The Rhodin Center for captive breeding.


TSA/WCS Myanmar Roofed Turtle breeding facility opens, Mandalay

January 2008. Red Listing workshop on Conservation Status of the Tortoises and Freshwater Turtles of Madagascar, Antananarivo, Madagascar, organized by TFTSG with support from CI and WCS; this and subsequent Red Listing workshops also supported by Frankel Family Foundation.

December 2006. Opening ceremony and dedication for the TSA/WCS breeding and headstart facility for the Myanmar Roofed Turtle at Yadanabon Zoo, Mandalay, Myanmar.

January 2006. John L. Behler passes away; Rick Hudson and Anders G.J. Rhodin establish the Behler Turtle Conservation Award, which honors leaders in the international chelonian conservation community at the annual TSA/TFTSG symposium.



Eric Goode and Maurice Rodrigues co-found the Turtle Conservancy

2006. Turtle Conservancy becomes the first Association of Zoos and Aquariums (AZA) accredited facility in the world solely dedicated to captive assurance colonies of turtles and tortoises.

2005. Turtle Survival Alliance evolves into an independent nonprofit organization, no longer an IUCN Task Force; led by Rick Hudson.

2005. Chelonian Conservation Center (captive breeding facility) established in Ojai, California, by Eric V. Goode, Maurice Rodrigues, William Holmstrom, and John L. Behler, evolving into the Behler Chelonian Center in 2006 and the Turtle Conservancy in 2010.



John Behler

2005. Anders G.J. Rhodin apppointed Chair of the TFTSG.

2005. Conservation Action Plan for Endangered Freshwater Turtles and Tortoises in India, first strategic workshop and IUCN Red Listing meeting to prioritize Indian turtle species for conservation, Kukrail, India, sponsored by TSA and MCBT.

2005. Establishment of International Centre for the Conservation of Turtles at the Allwetter Zoo, Münster, Germany, led by Elmar Meier.

August 2003. Turtle Survival Alliance hosts its first symposium and launches a newsletter / magazine, *Turtle Survival*. TSA and TFTSG continue to grow this symposium together into a series of increasingly important annual meetings, bringing together a broad international community of turtle conservationists and scientists with support from many organizations, including CRF, CI, TC, TCF, GWC, WCS, and others. The 15th symposium was held in 2017 in Charleston, South Carolina, USA, and attracted 300+ participants.



Anders Rhodin

April 2002. The Turtle Conservation Fund (TCF) is created as a partnership initiative of Conservation International, TFTSG, and TSA, with subsequent partnering and funding organizations and individuals: Shellshock Campaign of EAZA, Turtle Conservancy, Chelonian Research Foundation, Humane Society International of Australia, Global Wildlife Conservation, Wildlife Conservation Society, Chelonian Research Institute, Panaphil Foundation, Andrew Sabin Family Foundation, George Meyer and Maria Semple, Matthew Frankel, and Robert Steinwurtzel.

March 2002. Technical Workshop on Trade in Freshwater Turtles and Tortoises in Asia, held in Kunming, China, organized under the auspices of CITES, supported by TFTSG, CRF, TRAFFIC, and others.

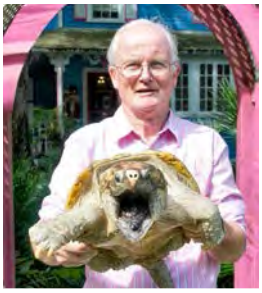


Kurt Buhlmann and Rick Hudson

January 2001. IUCN Asian Turtle Workshop: Developing Conservation Strategies through Captive Management, held at the Fort Worth Zoo, Texas. Brought together 80 stakeholders from around the world to examine the role of captive breeding in preventing freshwater turtle and tortoise extinctions, and resulted in the founding of Turtle Survival Alliance as an IUCN Task Force, with Rick Hudson and Kurt A. Buhlmann appointed founding Co-Chairs.

October 2000. Anders G.J. Rhodin and John L. Behler appointed Co-Chairs of the TFTSG.

August 2000. CRF published *Asian Turtle Trade* as part of its *Chelonian Research Monographs* series as proceedings of the December 1999 Phnom Penh meeting. The book catalyzed increased turtle community conservation action and CITES engagement in working to curtail the unsustainable commercial turtle trade in Asia and elsewhere.



Peter Pritchard founds the Chelonian Research Institute, Oviedo, Florida

December 1999. Asian Turtle Trade Workshop, organized and supported by WCS, USFWS, BfN (Government of Germany), CRF, KFBG, TRAFFIC, and WWF, held in Phnom Penh, Cambodia. About 40 participants from Asia and beyond took stock of collection and trade trends and formulated recommendations.

1998. Founding of Chelonian Research Institute in Oviedo, Florida, by Peter C.H. Pritchard.

1996. CRF initiates publication of *Chelonian Research Monographs*, with the first issue focused on Galapagos tortoises.

1996. International Congress of Chelonian Conservation held in Gonfaron, France. Follow-up to the 1993 meeting in Purchase, New York.



Bernard Devaux founds the Village des Tortues, Gonfaron, France

November 1993. CRF initiates publication of *Chelonian Conservation and Biology*, the first and only professional peer-reviewed scientific journal focused solely on turtles and tortoises.

July 1993. Conservation, Restoration and Management of Tortoises and Turtles: An International Conference held in Purchase, New York (results published 1997). This seminal meeting was the first clarion call to action for the emerging global and Southeast Asian Turtle Crisis.

May 1992. Chelonian Research Foundation (CRF) is founded by Anders G.J. Rhodin.

1990. John L. Behler appointed Chair of the TFTSG.

1988. Village des Tortues established by SOPTOM in Gonfaron, France.



Russell Mittermeier

1988. Initiation of a captive breeding and repatriation program for the critically endangered Western Swamp Turtle (*Pseudemydura umbrina*) in Perth, Australia, by Gerald Kuchling.

1987. The IUCN SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG) is created by merging the Tortoise and Freshwater Chelonian Specialist Groups, with Peter C.H. Pritchard and Ian Swingland appointed Co-Chairs.

1986. SOPTOM (Station d'Observation et de Protection des Tortues et de leurs Milieux) is founded in Var, France, by Bernard Devaux and David Stubbs.

1981. On the recommendation of Russell A. Mittermeier, the IUCN Species Survival Commission establishes the IUCN SSC Tortoise Specialist Group, chaired by Ian Swingland, and the IUCN SSC Freshwater Chelonian Specialist Group, chaired by Edward O. Moll.



Charles Darwin Research Station begins tortoise breeding program

1971. As a result of the near-extinction of several species of Galapagos Giant Tortoises due to long-standing exploitation and habitat degradation, a systematic recovery and repatriation program is started by the Charles Darwin Research Station on Santa Cruz Island, Galapagos, Ecuador. A male Española Giant Tortoise from the San Diego Zoo is returned to the Galapagos, eventually leading to successful restoration of that and several other Galapagos tortoise species.

MEMBER ORGANIZATIONS OF THE TURTLE CONSERVATION COALITION



IUCN SSC Tortoise and Freshwater Turtle Specialist Group
(TFTSG; www.iucn-tftsg.org)

The Tortoise and Freshwater Turtle Specialist Group (TFTSG) was formed in 1987 by the merger of the Freshwater Chelonian Specialist Group and Tortoise Specialist Group, both founded in 1981 by the Species Survival Commission (SSC) of the International Union for the Conservation of Nature (IUCN). The focus of the TFTSG is to provide the scientific foundation necessary to assess the survival status of all species of tortoises and freshwater turtles, to identify and document the threats to their survival, and to help catalyze conservation action to ensure that none become extinct and that viable populations persist in the wild. The TFTSG provides expertise and science-based recommendations with conservation relevance to IUCN and other institutions. The TFTSG is the official IUCN Red List Authority and works closely with the IUCN Red List Programme to assess, evaluate, and determine appropriate categorizations of the risk of extinction for these species on the IUCN Red List of Threatened Species. The TFTSG has been at the forefront of efforts to ensure that native turtle populations are adequately regulated and protected under domestic and international legislation. It has also worked extensively with partners to include more species in the CITES Appendices, while working to ensure that legal trade is sustainable and illegal trade is prosecuted. In 2001 the TFTSG helped found the Turtle Survival Alliance (TSA) as a Task Force of the TFTSG, before the TSA became an independent NGO, and in 2002 the TFTSG, in conjunction with Conservation International and the TSA, created the Turtle Conservation Fund.



Turtle Conservancy
(TC; www.turtleconservancy.org)

The Turtle Conservancy protects turtles and tortoises and their ecosystems through land acquisition, captive assurance colonies, illegal trade supression, increased awareness, and promotion of science. It has purchased and protected around 53,000 acres of critical habitat including 43,540 acres in Mexico for the Bolson Tortoise (*Gopherus flavomarginatus*), 1,000 acres also in Mexico for Goode's Thornscrub Tortoise (*Gopherus evgoodei*), and 1,000 acres in South Africa for the Geometric Tortoise (*Psammobates geometricus*). Further, it has helped to outright purchase 26 acres and protect 7,363 acres for the Palawan Forest Turtle (*Siebenrockiella leytensis*) in the Philippines. The TC's captive breeding program helps restore natural populations by operating the only AZA accredited facility solely devoted to turtles and tortoises. There it has bred 25 critically endangered species and became the only United States institution to return any captive bred turtle species to its range country for release into the wild when it sent Golden Coin Turtles (*Cuora trifasciata*) to China, in 2013. It works to monitor and prevent trade that threatens many species by partnering with TRAFFIC Southeast Asia and the US Fish and Wildlife Service and also cares for confiscated animals from around the world. The TC's efforts at outreach and global awareness have reached millions of people through television, social media, and its magazine *The Tortoise*. Finally, the TC supports science for conservation by co-publishing the journals *Chelonian Conservation and Biology* and *Chelonian Research Monographs* and by undertaking field and husbandry research. The TC was established in 2005 and is a 501(c)(3) public charity.



Turtle Survival Alliance
(TSA; www.turtlesurvival.org)

Organized in 2001, the Turtle Survival Alliance (TSA) was formed in response to the Asian Turtle Crisis and the need to engage multiple sectors in the development of captive management strategies to prevent the extinction of species. Today the TSA has an overarching Commitment to Zero Turtle Extinctions, is widely recognized as a catalyst for turtle conservation globally, and focuses on species ranked Critically Endangered by the IUCN Red List. An action oriented partnership organization, the TSA is dedicated to converting passion for turtles into effective conservation action. Employing multiple strategies to secure species both in captivity and the wild, the TSA has built an extensive network of conservation partners around the world and today manages rescue centers, assurance colonies, or head starting programs in 12 countries, primarily Asia, but also including Madagascar and Central/South America. These captive programs, coupled with field research, capacity building and community engagement, have led to successful reintroduction efforts for several species. Finally, as part of our Commitment to Zero Turtle Extinctions, the TSA began developing the Turtle Survival Center (TSC) in South Carolina in 2013, dedicated to saving species that were either functionally extinct in the wild, or believed to be in need of assurance colonies for survival. Today the TSC manages over 700 specimens of 30 critically endangered or endangered species, and employs five full-time staff. The TSA is a 501(c)(3) nonprofit foundation registered in the State of Texas and based at the Fort Worth Zoo.



Turtle Conservation Fund
(TCF; www.turtleconservationfund.org)

The Turtle Conservation Fund (TCF) is a strategizing and funding partnership coalition of leading turtle conservation organizations and individuals focused on ensuring the long-term survival of tortoises and freshwater turtles. The TCF was established in 2002 as a non-aligned collaborative partnership of Conservation International, the IUCN SSC Tortoise and Freshwater Turtle Specialist Group, and the Turtle Survival Alliance. It has since been joined and supported by several other turtle-focused conservation organizations, including the Shellshock Campaign of the European Association of Zoos and Aquaria, Humane Society International of Australia, Turtle Conservancy, Global Wildlife Conservation, Chelonian Research Foundation, Panaphil Foundation, Wildlife Conservation Society, Chelonian Research Institute, and the Andrew Sabin Family Foundation. TCF has also received major individual support from George Meyer and Maria Semple, as well as Matt Frankel. TCF produced a Global Action Plan in 2002, and in 2003 compiled the first list of the Top 25 Turtles on Death Row, and has since then provided strategic funding for many conservation projects from all over the world focused primarily on Critically Endangered or Endangered tortoises and freshwater turtles. To date the TCF has distributed over $1 million in small seed grants (average grant ca. $4,400) to nearly 240 projects from nearly 60 nations focused on threatened turtles and tortoises. Since TCF is not a formal legal entity, Conservation International and Chelonian Research Foundation have served as its financial NGO umbrella organizations.

Chelonian Research Foundation
(CRF; www.chelonian.org)

Founded in 1992 by Anders G.J. Rhodin, and based in Lunenburg, Massachusetts, CRF is an IRS-designated 501(c)(3) private operating foundation. The mission of CRF is the production, publication, and support of worldwide turtle and tortoise research, with an emphasis on the scientific basis of chelonian diversity and conservation biology. CRF has published the peer-reviewed professional turtle journal *Chelonian Conservation and Biology* since 1993 (distributed by Allen Press since 2006) as well as the book-length *Chelonian Research Monographs* series since 1996. The monograph series includes the ongoing comprehensive publication project on *Conservation Biology of Freshwater Turtles and Tortoises* compiled in association with the IUCN SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG) since 2008, as well as its associated checklist authored by the Turtle Taxonomy Working Group: *Turtles of the World: An Annotated Checklist and Atlas*. Recently, CRF has joined forces with the Turtle Conservancy to co-publish both *Chelonian Conservation and Biology* and *Chelonian Research Monographs*. CRF also previously published the discontinued *Turtle and Tortoise Newsletter*. Additionally, CRF for a long time provided annual support of turtle research and conservation through its now-closed Linnaeus Fund, and still provides support of various turtle conservation endeavors and programs, including the African Chelonian Institute in Senegal, the Student Presentation Awards at the TSA/TFTSG Annual Symposium, and the annual Behler Turtle Conservation Award. CRF also serves as a nonprofit financial umbrella organization for the TFTSG, the Turtle Conservation Fund, and the Eastern Box Turtle Conservation Trust.

Wildlife Conservation Society
(WCS; www.wcs.org)

The Wildlife Conservation Society (WCS) saves wildlife and wild places worldwide through science, conservation action, education, and inspiring people to value nature. We recognize chelonians as powerful flagship species pivotal in addressing critical conservation issues globally. WCS conducts both ex-situ and in-situ chelonian conservation programming in nations that are centers of turtle diversity, including Brazil, Cambodia, China, Colombia, Ecuador, Guatemala, India, Indonesia, Myanmar, and Vietnam. Notable field-based WCS projects on species in the Top 25 include the conservation of the Central American river turtle (*Dermatemys mawii*), the Magdalena River turtle (*Podocnemis lewyana*), the Burmese roofed Turtle (*Batagur trivittata*), the Burmese star tortoise (*Geochelone platynota*), the southern river terrapin (*Batagur affinis*), Cantor's giant softshell turtle (*Pelochelys cantorii*), the Roti Island snake-necked turtle (*Chelodina mccordi*), and the Yangtze giant softshell turtle (*Rafetus swinhoei*). We combine knowledge of demography, ecology, and genetics in our conservation actions to increase the likelihood that a given species can respond/adapt to environmental/ecological changes (e.g., climate change, land use modification). We also engage in countering the illegal trade of chelonians by working with range countries as well as on the larger international stage. We aim to continue to be proactive in our global chelonian conservation programing with the goal of assuring that the most imperiled species can once again be self-sustaining in the wild and that current self-sustaining wild populations remain that way.

Global Wildlife Conservation
(GWC; www.globalwildlife.org)

Austin-based Global Wildlife Conservation envisions a thriving Earth where all life flourishes. GWC conserves the diversity of life on Earth by preserving wildlands, restoring wildlife and engaging with global guardians. Driven by science, GWC maximizes its impact through conservation solutions in research and exploration, land purchase and protected area establishment, protected area management, poaching prevention, and capacity building. GWC targets species and ecosystems at imminent risk of disappearing forever, for the benefit of nature and society. Over the past eight years, GWC's leading scientists, with field experience in more than 50 countries, have built an extensive network of allied researchers and conservationists. This network supports GWC in the implementation of its exploration, research, education and conservation strategies. GWC has worked to conserve wildlife and habitat in more than 40 countries, helped establish more than 20 new nature reserves, protected more than 100 endangered species and 20,000 species overall, and helped educate more than 50 undergraduate and graduate students. GWC's work for turtles is closely integrated with the programs of the Turtle Conservancy, leveraging their combined skills, contact networks and resources to secure the future for highly threatened tortoises and freshwater turtles at sites around the world.

Conservation International
(CI; www.conservation.org)

For nearly 30 years, Conservation International (CI) has been protecting nature for the benefit of all. CI knows that human beings are totally dependent on nature — and that by saving nature, we're saving ourselves. To that end, CI is helping to build a healthier, more prosperous and more productive planet. CI does this through science, policy, and partnerships with countries, communities and companies. Over the years, CI has helped support 1,200 protected areas and interventions across 77 countries, safeguarding more than 601 million hectares of land, marine and coastal areas. CI has a strong history of working to protect natural areas in Biodiversity Hotspots and High-Biodiversity Wilderness Areas, as well as focused work for highly threatened species. CI has been an early and strong institutional force for the conservation of tortoises and freshwater turtles worldwide, through its scientific program as well as through in-country initiatives. Moreover, CI is a co-founder of the Turtle Conservation Fund and a strong supporter of the IUCN SSC Tortoise and Freshwater Turtle Specialist Group, Chelonian Research Foundation, Turtle Survival Alliance, and Turtle Conservancy.

CREDITS FOR SPECIES ACCOUNTS

Yangtze Giant Softshell Turtle
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Photo by Gerald Kuchling

Ploughshare Tortoise
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Yunnan Box Turtle
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Northern River Terrapin
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Myanmar Roofed Turtle
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Zhou's Box Turtle
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McCord's Box Turtle
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Geometric Tortoise
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Indochinese Box Turtle
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Black Softshell Turtle
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Asian Giant Softshell Turtle
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Pancake Tortoise
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Mojave Desert Tortoise
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Vietnamese Three-striped Box Turtle
Text by Torsten Blanck
Photo by Torsten Blanck

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The turtle conservation community mobilized in 2015 to triage and release a very large confiscation of illegally traded turtles, the Critically Endangered Palawan Forest Turtle, with over 3,000 individual turtles recovered. These turtles were destined for the international pet trade and exotic food markets in China and northern Southeast Asia. Over 90 percent of the rescued animals were successfully returned to their home range on the island of Palawan in the Philippines.

This seminal effort was led by Katala Foundation with help and collaboration from all the organizations in the Turtle Conservation Coalition, plus Angell Animal Medical Center, Chester Zoo, Columbus Zoo, Csaba Geczy, Friends of Wuppertal, Full Circle Foundation Hong Kong, Kadoorie Farm and Botanic Garden, Los Angeles Zoo, Monterey Bay Aquarium, New England Aquarium, Ocean Park Hong Kong, Oxbow Animal Health, Philippine Center for Terrestrial & Aquatic Research, Plinky Limpingco, Pro Wildlife, San Diego Zoo, Shaggy's Pet Station, Stichting Turtle Survival, Western Philippines University, Wroclaw Zoo, Wildlife Reserves Singapore, ZGAP, Zoo London, Zoo Leipzig, Zoo Med Laboratories, Zoo Parc Beauval, and Zoo Schonbrunn Vienna.

Turtle Conservancy/James Liu



Young Buddhist nuns holding a Critically Endangered Arakan Forest Turtle (*Heosemys depressa*) in Mandalay, Myanmar.

Turtle Conservancy/Eric V. Goode

Citation:

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.


The Turtle Conservation Coalition:
TURTLE CONSERVATION FUND
TCF
IUCN/SSC
Tortoise and Freshwater Turtle Specialist Group
TURTLE CONSERVANCY
TC
GLOBAL WILDLIFE CONSERVATION
TSA
turtle survival alliance
CHELONIAN RESEARCH FOUNDATION
CRF
CONSERVATION INTERNATIONAL
WCS
IUCN
SSC
Species Survival Commission