Turtles in Trouble:

The World's 25+ Most Endangered Tortoises and Freshwater Turtles—2011

Presented by the

Turtle Conservation Coalition

IUCN/SSC Tortoise and Freshwater Turtle Specialist Group,
Turtle Conservation Fund, Turtle Survival Alliance,
Turtle Conservancy / Behler Chelonian Center, Chelonian Research Foundation,
Conservation International, Wildlife Conservation Society,
and San Diego Zoo Global

Edited by

Anders G.J. Rhodin, Andrew D. Walde, Brian D. Horne,
Peter Paul van Dijk, Torsten Blanck, and Rick Hudson

Cover Photos: Staring Extinction in the Face

Top Left: The last living Pinta or Abingdon Island Giant Tortoise, Lonesome George, *Chelonoidis abingdonii*, from the Galápagos Islands, Ecuador; this iconic species faces certain extinction unless captive reproduction with some partially hybrid female can be accomplished. Photo by Anders G.J. Rhodin.

Top Right: The last known wild Red River or Yangtze Giant Softshell Turtle, *Rafetus swinhoei*, a male near Hanoi, Vietnam; one of only four known living animals, of which only one is a female. A pair in a captive breeding program in China offers the last hope for the survival of this species. Photo by Tim McCormack.

Bottom Left: One of the very last known Northern River Terrapins, *Batagur baska*, a male in breeding color, from the Sunderbans, Bangladesh; functionally extinct in the wild, with just a few hundred animals remaining, this one was saved from a local consumption market in order to be placed into a breeding colony. Photo by Rupali Ghosh.

Bottom Center: One of the very last known Yellow-headed Box Turtles, *Cuora aurocapitata*, from China, functionally extinct in the wild, with probably less than 150 animals left in the wild and disappearing rapidly; a few animals are being bred on commercial farms in China and a few captive breeding centers. Photo by Gerald Kuchling.

Bottom Right: One of the less than approximately 200 remaining wild adult Ploughshare Tortoises or Angonokas, *Astrochelys yniphora*, in Baly Bay National Park, Madagascar; the species faces certain extinction in the wild unless rampant poaching and illegal international trade of the remaining population can be halted. Photo by Anders G.J. Rhodin.

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The last known wild Red River Giant Softshell Turtle, *Rafetus swinhoei*, near Hanoi, Vietnam, when captured briefly in 2009 before being returned safely to its wetland habitat. Photo by Hoang Van Thai.

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Editorial Introduction and Executive Summary

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Turtles are in serious trouble. They are among the world's most endangered vertebrates, with about half of their more than 300 species threatened with extinction[7]. We commonly hear about the plight of other animal groups; however, turtles are much more at risk of impending extinction than birds, mammals, amphibians, or sharks and rays, and paralleled among the larger vertebrate groups only by the primates (Turtle Taxonomy Working Group 2010, www.iucnredlist.org, Hoffmann et al. 2010).

Turtles throughout the world are being impacted by a variety of major threats, to which many are gradually succumbing. They are being collected, traded, and eaten or otherwise used, in overwhelming numbers. They are used for food, pets, traditional medicine—eggs, juveniles, adults, body parts—all are exploited indiscriminately, with little regard for sustainability. On top of the targeted onslaught, their habitats are being increasingly fragmented, destroyed, developed, and polluted. Populations are shrinking nearly everywhere. Species worldwide are threatened and vulnerable, many are critically endangered, others teeter on the very brink of extinction, and a few have already been lost forever, with eight species and two subspecies having gone extinct since 1500 AD (see table, p. 5).

The world's living tortoise and freshwater turtle species are a remarkable evolutionary success story. There are about 328 currently recognized modern species (452 taxa; Turtle Taxonomy Working Group 2010). Turtles have existed for about 220 million years, since the Late Triassic Era, outlasting their early contemporaries, the dinosaurs. Turtles and tortoises have evolved a remarkable armored shell that has remained relatively unchanged through evolution, and while other vertebrate species have evolved and gone extinct, the basic body form of turtles has remained an obvious testament to their success and their ability to survive millions of years of natural selection. However, the previously successful survival adaptations of turtles, including delayed sexual maturity, high fecundity combined with high juvenile mortality, and a long adult life-span with low natural adult mortality, have left turtle populations vulnerable to new and devastating threats posed by human exploitation and habitat loss.

Turtles and tortoises are major biodiversity components of the ecosystems they inhabit, often serving as keystone species from which other animals and plants benefit—Desert and Gopher Tortoises in North America, Giant River Turtles in the Amazon basin of South America, Pig-nosed Turtles in Australia and New Guinea, Giant Tortoises in the Galápagos and Seychelles islands, and large Flapshell and Softshell Turtles in Asia—all represent major components in their environments and are part of the web of interacting and co-dependent species that constitute healthy functioning ecosystems.

Without turtles and tortoises, those ecosystems and the critically important human-welfare ecoservices they provide, would gradually suffer from the loss of biodiversity and degrade in ways still incompletely understood and difficult to predict. No turtle species should be lost to extinction, as none are expendable or unimportant. Increasingly, however, human activities are endangering many turtle and tortoise species while driving others into extinction.

We are facing a turtle survival crisis unprecedented in its severity and risk. Humans are the problem, and must therefore also be the solution. Without concerted conservation action, many of the world's turtles and tortoises will become extinct within the next few decades. It is now up to us to prevent the loss of these remarkable, unique jewels of evolution.

Without intervention, countless species will be lost. We need to work together for the survival of turtles throughout the world, to understand the risks and threats turtles face, to

[7] As determined by the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG) and noted on the IUCN Red List of Threatened Species or in TFTSG draft assessments (Turtle Taxonomy Working Group 2010, www.iucnredlist.org).

define survival and conservation objectives, and to develop the successful management strategies and organizational alliances that can help us reach those goals.

Recent Progress and Successes in Tortoise and Freshwater Turtle Conservation

The many organizations and individuals that comprise the international turtle conservation community have been working hard for many years to help reverse the threats to turtles and tortoises, and successes and major steps forward are being generated by these efforts.

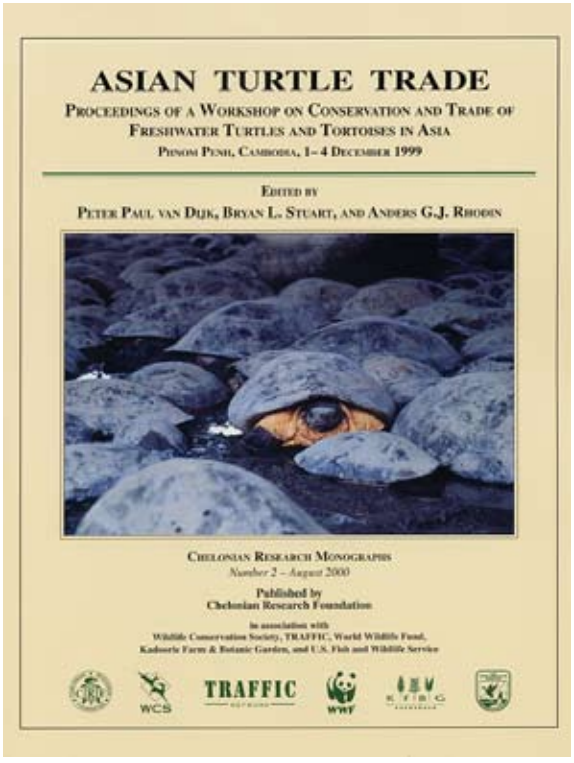
The Early Years. — Two early catalysts that generated conservation action for turtles, primarily in Asia, were the clarion warning alarms sounded by John Behler (1997) and the subsequent 1999 workshop on *Asian Turtle Trade* organized by the Wildlife Conservation Society (in collaboration with TRAFFIC Southeast Asia, World Wildlife Fund, Kadoorie Farm and Botanic Garden, and the U.S. Fish and Wildlife Service), in Phnom Penh, Cambodia. The publication of these proceedings (van Dijk et al. 2000) by Chelonian Research Foundation provided the first comprehensive documentation of the emerging and vast Asian Turtle Crisis.

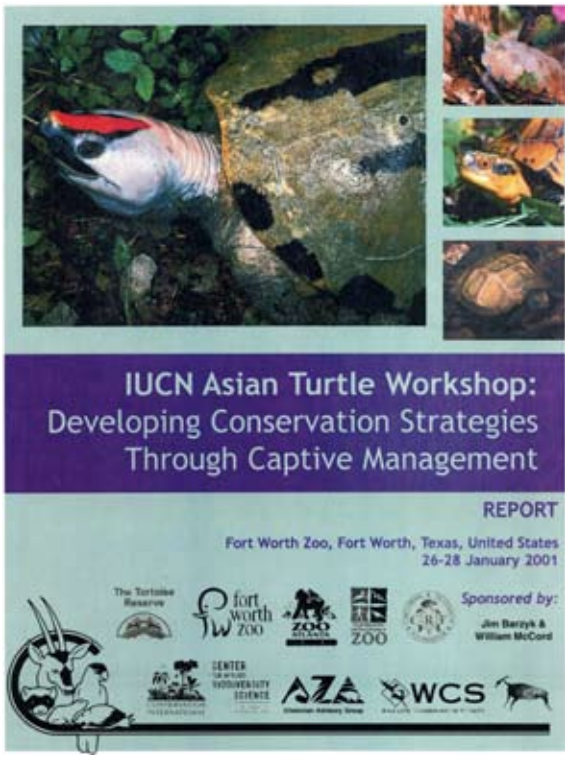
Identifying this regional crisis led to dedicated conservation actions by governments, inter-governmental agencies, and conservation NGOs to improve the regulation of turtle trade. It also tasked scientists to identify priority populations and species-specific conservation actions. There were two early and important results of this workshop. First, through action led by the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG), it helped stimulate and mobilize CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) to take direct and much-needed action on trade regulations for Asian turtles (Rhodin 2001).

Second, it led to another major catalytic workshop in Fort Worth, Texas, in 2001, organized by Rick Hudson and hosted by the Fort Worth Zoo (in collaboration with the IUCN/SSC Conservation Breeding Specialist Group [CBSG] and the TFTSG, with many sponsors), at which a unified concept of turtle conservation efforts focused on captive breeding was formulated, and the Turtle Survival Alliance (TSA) was created (CBSG 2001). Since then, the TSA has become the leading global turtle organization for implementing *in-situ* field projects, as well as developing assurance colonies for some of the most endangered tortoises and freshwater turtles.

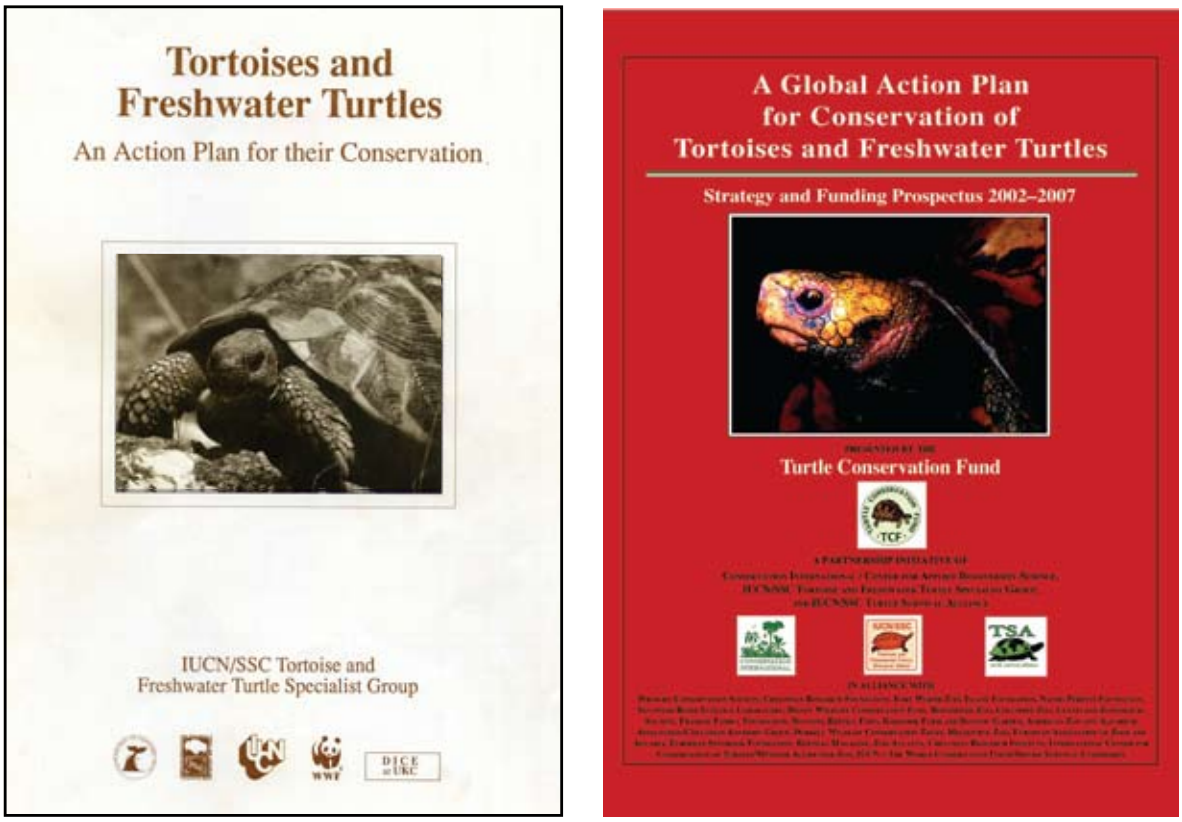
Also created in these early years was the Turtle Conservation Fund (TCF), a joint strategizing and funding mechanism founded in 2002 as a partnership initiative of Conservation International, the TFTSG, and the TSA.

Turtle Conservation Fund (TCF). — An early global conservation Action Plan for tortoises and freshwater turtles had been produced in 1989 by the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG 1989), with a second expanded one 13 years later in 2002 by the Turtle Conservation Fund, in collaboration with Conservation International, the TFTSG, the TSA, and several other affiliated partners (TCF 2002).





Early Catalytic Workshops on Conservation of Asian Tortoises and Freshwater Turtles (*left*: Cambodia 1999; *right*: Texas 2001).



Global Action Plans for Conservation of Tortoises and Freshwater Turtles (*left*: TFTSG 1989; *right*: TCF 2002).

Tortoises and Freshwater Turtles that have gone Extinct since 1500 AD, with approximate extinction dates.

Kinosternidae
- **Viesca Mud Turtle**
  - *Kinosternon hirtipes megacephalum*
  - Mexico (Coahuila); ca. 1970

Testudinidae
- **Daudin's Giant Tortoise**
  - *Aldabrachelys gigantea daudinii*
  - or *Dipsochelys dussumieri daudinii*
  - Seychelles (Mahé?); ca. 1850
- **Floreana Giant Tortoise, Charles Island Giant Tortoise**
  - *Chelonoidis nigra*
  - Ecuador (Galápagos: Floreana [Charles]); ca. 1850
- **Fernandina Giant Tortoise, Narborough Island Giant Tortoise**
  - *Chelonoidis phantastica*
  - Ecuador (Galápagos: Fernandina [Narborough]); ca. 1960
- **Reunion Giant Tortoise**
  - *Cylindraspis indica*
  - Réunion; ca. 1840
- **Mauritius Giant Domed Tortoise**
  - *Cylindraspis inepta*
  - Mauritius (Mauritius); ca. 1735
- **Rodrigues Domed Tortoise**
  - *Cylindraspis peltastes*
  - Mauritius (Rodrigues); ca. 1795
- **Mauritius Giant Flat-shelled Tortoise**
  - *Cylindraspis triserrata*
  - Mauritius (Mauritius); ca. 1735
- **Rodrigues Giant Saddleback Tortoise**
  - *Cylindraspis vosmaeri*
  - Mauritius (Rodrigues); ca. 1795

Pelomedusidae
- **Seychelles Mud Turtle**
  - *Pelusios seychellensis*
  - Seychelles (Mahé); ca. 1950

In the 2002 TCF plan, the first phase, *Preventing Imminent Extinctions*, is now behind us. We are pleased to say that no turtle species has gone extinct since the plan was drafted. Additionally, some species feared extinct have been rediscovered, and are now subject to targeted conservation programs. We are now well into the plan's second phase, *Expanding the Focus*, with the Turtle Conservation Coalition and its partners implementing comprehensive conservation strategies for a variety of regions and species. Ahead lies the challenge of the plan's third phase, *Securing the Future*, where we aim to ensure that progress made to date will not be lost and that we continue to expanded turtle conservation programs into the future.

Throughout the process, the TSA, TCF, and TFTSG have adhered to the three-pronged conservation vision articulated in the 2002 Action Plan that aims to balance: 1) *Capacity Building* in range countries to maximize skills and resources available to safeguard the survival of turtle populations in their native habitat; 2) *Conservation Research* on biology, ecology, and status to identify and adapt optimal conservation actions; and 3) the establishment of *Assurance Colonies* for captive breeding as a last line of defense against extinction and to maintain future options.

The TCF has helped meet the challenge of providing strategic funding support for needed research and conservation efforts directed at the most endangered species of freshwater turtles and tortoises. Since issuing its Action Plan in 2002, the TCF has received over 300 grant proposals

through 2010, of which 113 have been funded, supporting work in 37 different nations. Total requests have been nearly $1.8 million, with about $536,000 in awards granted, averaging nearly $5000 each. Of the World's Top 25 Most Endangered Tortoises and Freshwater Turtles identified by the TFTSG (2007), projects representing over 20 of these have been funded, including projects on about 65% of the taxa listed by IUCN as Critically Endangered or Endangered.

As a result of these granted projects, our knowledge of the population status and distribution of most priority species has been vastly improved, and positive on-the-ground actions to halt and reverse local turtle population declines have been started and are on-going by numerous researchers and turtle organizations worldwide, including participants in the Turtle Conservation Coalition.

Turtle Survival Alliance (TSA). — After forming in 2001 with an initial focus on establishing *ex-situ* assurance colonies in the USA and Europe for many of the most endangered species of tortoises and freshwater turtles, the Turtle Survival Alliance (TSA) vastly expanded its scope to establish robust *in-situ* programs that emphasize the recovery of Critically Endangered species while developing partnerships that build lasting capacity for turtle conservation.

The TSA has an overarching commitment to zero turtle extinctions in the 21st Century and to taking responsibility for species survival. It is action-oriented and focuses on implementation of field-based conservation programs, with success based on its ability to take swift and decisive action on behalf of endangered turtles and tortoises. The TSA has focused on building capacity for turtle conservation in range countries, thereby empowering local people to save their own turtles. By developing the infrastructure for turtle conservation through training and capacity building, the TSA has been able to effectively build successful programs to save species. It has focused on Critically Endangered species (as determined by the TFTSG and the IUCN Red List), generally those with an appropriate captive component (e.g., headstarting, assurance colonies, rescue centers), and either manages programs or has supported projects that directly impacts the survival of 17 of the current World's Top 25 Endangered Tortoises and Freshwater Turtles.

The TSA has also responded with concerted action to the priorities established by the global turtle conservation community, notably by implementing recovery programs for species in imminent danger of extinction. Workshops focused on capacity building and priority-setting have been held in Singapore in 2004, Hong Kong in 2005, India in 2005 (Centre for Herpetology and Madras Crocodile Bank Trust 2006), Myanmar in 2009, and a return workshop planned for Singapore in February 2011 in conjunction with the Wildlife Conservation Society, Wildlife Reserves Singapore Group, the TFTSG, and other partners. A strategic planning workshop in Lucknow, India, in 2010 identified five key turtle conservation areas within that country and set in motion a second nationwide action plan. Additional workshops focused on Asian box turtles (genus *Cuora*) and the tortoises of Madagascar have also been held.

The TSA has established programs in turtle diversity hotspots such as India, Madagascar, and Myanmar, and hired full-time staff to carry these programs forward to ensure sustainability, maximum effectiveness, and social integration. To date the TSA has spent nearly $1.4 million on turtle conservation. The TSA made history in 2008 when it successfully moved the last known female *Rafetus swinhoei*—the world's largest and most endangered freshwater turtle—to the last known male in China for captive breeding, and has since spent nearly $100,000 to encourage this pair to breed.

In addition to the accomplishments noted above, the TSA has also had the following successes: 1) established captive breeding programs for some of the world's most critically endangered turtles and tortoises (e.g., *Batagur trivittata* and *B. baska*); 2) promoted actions in local communities to reduce human impact on turtles and tortoises, (e.g., poacher conversion workshop in India, community-based protection programs for tortoises in southern Madagascar, development of countrywide monitoring networks for the Central American River Turtle, *Dermatemys mawii*); and 3) provided emergency transport and facilities for turtles and tortoises confiscated from the illegal trade.

Understanding that recovery of turtle and tortoise species will in most cases take decades, the TSA has made long-term commitments to programs in Belize, Bangladesh, China, India, Madagascar, Malaysia, and Myanmar. In Belize, TSA is joining forces with local NGOs in an effort to halt the continued decline of wild population of *Dermatemys mawii*. In India and Bangladesh, TSA supports comprehensive programs for *Batagur baska*, *B. kachuga*, and *Chitra indica* in association with the Madras Crocodile Bank Trust, the San Diego Zoo Institute for Conservation Research, and the Centre for Advanced Research in Natural Resources and Management. In 2009, TSA launched a field-based conservation program in southern Madagascar focused on *Astrochelys radiata* and *Pyxis* spp. in conjunction with Conservation International, the TFTSG, and Henry Doorly Zoo's Madagascar Biodiversity Partnership. This program aims to empower local people living in close association with tortoises to better protect them from poachers, while safeguarding important source populations. In Myanmar, TSA has partnered with the Wildlife Conservation Society and is bringing Critically Endangered species such as *B. trivittata* and *Geochelone platynota* back from the brink of extinction. The fact that the captive population of *B. trivittata* has grown from a handful of individuals to over 400 animals in just a few short years is a testament to the productivity of this partnership.

Future initiatives in Asia include turtle conservation programs in collaboration with the Turtle Conservation Centre in peninsular Malaysia to preserve some of the best remaining wild populations of *B. affinis* and *B. borneoensis*, and joining forces with the Asian Turtle Program in Vietnam to reintroduce the endemic *Mauremys annamensis* to areas of former occurrence. Similar initiatives will soon be launched in Latin America and Colombia, and Indonesia and Africa are considered the TSA's next big challenges for the coming decade.

IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG). — The TFTSG was established in 1981 by the IUCN (International Union for the Conservation of Nature) and the SSC (IUCN Species Survival Commission). The focus of the TFTSG is to provide the academic and scientific analysis 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 sustainable populations of all species persist in the wild. The TFTSG provides expertise and science-based recommendations with conservation relevance covering all species of freshwater and terrestrial turtles and tortoises, and is the official IUCN Red List Authority for the determination of global threat levels for these species. The TFTSG works closely with the IUCN Red List Programme to assess, evaluate, and determine appropriate threat level categorizations for these species on the IUCN Red List of Threatened Species™ .

The TFTSG works closely with CITES to develop strategies to address turtle trade, including listing appropriate turtle species on their Appendices. This has proven to be an effective though slow mechanism to address unsustainable international turtle trade and to try to ensure that permitted trade levels are not detrimental to species' survival. From 2000 to 2004, 39 Asian freshwater turtle species were added to CITES Appendix II and their trade monitored, leading to a gradual reduction in trade volumes of Asian turtle species. The CITES Secretariat also convened a meeting in 2002, hosted by China and supported by Chelonian Research Foundation, to engage its Asian Parties in developing and implementing better regulation and monitoring of turtle trade, with extensive participation by the TFTSG (CITES 2002, Rhodin 2002, van Dijk 2002).

At CoP14 in 2007, the CITES Parties (Decision 14.128) commissioned the TFTSG to undertake a study of the effects that CITES listings have had on Asian turtle trade and to make recommendations regarding the conservation and trade of tortoises and freshwater turtles. The study found that reported volumes of traded Asian turtles declined steeply after species were placed on the CITES Appendices. However, TFTSG also documented a steep concurrent increase in imports of North American turtles into Asia, notably softshell (*Apalone* spp.) and snapping turtles (*Chelydra*), to meet the demand of farms and consumption trade (IUCN/SSC Tortoise and Freshwater Turtle Specialist Group 2010a,b). The study also drew attention to widespread illegal trade in tortoises from India and Madagascar, among others, for the pet trade in Asia, and concluded with a series of recommendations that are currently under deliberation by the CITES Animals and Standing Committees for follow-up measures.

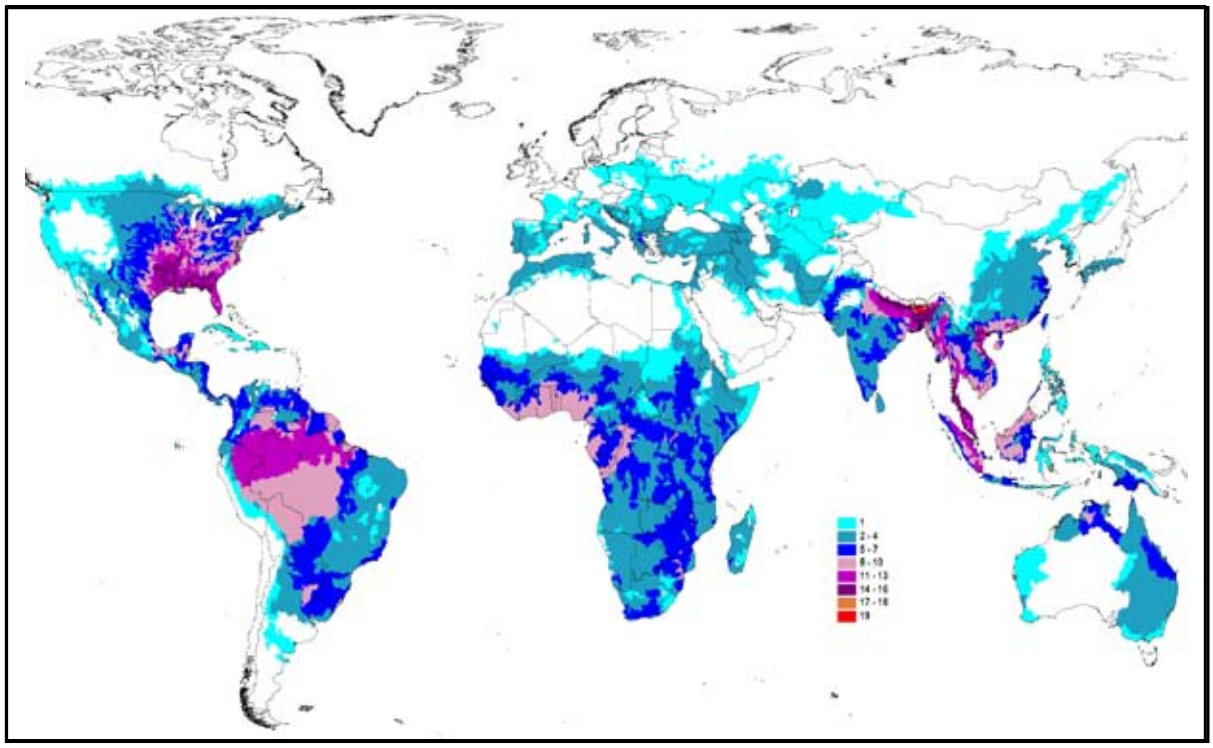
Alerted to the massive scale and diversity of wild-collected exports of its native turtle species to Asia, the U.S. Fish and Wildlife Service's International Wildlife Trade Program and the TFTSG co-convened a freshwater turtle workshop in St. Louis in September 2010. The workshop highlighted the pressing management, regulatory, scientific, and enforcement needs associated with the commercial take and trade of freshwater turtles in the USA. The workshop brought together Wildlife Agencies from all pertinent U.S. States, as well as federal, state, academic, and NGO-based turtle conservation specialists. Results and recommendations of the workshop have been posted online and serve as a baseline for further action to limit the impact of the commercial freshwater turtle trade in the United States, such as the laws and regulations that have already been enacted in Florida, Maryland, Oklahoma, Texas, and other leading States (http://www.fws.gov/international/dma_dsa/ CITES/ Appendix_III/turtles_ws.html).

Starting at the Cambodia workshop in 1999, the TFTSG has also conducted a series of regional IUCN Red Listing workshops to determine IUCN survival status of tortoises and freshwater turtles, with the first one covering all Asian species (IUCN/SSC Tortoise and Freshwater Turtle Specialist Group and Asian Turtle Trade Working Group 2000). Subsequent workshops have been held intermittently in collaboration with Conservation International, Wildlife Conservation Society, the Turtle Survival Alliance, the Turtle Conservancy, and other partners. Workshops have been held in Mexico, Spain and Greece (for Mediterranean species), India, Madagascar (Mittermeier et al. 2008), Australia and New Guinea, the USA, and Brazil (for South American species). These workshops have assessed the conservation status and survival prospects of the world's tortoises and freshwater turtles, provided updated Red List determinations, and helped develop action plans and priority setting.

By bringing together experts on a region's turtles and tortoises, these workshops have not only compiled the most comprehensive and up-to-date information on these species, but have also enabled regional experts to meet, interact, and compare experiences, often for the first time. The process has gradually compiled a standardized and comparable set of turtle status assessments that have helped to generate recommendations for priority conservation actions by Turtle Conservation Coalition participants and other organizations. In addition, much of this information is being gradually published by these scientists in collaboration with the TFTSG and Chelonian Research Foundation in its monograph project on *Conservation Biology of Freshwater Turtles and Tortoises* (Rhodin et al. 2008–2010). All these on-going assessment processes have also helped to generate other important status milestones, such as our series of Top 25 publications.

Top 25+ Threatened Turtles: A Background to the Listing Process

As part of our comprehensive strategy to highlight and help prioritize urgently needed conservation action for the most critically endangered turtles and tortoises in the world, we have highlighted the Top 25 most endangered species every four years since 2003. The first Top 25 list was issued by the TCF (Turtle Conservation Fund 2003) with the strategic title *Turtles on Death Row* (see map on p. 14), us-



The baseline maps used in this document are from Buhlmann et al. (2009), showing the global distribution of species richness in terms of the number of terrestrial and freshwater turtle and tortoise species in defined drainage basins (color scale = number of species per area). Projected distributions were based on GIS-defined hydrologic unit compartments (HUCs) constructed around verified localities and then adding HUCs that connected known point localities in the same watershed or physiographic region, and similar habitats and elevations as verified HUCs. The highest concentrations of species are in the Ganges-Brahmaputra basin, Southeastern USA, and Southeast Asia.

ing the concept from the original prospectus outlining the conservation goals of the TCF (Turtle Conservation Fund 2002). The second Top 25 list was issued four years later by the TFTSG (IUCN/SSC Tortoise and Freshwater Turtle Specialist Group 2007), being expanded to also include regional listings of more than just the Top 25 species and providing a general descending order of extinction risk.

This, our third Top 25 listing, encompasses more species than previously (and is therefore called the Top 25+), adding several more species that are also at very high risk of extinction. The species are arranged in a more or less general and approximate descending order of extinction risk, and separated into the Top 25, the Other Top 40 [species 26–40], and Others [species 41 and higher], for a total of 49 species covered (see overview tables, maps, and photos on pp. 12–16).

In contrast to the previous Top 25 lists, which were presented by single organizations (the TCF in 2003 and the TFTSG in 2007), the current 2011 list is presented by a group of organizations, that we have jointly agreed to designate as the ***Turtle Conservation Coalition*** (TCC) to reflect our collaborative approach in working together, and in order to speak with one voice on this important subject. The TCC is an informal alliance of the following turtle- and conservation-focused organizations currently working together on behalf of chelonian and biodiversity conservation: the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG), the Turtle Conservation Fund (TCF), the Turtle Survival Alliance (TSA), the Turtle Conservancy / Behler Chelonian Center (TC/BCC), Chelonian Research Foundation (CRF), Conservation International (CI), Wildlife Conservation Society (WCS), and San Diego Zoo Global (SDZG).

Working closely with the TCC, the International Union for the Conservation of Nature (IUCN) and its Species Survival Commission (SSC) and Red List Programme have provided a global framework for many of our conservation efforts, and CITES and the U.S. Fish and Wildlife Service have provided important support to allow much of the background analysis on specific threats to be accomplished. The TCC welcomes future participation by other associated organizations, including those focused more on sea turtles, for other potential projects or endeavors as indicated.

Our methodology for this 2011 Top 25+ list was to take the previous Top 25 lists from TCF (2003) and TFTSG (2007), including a synthesis of all the 2007 regional lists, and circulate them to the membership of the TFTSG (currently 274 members from 51 nations who work or focus their turtle conservation efforts in 107 nations; http://www.iucn-tftsg.org/membership/) for input and recommendations as to ranking of all terrestrial and freshwater turtle and tortoise species based on extinction risk. Those recommendations were then collated and sent for further review to the 30-member Steering Committee of the TFTSG, and then finally discussed at a joint leadership meeting of the principals of the Turtle Conservation Coalition, thereby generating the current list.

Species accounts were then prepared by the editors with input from multiple experts in the field, and photographs selected, using photos from the wild whenever possible. Maps showing general locations for the species utilized the base map from Buhlmann et al. (2009), showing the patterns of distribution of tortoise and freshwater turtle species richness across the globe.

In general, this document includes all terrestrial and freshwater turtles and tortoises currently ranked as Extinct in the Wild or Critically Endangered on the current 2010 IUCN Red List, or provisionally so, based on recent draft assessments by the TFTSG (Turtle Taxonomy Working Group 2010) carried out in a series of turtle-focused IUCN Red Listing workshops held around the world. In addition, included on this list are a few species at lesser Red List categories that are also considered to be at a high risk of extinction.

A few turtle taxa listed as Critically Endangered on the Red List or by the TFTSG are not included on this 2011 Top 25+ list. For example, Dahl's Toad-headed Turtle, *Mesoclemmys dahli*, currently listed on the Red List as Critically Endangered, and included on the first Top 25 list in 2003, has recently been determined by the TFTSG to warrant downlisting to Endangered. This was based on the recent discovery of additional populations and less apparent habitat threats, and the species may even qualify for Vulnerable status pending further analysis. This species represents a good case of increased conservation focus on a perceived critically endangered species leading to improved knowledge and survival status.

Additionally, the Giant South American River Turtle or Arrau, *Podocnemis expansa*, currently listed on the Red List as Lower Risk / Conservation Dependent, has recently been determined by the TFTSG to warrant uplisting to Critically Endangered on a global basis. However, regional populations in Brazil, despite being markedly reduced, are still fairly large and holding their own due to good conservation management, and the species is not considered to be at high risk for impending extinction at this time.

Subspecies and populations were not considered for inclusion in this document, although a few are listed as Critically Endangered on the Red List. The Black Spiny or Cuatro Cienegas Softshell Turtle, *Apalone spinifera atra*, the Seychelles Black Mud Turtle, *Pelusios subniger parietalis*, and the Seychelles Yellow-bellied Mud Turtle, *Pelusios castanoides intergularis,* are all at high risk of extinction, but in need of further genetic analysis to help determine their distinctiveness. The Greek Tortoise subspecies *Testudo graeca nikolskii* is still listed as Critically Endangered on the Red List, but has recently been synonymized under the Asia Minor Tortoise, *Testudo graeca ibera,* a taxon not considered at high risk (Turtle Taxonomy Working Group 2010). The Mediterranean population of the African or Nile Softshell Turtle, *Trionyx triunguis,* is listed as Critically Endangered on the Red List, but the species as a whole is considered Least Concern, and the Mediterranean population has recently been determined by the TFTSG to no longer warrant a ranking of Critically Endangered.

What About Sea Turtles?

This 2011 Top 25+ listing does not formally assess or include the seven species of sea turtles, as the Red List status of those species is determined by the IUCN/SSC Marine Turtle Specialist Group, and our groups are here focused only on terrestrial and freshwater turtles and tortoises. Unfortunately, non-marine turtles often receive much less conservation attention than the generally more apparently charismatic sea turtles (although we naturally feel that tortoises and freshwater turtles are fully as charismatic as sea turtles).

However, if we had included sea turtles in our assessment, it is our opinion that two species might have warranted inclusion on our Top 25+ list. The Kemp's Ridley, *Lepidochelys kempii,* assessed as Critically Endangered on the IUCN Red List, with its small regional and highly impacted population, might have been included on the lower portions of the list. And the Leatherback Sea Turtle, *Dermochelys coriacea,* also assessed as Critically Endangered on the IUCN Red List, with its larger global but highly impacted populations, might also have been included, but possibly further down on the list. However, the Hawksbill Sea Turtle, *Eretmochelys imbricata,* although also assessed as Critically Endangered on the IUCN Red List, would probably not have been included on our Top 25+, as it is similar to the Giant South American River Turtle, *Podocnemis expansa*, also provisionally considered Critically Endangered on the IUCN Red List, but also not included on our Top 25+ list. That species also has a large global population and, just like the Hawksbill, though many populations are reduced in a major way and facing local extirpation in several areas, neither species appears to be facing a high risk of global extinction anytime soon.

Unfortunately, there are many more species of terrestrial and freshwater turtles and tortoises that are at significantly higher risk of impending extinction than any (or at least most) of the sea turtles. Nevertheless, sea turtles in general tend to garner much broader and stronger levels of support from both non-governmental and governmental conservation organizations than non-marine turtles receive. It is evident that conservation resource allocation should include similar or comparable levels of support for terrestrial and freshwater turtles and tortoises and sea turtles alike. All these highly endangered and important animals are facing a high extinction risk, and all need our help.

Patterns of Threat Among Turtles and Tortoises

With anywhere from 48 to 54% of all 328 of their species considered threatened (Turtle Taxonomy Working Group 2010), turtles and tortoises are at a much higher risk of extinction than many other vertebrates: birds (ca. 13%), mammals (ca. 21–25%), sharks and rays (ca. 17–31%), or amphibians (ca. 30–41%) (Hoffmann et al. 2010), and paralleled among the larger groups only by the primates (ca. 48%) (www.iucnredlist.org).

Of the 263 species of freshwater and terrestrial turtles (i.e., not tortoises or sea turtles), one species is already Extinct, with 117 (45%) of the remaining 262 species considered Threatened by the IUCN, and 73 (28%) either Critically Endangered or Endangered. Of the 58 species of tortoises (family Testudinidae), seven are already Extinct and one is Extinct in the Wild, with 33 (66%) of the remaining 50 species considered Threatened, and 18 (36%) either Critically Endangered or Endangered, yielding 41 (71%) of all tortoise species either already gone or almost gone. Of the seven species of sea turtles, six (86%) are considered Threatened, and five (71%) are Critically Endangered or Endangered. In comparison, tortoises have nearly as high a percentage of threatened species as sea turtles, and freshwater turtles are not far behind.

In terms of analysis of geographic patterns of the 2011 Top 25 tortoise and freshwater turtle species [1–25], if we consider continents, 17 species (68%) are from Asia, 3 (12%) are from Africa, 3 (12%) from South America, and one each (4% each) are from North America and Australia. If we consider countries, 6 species (24%) occur in China, 4 (16%) in Indonesia, 3 (12%) in Vietnam, and 2 (8%) in Madagascar. If we expand this geographic analysis to the 2011 Top 40 [1–40], if we consider continents, then 25 species (63%) are from Asia, 7 (18%) from Africa, 4 (10%) from North America, 3 (8%) from South America, and one (3%) from Australia; if we consider countries, then 9 species (23%) occur in China, 7 (18%) in Vietnam, 5 (13%) in Madagascar, and 4 (10%) in Indonesia.

In terms of analysis of taxonomic patterns of the 2011 Top 25 species [1–25], if we consider families, 13 (52%) are Geoemydidae, 4 (16%) are Testudinidae, 3 (12%) are Chelidae, 2 each (8% each) are Trionychidae and Podocnemididae, and one (4%) is the monotypic family Dermatemydidae. If we expand this taxonomic analysis to the 2011 Top 40 [1–40], then 19 (48%) are Geoemydidae, 9 (23%) are Testudinidae, 3 (8%) are Chelidae, 4 (10%) are Trionychidae, 2 each (5% each) are Podocnemididae and Emydidae, and one (3%) is the monotypic family Dermatemydidae. If we consider species on the 2011 Top 25, then 5 each (20% each) are from the Asian genera *Cuora* and *Batagur* (Geoemydidae). If we expand this analysis to the 2011 Top 40, then 9 (23%) are *Cuora*, 5 (13%) are *Batagur*, and 3 (8%) are Asian *Chitra* (Trionychidae).

Clearly, Asian species (most notably from China and Vietnam, but also from Indonesia, Malaysia, Myanmar, India, Bangladesh, Cambodia, Laos, Thailand, and the Philippines) of the family Geoemydidae, and especially of the genera *Cuora* and *Batagur*, are at the highest general risk of extinction. Also at very high risk of extinction are all five of the endemic species of Madagascar.

The regional pattern of high extinction risk for Asian species is primarily because of the long-term unsustainable exploitation of turtles and tortoises for consumption and traditional Chinese medicine, and to a lesser extent for the international pet trade, as identified and described in detail in our earlier volume on the *Asian Turtle Trade* (van Dijk et al. 2000). In addition, there is an expanding Chinese domestic pet trade driven by high-end investment-oriented demand for accumulation of *Cuora* specimens that is causing increased pressure on remaining populations of these species.

The Way Forward

This presentation of the world's most endangered turtles is intended to help raise awareness about the critical survival status of this well-known group of animals that have thrived on our planet for millions of years, but who now face an extremely high extinction risk within our lifetimes. We could quickly and easily lose several of these important and charismatic animal species unless we take decisive action to safeguard their future. This list of the most endangered turtles should be used as an effective guideline to set urgent priority actions for conservation and research on these species, although in no way should it discourage conservation or research on any other less endangered species.

Despite the gains made by the partner organizations in the Turtle Conservation Coalition, as outlined earlier, we still need more progress and sustainable successes. Our prime focus to date has been mainly on the crisis situations in Asia and Madagascar, but turtles all over the world need our help and conservation action. Resources are always a limiting factor, but together we have succeeded in increasing support to these efforts. We will continue to work hard to generate more and broader-based support and to make a more permanent difference for the survival of turtles worldwide.

It is our intention to revisit this Top 25+ list within a four-year time frame in order to update relevant status changes. At that time we expect to report further conservation successes and hopefully begin to take some turtles *off* this list. Let us all do whatever we can to help make a difference.

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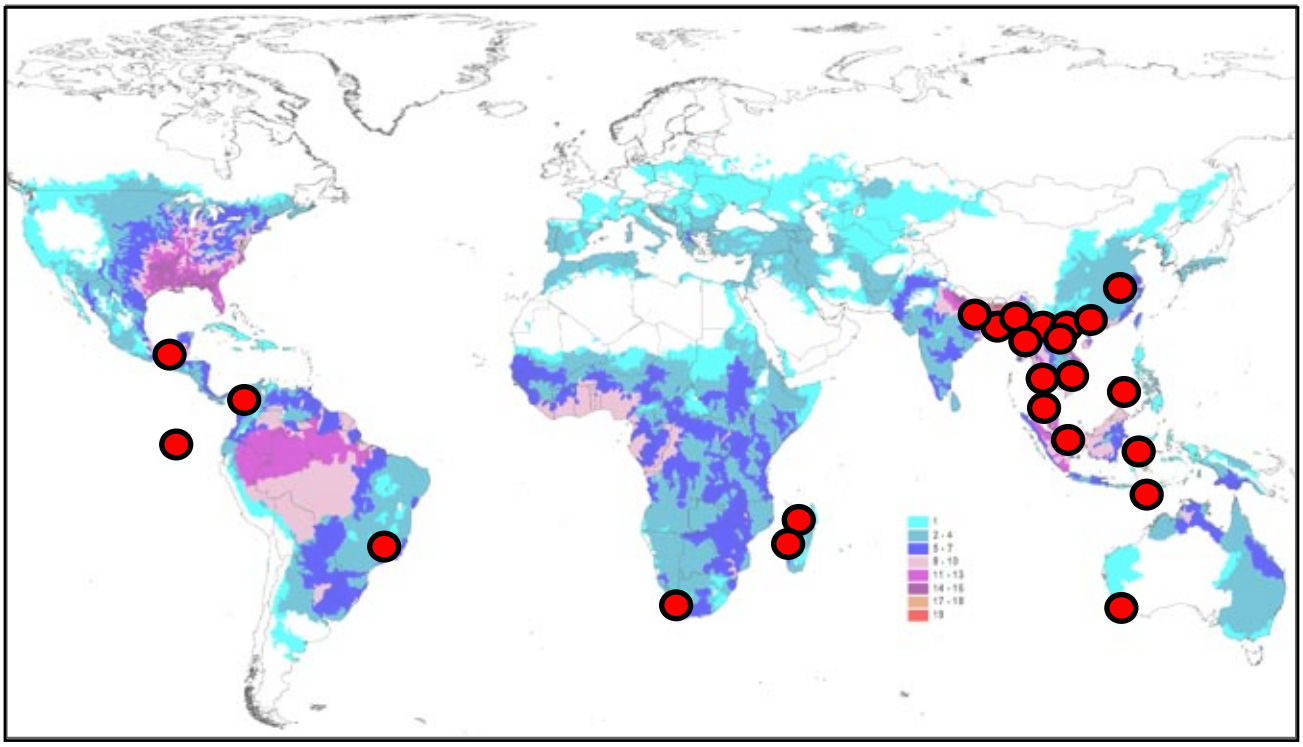
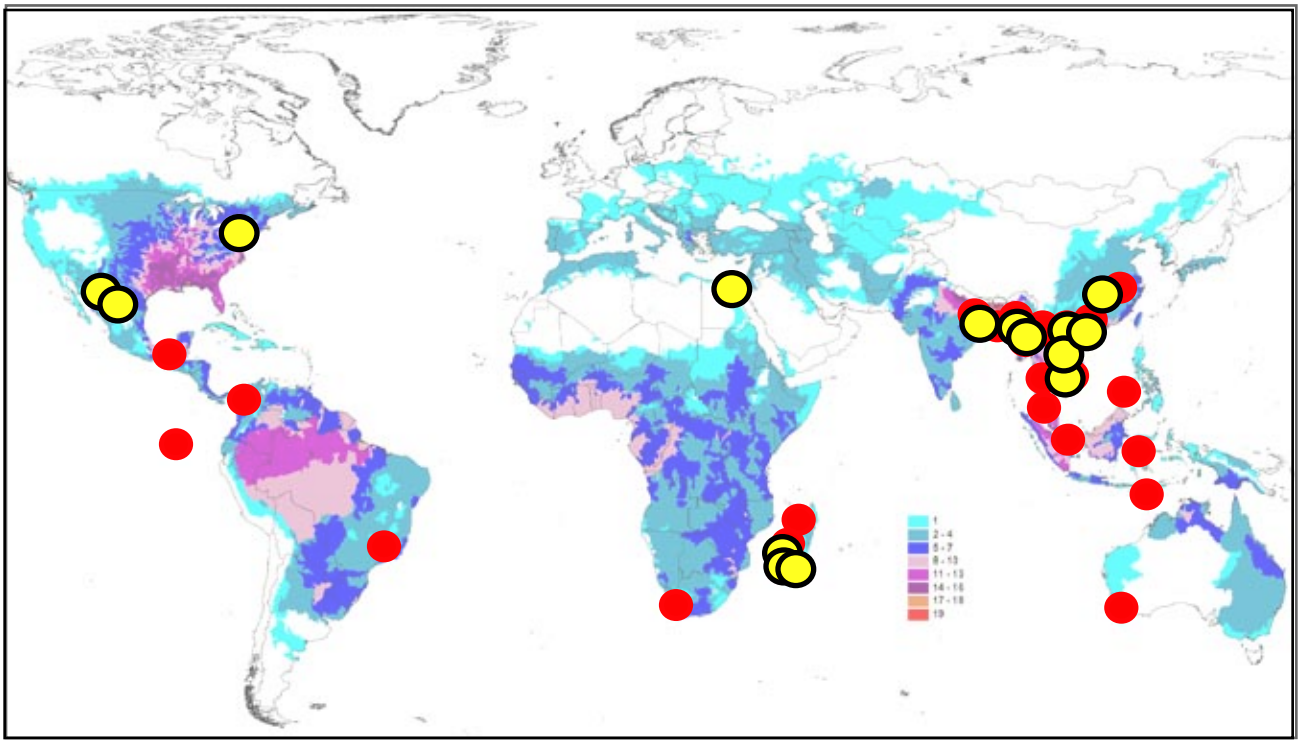
Table of Species of Tortoises and Freshwater Turtles Considered to be at the Highest Risk for Extinction in 2011: Arranged in General and Approximate Descending Order of Extinction Risk

Genus	Species	Family	Distribution	IUCN [1] Red List	TFTSG [1] Draft
Top 25 Endangered Tortoises and Freshwater Turtles at Extremely High Risk of Extinction:					
Chelonoidis	*abingdonii*	Testudinidae	South America: Ecuador (Galápagos)	EW	
Rafetus	*swinhoei*	Trionychidae	Asia: China, Vietnam	CR	
Cuora	*yunnanensis*	Geoemydidae	Asia: China	CR	
Batagur	*baska*	Geoemydidae	Asia: Bangladesh, India, Myanmar	CR	
Batagur	*trivittata*	Geoemydidae	Asia: Myanmar	EN	CR
Cuora	*zhoui*	Geoemydidae	Asia: China, Vietnam (?)	CR	
Cuora	*mccordi*	Geoemydidae	Asia: China	CR	
Cuora	*aurocapitata*	Geoemydidae	Asia: China	CR	
Cuora	*trifasciata*	Geoemydidae	Asia: China, Laos, Vietnam	CR	
Astrochelys	*yniphora*	Testudinidae	Africa: Madagascar	CR	
Geochelone	*platynota*	Testudinidae	Asia: Myanmar	CR	
Chelodina	*mccordi*	Chelidae	Asia: Indonesia, Timor-Leste	CR	
Chitra	*chitra*	Trionychidae	Asia: Indonesia, Malaysia, Thailand	CR	
Mauremys	*annamensis*	Geoemydidae	Asia: Vietnam	CR	
Dermatemys	*mawii*	Dermatemydidae	North / Central America: Belize, Guatemala, Mexico	CR	
Erymnochelys	*madagascariensis*	Podocnemididae	Africa: Madagascar	CR	
Batagur	*affinis*	Geoemydidae	Asia: Cambodia, Indonesia, Malaysia, Thailand	NE	CR
Batagur	*kachuga*	Geoemydidae	Asia: Bangladesh, India, Nepal	CR	
Leucocephalon	*yuwonoi*	Geoemydidae	Asia: Indonesia	CR	
Pseudemydura	*umbrina*	Chelidae	Australia (Western Australia)	CR	
Mesoclemmys	*hogei*	Chelidae	South America: Brazil	EN	CR
Psammobates	*geometricus*	Testudinidae	Africa: South Africa	EN	CR
Siebenrockiella	*leytensis*	Geoemydidae	Asia: Philippines	CR	
Podocnemis	*lewyana*	Podocnemididae	South America: Colombia	EN	CR
Batagur	*borneoensis*	Geoemydidae	Asia: Indonesia, Malaysia	CR	
Other Top 40 Tortoises and Freshwater Turtles at Very High Risk of Extinction:					
Cuora	*pani*	Geoemydidae	Asia: China	CR	
Testudo	*kleinmanni*	Testudinidae	Africa / Middle East: Egypt, Israel, Libya	CR	
Heosemys	*depressa*	Geoemydidae	Asia: Myanmar	CR	
Cuora	*picturata*	Geoemydidae	Asia: Vietnam	NE	CR
Pyxis	*planicauda*	Testudinidae	Africa: Madagascar	CR	
Chitra	*vandijki*	Trionychidae	Asia: Myanmar, Thailand	NE	CR
Mauremys	*nigricans*	Geoemydidae	Asia: China, Vietnam (?)	EN	CR
Chitra	*indica*	Trionychidae	Asia: Bangladesh, India, Nepal, Pakistan	EN	
Terrapene	*coahuila*	Emydidae	North America: Mexico	EN	
Astrochelys	*radiata*	Testudinidae	Africa: Madagascar	CR	
Cuora	*bourreti*	Geoemydidae	Asia: Cambodia (?), Laos (?), Vietnam	NE	CR
Cuora	*galbinifrons*	Geoemydidae	Asia: China, Laos, Vietnam	CR	
Pyxis	*arachnoides*	Testudinidae	Africa: Madagascar	CR	
Gopherus	*flavomarginatus*	Testudinidae	North America: Mexico	VU	EN
Glyptemys	*muhlenbergii*	Emydidae	North America: USA	EN	CR
Other Tortoises and Freshwater Turtles at High Risk of Extinction:					
Elusor	*macrurus*	Chelidae	Australia (Queensland)	EN	
Manouria	*emys*	Testudinidae	Asia: India to Thailand to Indonesia	EN	
Homopus	*solus*	Testudinidae	Africa: Namibia	VU	
Chelonoidis	*hoodensis*	Testudinidae	South America: Ecuador (Galápagos)	CR	
Chelonoidis	*duncanensis*	Testudinidae	South America: Ecuador (Galápagos)	EW	CR
Nilssonia	*formosa*	Trionychidae	Asia: Myanmar, Thailand (?)	EN	
Nilssonia	*nigricans*	Trionychidae	Asia: Bangladesh, India	EW	CR
Sternotherus	*depressus*	Kinosternidae	North America: USA	VU	CR
Pelochelys	*cantorii*	Trionychidae	Asia: India to China to Indonesia to Philippines	EN	

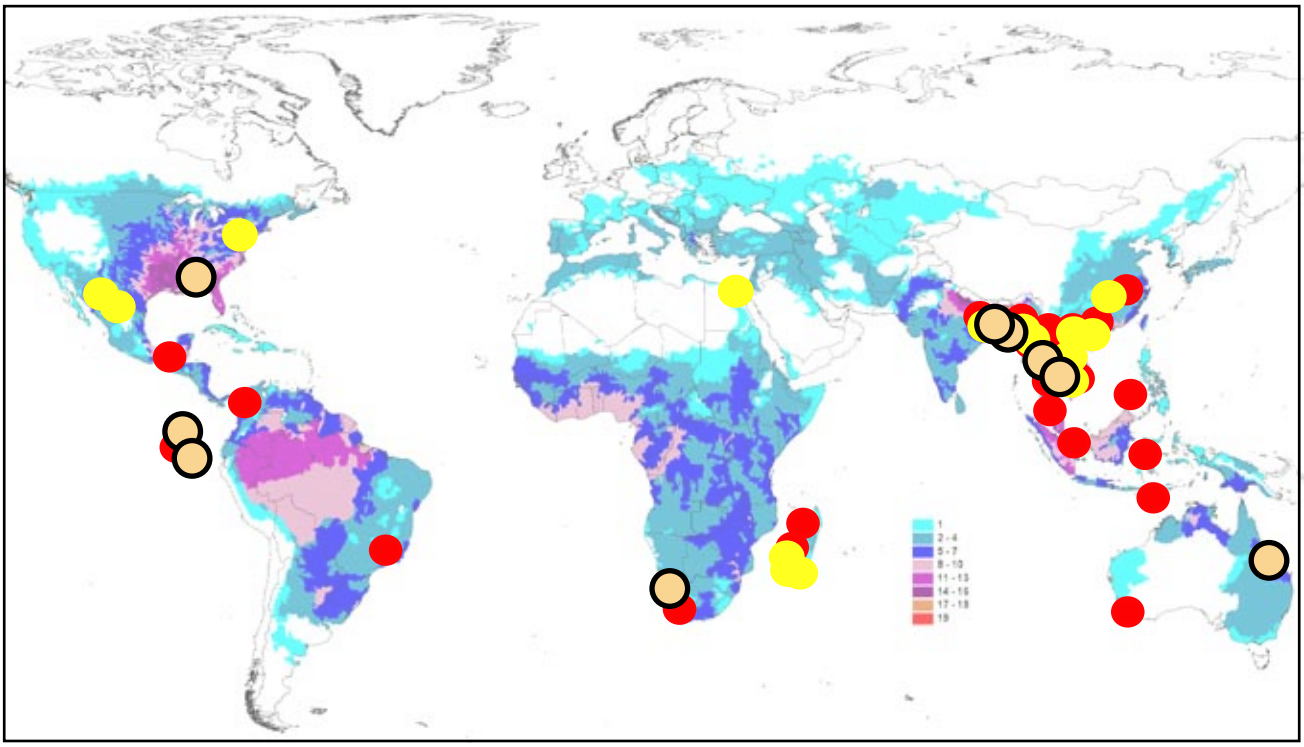
[1] IUCN Threat Categories: EW = Extinct in the Wild; CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NE = Not Evaluated



Top 25 Endangered Tortoises and Freshwater Turtles at Extremely High Risk of Extinction in 2011.



Top 25 (red) plus Other Top 40 [26–40] (yellow) Tortoises and Freshwater Turtles at Very High Risk of Extinction in 2011.



Top 25 (red) plus Other Top 40 [26–40] (yellow) plus Other [41+] (tan) Tortoises and Freshwater Turtles at High Risk of Extinction in 2011.

Map from the original 2003 Turtle Conservation Fund listing of the Top 25 Turtles on Death Row.

Table of all species (and one subspecies) of turtles and tortoises, arranged taxonomically, that have been included on our Top 25 lists: TCF (2003), TFTSG (2007), and the present 2011 Top 25+ list.

Family	Genus	Species	Distribution	2003 Top 25	2007 Top 25	2011 Top 25	2011 [26–40]	2011 [41+]
Chelidae	*Chelodina*	*mccordi*	Asia	x	x	x		
Chelidae	*Elusor*	*macrurus*	Australia	x	x			x
Chelidae	*Mesoclemmys*	*dahli*	South America	x				
Chelidae	*Mesoclemmys*	*hogei*	South America			x		
Chelidae	*Pseudemydura*	*umbrina*	Australia	x	x	x		
Dermatemydidae	*Dermatemys*	*mawii*	North / Central America	x	x	x		
Emydidae	*Glyptemys*	*muhlenbergii*	North America	x			x	
Emydidae	*Graptemys*	*flavimaculata*	North America	x				
Emydidae	*Terrapene*	*coahuila*	North America		x		x	
Geoemydidae	*Batagur*	*affinis*	Asia			x		
Geoemydidae	*Batagur*	*baska*	Asia	x	x	x		
Geoemydidae	*Batagur*	*borneoensis*	Asia	x	x	x		
Geoemydidae	*Batagur*	*kachuga*	Asia			x		
Geoemydidae	*Batagur*	*trivittata*	Asia	x	x	x		
Geoemydidae	*Cuora*	*aurocapitata*	Asia		x	x		
Geoemydidae	*Cuora*	*bourreti*	Asia				x	
Geoemydidae	*Cuora*	*galbinifrons*	Asia				x	
Geoemydidae	*Cuora*	*mccordi*	Asia			x		
Geoemydidae	*Cuora*	*pani*	Asia				x	
Geoemydidae	*Cuora*	*picturata*	Asia				x	
Geoemydidae	*Cuora*	*trifasciata*	Asia	x	x	x		
Geoemydidae	*Cuora*	*yunnanensis*	Asia		x	x		
Geoemydidae	*Cuora*	*zhoui*	Asia			x		
Geoemydidae	*Heosemys*	*depressa*	Asia	x	x		x	
Geoemydidae	*Leucocephalon*	*yuwonoi*	Asia	x	x	x		
Geoemydidae	*Mauremys*	*annamensis*	Asia	x	x	x		
Geoemydidae	*Mauremys*	*nigricans*	Asia				x	
Geoemydidae	*Siebenrockiella*	*leytensis*	Asia	x	x	x		
Kinosternidae	*Sternotherus*	*depressus*	North America					x
Podocnemididae	*Erymnochelys*	*madagascariensis*	Africa	x	x	x		
Podocnemididae	*Podocnemis*	*lewyana*	South America			x		
Testudinidae	*Astrochelys*	*radiata*	Africa				x	
Testudinidae	*Astrochelys*	*yniphora*	Africa	x	x	x		
Testudinidae	*Chelonoidis*	*abingdonii*	South America	x	x	x		
Testudinidae	*Chelonoidis*	*duncanensis*	South America					x
Testudinidae	*Chelonoidis*	*hoodensis*	South America					x
Testudinidae	*Geochelone*	*platynota*	Asia	x	x	x		
Testudinidae	*Gopherus*	*flavomarginatus*	North America				x	
Testudinidae	*Homopus*	*signatus cafer*	Africa	x				
Testudinidae	*Homopus*	*solus*	Africa					x
Testudinidae	*Manouria*	*emys*	Asia					x
Testudinidae	*Psammobates*	*geometricus*	Africa	x	x	x		
Testudinidae	*Pyxis*	*arachnoides*	Africa				x	
Testudinidae	*Pyxis*	*planicauda*	Africa	x	x		x	
Testudinidae	*Testudo*	*kleinmanni*	Africa / Middle East	x	x		x	
Trionychidae	*Chitra*	*chitra*	Asia	x	x	x		
Trionychidae	*Chitra*	*indica*	Asia		x		x	
Trionychidae	*Chitra*	*vandijki*	Asia				x	
Trionychidae	*Nilssonia*	*formosa*	Asia					x
Trionychidae	*Nilssonia*	*nigricans*	Asia					x
Trionychidae	*Pelochelys*	*cantorii*	Asia					x
Trionychidae	*Rafetus*	*swinhoei*	Asia	x	x	x		

The World's Top 25 Endangered Tortoises and Freshwater Turtles – 2011

Chelonoidis abingdonii
Photo A.G.J. Rhodin

Rafetus swinhoei
Photo T. McCormack

Cuora yunnanensis
Photo T. Zhou, W.P. McCord, T. Blanck

Batagur baska
Photo R. Ghosh

Batagur trivittata
Photo R. Hudson

Cuora zhoui
Photo T. Blanck

Cuora mccordi
Photo T. Blanck

Cuora aurocapitata
Photo G. Kuchling

Cuora trifasciata
Photo P. Crow

Astrochelys yniphora
Photo A.G.J. Rhodin

Geochelone platynota
Photo B.D. Horne

Chelodina mccordi
Photo A.G.J. Rhodin

Chitra chitra
Photo C. Tabaka

Mauremys annamensis
Photo R. Reed

Dermatemys mawii
Photo M. Merida

Erymnochelys madagascariensis
Photo A.G.J. Rhodin

Batagur affinis
Photo E.H. Chan

Batagur kachuga
Photo B.D. Horne

Leucocephalon yuwonoi
Photo C. Hagen

Pseudemydura umbrina
Photo G. Kuchling

Mesoclemmys hogei
Photo R.A. Mittermeier

Psammobates geometricus
Photo A. de Villiers

Siebenrockiella leytensis
Photo R.M. Brown

Podocnemis lewyana
Photo A. Cadavid

Batagur borneoensis
Photo D. Hendrie

Turtles in Trouble:

The World's Top 25 Endangered Tortoises and Freshwater Turtles at Extremely High Risk of Extinction—2011

Arranged in General and Approximate Descending Order of Extinction Risk

Pinta Giant Tortoise, Abingdon Island Giant Tortoise

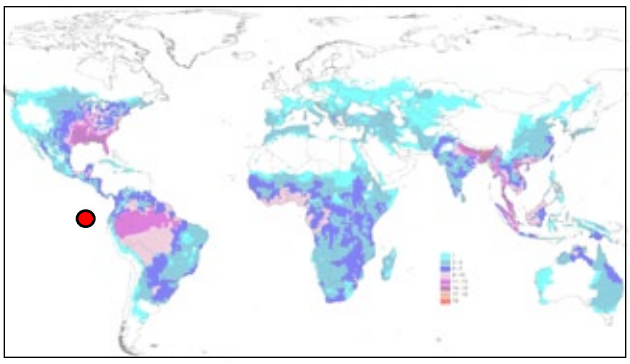
Chelonoidis abingdonii (Günther 1877); Family Testudinidae
South America: Ecuador (Galápagos: Pinta [Abingdon] [extirpated])
IUCN Red List: EW, Extinct in the Wild, as *Chelonoidis nigra abingdoni*
CITES: Appendix I, as *Chelonoidis nigra*

While there is some scientific disagreement whether the various different island forms of Galápagos tortoises represent separate species or subspecies, all agree that Lonesome George (aptly named and seen here at right) is the last surviving individual of his kind, the Abingdon Island or Pinta Giant Tortoise, *Chelonoidis abingdonii*. The species was driven to near-extinction by collection for consumption by whalers during the 19th century and other Galápagos settlers during the 20th century, with Lonesome George being found as the last living tortoise on his island in 1972.

Lonesome George, *Chelonoidis abingdonii*. Photo by Anders G.J. Rhodin.

After being found he was moved into protective custody at the Charles Darwin Research Station on Santa Cruz Island in the hope that a female might be found for a captive breeding program—but this has not happened despite extensive husbandry and mating efforts. Thus the Pinta Tortoise is now listed as Extinct in the Wild on the IUCN Red List of Threatened Species, and his species faces imminent and certain extinction unless a female of his kind is found somewhere.

Amazingly, and offering a faint glimmer of hope, recent field research elsewhere in the Galápagos has demonstrated that a very few hybrid animals carrying up to 50% of Lonesome George's genotype have been found among wild tortoises on Albemarle Island (Isabela) around the base of Volcan Wolf. These are likely from a ship dropping some Pinta Tortoises overboard in an emergency long ago, after which some of them drifted ashore and interbred with the local tortoises, *Chelonoidis becki*. Genetic screening and selective back-crossing offers new hope that Lonesome George's lineage could be partially restored, but this would be an exceedingly long shot with very low likelihood of success. Lonesome George has become a conservation icon and a symbol for heroic last-ditch efforts to save a species from extinction, but barring unlikely reproductive success, may truly become the very last of his kind.



Distribution of *Chelonoidis abingdonii*.

Lonesome George, *C. abingdonii*. Photo by Peter C.H. Pritchard.

Red River Giant Softshell Turtle, Yangtze Giant Softshell Turtle

Rafetus swinhoei (Gray 1873); Family Trionychidae
Asia: China (Anhui [?, extirpated?], Jiangsu [?, extirpated?], Yunnan, Zhejiang [?, extirpated?]), Vietnam
IUCN Red List: CR, Critically Endangered A1cd+2cd
CITES: Appendix III (China)

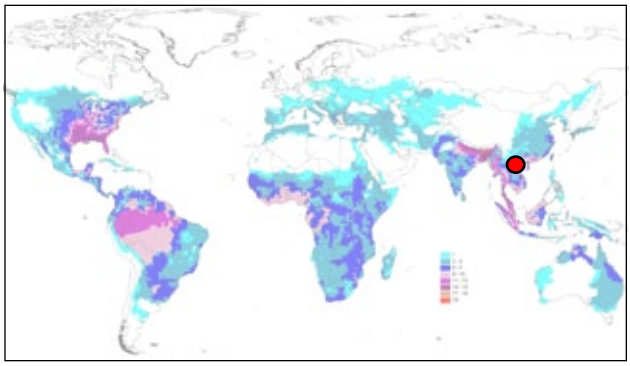
Rafetus swinhoei is an enormous softshell turtle with shell length over 100 cm that can reach 120 kg (250 lbs). Historically this species inhabited the Red River of Yunnan, China, and Vietnam, and possibly the lower Yangtze River floodplain. Although worshipped in some areas, capture for consumption, wetland destruction, and water pollution have severely impacted its populations. It is hard to believe that such a magnificent creature is almost gone, yet the global population is down to only four known remaining individuals. One has lived for decades in Hoan Kiem Lake in downtown Hanoi where it is respected and worshipped; another lives in a lake west of Hanoi. Unfortunately, both are males.

Last known wild *R. swinhoei*, nr. Hanoi, Vietnam. Photo by Tim McCormack.

The other remaining two animals, a male and a female, currently reside together in the Suzhou Zoo in China, after decades of living in separate facilities in China. The culmination of years of work by Wildlife Conservation Society China, Turtle Survival Alliance, and Chinese authorities, with support from the Turtle Conservation Fund and other organizations, brought these two animals together in 2008. Eggs have been produced each year since, but all have died during incubation. Years of inadequate nutrition and perhaps the advanced age of the male (possibly >100 years) may be contributing to the lack of successful breeding. With continuous input from the supporting organizations, numerous husbandry adjustments have been made with regard to monitoring nutrition, egg incubation, water quality, and visitor impact. Glass barriers have been erected around the breeding pools to prevent public feeding and trash disposal, and the pair can be now be left together year around to improve the chances of a successful breeding.

Recent intensive surveys in Yunnan, China, showed evidence of *R. swinhoei* encounters in the past twenty years, and one or a few more individuals could still be surviving in the wild. In Vietnam, the Asian Turtle Conservation Network has worked tirelessly over the past decade to survey suitable wetlands for surviving wild individuals (and found the fourth known animal as a result), and is working with local communities and authorities on turtle conservation awareness. This work was rewarded when the wetland west of Hanoi broke its dam last year and the turtle was caught about 10 km downriver; the existing awareness enabled the turtle to be retrieved from the fisherman and released into its (repaired) wetland unharmed. Had the awareness campaign not been successful this animal would have ended up in a soup pot.

Priority actions for the species include continuing to work with Suzhou Zoo towards successful reproduction and eventually developing a reintroduction program for the species. This may include bringing in one of the other, potentially younger males. In addition, it is essential to continue surveys and awareness work in Yunnan and northern Vietnam where possibly another individual could be located in the wild and possibly brought together with the last known wild animal. Awareness and continued local vigilance is needed on behalf of the last wild individual.



Distribution of *Rafetus swinhoei*.

Female *R. swinhoei*, in Suzhou Zoo. Photo by Gerald Kuchling.

Yunnan Box Turtle

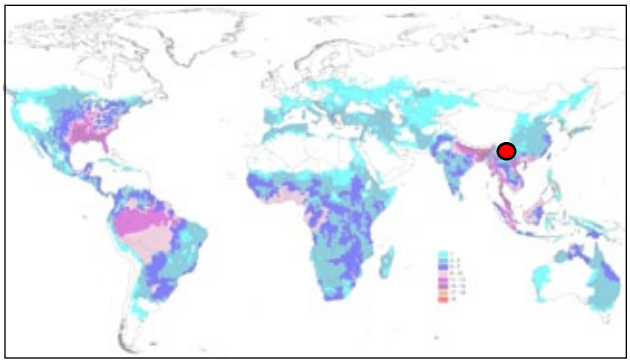
Cuora yunnanensis (Boulenger 1906); Family Geoemydidae
Asia: China (Yunnan)
IUCN Red List: CR, Critically Endangered B2ab(ii,iii,v), D
CITES: Appendix II, as *Cuora* spp.

Cuora yunnanensis was described in 1906 by Boulenger from the southern Chinese Yunnan Province. After its initial description it all but vanished, only rarely being seen. It is a small turtle with carapace length of up to 19 cm, with a dull brown carapace. Its head is predominantly brown with distinctive yellow lines, and a plastron that is yellow with some darker pigmentation. There is only one yellow (orange in juveniles) stripe on the middle upper part of the forelegs; this stripe does not occur on any other *Cuora* and is therefore diagnostic.

Cuora yunnanensis from Yunnan. Photo by Zhou Ting, William P. McCord, and Torsten Blanck.

Despite intensive field research, the species was not seen between 1940 and the early 21st century and its presumed habitat disappeared under the growing development around the expanding urban area of Kunming, Yunnan. This lead to the assumption that the species was probably extinct, and it was subsequently officially listed as Extinct on the IUCN Red List in 2000. However, fortuitously in 2004, photos of a female specimen were posted on an internet forum requesting assistance in identification. Only a few months later, an adult male appeared in the local pet trade. Both animals were purchased by a local turtle specialist and have subsequently been bred since 2006 and have produced a dozen hatchlings. Genetic research has confirmed the validity of the species and the recently found specimens and that they do not represent animals of hybrid origin. In 2006 another female specimen was found in a local Chinese market and between 2007 and 2009 a few further animals were also discovered. The species is highly sought after in the pet trade with a few specimens already appearing in the larger Chinese cities. Prices of USD15–50,000 have been offered, making it the most expensive of all the Chinese box turtles.

After nearly a decade of intensive searching, it was not until 2008 that the habitat of the species was finally found by a team from Kunming Institute of Zoology. An assurance colony is now being maintained at the Institute and is supported by the Turtle Survival Alliance with proper enclosures and guidance for keeping and breeding this species. In 2010, the first eggs from this effort were laid. The habitat is currently being studied and efforts to protect it are underway, although it is difficult in this area. While the species was able to hide and survive for nearly a century, its recent discovery is likely to further threaten its small and isolated population.



Distribution of *Cuora yunnanensis*.

Cuora yunnanensis hatched in captivity. Photo by Zhou Ting.

Northern River Terrapin

Batagur baska (Gray 1830); Family Geoemydidae
Asia: Bangladesh, India (Orissa, West Bengal), Myanmar, Thailand (?) (extirpated?)
IUCN Red List: CR, Critically Endangered A1cd
CITES: Appendix I

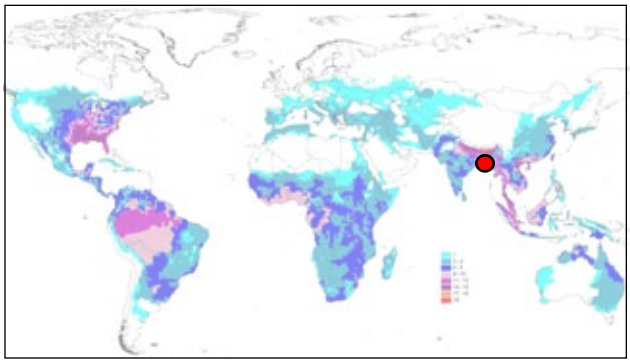
The genus *Batagur*, comprising five Critically Endangered and one Endangered species, is the group of river turtles closest to the brink of extinction. With males exhibiting striking seasonal breeding colors, they are also some of the most attractive and unusual turtles in the world. All six species of the genus are highly aquatic and grow to a large size. Because of the tasty flesh and delicious eggs, these riverine and estuarine turtle species have been heavily harvested and exploited throughout their range for a very long time. *Batagur baska*, the Critically Endangered type species of the genus, was until recently considered to be relatively wide-ranging in estuaries from India to Indonesia, but genetic analysis determined that what was previously considered one species was in fact two separate and even more critically endangered species: the Northern River Terrapin, *B. baska*, and the Southern River Terrapin, *Batagur affinis*. Both are Critically Endangered.

Batagur baska male in breeding color from Bangladesh. Photo by Rupali Ghosh.

Populations of the Northern River Terrapin, previously highly abundant in river deltas and estuaries of Orissa and West Bengal in India and the Ayeryawady Delta in Myanmar during the 19th and early 20th centuries, have now all but vanished. Only a few remnant individuals have been recorded from village ponds where local fishermen maintain the turtles as a source of eggs, as there are no longer any known nesting areas. In November 2010 a wild-caught male was seen slaughtered at a market in Dhaka, Bangladesh, providing evidence of a few remaining specimens in the wild.

The turtles have declined due to the all too common problems of overharvesting of both adults and eggs for human consumption. Habitat loss and degradation such as sand mining, dam construction, and pollution have also contributed to this species' decline.

With so few animals remaining it has become a race against time to secure the last of the living animals in assurance colonies before this species blinks into extinction. Currently the Turtle Survival Alliance and Zoo Schoenbrunn in Vienna are funding the construction of new captive breeding facility in Bangladesh for animals that have been removed from the illegal wildlife trade, or have been bought from their owners who had been keeping them as talismans in their fish breeding ponds. All efforts need to be made to bring together the last of the remaining individuals of this species to round up breeding groups. For the long-term survival of the species it is essential to initiate a studbook for pedigree breeding, including all known captive kept specimens in Bangladesh, India, and Austria to minimize inbreeding depression and genetic drift.



Distribution of *Batagur baska*.

Batagur baska female from India. Photo by Rick Hudson.

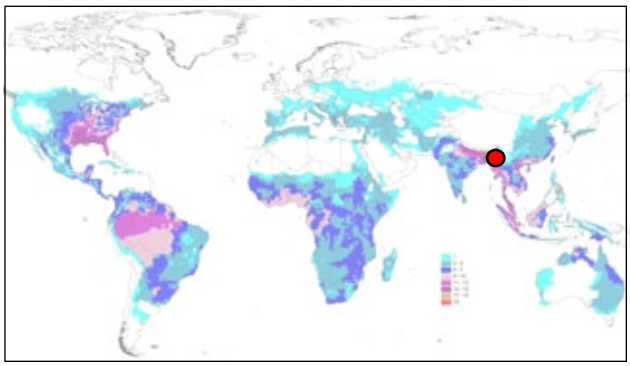
Burmese Roofed Turtle

Batagur trivittata (Duméril and Bibron 1835); Family Geoemydidae
Asia: Myanmar
IUCN Red List: EN, Endangered A1c; TFTSG Draft: CR, Critically Endangered
CITES: Appendix II, as *Batagur* spp.

Not seen by scientists since the 1930s, *Batagur trivittata* was once feared extinct. Previously numbering in the hundreds of thousands, this large riverine turtle had undergone drastic declines due to many years of hunting and harvesting of eggs from the nesting beaches. "Rediscovered" in 2002 when a trio was retrieved in a temple pond in Mandalay, Myanmar, this species has since been the subject of an intensive species recovery effort that provides hope for their long-term survival. Subsequent river surveys from 2002 to 2004 revealed two remnant population clinging to existence: one in the Dokhtawady River and a second one in the upper Chindwin River in a remote corner of northern Myanmar. Now it is recognized as one of the most endangered turtles in the world, with only 5–7 adult nesting females known to remain in the wild. Unfortunately, the Dokhtawady population has not received any attention since 2004 and it is unknown if it still persists. In 2005, the Wildlife Conservation Society (WCS) began protecting the nesting beaches on the upper Chindwin River, and to date 376 hatchlings (2006–10) have been transferred to headstarting facilities at Yadanabon Zoo. These facilities were made possible due to funding and efforts by the Turtle Survival Alliance.

Batagur trivittata male in breeding color from Myanmar. Photo by Rick Hudson.

Although the WCS turtle team has had much success in securing hatchlings each year, more can be done. Of the eggs that are laid each year on the upper Chindwin River, nearly 100 show signs of being infertile. It is possible that there are not enough males left in the wild to inseminate the remaining few females. WCS hopes to experimentally release some of the 5-year old male headstarted turtles into this region in hopes of increasing the number of fertile eggs laid each year.



Distribution of *Batagur trivittata*.

In addition to the wild population, there is a small captive breeding group of eight adults at Yadanabon Zoo in Mandalay that has successfully produced 37 hatchlings from 2008 to 2010. While the captive breeding program is a key component to the species' survival, this is the only captive group worldwide, a worrisome "all eggs in one basket" scenario. Efforts are currently underway to distribute this captive gene pool among several facilities in Myanmar to prevent the risk of catastrophic loss.

With a robust captive population—now numbering 417 individuals—serving as a hedge against extinction, saving the remnant wild population becomes an urgent priority. This promises to be an uphill battle because the number of threats is increasing. Currently wide-spread gold mining is disrupting historic, preferred nesting beaches, while unsustainable fishing practices—dynamiting, electro-shocking, gill-netting—cause significant mortality. However, the single greatest threat is a proposed dam on the upper Chindwin that will inundate all known nesting beaches and impound much of the remaining river habitat. It is unknown how this species will respond to such a drastic environmental disturbance, but we must be prepared with mitigation measures. Surveys are currently underway to locate additional suitable habitat where a wild population can be safeguarded.

Zhou's Box Turtle

Cuora zhoui Zhao *in* Zhao, Zhou, and Ye 1990; Family Geoemydidae
Asia: China (Guangxi [?]), Vietnam (?)
IUCN Red List: CR, Critically Endangered A1d+2d
CITES: Appendix II, as *Cuora* spp.

Cuora zhoui in captivity. Photo by Torsten Blanck.

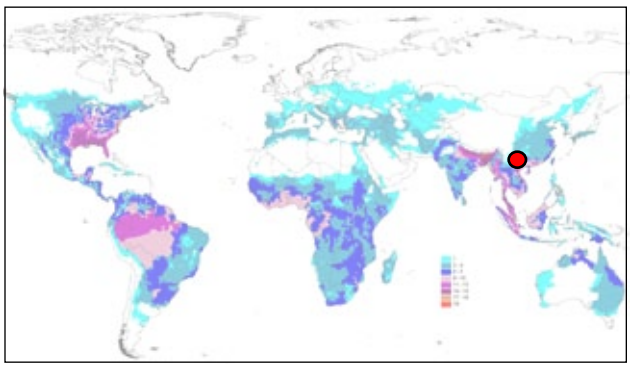
This member of the Asian box turtle genus *Cuora* only became known to science when it was described in 1990. *Cuora zhoui* was discovered by Chinese scientists who purchased a handful of specimens from a market in Pingxiang, a small trading village in southern China's Guangxi Province near the border to Vietnam. A year later, the species was also described as *Cuora pallidicephala* by American scientists who had received specimens of this species from a Hong Kong turtle trader. These specimens were said to originate from southern China's Yunnan Province. As the Chinese description appeared first, it is the official accepted description and name for this species.

Cuora zhoui is a very distinct species, with a brownish to black carapace, a black plastron with a yellow central figure, and an olive colored head. Some hypothesized that this species might be a hybrid between *Mauremys mutica* and *Cuora pani*, but genetic studies have clearly shown that *C. zhoui* is a valid species. It is a relatively small turtle with adults reaching a carapace length of up to about 19 cm.

Despite intensive searches for the past two decades, this species has not yet been found in the wild and thus its native habitat and natural habits remain unknown. Some recent evidence now suggests that the species might originate from northern Vietnam rather than from southern China, and efforts are underway to investigate this further. Based upon the low number of specimens that have appeared in the trade in the last two decades, this species is probably highly isolated and restricted to a very small range.

Less than 200 specimens have ever appeared in the trade and of these, less than 100 have survived until today. There are only three turtle breeders that have reproduced this species so far in captivity, the most successful being Elmar Meier at Zoo Münster, who has produced more than 30 hatchlings.

No specimens of this species have appeared in the Asian turtle trade during the last two years, which might indicate that the species is already extirpated from the wild; gone before science was able to study and protect it. Intense field research is urgently needed to determine if it still occurs in the wild. If not, at least we need to find its former habitat in order to provide a future place for an eventual reintroduction program.



Distribution of *Cuora zhoui*.

Cuora zhoui in captivity. Photo by Torsten Blanck.

McCord's Box Turtle

Cuora mccordi Ernst 1988; Family Geoemydidae
Asia: China (Guangxi)
IUCN Red List: CR, Critically Endangered A1d+2d
CITES: Appendix II, as *Cuora* spp.

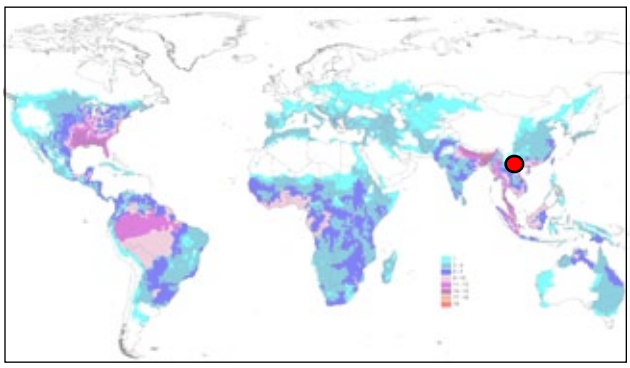
Cuora mccordi is a yellow-headed and chestnut-brown-shelled member of the Asian box turtle genus *Cuora* that became known to science during the early 1980s. It was finally described as a new species in 1988. The species reaches carapace lengths of up to 23 cm.

Despite its description based on specimens purchased in the market of Bose, a smaller city in western Guangxi Province, southern China, the species' habitat and distribution remained unknown for two decades. This raised speculation that the species might just be a hybrid of *Cuora trifasciata* x *Cuora flavomarginata*, but genetics substantiated that it is a valid and genetically distinct species.

Cuora mccordi from China in captivity. Photo by Torsten Blanck.

It was not until 2005 that a team of scientists discovered the species' native habitat 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 and broad-leafed forests in an area of less than 50 km². This species is usually hidden, dug into the soil or below plants where it is well camouflaged with its brown carapace. Unfortunately this does not camouflage the species from human collection. In the 1970s, while still unknown to science, local villagers used the turtles instead of stones to throw at their buffaloes since they were easier to find than stones in the area. Around this same time, villagers tried to produce turtle jelly from them, but the taste was not as good as the jelly produced from *C. trifasciata*. In the early 1980s a well-known Hong Kong turtle dealer appeared in their village and started to pay them for collecting these turtles for him. At first he offered just a few cents, but gradually the price increased as the species became rarer, caused by the collecting pressure as well as destruction of their habitat. In the 2000s, a villager could earn as much as USD 4000 for a single specimen, more than a yearly income in this area. In 2008, a male specimen, one of the last ones remaining, was sold in Guangzhou, Guangdong Province, China for USD 20,000. Surveys conducted in 2009 discovered only one specimen in the wild and in 2010 no specimens were observed, indicating probable extirpation in the wild.

Approximately 350 specimens have entered the trade; most of them ending up in western collections. Due to limited knowledge of the species, only about 150 are still alive today and are reproducing well in captivity. Conservation efforts for this species require the formation and management of better breeding groups to increase reproductive output. In addition, conservation of the remaining habitat is required so that in the future this species can hopefully be reintroduced to its native habitats. Efforts at establishing an *in-situ* breeding project in China are also being considered.



Distribution of *Cuora mccordi*.

Cuora mccordi hatched in captivity. Photo by Torsten Blanck.

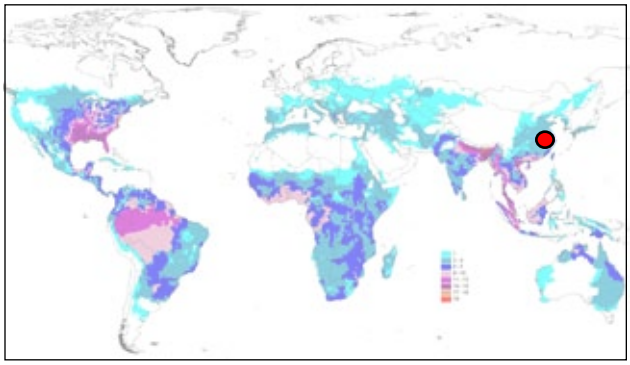
Yellow-headed Box Turtle

Cuora aurocapitata Luo and Zong 1988; Family Geoemydidae
Asia: China (Anhui)
IUCN Red List: CR, Critically Endangered A1d+2d
CITES: Appendix II, as *Cuora* spp.

Cuora aurocapitata is a highly aquatic member of its genus, reaching carapace lengths of up to 18 cm. Similar to most of the *Cuora*, it is sexually dimorphic, with males smaller than females; in addition males are comparatively flatter than females with longer, thicker tails. This species once thrived in the fast flowing hillside streams in the highlands of southern Anhui Province, eastern China, where it preyed upon shrimp, insects, and small fish. Similar to many of the recently described *Cuora*, its scientific description in 1988 helped accelerate its demise. It took until 2004 for scientists to find the species in the wild for the first time. While already collected and consumed by local villagers for centuries, the pet trade became interested in this bright yellow-headed species with its nice grayish carapace with reddish and brown blotches shortly after its description. This led to uncontrolled collection. By the late 1990s the population apparently collapsed, not only due to overharvesting, but also pollution and destruction of its habitat. It was never common and is highly endemic, only occurring in three river systems of the southern Anhui mountain ranges. Both western and Chinese collections now hold more specimens than are left in the wild. Current estimates of its status in the wild range between 50–150 animals. Although the species is breeding in increasing numbers in captivity, the mortality of wild-caught animals has been high.

Cuora aurocapitata female from a turtle farm in Anhui, China. Photo by Gerald Kuchling.

Ongoing hydroelectric damming of the hill streams in its native habitat is destroying the nesting beaches and opening up previously remote stream and forest areas to exploitation; dynamite and poison fishing kills both turtles and their prey, and pollution and collection for the turtle trade do the rest. Following this trend, the species is predicted to be extinct in the wild in less than 5 years. An international team supported by the Turtle Survival Alliance and Turtle Conservation Fund is working to prevent imminent extinction through the use of local awareness campaigns, recovering destroyed nesting beaches, and trying to protect the last remaining remote habitats in which a few animals still seem to occur.



Distribution of *Cuora aurocapitata*.

Cuora aurocapitata in captivity. Photo by Cris Hagen.

Chinese Three-striped Box Turtle, Golden Coin Turtle

Cuora trifasciata (Bell 1825); Family Geoemydidae
Asia: China (Fujian, Guangdong, Guangxi, Hainan, Hong Kong), Laos, Vietnam
IUCN Red List: CR, Critically Endangered A1d+2d
CITES: Appendix II, as *Cuora* spp.

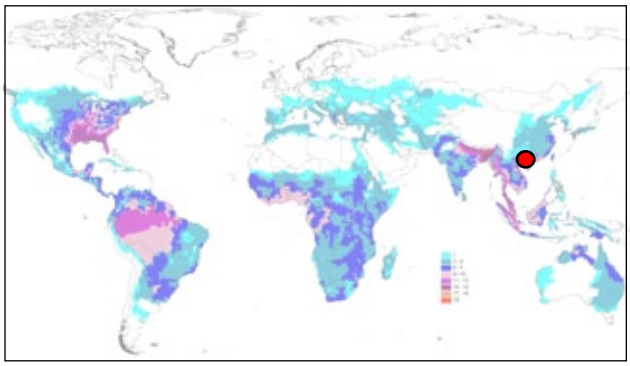
Cuora trifasciata is one of the oldest known members of the genus, being the second one described, by Bell in 1825. The species reaches up to 32 cm shell length and the carapace is chestnut-brown with three longitudinal black stripes, giving the species its scientific name; the plastron is black and the head golden yellow with black lines and a brown blotch behind each eye.

This species has a long history of usage in traditional Chinese medicine. The Chinese name for this species is Golden Coin Turtle; the word 'turtle' in Chinese has the same sound as the word for 'return' and hence it is often kept by people to bring good luck because its name suggests gold coins will return. Recently, some traders claimed that consuming jellies and extracts from this turtle was capable of curing cancer, and this partly resulted in an enormous increase in its commercial value, with animals now selling for many thousands of dollars each. Because of its high value, the species is currently being farmed by the thousands and there is also a demand for breeding stock. Unfortunately, its supposedly magical curing power and its extremely high value driven by trade and the demand of breeding farms has led to its demise in the wild. While populations previously seemed to tolerate low-volume collection for centuries, the last three decades of intense collecting and massive habitat destruction and degradation have brought the species to the brink of extinction in the wild.

Cuora trifasciata from Hong Kong. Photo by Paul Crow.

The species was once distributed throughout the hill streams and marshes in low- to mid-elevation forests of the southern Chinese Provinces of Fujian, Hong Kong, Guangdong, Hainan, and Guangxi, but has now been largely extirpated from most of its former habitat.

Some regard Vietnamese and Laotian populations of Three-striped Box Turtles as a separate species, *Cuora cyclornata*, but this interpretation is not currently widely accepted. If this potential taxonomic split were to gain scientific acceptance, then the distribution and population size of each of the two species would be even more precarious than previously feared. Complicating this further is that some populations seem to show a hybrid origin and commercial farms usually produce a mixture of different genetic lineages.



Distribution of *Cuora trifasciata*.

Less than 10 specimens per year are still encountered on the Chinese mainland, with a last stronghold in Hong Kong, where in recent years illegal trapping has led to a sharp decline. Prices have skyrocketed to USD 20,000 being paid for an adult wild caught male, since the farms so far only produce females because of high incubation temperatures. Furthermore, wild-caught animals are said to have more curative medicinal powers. In recent years, owning this species seems to have become a kind of investment and status symbol in China.

Due to the high demand and value of this species, its survival in the wild is unlikely without effective protection. The targeted protection of the last remaining populations and increased breeding efforts of genetically pure groups, as carried out jointly by Kadoorie Farm and Botanic Garden and Agriculture, Fisheries and Conservation Department, Hong Kong Special Administrative Region Government, are important to preserve the future of this species. Additionally, the maintenance of *ex-situ* assurance colonies such as the one at the International Turtle Center at Zoo Münster, Germany, partially supported by the Shellshock Campaign of the European Association of Zoos and Aquaria and the Turtle Conservation Fund, is critically important in order to maintain options for possible future repatriation efforts.

Ploughshare Tortoise, Angonoka

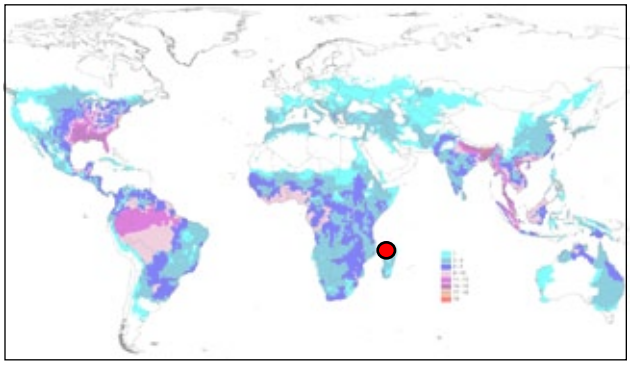
Astrochelys yniphora (Vaillant 1885); Family Testudinidae
Africa: Madagascar
IUCN Red List: CR, Critically Endangered A4ad, B2ab(v), C1, E
CITES: Appendix I

Astrochelys yniphora female from Baly Bay N.P., Madagascar. Photo by Anders G.J. Rhodin.

This large and strikingly beautiful tortoise is one of the rarest tortoises in the world. Males of this species have an elongated plough-shaped front spike comprised of the gular scute emerging from the plastron. Males use this projection in breeding jousts aimed at flipping over their opponents in an attempt to demonstrate male dominance and the opportunity to mate with females.

Evidence that this species was traded by Arabs dates back as far as the 8th century and since then Ploughshare Tortoises were collected to provision ships, particularly European. More recently their declines have been the result of wildfires, deforestation, and most importantly, extraordinary pressure from poaching for the illegal pet trade. Although this species has received conservation attention since the 1970s, and intensively since the 1990s, there are now only a few hundred adult and subadult animals estimated to survive in the wild. Though certainly without the conservation attention it has received it is unlikely that this species would still exist in the wild. Today the species can only be found in five geographically isolated populations within a tiny area of dry scrubland in northwestern Madagascar, encompassed within the boundaries of Baly Bay National Park, created in 1998.

A captive breeding facility for the Ploughshare Tortoise, managed by Durrell Wildlife Conservation Trust for the Malagasy Government, exists at Ampijoroa, Madagascar, a reintroduction program is in progress at Baly Bay, and field-based research on the species has been conducted over the years. Local enforcement capacity from park and village patrols is somewhat limited and under severe pressure from poachers. Recent political unrest in Madagascar has led to increased poaching activities, with many specimens of this rare species showing up in Asian markets. Single individuals can sell for around USD 10,000 as pets on the international black market, and these high prices create great incentives to poach the remaining wild animals. There are many Ploughshare Tortoises held illegally in Asia, but international efforts aimed at curbing the illegal high-end pet trade are beginning to gain some traction.



Distribution of *Astrochelys yniphora*.

For this impressive and unique animal to continue to exist in the wild it is imperative to reinforce effective and reliable enforcement patrols inside and outside the core protected and reintroduction areas. Durrell Wildlife Conservation Trust and the Turtle Conservancy have begun an initiative in partnership that is making proper patrol boats, fuel, and other resources continually available. Full-time on-site research programs need to be continued as an independent presence and monitoring system to keep close watch on what is happening to the animals and to act as a deterrent to poachers. In addition, increased efforts are needed to enforce legal protection and to prosecute those who are driving the illegal trade, both nationally and internationally. The many animals now held illegally need to be moved into multiple secure captive breeding programs in order to prepare for anticipated repatriation as protection improves within the species' native habitat.

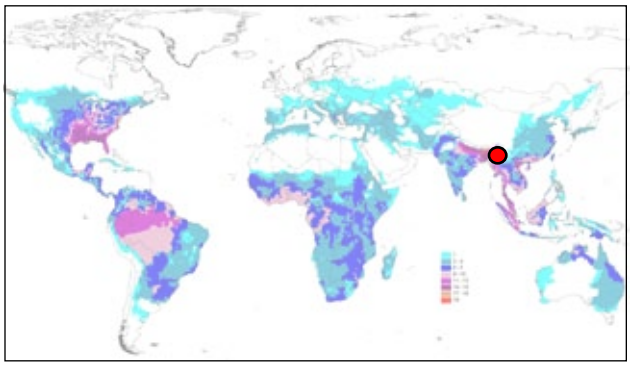
Burmese Star Tortoise

Geochelone platynota (Blyth 1863); Family Testudinidae
Asia: Myanmar
IUCN Red List: CR, Critically Endangered A1cd+2cd, C2a
CITES: Appendix II, as Testudinidae spp.

The Burmese Star Tortoise is a "star" among tortoises with beautiful well-defined symmetrical star patterns radiating across its carapace. It is also one of the rarest tortoises in the world, having a limited distribution that is under intensive human induced pressures. Its close relative, the Indian Star Tortoise (*Geochelone elegans*) is very similar in appearance, but the Burmese Star Tortoise can be easily distinguished by having a greater star pattern on the carapace and a horny claw at the tip of the male's tail. An additional distinguishing feature is that the plastron of *Geochelone platynota* has dark blotches and lacks the 'stars' found on the plastron of *G. elegans*.

Geochelone platynota from Myanmar at Behler Chelonian Center. Photo by Brian D. Horne.

Unfortunately, very little is known about this species in the wild, as it is one of the least studied of all tortoises. Based on the limited data available, we know that it inhabits the dry zone of central Myanmar (Burma), where it occurs in deciduous forests, thorn scrub, and pastures. The Burmese Star Tortoise is locally collected for human consumption; however, the demand for its meat from neighboring China, as well as its purported medicinal benefits, has resulted in intensive unsustainable hunting. More recently it has become highly prized in the international pet trade, further exacerbating these hunting pressures, resulting in almost total extirpation of all animals from the wild. Recent surveys indicate that only a few extremely small fragmented populations remain, with most previous populations entirely destroyed (based on recent fieldwork there are essentially no viable populations remaining in the wild). The species was previously known to occur in two protected areas, Shwe Settaw Wildlife Sanctuary and the Minzontaung Wildlife Sanctuary, but today only captive populations exist under strict lock and key at breeding facilities in these sanctuaries, with theft being of great concern.



Distribution of *Geochelone platynota*.

Conservation measures for the species include the creation of *in-situ* and *ex-situ* assurance colonies. Breeding programs exist in Myanmar with the hopes that the offspring can be released back into the wild at some future point. In addition, the Turtle Survival Alliance has been instrumental in sharing husbandry techniques and has invested heavily in building expanded captive management facilities, that has resulted in increased captive breeding success. Recently, the Turtle Conservancy established an agreement with the Taipei Zoo (these two organizations have the largest captive breeding group of Burmese Star Tortoises outside of Myanmar) to return young produced at both facilities to Myanmar for eventual release back into the wild. However, a tough road lies ahead before any releases can be successful because any wild tortoise stands a high chance of being collected. Education awareness programs need to be initiated so that this trend can be reversed. Additionally, habitat destruction needs to be halted, as the rapid rate of loss may not leave any suitable habitat for future tortoise releases.

Roti Island Snake-necked Turtle, Timor Snake-necked Turtle

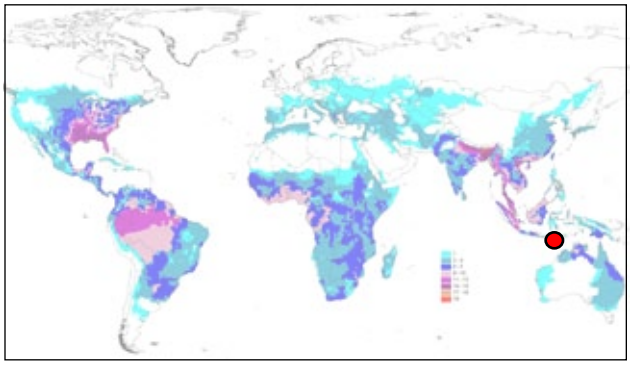
Chelodina mccordi Rhodin 1994; Family Chelidae
Asia: Indonesia (Lesser Sundas [Roti]), Timor-Leste
IUCN Red List: CR, Critically Endangered A1d, B1+2e
CITES: Appendix II

The Roti Island Snake-necked Turtle is a moderate-sized freshwater turtle (carapace length up to about 24 cm) of the side-necked family Chelidae, occurring on the tiny island of Roti just west of Timor in southeastern Indonesia, as well as the eastern tip of the island of Timor in the new country of Timor-Leste. It has three currently recognized subspecies: *C. m. mccordi* (Western Roti Island Snake-necked Turtle), *C. m. roteensis* (Eastern Roti Island Snake-necked Turtle), and *C. m. timorensis* (Timor Snake-necked Turtle) from Timor-Leste. The Timor-Leste subspecies may in fact be a separate species, isolated from the Roti populations, but is currently considered a subspecies of *C. mccordi*. *Chelodina mccordi* is geographically isolated from all other *Chelodina* species that occur in Australia and New Guinea, and represents a relictual form whose biogeographic origin appears to have been by vicariant dispersal from northwestern Australia, with Roti and Timor originally having formed a part of the splintered edge of the Gondwanan tectonic plate.

Chelodina m. mccordi from central Roti Island, Indonesia. Photo by Anders G.J. Rhodin.

Chelodina mccordi has an extremely limited distribution and, since its description as a new species in 1994, its Roti populations have been subjected to intense collection pressure for the international pet trade market, which has driven its Roti populations into virtual commercial extinction within ten years of its description. Recent field surveys on Roti have documented extremely depleted remaining populations still being impacted by persistent collection efforts, with remaining habitat areas also being reduced by agricultural development and conversion of swamps and marshland to rice fields. The small population in Timor-Leste may still be in relatively good shape and possibly protected within the boundaries of the newly-created Conis Santana National Park, but the potential for exploitation of these populations is great, and the species faces a very uncertain future.

No major protected areas exist on Roti in *C. mccordi* habitat, but a previously proposed area, Tanjung Pukuwatu on the Tapuafu Peninsula in northeastern Roti, provides significant potential for critical habitat protection for some remnant turtle populations. Captive breeding efforts through *ex-situ* assurance colonies also provide some hope for saving the species, but improved control of persistent illegal trade and creation of secure protected areas on Roti are urgently needed to prevent *C. mccordi* from becoming extinct in the wild.



Distribution of *Chelodina mccordi*.

C. m. timorensis from Timor-Leste. Photo by Bonggi R. Ibarrondo.

Asian Narrow-headed Softshell Turtle

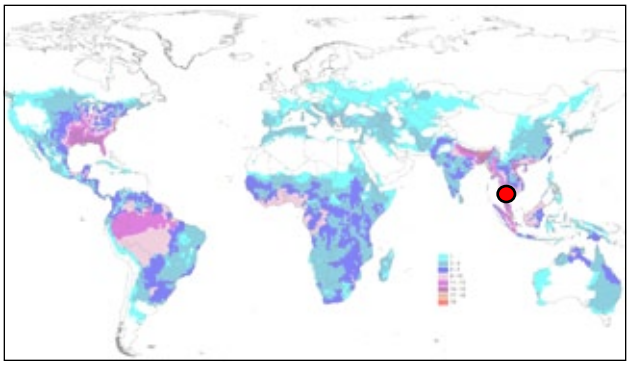
Chitra chitra Nutaphand 1986; Family Trionychidae
Asia: Indonesia (Java, Sumatra), Malaysia (West), Thailand
IUCN Red List: CR, Critically Endangered A1cd, B1+2c
CITES: Appendix II, as *Chitra* spp.

Of all the softshell turtles, *Chitra chitra* is arguably the most attractively patterned species, and it may also be the heaviest and largest of all freshwater turtles. The maximum recorded weight of a *C. chitra* is 254 kg (560 lbs) and it can grow to a carapace length in excess of 120 cm or 4 feet. *Chitra chitra* is a highly specialized ambush predator, feeding almost exclusively on live fish, and has evolved specific neck bones and muscles that enable it to capture its prey in a very unique manner. It captures its prey by rapidly extending its head in a striking manner while greatly expanding its mouth and throat. This expansion creates a vortex that vacuums fish into its mouth in the blink of an eye.

Chitra chitra adult from Thailand. Photo by Chris Tabaka.

Across its range, *C. chitra* is under threat from a combination of accidental mortality as fisheries bycatch, targeted hunting for food and the pet trade, and egg harvesting, which is highly effective and causes a severe impact, as the species is extremely predictable in both its nest site selection and timing of nesting. It is also impacted by the creation of reservoirs that alter the flow regimes of its native rivers. When water is released from the dams during the dry season, it often floods the nesting beaches effectively drowning the developing eggs. Furthermore, as it is a sit and wait predator that is highly dependent on capturing live prey, decreases in water clarity (increased turbidity) as a result of catchment erosion and river alteration greatly reduces its efficiency in capturing fish.

The Thai Fisheries Department has a program to breed this species in captivity for the purpose of releasing offspring back into the wild to augment the declining populations. Although the program had initial success and well over 100 hatchlings were produced, it was subsequently impacted by disease among the offspring and cessation of reproduction of the captive adults. Priority conservation measures include reassessing the captive breeding and headstarting program in Thailand. This needs to be coupled with increasing public awareness about the conservation of the species with the hopes of reducing the impacts of targeted hunting and egg gathering, as well as safeguarding key breeding and feeding areas from collection and hunting impacts. Similar conservation actions then need to be implemented for other populations in Peninsular Malaysia and Indonesia.



Distribution of *Chitra chitra*.

Chitra chitra hatchling from Thailand. Photo by Peter Paul van Dijk.

Vietnamese Pond Turtle, Annam Pond Turtle

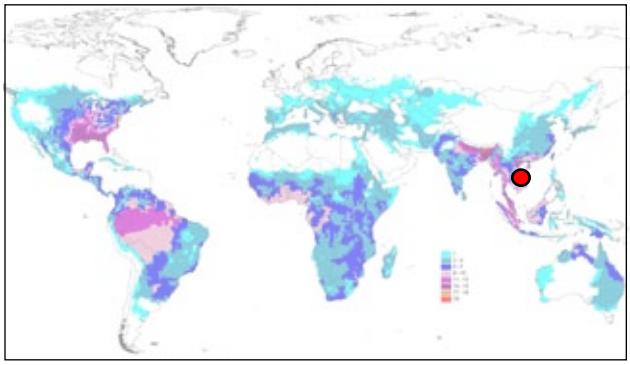
Mauremys annamensis (Siebenrock 1903); Family Geoemydidae
Asia: Vietnam
IUCN Red List: CR, Critically Endangered A1d+2d
CITES: Appendix II

The Vietnamese Pond Turtle is a mostly aquatic medium-sized turtle, up to 29 cm carapace length, of particular conservation concern. This highly localized endemic is found only in coastal lowland wetlands and rivers of a few provinces of central Vietnam from Da Nang south to Phu Yen.

Mauremys annamensis at Fort Worth Zoo. Photo by Rick Reed.

The species has suffered greatly from loss of its lowland habitats which have almost entirely been lost or severely degraded and fragmented. Conversion to agricultural land, particularly for rice cultivation, as well as increasing urban developments in these highly populated areas are to blame. During the 1980s and early 1990s the species was also seen in wildlife trade in large numbers, but rapidly diminished with wild caught animals now extremely rare. Despite being given full legal protection under Vietnamese law, the species is still sought after for sale to international markets, particularly China, but also increasingly for local consumption in Vietnam for traditional medicinal beliefs.

With the species almost extirpated throughout its range, the Asian Turtle Program (ATP) of Cleveland Metroparks Zoo conducted a number of field surveys in 2006 which resulted in the capture of an animal in Quang Nam Province. This was the first documented wild Vietnamese Pond Turtle found in native habitat since 1939. Since 2007 a turtle-focused conservation team has been based in central Vietnam. They have identified additional possible remaining habitat for the species, are conducting regular community activities and working with local wildlife protection authorities. With the species reproducing well in captive collections in the USA and Europe, where well-established Taxon Management Groups have been extremely successful, the best option for conservation of the Vietnamese Pond Turtle appears to be release and reintroduction into native habitat in conjunction with enforcement, awareness, and community engagement. The ATP is working in Quang Ngai with the Forest Protection Department to establish a Turtle Assurance Colony (TAC) to allow animals to be repatriated. As it is currently believed that no existing protected habitat exists in which the species occurs, a Species Habitat Conservation Area (SHCA) is also being planned to secure critical habitat.



Distribution of *Mauremys annamensis*.

M. annamensis hatched at Fort Worth Zoo. Photo by Andrew Brinker.

Central American River Turtle

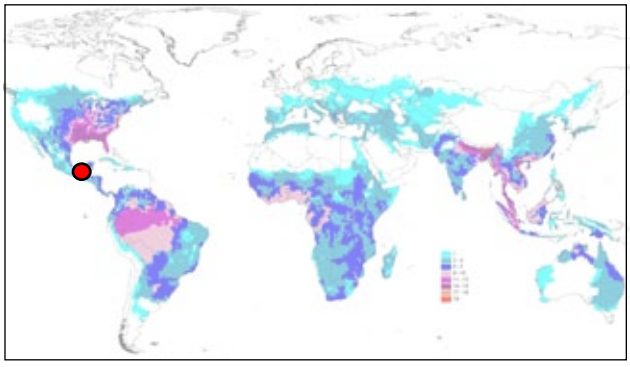
Dermatemys mawii Gray 1847; Family Dermatemydidae
North/Central America: Belize, Guatemala, Honduras (?), Mexico (Campeche, Chiapas, Quintana Roo, Tabasco, Veracruz)
IUCN Red List: CR, Critically Endangered A2abd+4d
CITES: Appendix II

Dermatemys mawii female from Guatemala. Photo by Melvin Merida, WCS.

The last remaining representative of a turtle family dating back 65 million years, this unique species reaches a carapace length of up to 65 cm and can weigh as much as 22 kg. It is entirely aquatic, inhabiting rivers, lagoons, and other large wetlands in southern Mexico, Guatemala, Belize, and possibly Honduras. It is so adapted to living in water that it can barely move on land or even hold its head up when out of the water. This would seemingly present a problem for nesting, however, rather than emerging onto land to nest, females dig nests on beaches just below the waterline during floods, and the eggs only begin developing after the water level drops. Like many neotropical turtles, this species is crepuscular or nocturnal; often spending the day resting on the bottom of rivers and lagoons, anywhere the water is deep. Well oxygenated water is preferred. The species is able to extract oxygen from the water via special vascular tissue in its mouth, and is therefore able to remain submerged for a long time without surfacing to breathe. During high water periods animals feed on shoreline vegetation. When water levels rise (3–8 m in some habitats) the turtles have access to a greater variety of these foods in flooded forests.

Laboratory incubation demonstrates that there is a wide range in incubation periods (115–223 days) of the eggs, which can be attributed to embryonic diapause and estivation. Embryonic diapause (a temporary halt in development) allows the embryo to survive prolonged periods of cool temperatures or low oxygen environments. Growth of the embryo only resumes when incubation temperatures are suitably warm and nests are no longer saturated with water. In addition, fully developed embryos estivate in the egg until hatching is stimulated by an increase in soil moisture from the first summer rains. Hatchlings differ from adults in having the tip of their snout bright orange; this color fades in the first two years to a pale yellow. Sex determination is temperature-dependent (as it is in many turtle species) with temperatures above 28°C producing females and temperatures of 25–26°C producing males.

This species is highly esteemed for local consumption, and intensive collection, particularly for Easter festivals, has depleted populations severely across its range, to the point where many local populations have been entirely extirpated. Many NGO's have been involved in helping to document survival status and developing conservation solutions. The Turtle Survival Alliance is currently conducting surveys throughout Belize to assess status there, and is helping to develop a recovery plan, Wildlife Conservation Society has been doing work in Guatemala, Conservation International and Conacyt have supported population studies in Mexico, and the Turtle Conservation Fund has provided support for several projects on the species. Priority actions needed include local enforcement of existing protective regulations in the range countries, and developing, coordinating, and implementing a comprehensive conservation and recovery strategy for the species. This should include a consideration of reintroduction and headstarting to bolster remaining wild populations and, possibly, managed commercial production systems to reduce poaching pressure.



Distribution of *Dermatemys mawii*.

Dermatemys mawii adult male. Photo by Gracia Syed.

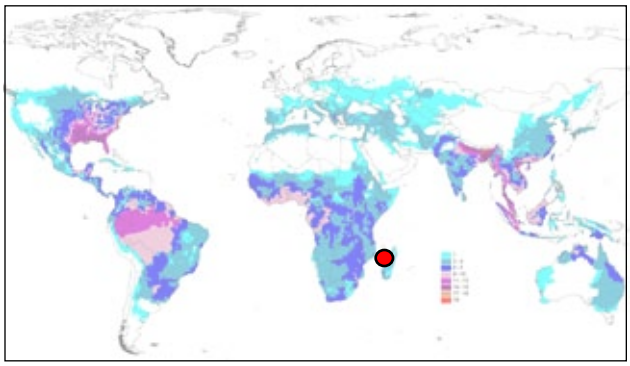
Madagascan Big-headed Turtle

Erymnochelys madagascariensis (Grandidier 1867); Family Podocnemididae
Africa: Madagascar
IUCN Red List: CR, Critically Endangered A4d
CITES: Appendix II

Erymnochelys madagascariensis from Ankarafantsika, Madagascar. Photo by Anders G.J. Rhodin.

This evolutionarily distinct and biogeographically endemic freshwater turtle is the only Old World representative of the family Podocnemididae (the remaining members of this family occur in South America). As its common name suggests, this species has a large head, which in fully-grown adults shows a strong temporal helmet, or casque. Its jaws are extremely powerful with a slight hook at their apex that may enhance its ability to feed on mollusks, fish, amphibians, and even birds; however, adults also commonly eat seeds from trees and palms as well as aquatic vegetation. Additionally, the eyes of this species are situated forward on the head; thus it needs only to extend a small portion of its head above the water surface to observe potential prey, while the vast majority of its body remains submerged. The low flat profile and brown to slate-gray color of the carapace makes this species look remarkably like a rock, additionally camouflaging it from potential prey and predators.

This species was formerly widely distributed in western Madagascar's west-flowing rivers and floodplain lakes. However, its current distribution is extremely fragmented due to overexploitation. The species 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 *réré*, as the species is locally called, is well known to the local people, as it is a large turtle, up to 50 cm carapace length and 17 kg; and due to its much-desired meat, it is heavily collected for local and commercial consumption. Increasing pressure from a dramatically growing human population and changes in fishing habits towards the use of nets, which results in substantial by-catch of this species, is having dramatic deleterious effects on its populations. In addition, locals also harvest eggs for consumption, thereby reducing recruitment to the populations. In some areas, few adults remain, thus recruitment to the population will be non-existent and the species' survival will be dependent on the remaining juveniles surviving until adulthood.



Distribution of *Erymnochelys madagascariensis*.

Survey data in the past three decades document an ongoing decline of the species. Durrell Wildlife Conservation Trust and Conservation International, along with Madagascar National Parks, have been involved in a program to protect the species, reintroduce headstarted animals, and engage local communities at several sites in Madagascar. This conservation work has been closely integrated within the local culture and traditional conservation practices of the local communities, which has been a key to its success, with populations at Ankarafantsika as a result showing some improvement in status. This program has also received support from the Turtle Conservation Fund, but needs substantial increases in resources and intensity with an emphasis on reducing the harvest of adult animals.

Southern River Terrapin

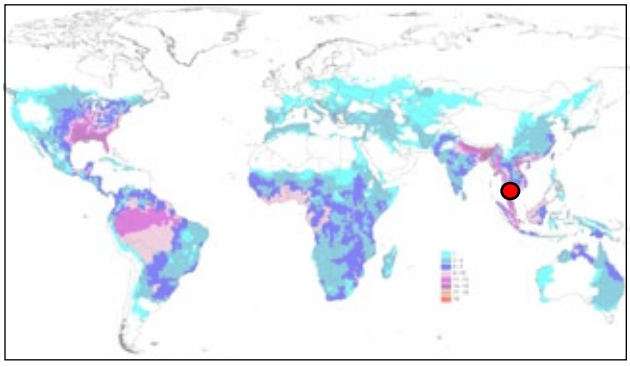
Batagur affinis (Cantor 1847); Family Geoemydidae
Asia: Cambodia, Indonesia (Sumatra), Malaysia (West), Myanmar (?), Singapore (extirpated), Thailand (extirpated?), Vietnam (extirpated)
IUCN Red List: NE, Not Evaluated; TFTSG Draft: CR, Critically Endangered
CITES: Appendix I

The plight of this species underscores the importance of proper taxonomy in conservation of wildlife. This critically endangered large river turtle was until recently considered to be a wide-ranging species (from India to Indonesia), but genetic analysis determined that it was two separate species: the Northern River Terrapin, *Batagur baska*, and the Southern River Terrapin, *B. affinis*. A recent study has further split *B. affinis* into two subspecies: the Western Malay River Terrapin, *B. a. affinis*, and the Eastern Malay River Terrapin, *B. a. edwardmolli*.

Batagur affinis male in breeding color from Setiu River, Malaysia. Photo by Eng Heng Chan.

Living in the estuaries of large rivers and their associated mangroves, as well as in the upper reaches of the rivers, *B. affinis* was once a highly abundant species that was well integrated into human culture. Often the eggs of these turtles were so highly esteemed that they were deemed the sole property of the ruling kings. Sadly, the turtles were overexploited for their flesh and eggs and only small isolated populations remain. Much like its sister species to the north, habitat loss and degradation such as rampant sand-mining, dam construction, and pollution have also greatly exacerbated this species' decline. In addition, large-scale shrimp farms that discharge effluents into rivers cause salinization and negatively impact turtles by killing many of the aquatic plant species that they feed upon.

Today there are multiple conservation projects for *B. affinis* in the countries where it still occurs, however, these programs are not well integrated. Additionally, the programs have not yet been able to focus on reducing adult mortality and have only been successful in securing the hatching of offspring from nests laid naturally or at captive breeding centers.



Distribution of *Batagur affinis*.

In Peninsular Malaysia, where some wild breeding populations still exist, government programs have focused on egg incubation, headstarting, and release. This approach has not been successful in arresting the decline of the species along the west coast of the peninsula, where the number of wild clutches deposited have plummeted from a few thousand to less than 40 in just the past 20 years. It is believed that rampant poaching of terrapins for illegal trade along the west coast has contributed to the rapid decline of this region's turtle populations. Yet, a similar conservation approach on the Terengganu River on the east coast of the peninsula appears to have helped sustain a small nesting population. As recently as 2008, 100 wild nests were collected along this river for incubation.

A research and conservation project initiated in 2004 on the population on the Setiu River on Peninsular Malaysia's eastern coast has made headway into some long unanswered questions about biology and the effectiveness of headstarting for the species. Monitoring of released headstarted terrapins has demonstrated their ability to survive and grow in the wild, but whether they survive the 10–20 years needed to reach sexual maturity remains to be seen.

In Cambodia, where the species was previously thought to be extirpated, the recent discovery of a very small population of no more than a handful of nesting adults has received focused conservation attention from the Wildlife Conservation Society with support from Conservation International and the Turtle Conservation Fund.

Red-crowned Roofed Turtle

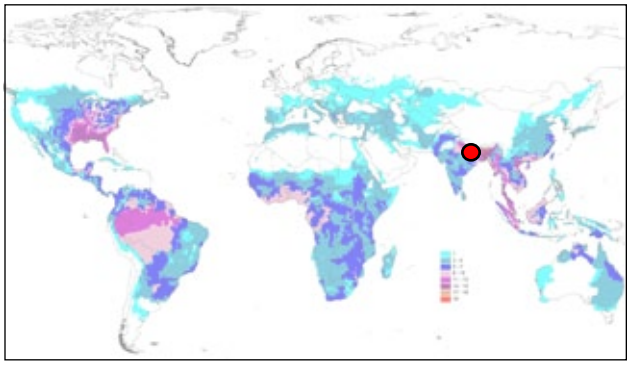
Batagur kachuga (Gray 1831); Family Geoemydidae
Asia: Bangladesh, India (Bihar, Madhya Pradesh, Punjab, Uttar Pradesh, West Bengal), Nepal
IUCN Red List: CR, Critically Endangered A1cd
CITES: Appendix II, as *Batagur* spp.

Batagur kachuga male in breeding color from Chambal River, India. Photo by Brian D. Horne.

The last known stronghold for this large river turtle (up to 60 cm carapace length) is on the Chambal River in central India, however, small isolated populations may still exist in the Ganges and Brahmaputra River basins, including in Bangladesh. It has also been reported as very rare in Nepal, where it breeds along a few rivers. No more than approximately 500 adult females remain of a species that once had a very large range. The species has been decimated due to high levels of hunting and habitat degradation, including pollution and large-scale water extraction projects for agriculture and drinking purposes. The main anthropogenic threats to the remaining population are accidental drowning of adults in illegal fishing nets, sand-mining, agricultural cultivation on sand banks and bars, water diversion, and irregular flow from upstream dams.

The species demonstrates marked sexual dimorphism, with males being more brightly colored and smaller than females. Males during the breeding season display vibrant head patterns with bright blues, yellows, and reds. Expression of breeding coloration to this extant is very unusual in turtles. Females nest from March through mid-April, laying 11–30 eggs that hatch just before monsoonal rains after a nearly three-month incubation period.

The Turtle Survival Alliance, the San Diego Zoo Institute for Conservation Research, and the Madras Crocodile Bank Trust have been jointly engaged in a conservation program on the National Chambal (River) Sanctuary since 2005. This has had good success, with a series of riverside hatcheries, two headstarting rearing facilities, poacher conversion initiatives, and public awareness campaigns.



Distribution of *Batagur kachuga*.

To date the program has produced over 4000 hatchling *B. kachuga*; however, during the monsoon rains that flood the river, released turtles may leave the sanctuary and the protection it affords and migrate to less protected or unprotected sections of the river.

With the presumed low survival rate of hatchlings to adulthood (a minimum of 10–15+ years is required to reach maturity for females); there is great need to maintain production of thousands of hatchlings per year to hopefully offset the decline of turtle populations in the Chambal River. The determination of survival and movement through radio-tracking of headstarted juveniles is needed to gauge the success of the project. Additional captive assurance colonies need to be developed to help maintain an adequate genetic diversity of animals in case the single largest population of these turtles is lost due to a man-made or natural disaster. Currently the species is captive-bred at Madras Crocodile Bank and captive colonies are being maintained there and at Kukrail Gharial (and Turtle) Rehab Centre in Lucknow. This needs to be expanded in other zoos and captive centers across the species' historic range. Additional surveys need to be conducted to determine if there are any other remaining populations. Reintroduction programs should be initiated along other protected habitats such as the Son, Kane, Betwa, and other rivers in the historic range. Continued efforts need to focus on reducing the incidental by-catch of this species in fishing nets. New surveys have been launched in Nepal by CARON and in Bangladesh by CARINAM to determine the current status of those populations.

Sulawesi Forest Turtle

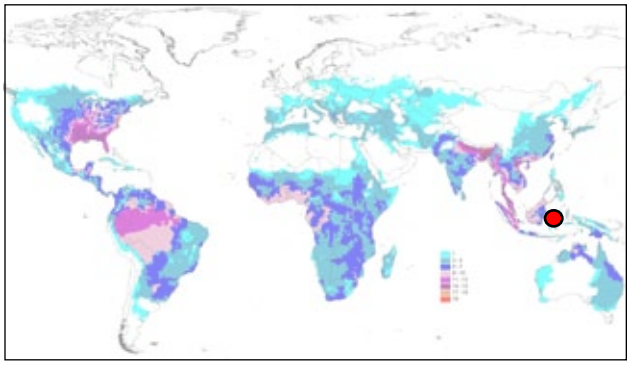
Leucocephalon yuwonoi (McCord, Iverson, and Boeadi 1995); Family Geoemydidae
Asia: Indonesia (Sulawesi)
IUCN Red List: CR, Critically Endangered A1cd+2cd, C1
CITES: Appendix II

This medium-sized (carapace length up to 28 cm) semi-aquatic turtle endemic to the Indonesian island of Sulawesi was originally found in Chinese food markets in relatively high abundance in the early 1990s. Frank Yuwono, after whom the species is named, obtained the first specimen known to science from a market in Gorontalo, Sulawesi. The species was formally described to science in 1995, and was found to be so evolutionarily distinct that it was reassigned to a new monotypic genus in 2000.

Leucocephalon yuwonoi from Sulawesi, Indonesia. Photo by Cris Hagen.

Males are easily distinguished from females by their pale white to cream-colored heads, while females are more darkly colored. While not much is known about the natural history of this species, it is thought to spend the day in the forest and only move to water after dark to feed, rest, and possibly mate. Females lay one, or occasionally two eggs, although multiple clutches in a year are possible.

Although it is a poorly known species, it is evident that habitat destruction from commercial logging, small-scale agriculture, and clearing of forest for oil palm plantations has greatly reduced the forest cover that the turtle depends upon for its survival, and deforestation rates in Sulawesi are among the highest in the world. This habitat destruction, collection for the commercial meat and pet markets, and its very low reproductive output are cause for great concern. This species is thought to occur in three protected areas, however, it has yet to be confirmed in these localities. Population assessments have not been completed anywhere within its range. Despite this, the Indonesian government has set unsustainable export quotas, and these quotas have already been exceeded on multiple occasions. This is in addition to an unknown number of animals that are being exported illegally or due to inadequate species identification skills of wildlife trade inspectors.



Distribution of *Leucocephalon yuwonoi*.

Priorities for this species include field research into basic natural history, including demography, habitat use, diet, and reproduction, so that effective conservation measures can be developed. In addition, surveys throughout the range are required, particularly in protected areas. Habitat conservation, while necessary, will not be sufficient to maintain this species, as so little is known about its natural history. *Ex-situ* and *in-situ* captive breeding programs are needed to supplement populations and act as assurance colonies. *In-situ* efforts should focus on the parks and other protected areas, and could be used as release points for captive raised young. However, thus far captive propagation has proven difficult, with only a few hatchlings being produced. A better understanding of the species' natural biology and increased efforts by herpetoculturists and zoos will likely lead to successful captive management.

Western Swamp Turtle

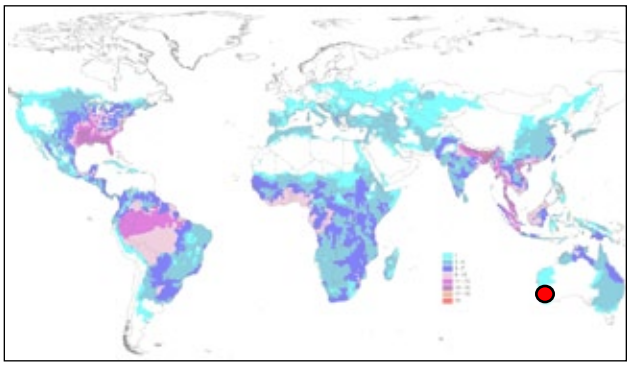
Pseudemydura umbrina Siebenrock 1901; Family Chelidae
Australia (Western Australia)
IUCN Red List: CR, Critically Endangered A1c, B1+2c, C1+2b, D
CITES: Appendix I

Pseudemydura umbrina from Western Australia. Photo by Gerald Kuchling.

A small turtle exquisitely adapted to life in the ephemeral clay swamps of the Swan River valley of Perth. This small freshwater turtle of an ancient and distinct family has a prominent spiny neck and grows no larger than 15 cm shell length. This species is the only turtle known to dig its nest with its forelimbs; all other turtles use their hind limbs. It spends many months estivating during the hot dry summer, emerging for a few months to feed and reproduce during the wet season. First described in 1901 based on a specimen acquired by the Vienna Natural History Museum in 1839, the species was only rediscovered in its natural habitat in 1954. By then most of its habitat had already been drained and converted to suburbs, clay pits, vineyards, and cattle pastures. Although the wild population was estimated at over 200 in the 1960s, less than 20 adults remained by the late 1980s.

The species is restricted to the Perth region of Western Australia where it persists in only two small nature reserves of a few hectares each, and a multi-decade captive breeding effort and intense protection through fencing and predator exclusion, headed by Gerald Kuchling, has resulted in improved survival rates in recent years. Reintroduction and introductions of captive-bred turtles more than quadrupled the overall population size in the wild, but despite these efforts, successful natural recruitment is currently only occurring in the smallest population which had persisted on its own. Understanding the effects of extreme seasonal changes on the turtles' biology and behavior proved to be the key to a successful captive breeding program, which together with intensive protection of the remaining wetlands and reintroduction has averted near-certain extinction. Despite this modest, hard-won progress, the species remains under severe threat from introduced predators (foxes and rats) as well as stochastic events related to climate change: drought, increased aridity, drying ponds, and bushfires

A collaborative research program involving different Universities and government agencies started in 2010 which will integrate biophysiological and hydrological models to identify wetlands where *Pseudemydura* could survive and reproduce under drier, hotter climates. Continuing Federal and State funding of the recovery program will be needed to establish additional assurance reintroduction and introduction sites to ensure survival of this ephemeral swamp specialist in a changing and drying climate.



Distribution of *Pseudemydura umbrina*.

P. umbrina in its tiny natural reserve. Photos by Gerald Kuchling.

Hoge's Side-necked Turtle

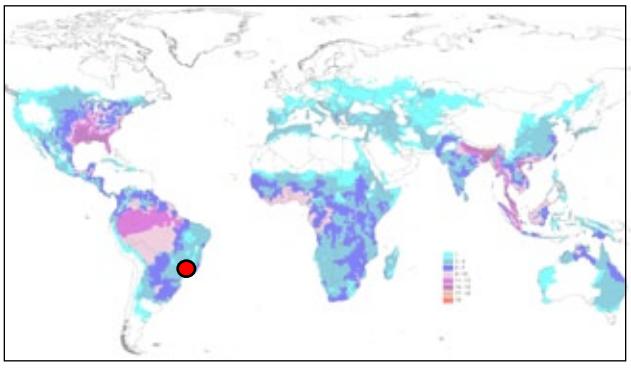
Mesoclemmys hogei (Mertens 1967); Family Chelidae
South America: Brazil (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo [?])
IUCN Red List: EN, Endangered B1+2c; TFTSG Draft: CR, Critically Endangered
CITES: Not Listed

This moderate-sized species (carapace length to 38 cm) was described based on a single animal discovered in the serpentarium tanks of the Instituto Butantan in São Paulo, Brazil. This poorly known Brazilian endemic species has one of the smallest ranges of any of the South American members of the family Chelidae, restricted to small portions of the states of Espiríto Santo, Minas Gerais, and Rio de Janeiro. The range of this species appears to be smaller than originally thought, as it does not apparently occur at its doubtful type locality in São Paulo. If accurate, the type locality would result in a fragmented range with an essentially impassable geographic barrier of a large swath of land and forest at elevations higher than this species is thought to occur.

Mesoclemmys hogei female from Espírito Santo, Brazil. Photo by Russell A. Mittermeier.

Originally described in the genus *Phrynops*, the species has since been reclassified as a member of the closely related genus *Mesoclemmys*. Primitive in many of its osteologic features, it may instead represent a distinct and monotypic genus with some similarities to Australian chelid turtles. In females the lateral portions of the dorsal head have a variable area of dark wine red color suffusion, a unique feature among members of the genera *Phrynops* and *Mesoclemmys*.

All confirmed collected specimens (only 10 in museums from 9 localities), have been found in low-lying areas under 500 m elevation along the Rio Paraíba drainage in the states of Rio de Janiero and southern Minas Gerais (notably the Rio Carangola basin), and north to coastal Espírito Santo in Brazil. The Rio Paraíba is under heavy pressures of habitat destruction due to human uses, including pollution and deforestation and the resulting alteration of watercourses causing erosion and siltation.



Distribution of *Mesoclemmys hogei*.

The species is apparently omnivorous, feeding on meat and fish in captivity, but with stomach contents in the wild yielding leaves, seeds, and plant stems. Nothing is known about reproductive biology, and nesting, eggs, or hatchlings have not been described. No data on growth are available.

Currently, nothing is known regarding total population size—only localized populations are known, and no protected areas occur within the range of this species. The species appears to be rare throughout its range, and may occur as a series of disjunct populations with very low overall density. Concerted efforts at locating the species in the main Rio Paraíba drainage have often been unsuccessful. However, a few populations occur along the northern periphery of the Rio Paraíba basin, such as in the Rio Carangola in southeastern Minas Gerais. Unfortunately, even that river is threatened by habitat degradation and the population of *M. hogei* there has decreased by over 15% annually over the last ca. 17 years.

The species is in desperate need of studies to determine its actual distribution, population levels, specific threats, and general ecology. Basic life history data are unavailable, and no rational management plans can be implemented unless more is known about the species. A protected area for the species has been recommended near Faria Lemos on the Rio Carangola. Establishment of a captive population at a research facility within the species' natural range should be considered to allow for detailed reproductive biology studies and to establish a breeding colony, but the establishment of captive breeding colonies outside the species' range should be discouraged.

Geometric Tortoise

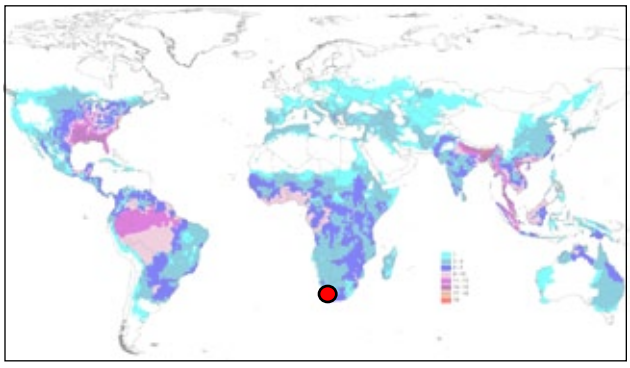
Psammobates geometricus (Linnaeus 1758); Family Testudinidae
Africa: South Africa
IUCN Red List: EN, Endangered A1ac, B1+2c; SARCA/TFTSG Draft: CR, Critically Endangered
CITES: Appendix I

Psammobates geometricus from South Africa. Photo by Atherton de Villiers.

The Geometric Tortoise is an excellent example of convergent evolution due to its striking resemblance to star tortoises of India and Burma. However, this beautiful tortoise is not closely related to its Asian look-alikes, and can be distinguished by the presence of a nuchal scute on the anterior carapace. As its Latin name suggests—*psammos* and *bates* means "inhabitant of the sands"—this species is found in low-lying areas of the Western Cape Province, South Africa, with acidic, sandy and nutrient-poor shale and alluvium soils with sparse vegetation, characterized by grasses and low to medium-high shrubs.

This species once occurred throughout the low-lying West Coast and inland renosterveld from Gordon's Bay to Piketberg, and in the Upper Breede River and Ceres valleys. Although its historic range was never vast, it now occupies only approximately 22 km^2 (8.5 sq.mi.) of highly fragmented remnants of suitable shale renosterveld and alluvium fynbos habitat in the Western Cape. Habitat destruction for agriculture, mainly for vineyards and wheat farming, degradation by invasive non-native plants and animals, coupled with fire suppression and increasing predator pressure have been, and continue to be, the main threats to the remaining habitat patches and populations.

This small species does not exceed 20 cm in carapace length, however, average adult sizes are more typically 10 cm for males and 12.5 cm for females, exhibiting strong sexual dimorphism with females larger than males and pronounced differences in plastron concavity, shell shape and tail size. Sexual maturity in females is reached in 8 to 10 years. Generally active year-round, inactivity may only occur during the coolest months of the year (June to August). Breeding behavior and oviposition (1–5 eggs in 1–3 clutches per year) occurs from September to November with hatchlings emerging 6–8 months later in March to May. Geometric Tortoises may reach ages of up to 30 years and more.



Distribution of *Psammobates geometricus*.

More than 90% of its former habitat has been destroyed and this species now occurs in a few small to medium-sized populations in isolated patches of uncultivated land. Protection measures include full legal protection, and populations in both private and provincial nature reserves, as well as conservation stewardship contract nature reserves, occupying areas of between 30 and ca. 1000 ha of suitable habitat. The most pressing conservation need for this species is the acquisition of more suitable native habitat, and more conservation stewardship nature reserves are being negotiated with private landowners. Management is required to prevent habitat alteration, and in this fire-adapted habitat, fire is required to maintain the open nature of the habitat and its species diversity. However, small tortoise populations are extremely vulnerable to fires and up to 80% mortality can be expected.

This species does poorly in captivity and a highly managed *in-situ* breeding facility may be warranted. Because threats continue to operate in natural habitats, headstarting is, however, unlikely to improve the status of this species. A species conservation management plan is imminent, and the South African Reptile Conservation Assessment has recently determined the species to warrant Critically Endangered status on the IUCN Red List, as noted by the Tortoise and Freshwater Turtle Specialist Group.

Philippine Forest Turtle

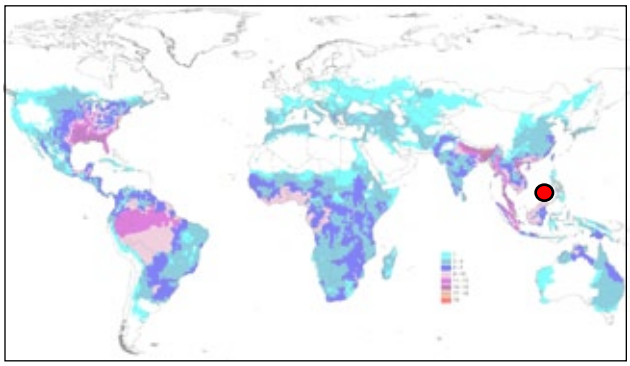
Siebenrockiella leytensis (Taylor 1920); Family Geoemydidae
Asia: Philippines (Palawan)
IUCN Red List: Critically Endangered A2d, B1+2c
CITES: Appendix II

Siebenrockiella leytensis male from Palawan, Philippines. Photo by Rafe M. Brown.

The Philippine Forest Turtle was formerly known from only a few museum specimens, allegedly collected on the southeastern Philippine island of Leyte in the early 1920s, after which it is named. For almost 70 years, biologists were unable to locate any additional specimens, living or dead. Hence, the species took on a legendary status among turtle biologists as one of the rarest turtles in the world. Finally in 1988, a specimen was surprisingly purchased in a food market 650 km west of Leyte, on the southwestern Philippine island of Palawan. Today, all evidence suggests that the original description of this species as occurring on Leyte was erroneous, although it is possible that early traders had transported some to Leyte and sold them in the market where they were first discovered. Scientists have only recently completed thorough surveys for this species. Since its rediscovery in 2004 it is considered endemic to the Palawan island group.

There is still very little known about this semi-aquatic species. It has been observed in numerous aquatic habitats including streams, creeks, and rivers with associated forest cover, as well as swamps. In addition, it is crepuscular or even nocturnal, hiding during the day under rocks or in deep earthen burrows or natural limestone caves. Its habitat is threatened by slash-and-burn farming practices, logging, agricultural encroachment, and associated habitat degradation.

Yet, the biggest threat to the Philippine Forest Turtle is its perceived rarity. The demand in the international pet trade surged when it was rediscovered. Sadly, it continues to be illegally exported from the Philippines in significant numbers, although the species is protected both locally under Philippine law, and its trade regulated internationally by CITES. The Philippines banned its export for commercial purposes. Numerous specimens are now known to occur in North America, Europe, and Asia, where it sells for exorbitant prices. Surveys and confiscations show that there continues to be an active trade in the species both for local consumption and export. Additionally, evidence suggests that some populations of this species have declined in the recent past and that no adults larger than 30 cm in carapace length and no hatchlings can be found in some localities.



Distribution of *Siebenrockiella leytensis*.

Effective conservation actions for this species will require greater knowledge of the species' natural history. Furthermore, actions must be intensified to halt its illegal trade via local and international authorities. Lastly, community based conservation programs need to be continued to provide effective long-term *in-situ* protection of the remaining populations and their habitats.

Being the focal species of the Philippine Freshwater Turtle Conservation Program implemented by Katala Foundation, this NGO, with partial support from the Turtle Conservation Fund, is addressing these aspects by implementing a community-based conservation project, conducting population size studies, studies on home range, information education campaigns, trade surveys, and collaborating with authorities to stop the illegal trade.

Magdalena River Turtle

Podocnemis lewyana Duméril 1852; Family Podocnemididae
South America: Colombia (Antioquia, Atlántico, Bolívar, Boyacá, Caldas, Cesar, Córdoba, Cundinamarca, La Guajira, Magdalena, Santander, Sucre)
IUCN Red List: EN, Endangered A1bd; TFTSG Draft: CR, Critically Endangered
CITES: Appendix II, as *Podocnemis* spp.

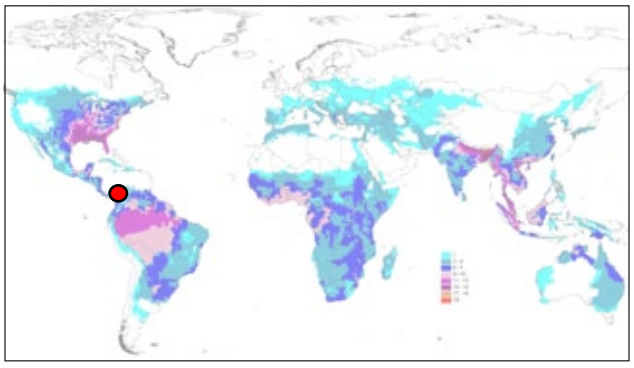
This large herbivorous river turtle (carapace length up to 46 cm) is restricted to remote areas of the Sinú, San Jorge, Cauca, and Magdalena River drainages of northwestern Colombia. However, some evidence suggests that it may also occur in the Ranchería and Cocorná Rivers. From a biogeographical perspective, this species is very interesting as it is the only member of the Family Podocnemididae to occur northwest of the Andes Mountains; all other family members inhabit the Orinoco, Essequibo, or Amazon drainages. It is a typical riverine species, yet it also inhabits adjacent lagoons, swamps, and flood-plain marshes. These river turtles, in areas where they still exist, are often seen basking alone or in groups on fallen tree trunks and on riverbanks.

Podocnemis lewyana female from Río Magdalena, Colombia. Photo by Alejandra Cadavid.

This species faces a multitude of threats, yet follows a pattern commonly seen among other declining turtle populations: habitat destruction, pollution, depredation, and unsustainable exploitation. Many of the areas surrounding the rivers that this species occupy have been converted to pastures and plantations, thereby reducing natural forest habitat and associated ecological processes.

In addition, there are many human activities associated with these lands, including draining of wetlands for agriculture and irrigation as well as sedimentation and pollution in remaining wetlands. Added to this are hydrological changes due to dams that not only alter natural river flow, but also release water that floods downstream nesting areas causing egg mortality and recruitment failure.

Heavy subsistence hunting and commercial exploitation throughout this species' range has greatly reduced populations to very low densities, and in some areas it has been extirpated. Local communities use numerous hunting techniques, including nets, baited hooks, and even diving for individuals, as well as the use of dogs to find nesting females. The meat, eggs, and hatchlings (for the domestic pet trade) are all actively sought. Furthermore, the nesting season coincides with the Easter holiday, a period when there is a high demand for turtle meat due to religious restrictions on eating other forms of meat. Harvesting females at this time is especially damaging to the population, as females and their yearly production of eggs are lost. To a lesser degree this species is consumed for presumed medicinal value in certain riverside communities. In addition to harvest for human consumption, lizards, domestic dogs, and pigs depredate nests. Cattle may also trample nests when crossing nesting areas to drink from the river.



Distribution of *Podocnemis lewyana*.

By Colombian law commercial exploitation of the Magdalena River Turtle, including eggs and hatchlings, is prohibited. However, there is no effective implementation of these laws, leaving the species effectively unprotected. No protected areas exist within the range of this species. Currently, some efforts are underway to provide public education and improve awareness, yet these efforts need to be increased, giving more emphasis for the need to protect adults, especially reproductive females. As part of this awareness campaign, locally-based protection and headstarting programs are also needed. Currently this species is being bred in captivity at a private reptile farm in Colombia, so locally-based captive management efforts are an additional conservation possibility.

Painted Terrapin

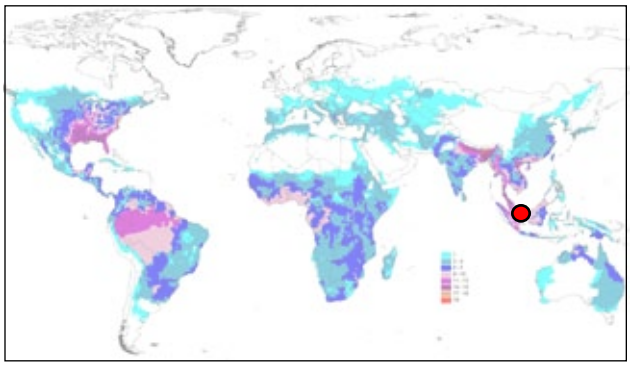
Batagur borneoensis (Schlegel and Müller 1845); Family Geoemydidae
Asia: Brunei, Indonesia (Kalimantan, Sumatra), Malaysia (East, West), Thailand
IUCN Red List: CR, Critically Endangered A1bcd
CITES: Appendix II, as *Batagur* spp.

Male Painted Terrapins in full breeding color are widely considered one of the most strikingly beautiful turtles, with pure white heads strikingly interrupted by a red swath bordered by vivid indigo running between their eyes. Additionally the color of the males' shells lightens during the breeding season, further emphasizing the three predominant black stripes that run parallel down the length of the shell. Such brilliant and colorful sexual dimorphism is unusual among turtles.

Batagur borneoensis male from Perak, Malaysia, in breeding color. Photo by Doug Hendrie.

This Critically Endangered large river turtle was previously in its own monotypic genus *Callagur*, but has recently been reassigned to the genus *Batagur*. Genetic studies have shown that it is most closely related to *Batagur dhongoka* (Three-striped Roofed Turtle) from India and Nepal. Although it is found sympatrically with *B. affinis* (Southern River Terrapin) in many parts of its range, the two species differ in their choice of nesting sites and breeding seasons. *Batagur affinis* tends to nest on sandy riverbanks, whereas *B. borneoensis* nests on ocean beaches that are often frequented by sea turtles that share the same nesting season as well.

Global status has not been fully elucidated for this species, though most populations are in serious decline. In Malaysia, wild populations occur in both West and East Malaysia and the species is believed to be widely distributed. However, numbers have dwindled due to unsustainable exploitation and insufficient and uncoordinated conservation efforts. Remnant populations can still be found in Sumatra. Much like other species of large river turtles, *B. borneoensis* has suffered from overexploitation of its flesh and eggs as well as habitat loss and degradation. Development of large-scale agro-based projects 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. It is also smuggled across borders and traded illegally for food.



Distribution of *Batagur borneoensis*.

Conservation measures accorded to the species have been limited and not well-planned. In Malaysia, eggs from wild nests are incubated in several locations in Terengganu and Sarawak. Available records indicate that the numbers in Terengganu have declined from several hundred clutches protected per year to less than 100 in 2010. Headstarting work has been sporadic and not sustained. To date, close to 200 headstarted Painted Terrapins have been released into the Setiu River in Terengganu. Sampling of wild Painted Terrapins caught in fishermen's nets in the Setiu River 2009 and 2010 has yielded a total of 249 individuals. Eighty of these were large enough that their sex could be determined, giving a ratio of 50 females to 30 males.

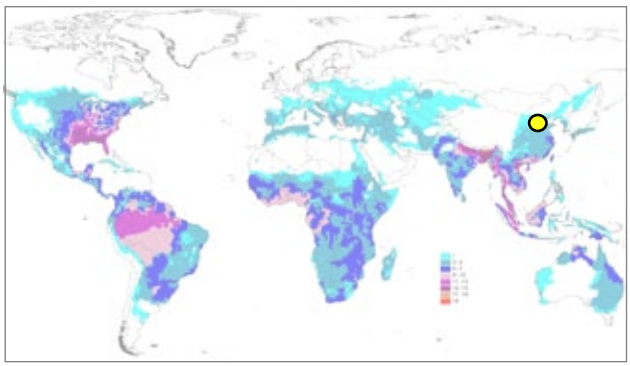
A survey of the rivers in Terengganu carried out in 2010 indicated the occurrence of *B. borneoensis* in all rivers in the state. Its occurrence in the rivers of the remaining states of Malaysia has not been well documented. There is an urgent need to identify all rivers with viable populations of the species.

Turtles in Trouble:
Other Top 40 Tortoises and Freshwater Turtles at Very High Risk of Extinction
[species 26–40]

Pan's Box Turtle

Cuora pani Song 1984; Family Geoemydidae
Asia: China (Gansu, Hubei, Shaanxi, Sichuan)
IUCN Red List: CR, Critically Endangered A1d+2d; CITES: Appendix II, as *Cuora* spp.

This small aquatic species (shell length to 19 cm), with a brown flat streamlined shell, occurs in the central Chinese Qin Ling mountain range, and inhabits small clear hill streams at altitudes of 400–800 m. It occupies the most continental and harsh environment of any *Cuora*, even tolerating cold winters. Very few specimens of exact provenance are known and little is known of its habitat and ecology. Its distribution seems to be very scattered and populations appear to have always been small. It has been exploited by the pet trade and is threatened by severe habitat destruction. Despite being listed in Shaanxi's Protected Animals in 1989, and in China's National Protected Animals in 2000, poaching continues and it is the last of the rare Chinese aquatic *Cuora* species that is still occasionally found in markets. Only about 250 specimens survive in captivity; however, captive breeding has been quite successful in the last few years.



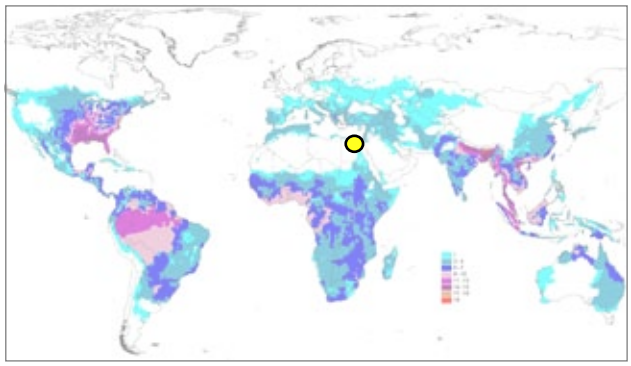
Cuora pani in captivity. Photo by Torsten Blanck.

Other Top 40 Tortoises and Freshwater Turtles at Very High Risk of Extinction

Egyptian Tortoise

Testudo kleinmanni Lortet 1883; Family Testudinidae
Africa / Middle East: Egypt, Israel, Libya
IUCN Red List: CR, Critically Endangered A2abcd+3d; CITES: Appendix I

This small tortoise (shell length up to 18 cm, usually only 10–14 cm) occurs in highly localized and generally very low densities in the sand dunes and patches of desert scrub of northeast Libya, coastal Egypt, the Sinai desert, and adjacent Israel. Threatened by habitat loss and introduced predators, the most severe threat is illegal collection for the regional and international pet trade, despite its CITES I status. Research and awareness work by Sherif Baha el Din, and community engagement work by Omar Attum with the Bedouin tribes in the species' range to provide sustainable income through tortoise-themed handicrafts as an alternative to collecting for the trade, deserve ongoing and increased support to intensify and expand these efforts.

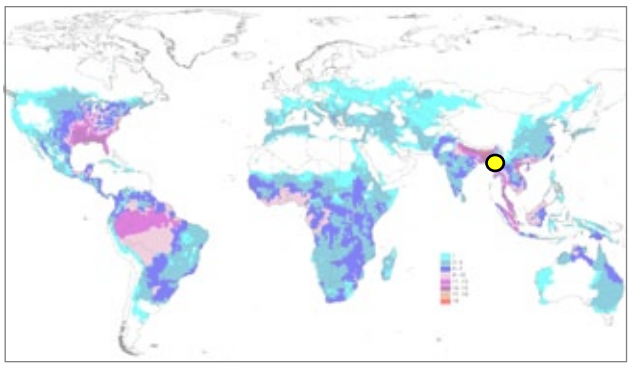


T. kleinmanni at Behler Chelonian Center. Photo by Eric V. Goode.

Arakan Forest Turtle

Heosemys depressa (Anderson 1875); Family Geoemydidiae
Asia: Myanmar
IUCN Red List: CR, Critically Endangered A2cd, B1+2c; CITES: Appendix II

Known only from the Arakan Hills of western Myanmar, this poorly known species with shell length up to 29 cm, which went more than a century since its description without being seen by science, began turning up in Chinese food markets in the 1990s, and was only documented in the wild as recently as 2009. It is under great threat due to habitat destruction and exportation to China for human consumption. The species has a limited activity period during the monsoon season; the remainder of the year it estivates, often at the base of thick stands of bamboo. The Wildlife Conservation Society is currently conducting population surveys in order to best determine current population status and effective conservation actions. A limited number of animals are being bred in captivity in Myanmar as well as in the USA and Europe.



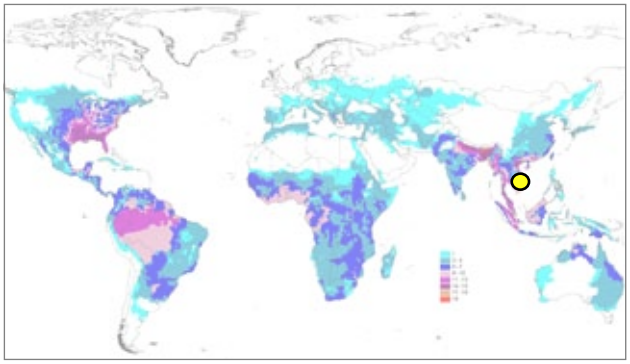
Heosemys depressa in Myanmar. Photo by Brian D. Horne.

Other Top 40 Tortoises and Freshwater Turtles at Very High Risk of Extinction

Southern Vietnam Box Turtle

Cuora picturata Lehr, Fritz, and Obst 1998; Family Geoemydidae
Asia: Vietnam
IUCN Red List: NE, Not Evaluated; TFTSG Draft: CR, Critically Endangered

This is a highly terrestrial species, with a high-domed orange-brownish and cream-colored shell up to 18 cm in length. Recently considered a subspecies of *C. galbinifrons*, it is one of only two species of *Cuora*, the other being *C. zhoui*, whose native habitat remains a mystery. The species was described from pet trade specimens, but is believed to originate from the southern parts of the Vietnamese central highlands region of the Annamite mountain range. Despite its range being unknown to science, it was previously readily traded for fairly low prices (USD 60) in Vietnamese and Chinese food markets. While hundreds were still available in Guangzhou until 2007, numbers have dramatically decreased since then, probably indicating a collapse of wild populations. Nothing is known about its habits in the wild, captive populations have suffered from high losses, and at present probably less than 100 specimens remain in captivity.

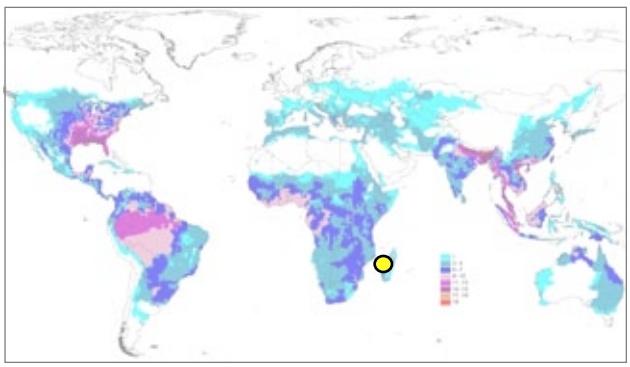


Cuora picturata. Photo by Torsten Blanck.

Flat-tailed Tortoise, Flat-shelled Spider Tortoise

Pyxis planicauda (Grandidier 1867); Family Testudinidae
Africa: Madagascar
IUCN Red List: CR, Critically Endangered A4acd; CITES: Appendix I

The most range-restricted of the spider tortoises in Madagascar, this species has been greatly imperiled by habitat loss and previous over-collection for the international pet trade. Since being placed on CITES Appendix I in 2002, legal exploitation for the pet trade has ceased and its severe population decline seems to have stabilized. Noted for having a distinctly flat tail, this species has long been desired by pet keepers, although it adapts poorly to captive conditions and is highly susceptible to bacterial and viral infections. Due to its low reproductive potential and poor survivorship in captivity outside its range, conservation measures should focus on maintaining viable wild populations and protecting its native habitat, as is currently the case in Kirindy Forest, where the species remains locally abundant in a small population.



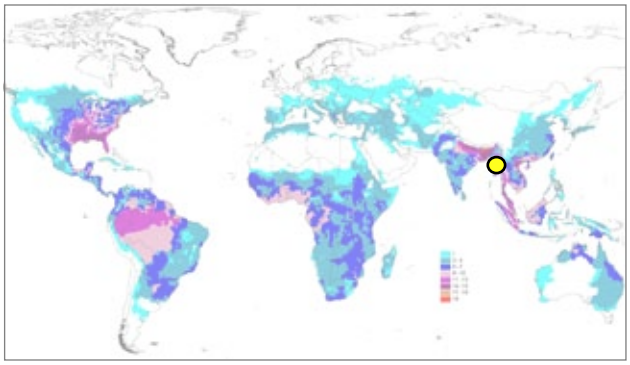
Pyxis planicauda, Madagascar. Photo by Anders G.J. Rhodin.

Other Top 40 Tortoises and Freshwater Turtles at Very High Risk of Extinction

Burmese Narrow-headed Softshell Turtle

Chitra vandijki McCord and Pritchard 2003; Family Trionychidae
Asia: Myanmar, Thailand
IUCN Red List: NE, Not Evaluated; TFTSG Draft: CR, Critically Endangered; CITES: Appendix II, as *Chitra* spp.

After decades of uncertainty whether any *Chitra* softshells occurred in the Ayeyarwady river system of Myanmar, these turtles were finally confirmed in the 1990s and described as a separate species in 2003, and in 2005 the species was confirmed to also inhabit the Salween River, including the stretch bordering Thailand. All indications from field surveys and market observations are that the species is rare to very rare, and intensively exploited. On top of this, dams and reservoirs are being built across many of the rivers, and more dams are being planned. Further status surveys and local nest protection initiatives, and possibly headstarting efforts, are desirable, but ideally what is needed is the designation of the upper Chindwin or another one of Myanmar's rivers as a protected Wild and Scenic River, where *Chitra vandijki*, other riverine turtle species, migratory fish, waterfowl and other biodiversity are secured from exploitation and habitat degradation, while retaining the downstream ecosystem benefits of access to clean freshwater and provision of food for rural communities.

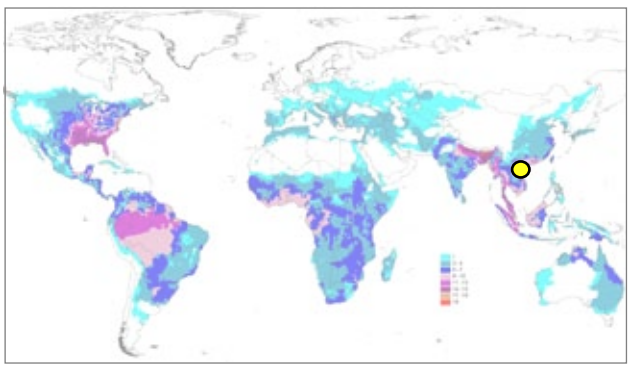


Chitra vandijki, Chindwin River, Myanmar. Photo by Win Ko Ko.

Chinese Red-necked Turtle

Mauremys nigricans (Gray 1834); Family Geoemydidae
Asia: China (Guangdong, Guangxi, Hainan [?]), Vietnam (?)
IUCN Red List: EN, Endangered A1d+2d; TFTSG Draft: CR, Critically Endangered; CITES: Appendix III (China)

This is an aquatic species with a black shell (length up to 28 cm) that inhabits hill streams in southern China at elevations of 300–700 m in evergreen forests. Hatchlings have scarlet red plastra, and males develop intricate ivory markings on the head with vivid orange or red streaks on the throat and limbs. Remarkably, females construct nests with two adjacent cavities. Wild populations appear to have crashed over the last few decades, and biologists in southern China have not located wild animals for several years. The species is rare and attractive, thus in heavy demand and expensive in the pet trade. Unlike many other Asian turtles, this species is not widely consumed, nor was it historically reported as used for food or medicine, undoubtedly because of its strong musk odor. Recent *ex-situ* conservation measures for the species are outlined in Taxon Management Plans by the Turtle Survival Alliance and the European Studbook Foundation.



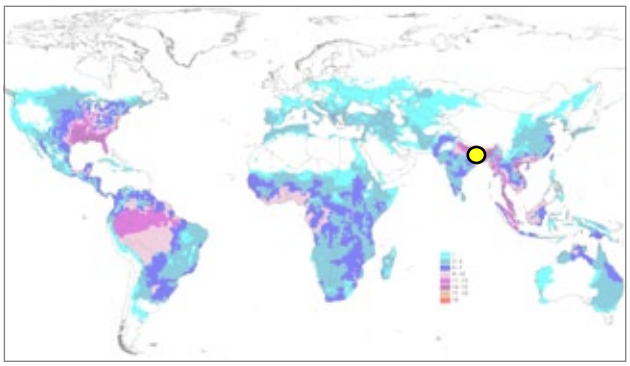
Mauremys nigricans from China. Photo by Cris Hagen.

Other Top 40 Tortoises and Freshwater Turtles at Very High Risk of Extinction

Indian Narrow-headed Softshell Turtle

Chitra indica (Gray 1830); Family Trionychidae
Asia: Bangladesh, India (Andhra Pradesh, Madhya Pradesh, Maharashtra, Orissa, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal), Nepal, Pakistan
IUCN Red List: EN, Endangered A1cd+2cd; CITES: Appendix II, as *Chitra* spp.

This large secretive softshell turtle can lay clutches of more than 200 eggs. However, this incredible reproductive potential is not enough to counteract overfishing for consumption of its flesh as well as widespread habitat destruction. As a sit-and-wait predator, it is highly specialized to capture and swallow fast swimming fish in a single rocket-like lunge of its head as it lays hidden beneath the sand in shallow rivers. As a species that is surprisingly delicate and difficult to maintain in captivity, its conservation measures should focus most heavily on reducing adult mortality and hatch-and-release programs. Currently the Turtle Survival Alliance is conducting conservation programs for this species on the upper Ganges River with the aid of former turtle poachers. Programs such as this will play a crucial role in the recovery of this species in the wild.

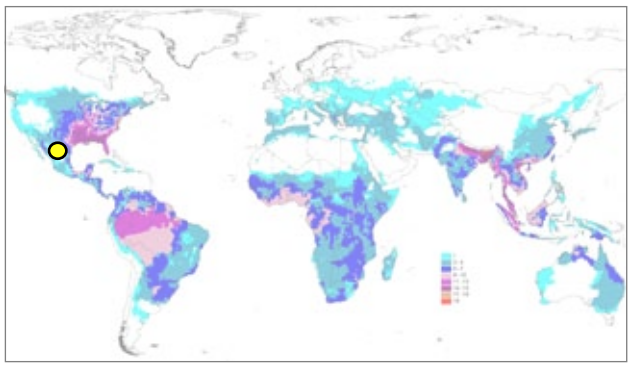


Chitra indica from India. Photo by Peter Praschag.

Coahuilan Box Turtle

Terrapene coahuila Schmidt and Owens 1944; Family Emydidae
North America: Mexico (Coahuila)
IUCN Red List: EN, Endangered A2c+4c, B1ab(i,ii,iii,iv,v)+2b(i,ii,iii,iv,v); CITES: Appendix I

Found only in the northeastern Cuatro Ciénegas basin of Coahuila, Mexico, this restricted-range species is highly aquatic and can be found in streams and temporary water bodies of this high biodiversity region. Water diversion from man-made canals within the basin, and groundwater exploitation by aquifers outside the basin, have lowered the water table and resulted in widespread wetland habitat desiccation, placing the species at very high risk of extinction. Due to its limited range and small population, this species is also particularly susceptible to changes in global climate patterns. A management plan implementing local and regional regulation of water extraction affecting the basin is critical for the protection of the species. Currently there are several small breeding groups within North American zoos, and repatriation to the wild may at some point be recommended.



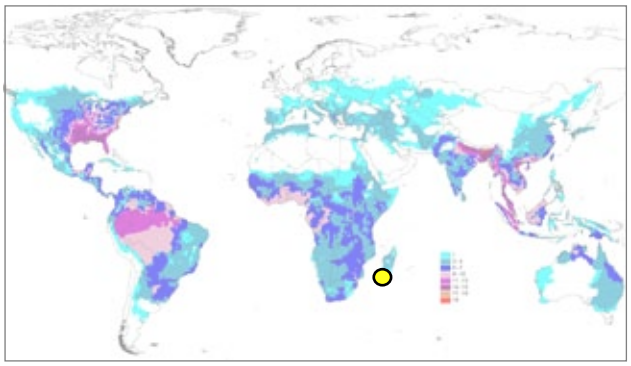
Terrapene coahuila, Mexico. Photo by Jennifer G. Howeth.

Other Top 40 Tortoises and Freshwater Turtles at Very High Risk of Extinction

Radiated Tortoise

Astrochelys radiata (Shaw 1802); Family Testudinidae
Africa: Madagascar; Introduced: Mauritius (Rodrigues, Round), Réunion
IUCN Red List: CR, Critically Endangered A4d, E; CITES: Appendix I

This large and strikingly beautiful and charismatic species of tortoise was once considered to be one of the more abundant tortoise species on the planet. However, due to the incredible scale of recent degradation and destruction of its vulnerable dry spiny forest habitat in southern Madagascar, as well as rapidly increasing exploitation for the domestic food trade and the international pet trade, this species has plummeted in numbers. In addition, long-held local cultural beliefs by some tribes to not harm the tortoises have gradually eroded due to extreme human poverty in the region. The Turtle Survival Alliance, in conjunction with Conservation International, the Turtle Conservation Fund, and the IUCN Tortoise and Freshwater Turtle Specialist Group, are focusing significant conservation attention and resources on this species and this important biodiversity region.

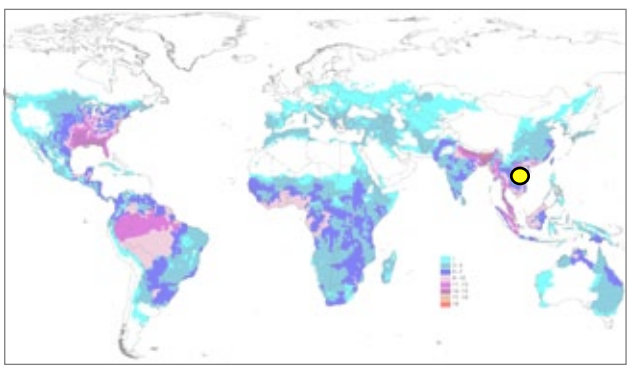


Astrochelys radiata, Madagascar. Photo by Anders G.J. Rhodin.

Bourret's Box Turtle

Cuora bourreti Obst and Reimann 1994; Family Geoemydidae
Asia: Cambodia (?), Laos (?), Vietnam
IUCN Red List: NE, Not Evaluated; TFTSG Draft: CR, Critically Endangered; CITES: Appendix II, as *Cuora* spp.

This is another highly terrestrial and secretive hill species of the genus *Cuora*, with a carapace length of up to 19 cm, its shell varying from cream to orange-brown to nearly completely black. It was described as a subspecies of *C. galbinifrons*, but genetic studies have shown that it is more likely a separate species, although debate about this continues. It inhabits the evergreen monsoon hill forests of the Annamite mountain range at elevations of 300–800 m in central Vietnam, possibly also occurring in adjacent Laos and Cambodia. Overharvesting for food markets has decimated wild populations of the species. While it is still seen in modest numbers in Chinese food markets, it is now only rarely encountered in the wild. The Asian Turtle Program, supported by the Turtle Survival Alliance, the Turtle Conservation Fund, and others, is currently actively surveying for this species in central Vietnam, and maintains an assurance colony at Cuc Phuong.



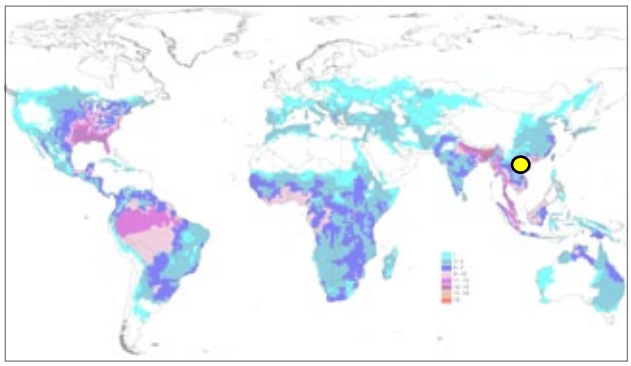
Cuora bourreti, Vietnam. Photo by Torsten Blanck.

Other Top 40 Tortoises and Freshwater Turtles at Very High Risk of Extinction

Indochinese Box Turtle

Cuora galbinifrons Bourret 1939; Family Geoemydidae
Asia: China (Guangxi, Hainan), Laos, Vietnam
IUCN Red List: CR, Critically Endangered A1d+2d; CITES: Appendix II, as *Cuora* spp.

The Indochinese Box Turtle was described from the Tam Dao mountain region in northern Vietnam back in 1939, and was regarded as somewhat of a phantom until the 1960s, when the first specimens began to arrive in western collections. The species has a moderately domed brownish to black carapace with yellowish to reddish lateral areas often intersected by dark stripes. This species inhabits evergreen monsoon hill forests at elevations of 300–900 m of northern Vietnam, northern Laos, extreme southern Chinese Guangxi Province and Hainan Island, the latter sometimes regarded as an intermediate population of *C. galbinifrons* and *C. bourreti* which has at times been considered a separate subspecies. The species is hunted with the help of dogs and sold to Chinese food markets. The species was once considered to be very hard to keep alive in captivity, but in recent years breeding has occurred to an increasing extent. The Asian Turtle Program at Cuc Phuong in Vietnam maintains an assurance colony.

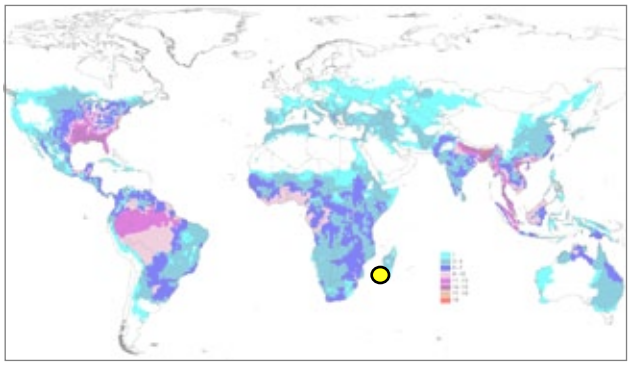


Cuora galbinifrons, Vietnam. Photo by Doug Hendrie.

Spider Tortoise

Pyxis arachnoides Bell 1827; Family Testudinidae
Africa: Madagascar
IUCN Red List: CR, Critically Endangered A4cd, E; CITES: Appendix I

This small, attractive tortoise has a limited distribution in southwestern Madagascar. Populations have declined precipitously from a combination of several factors: loss of its scrub and dune habitat, targeted collection for the international pet trade in the 1990s and up to 2004 before being placed on CITES Appendix I, and steeply increasing local consumption as local taboos and customs break down. All three of its subspecies are affected, but the northern *P. a. brygooi* is the most impacted. Surveys over the last few years by Ryan Walker and colleagues have found that *P. a. brygooi* is restricted to just four extant populations, of which three are depleted and only one remains at reasonably high density, but at high risk for exploitation. Local villagers are positive towards tortoises, and urgent action to empower communities to keep protecting tortoises and prevent incursion by outside tortoise collectors is essential.



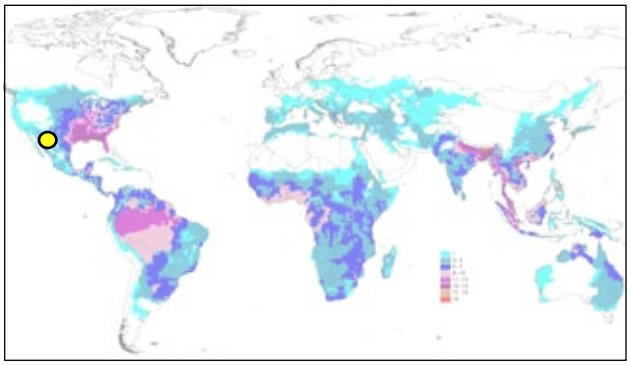
Pyxis a. oblonga, Madagascar. Photo by Anders G.J. Rhodin.

Other Top 40 Tortoises and Freshwater Turtles at Very High Risk of Extinction

Bolson Tortoise

Gopherus flavomarginatus Legler 1959; Family Testudinidae
North America: Mexico (Chihuahua, Coahuila, Durango); Introduced: USA (New Mexico)
IUCN Red List: VU, Vulnerable A1cd; TFTSG Draft: EN, Endangered; CITES: Appendix I

Only known to science since the late 1950s, this species is found in a very small region of the Chihuahuan Desert. It is the largest North American tortoise, reaching over 45 cm in shell length, yet is the least known. Previously somewhat impacted by domestic pet trade, but more by hunting for local consumption, the species is now mainly threatened by habitat conversion into agricultural land for biofuel production and cattle ranching. The recent proliferation of water wells, stock tanks, irrigated corn fields, and increased cattle stocking not only degrades this hyper-arid habitat, but the water provides subsidy for predators of eggs and juveniles. Previously also occurring in New Mexico and Texas during the Pleistocene, this species has been suggested for possible reintroduction into portions of its former range in Mexico and the USA.

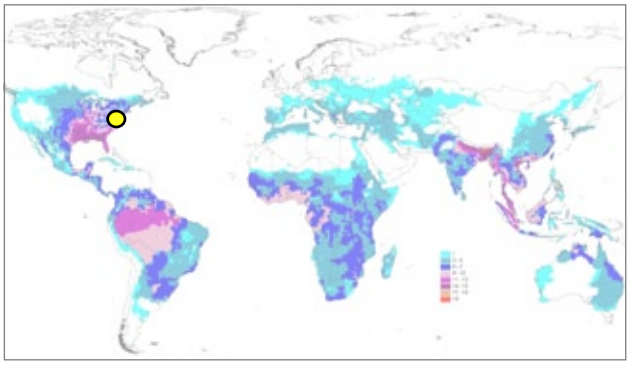


Gopherus flavomarginatus, Mexico. Photo by Eric V. Goode.

Bog Turtle

Glyptemys muhlenbergii (Schoepff 1801); Family Emydidae
North America: USA (Connecticut, Delaware, Georgia, Maryland, Massachusetts, North Carolina, New Jersey, New York, Pennsylvania, South Carolina, Tennessee, Virginia)
IUCN Red List: EN, Endangered A1cd+2cd; TFTSG Draft: CR, Critically Endangered; CITES: Appendix I

At a maximum size of 11.5 cm shell length, the Bog Turtle is one of the world's smallest turtle species. It occurs in highly fragmented small populations in spring-fed fens and marshes. It lost the great majority of its suitable habitat in historic and recent times through conversion to agricultural land and drainage; it has suffered further impact from past collection for the pet trade, and possibly roadkill and increased predation rates. Recent observations of disease outbreaks, and the prospect of climatic change, represent unquantified but potentially severe impacts on the horizon. Due to the species' highly fragmented occurrence in habitats subject to vegetational succession, intensive management is needed to retain existing populations. Restoration of former habitat, and creation of alternative sites, is challenging, while the species' low reproductive output (on average under 4 eggs/year per mature female) means recovery is a slow gradual process at best.



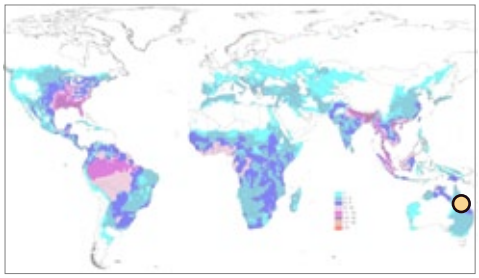
Glyptemys muhlenbergii, USA. Photo by Maurice Rodrigues.

Turtles in Trouble:
Other Tortoises and Freshwater Turtles at High Risk of Extinction
[species 41 and higher]

Mary River Turtle

Elusor macrurus Cann and Legler 1994; Family Chelidae; Australia (Queensland)
IUCN: Endangered B1+2c; CITES: Not Listed

This species had been known from the pet trade for decades before it was discovered to inhabit the small Mary River basin of southern Queensland and finally described in 1994. As a "bum-breathing" turtle species, which absorbs much of its oxygen from the water through its cloaca, it is particularly dependent on clear oxygenated running water. Its survival outlook was severely compromised by recent plans to build a large dam and shallow reservoir in the middle of the Mary River, but the project was cancelled in 2009. Dedicated efforts to protect nesting sites have been made by Tiaro and District Landcare and others for many years, but run-off from adjacent farmland and recent severe floods in the region continue to threaten the species.

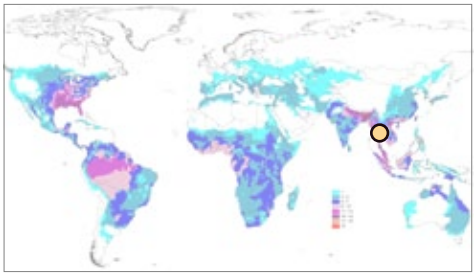


Elusor macrurus, Mary River, Australia. Photo by John Cann.

Asian Giant Tortoise

Manouria emys (Schlegel and Müller 1840); Family Testudinidae; Asia: Bangladesh, India (Assam, Meghalaya, Mizoram, Nagaland), Indonesia (Kalimantan, Sumatra), Malaysia (East, West), Myanmar, Thailand
IUCN Red List: EN, Endangered A1cd+2cd; CITES: Appendix II, as Testudinidae spp.

As the largest mainland tortoise in Asia (shell length up to 58 cm), this species (with two subspecies) faces considerable pressure from hunting and habitat destruction (logging, conversion of closed-canopy forests to agricultural land, fire impacts). Due to its large size, it is particularly desirable for consumption, either for local subsistence or traded, often destined for the main course at weddings or religious festivals. The nesting behavior of females is noteworthy in that they make large mounds of plant material in which to lay their eggs. After nesting, females often remain in the vicinity of the nest and appear to be guarding it from predators.



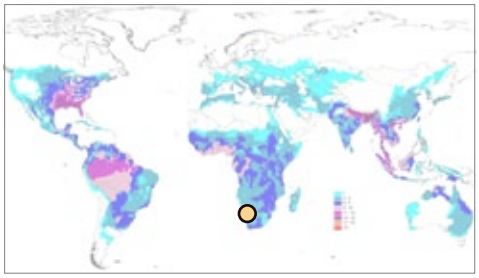
Manouria emys emys, in the wild in Borneo. Photo by Peter Riger.

Other Tortoises and Freshwater Turtles at High Risk of Extinction

Nama Tortoise, Nama Padloper

Homopus solus Branch 2007; Family Testudinidae; Africa: Namibia
IUCN Red List: VU, Vulnerable C2a, originally listed as *Homopus bergeri;* CITES: Appendix II, as Testudinidae spp.

This small tortoise only grows to a shell length of 12 cm, with males being even smaller. It is found in a harsh, rocky, semi-desert to desert terrain with apparently low population densities, but due to small size and cryptic coloration may be overlooked. It is endemic to Namibia and has a low reproductive output of one egg per clutch. Its small size and restricted small population makes it highly vulnerable and a target for the pet trade, but wild populations do not yet appear to be threatened with habitat destruction.

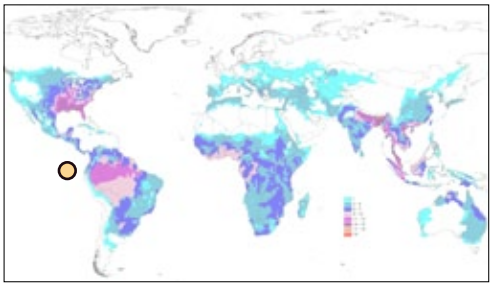


Homopus solus, Namibia. Photo by Maurice Rodrigues.

Espanola Giant Tortoise, Hood Island Giant Tortoise

Chelonoidis hoodensis (Van Denburgh 1907); Family Testudinidae; South America: Ecuador (Galápagos: Española [Hood])
IUCN Red List: CR, Critically Endangered D, as *Chelonoidis nigra hoodensis*; CITES: Appendix I, as *Chelonoidis nigra*

This species came perilously close to extinction as a result of exploitation by 19th century whalers who used the tortoises for provision on their ships, and then competition from feral goats that stripped most island vegetation. By the mid-1960s only 15 *C. hoodensis* remained. These were all brought into captivity at the Charles Darwin Research Station (CDRS) and managed in a breeding colony that has now successfully restocked the island and restored a small but healthy population that now appears to be holding its own.

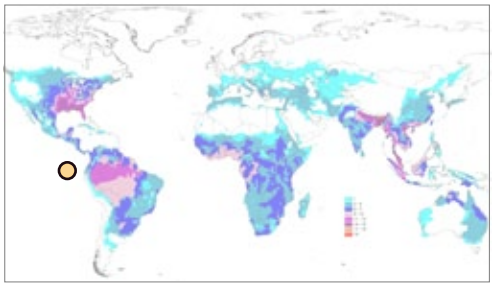


Chelonoidis hoodensis at CDRS. Photo by Peter C.H. Pritchard.

Pinzon Giant Tortoise, Duncan Island Giant Tortoise

Chelonoidis duncanensis (Garman *in* Pritchard 1996); Family Testudinidae; South America: Ecuador (Galápagos: Pinzón [Duncan])
IUCN Red List: EW, Extinct in the Wild, as *Chelonoidis nigra duncanensis*; TFTSG Draft: CR, Critically Endangered; CITES: Appendix I, as *Chelonoidis nigra*

This species was nearly lost to predation by introduced rats that consumed all hatchlings, with less than 100 adults remaining in the wild by 1990. A captive breeding program by the Charles Darwin Research Station restocked the island, while a predator eradication program destroyed rats. At this time there is a fairly healthy but small population of repatriated animals on the island, and still a few of the original >100-year-old tortoises, such as this ancient adult soaking up the heat on this hot and xeric island.



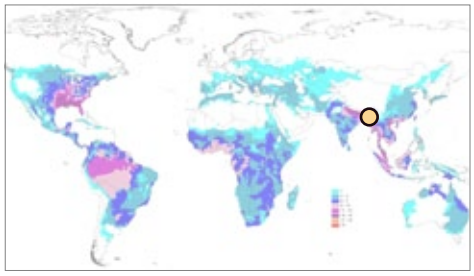
Chelonoidis duncanensis on Pinzón. Photo by Anders G.J. Rhodin.

Other Tortoises and Freshwater Turtles at High Risk of Extinction

Burmese Peacock Softshell Turtle

Nilssonia formosa (Gray 1869); Family Trionychidae; Asia: Myanmar, Thailand (?)
IUCN Red List: EN, Endangered A1cd+2d, B1+2c; CITES: Not Listed

This poorly known species from Myanmar is hunted for its meat and exported in unregulated numbers to markets in China. Its shell has four large ocelli reminiscent of the 'eyes' on peacock feathers. Wild populations in the Chindwin, Irawaddy, and Salween Rivers are being impacted by over-fishing and gold mining along their nesting riverbanks. Dwindling wild populations need greater protection as well as detailed surveys to better estimate their size and nesting areas. A few individuals are being headstarted at the Yadanabon Zoo in Mandalay, with assistance from the Turtle Survival Alliance; nest protection programs should be initiated for hatch and release programs.

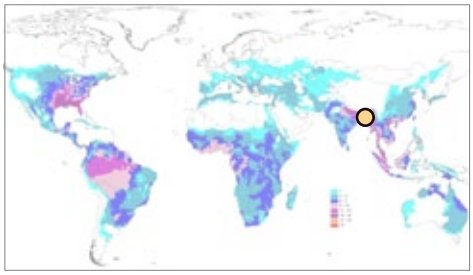


Nilssonia formosa, Myanmar. Photo by Peter Paul van Dijk.

Black Softshell Turtle, Bostami Softshell

Nilssonia nigricans (Anderson 1875); Family Trionychidae; Asia: Bangladesh, India (Assam)
IUCN Red List: EW, Extinct in the Wild; TFTSG Draft: CR, Critically Endangered; CITES: Appendix I, as *Aspideretes nigricans*

This species was long considered one of the rarest turtles in the world, thought to be extinct in the wild, and known only from a single population of about 150 animals at the Bostami Shrine in Bangladesh. Fortunately, the species has now been confirmed in a few natural localities in the Brahmaputra River drainage of the northern Indian state of Assam, as well as at a small number of Indian Buddhist temple ponds. Often misidentified as more widely distributed species, it faces severe threats of habitat destruction and overexploitation for human consumption. Greater protection is needed for wild populations, such as nest site protection and anti-poaching programs, and temple ponds that house this species may need support to optimize captive breeding.

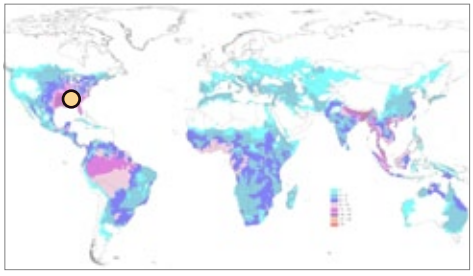


Nilssonia nigricans, India. Photo by Chittaranjan Baruah.

Flattened Musk Turtle

Sternotherus depressus Tinkle and Webb 1955; Family Kinosternidae; North America: USA (Alabama)
IUCN Red List: VU, Vulnerable B1+2c; TFTSG Draft: CR, Critically Endangered; CITES: Not Listed

This is a very small species with a shell length of only 6–12 cm and a life span of up to 60 years. Superbly adapted to hiding among cracks in bedrock in its stream habitat, it feeds mostly on freshwater snails. The species inhabits a small part of the Black Warrior River system in Alabama, which has been severely impacted by pollution, sedimentation from coal mining, and impoundment of stream sections. Disease has impacted the species and animals are in some demand for the pet trade. Much of the historical impact has ceased or been brought under tighter regulation, but surviving populations occupy less than 10% of historically suitable habitat, mostly within a protected wilderness area, and populations remain at ca. 90% lower abundance than 20 years ago. While causes of reduction have largely ceased, population recovery to historical levels is unlikely in the foreseeable future if present trends and processes continue.



S. depressus, Alabama, USA. Photo by C. Kenneth Dodd, Jr.

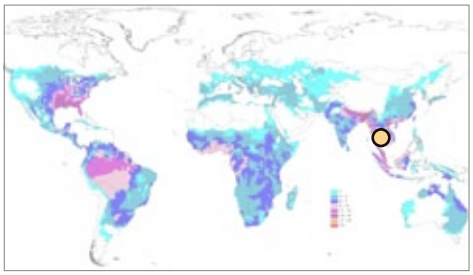
Other Tortoises and Freshwater Turtles at High Risk of Extinction

Asian Giant Softshell Turtle

Pelochelys cantorii Gray 1864; Family Trionychidae; Asia: Bangladesh, Cambodia, China (Anhui [extirpated], Fujian, Guangdong, Guangxi, Hainan, Jiangsu, Jiangxi, Yunnan, Zhejiang), India (Kerala, Orissa, Tamil Nadu, West Bengal), Indonesia (Java, Kalimantan, Sumatra), Laos, Malaysia (East, West), Myanmar, Philippines (Luzon, Mindanao), Singapore (extirpated), Thailand, Vietnam

IUCN Red List: EN, Endangered A1cd+2cd; CITES: Appendix II, as *Pelochelys* spp.

This species once thrived in most tropical and subtropical rivers of Asia, including brackish and marine coastal waters, sometimes nesting on beaches used by sea turtles. Few animals exceed 80 cm carapace length, though sizes up to 200 cm have been claimed. It is an ambush predator feeding on fish and crustaceans. Habitat destruction and heavy pollution along with intensive egg collection and exploitation for its meat and cartilaginous dried shell, sought after for traditional Chinese medicine, have extirpated most populations. Conservation International and the Turtle Conservation Fund, with others, support a protection program for a viable population in Cambodia. Surveys in its eastern range are urgently required, as well as rangewide genetic evaluations.



Pelochelys cantorii, Cambodia. Photo by Annette Olsson.

Ancient Galápagos tortoises, *Chelonoidis vicina*, in the mist on Volcan Alcedo, in the wild, as they should be, and as they should be protected, enjoyed, and celebrated by all of us and our children's children into a long and secure future. Photo by Peter C.H. Pritchard.

Turtle Conservation Coalition

The Turtle Conservation Coalition is an informal alliance currently consisting of the following turtle- and conservation-focused organizations working together on behalf of chelonian and biodiversity conservation: TFTSG, TCF, TSA, TC/BCC, CRF, CI, WCS, and SDZG, and welcomes further associated organizations. The IUCN and SSC provide a global framework for conservation efforts.

IUCN/SSC Tortoise and Freshwater Turtle Specialist Group (TFTSG)

Established in 1981 by the IUCN and the SSC, the mission of the TFTSG is to identify and document threats to the survival of all species of tortoises and freshwater turtles, and to help catalyze conservation action to ensure that none become extinct and that sustainable populations of all species persist in the wild. The TFTSG provides expertise and science-based recommendations with conservation relevance covering all species of freshwater and terrestrial turtles and tortoises, and is the recognized global authority and official IUCN Red List Authority for the determination of global threat levels for these species. The TFTSG works closely with the IUCN Red List Programme to assess, evaluate, and determine appropriate threat level categorizations for tortoises and freshwater turtles on the IUCN Red List. [**www.iucn-tftsg.org]**

Turtle Conservation Fund (TCF)

Established in 2002 by CI, the IUCN/SSC TFTSG, and the TSA, the TCF is a strategizing and funding coalition focused on ensuring the long-term survival of tortoises and freshwater turtles. Later joined by the Shellshock Campaign of the European Association of Zoos and Aquaria, the TCF has expanded to become a broader-based partnership of several leading turtle conservation organizations and individuals. The TCF provides strategic funding for conservation projects focused primarily on Critically Endangered or Endangered tortoises and freshwater turtles. [**www.turtleconservationfund.org]**

Turtle Survival Alliance (TSA)

Established in 2001 as an IUCN Task Force of the TFTSG, the TSA was founded as an independent NGO in 2008. The mission of the TSA is transforming passion for turtles into effective conservation action through a global network of living collections and recovery programs. The TSA works in range countries where endangered chelonian species occur, developing the capacity for turtle conservation through training and capacity building, and generally emphasizing programs with a captive component (headstarting, captive breeding, and rescue). The TSA is committed solely to turtle conservation, and operates under a singular, overarching commitment: zero turtle extinctions in the 21st century. Since forming, the TSA has become recognized as a global force for turtle conservation, capable of taking swift and decisive action on behalf of critically endangered chelonians. [**www.turtlesurvival.org]**

Turtle Conservancy / Behler Chelonian Center (TC/BCC)

Founded in 2005 as the BCC, the TC was created as its umbrella organization in 2009. The mission of the TC is to ensure that turtles and tortoises flourish worldwide and to promote the conservation of chelonian habitat around the world. The TC/BCC focuses on those cases where captive breeding and protection in native habitats reinforce each other; that is, where there is a synergistic interaction between *in-situ* and *ex-situ* conservation. The TC purchases and permanently protects land where necessary and feasible, and focuses on education to help promote understanding of the conservation consequences of human actions on turtles, both positive and negative. [**www.turtleconservancy.org]**

Chelonian Research Foundation (CRF)

Founded in 1992, 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 publishes the peer-reviewed professional turtle journal *Chelonian Conservation and Biology* as well as the *Turtle and Tortoise Newsletter* and *Chelonian Research Monographs*, including the comprehensive TFTSG-associated project on *Conservation Biology of Freshwater Turtles and Tortoises*. CRF also provides annual support of turtle research through its Linnaeus Fund. [**www.chelonian.org]**

Conservation International (CI)

Founded in 1987, the mission of CI is to build upon a strong foundation of science, partnership and field demonstration, to empower societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity. CI imagines a healthy, prosperous world in which societies are forever committed to caring for and valuing nature, for the long-term benefit of people and all life on Earth. CI applies innovations in science, economics, policy and community participation to protect the Earth's richest regions of plant and animal diversity in the biodiversity hotspots, high-biodiversity wilderness regions and key marine ecosystems. [**www.conservation.org]**

Wildlife Conservation Society (WCS)

Founded in 1895 as the New York Zoological Society, the mission of WCS is to save wildlife and wild places worldwide. This is done through science, global conservation, education and the management of the world's largest system of urban wildlife parks, led by the flagship Bronx Zoo. Together these activities change attitudes towards nature and help people imagine wildlife and humans living in harmony. WCS is committed to this mission because it is essential to the integrity of life on Earth. [**www.wcs.org]**

San Diego Zoo Global (SDZG)

Founded in 1916, San Diego Zoo Global focuses on conservation and research work around the globe and educates millions of individuals a year about wildlife. The Zoo also manages the San Diego Zoo Safari Park, which includes a native species reserve, and the San Diego Zoo Institute for Conservation Research. [**www.sandiegozoo.org/conservation/globalactionteam**]

International Union for the Conservation of Nature (IUCN)

Founded in 1948, the IUCN includes sovereign states, government agencies, and non-governmental organizations in a unique world partnership of over 1000 members spread across some 160 countries. IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. IUCN supports global alliances to safeguard natural resources at local, regional, and global levels. **[www.iucn.org]**

Species Survival Commission (SSC)

Established in 1949 as one of six Commissions of the IUCN, the SSC is a science-based network of about 8000 volunteer experts and over 100 Specialist Groups, Red List Authorities, and Task Forces, all working together towards achieving the vision of "A world that values and conserves present levels of biodiversity." The SSC produces the IUCN Red List of Threatened Species, the global standard for assessing extinction risk. **[www.iucn.org/about/work/programmes/species/; www.iucnredlist.org]**

Turtle Conservation Coalition