CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

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CONSERVATION OF ASIAN TORTOISES AND FRESHWATER TURTLES: SETTING PRIORITIES FOR THE NEXT TEN YEARS

Recommendations and conclusions from the workshop in Singapore, February 21-24, 2011

The attached information document has been submitted by the United States of America in relation to agenda item 18[*].

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Conservation of Asian Tortoises and Freshwater Turtles: Setting Priorities for the Next Ten Years

Recommendations and Conclusions from the Workshop in Singapore, February 21-24, 2011

Compiled by **Brian D. Horne**, **Colin M. Poole** and **Andrew D. Walde**

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CONSERVATION OF ASIAN TORTOISES & FRESHWATER TURTLES WORKSHOP

On the cover

Clockwise from left:
Wild-caught adult Impressed Tortoise Manouria impressa for sale in a food market in Guangzhou, China. Photo by Liana Joseph

A male Red-crowned Roofed Turtle *Batagur kachuga* in breeding color on the Chambal River, Uttar Pradesh, India. Photo by Sheena Koeth

Turtles for sale in the pet market in Guangzhou, China. Photo by Liana Joseph

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Table of Contents

Photo by Peter Praschag

Turtles for sale in the open markets of Dhaka, Bangladesh.

Introduction

Asia is a vast continent, with varied habitats and the world's most species rich and diverse turtle fauna. In 1999, due to a growing concern about the plight of Asian turtles, a meeting was convened in Phnom Penh, Cambodia. The focus of the meeting was to discuss the status and the burgeoning trade of wild turtles for consumption, traditional medicines, and the pet trade that could be measured in tons of living turtles being traded daily in open markets throughout Asia. The meeting revealed that the situation was far worse than any individual group or region had previously imagined. Sadly, many Asian chelonians were headed towards extinction at an unprecedented rate and immediate conservation actions were necessary. Notable turtle conservation initiatives that arose shortly thereafter include the Turtle Conservation Fund (TCF), the Turtle Survival Alliance (TSA), and the Asian Turtle Conservation Network (ATCN).

Significant strides have been made since the 1999 workshop, such as the last known female *Rafetus swinhoei* being paired with a male at the Suzhou Zoo in China. Notably no species of turtles has gone extinct and a small number of species thought to be extinct was rediscovered (e.g., *Cuora yunnanensis* and *Siebenrockiella leytenesis*). The Burmese Roofed Turtle (*Batagur trivittata*) an additional species feared to be extinct in 1999 was rediscovered in the remote Chindwin River Valley in northwestern Myanmar where upon an integrated recovery program was initiated which combines captive breeding, head-starting, and field conservation. This has resulted in the known global population of these turtles to grow from just seven individuals to over 400. Already a great conservation and management success, the next phase of this project will be to release some of these young back into the native rivers, where mitigation of threats and education of the local people will ensure its survival.

However, the trade in wild caught turtles and turtle products (e.g., meat, shell, eggs, and cartilage) is still the number one problem facing global turtle populations. As long-lived vertebrates, which have a reproductive strategy that is reliant on adults living for numerous decades, increases in annual adult mortality can rapidly cause populations to decline or collapse. Moreover, such populations are slow to recover as juvenile turtles naturally have high mortality rates and often require more than a decade to reach sexual maturity. Failure to enforce local and international laws continues to hinder progress and legal loopholes provide avenues for wildlife traders to skirt the legal requirements of trading in endangered species.

In response, a three-day workshop on the plight of Asia's tortoises and freshwater turtles and their conservation was held in Singapore (February 21st – 24th, 2011) to detail how turtle conservation within the region has progressed, and to identify avenues for future action. Nearly 70 delegates from 17 countries – including 14 Asian nations – attended. Wildlife Reserves Singapore (WRS), the Wildlife Conservation Society (WCS), and the TSA hosted the workshop in collaboration with the Wildlife Reserves Singapore Conservation Fund, San Diego Zoo Global, the IUCN Tortoise and Freshwater Turtle Specialist Group (TFTSG), and Kadoorie Farm and Botanic Garden.

A primary directive and the basis of the workshop, participants were tasked with looking back at the last decade of turtle conservation since the pivotal meeting in Phnom Penh, Cambodia, in 1999 that first brought together the region's turtle experts. By assessing the past eleven years, participants were able to identify what actions worked well, which ones did not work as well as hoped, and which recommendations/priorities had not been adequately addressed. Next, the participants were asked to look forward to determine emerging trends and new developments and dilemmas/challenges in the continuously changing habitat impacts and market trade in turtles and turtle products.

Herein, we present a set of recommendations and conclusions arising from presentations, discussions, and break-out sessions at the workshop. The first set of overall recommendations represent the immediate steps necessary for staving off extinction of Asia's most endangered turtles. These recommendations are of the highest priority.

Key policy recommendations are then made, arising from an International Union for Conservation of Nature (IUCN) Red-Listing process that was incorporated as part of the Singapore workshop and a specific session on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The Red List ranks the species in terms of how imperiled the individual species are, and recommended changes in rankings reflect how species' present status and survival prospects are compared to previous years. These recommendations dovetail into recommendations for proposed changes to the CITES listing of Asian turtles and how specific species need to be more strictly regulated and supervised in their international trade to protect wild populations. The key policy recommendations should be pivotal in encouraging participating countries to enforce existing laws and regulations and in some cases create new laws or regulations.

Two genera have been identified as priority groups as they make up a large percentage of the most critically endangered turtles in Asia. This is followed by a section on emerging threats and includes recommendations for dealing with these new issues. After which we detail a number of emerging opportunities for turtle conservation in Asia. We then detail two potential species for pilot reintroduction programs. Before we conclude, we detail species-specific recommendations for the 36 confirmed and proposed Critically Endangered Turtles and Tortoises in South and Southeast Asia, and lastly, we have a short section on the need to gather information on species' ranked as Data Deficient in order to determine such species population status.

I. Priority Recommendations

The recommendations below are not ranked and are considered of equal importance.

a. Globally integrated assurance colonies must be created for Critically Endangered and Endangered species of freshwater turtles and tortoises in Southeast Asia as outlined in Table 1 and Table 2. A goal of three separate assurance colonies with a minimum of 25 adult male and 25 adult female founders per colony will maximize the retention of genetic diversity and minimize the risk of catastrophic loss of a colony due to events such as infectious disease or natural disaster. These assurance colonies must be aligned with field conservation efforts so that captive bred offspring can supplement wild populations or re-populate habitats where turtles have been extirpated once the reason for the population decline has been sufficiently addressed. The utmost effort should be directed towards creating breeding programs, which exchange stock from zoos and private individuals that already maintain captive turtles, as well as supplementation from confiscated animals in the trade, and not removing additional animals from the wild.

b. All Critically Endangered (36) and Endangered (21) species need focused in-situ conservation action (as listed in Tables 1 and 2). This should include a minimum of one legally designated protected area that encompasses the necessary habitat for the species to complete all life stages, as well as being staffed with adequate anti-poaching enforcement personnel. This may entail the creation of new protected areas for these species and efforts should be made to provide coverage for multiple species of Critically Endangered and Endangered turtle species. In addition, the management of all current, and any newly created areas important for the conservation of Critically Endangered and Endangered turtles, must have long-term management plans that are in line with the natural history of the species they are protecting.

c. Governments must rigorously enforce existing laws and regulations concerning all trade — both national and international — in freshwater turtles and tortoises, and penalties for violation need to be levied to the fullest extent of the relevant laws. Particular attention by law enforcement officials needs to be directed at preventing wild caught Critically Endangered (Table 1) and Endangered (Table 2) species, as well as their eggs, meat, and shells, from being traded both nationally and internationally.

d. The identification of field localities is of the utmost priority when there is a complete lack of data or limited information on species-specific field localities (i.e., species only known from the markets or species that have limited data on the existence of multiple wild populations within restricted ranges). Therefore, field surveys are essential to identify field localities for 15 Critically Endangered species and five Endangered species so that remnant wild populations can be safeguarded (as listed in Tables 1 and 2).

Photo by Moz Images

A wild caught Indian Peacock Softshell Turtle *Nilssonia hurum* awaiting sale in a market in central Dhaka, Bangladesh. In the background are various species of the Indian Flapshell Turtle *Lissemys sp*.

II. Policy Recommendations

a. Updates to IUCN Red List Status

The IUCN Red List status of 85 taxa was provisionally assessed (see Table 3) in a session involving the majority of workshop participants. The following recommendations emerged: Thirty-four species required no change from their present assessment, two species may qualify to be 'down-listed' by a single category, 18 species warrant 'up-listing' by a single category, two species may move up two categories, 12 species which were not previously included in the Red List were provisionally assessed, and assessments for 17 species were deferred pending the *Cuora* workshop or other additional input.

This resulted in 36 species now being proposed to be ranked as Critically Endangered*, 21 as Endangered*, ten as Vulnerable*, six ranked as Near Threatened*, three as Least Concern*, and the remaining nine classified as Data Deficient* or deferred to a later date for status updates.

* see glossary for explanation of terms

Recommendation

The IUCN Tortoise and Freshwater Turtle Specialist Group will take these recommendations forward to formally update the status of these species on the IUCN Red List.

Photo by Carrie Stengel

Malayan Box Turtle *Cuora amboinensis* being weighed for sale in Jakarta, Indonesia.

b. Updates to CITES Statuses

Thirteen species were recommended to be included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II, allowing limited, regulated and reported international trade, and some 25 species were suggested for transfer from Appendix II to Appendix I, prohibiting international commercial trade (see Table 4). All the Chinese and Vietnamese endemic *Cuora* species were recommended for transfer to Appendix I, as well as all species ranked Critically Endangered in the Red List and continuing to be in international trade, including *Platysternon megacephalum*, *Batagur borneoensis*, *Heosemys annandalii*, *Heosemys depressa*, *Mauremys annamensis*, *Mauremys mutica*, *Nilssonia formosa*, *Nilssonia leithii* and *Siebenrockiella leytensis*. In addition, it was recommended that several species believed to be unsustainably traded internationally as a result of widespread illegal collection and trade: the Indian Flapshell Turtle, *Lissemys punctata*, the Impressed Tortoise, *Manouria impressa*, Cantor's Softshell Turtle, *Pelochelys cantorii*, and Bibron's Softshell Turtle, *Pelochelys bibroni* also be transferred to Appendix I. Appendix I status would strengthen the enforcement options available to wildlife authorities in countries of origin, transit, and destination.

Recommendation

All participants will work with their national CITES Management Authority to propose uplistings relevant to their country and support them through the provision of appropriate scientific data.

Photo by Uzma Noureen

Calipee from a large South Asian Softshell Turtle *Nilssonia sp*. being dried along the Indus River of Pakistan in preparation for its sale and eventual export to China.

III. Priority Genera

Two genera (*Batagur* and *Cuora*) are singled out due to the high percentage of species within each genus being Critically Endangered. Five species (83%) of *Batagur* and 10 species (90%) of *Cuora* are Critically Endangered. Incredibly, these 15 species comprise greater than 40% of all Critically Endangered turtles in South and Southeast Asia. These two genera clearly illustrate opposite ends of the spectrum from an Asian chelonian conservation perspective; *Batagur* sp. are large river turtles requiring large rivers and are hunted for human consumption, while the *Cuora* are relatively small terrestrial and semi-terrestrial species that are intensively collected for the pet trade and traditional Eastern medicines. The issues concerning these two genera are outlined below and species specific recommendations given in Section VI.

a. *Batagur*

Photo by Win Ko Ko Ko

Sub-adult male Burmese Roofed Turtle *Batagur trivittata* being prepared for release into the Chindwin River of Myanmar after being head-started at the Yadanabon Zoo in Mandalay.

Turtles in the genus *Batagur* are large hardshelled river turtles and are all highly sought for human consumption, mainly due to their size. They are especially vulnerable to being over hunted as they congregate at favored nesting beaches during seasonal nesting periods. There has been a marked increase in collection of both adults and eggs in the past few decades, which has resulted in little to no recruitment into the breeding populations. In addition, an increase in dam projects as well as commercial sand and gold mining on many of the region's rivers has altered riverine habitats to the point that they are no longer suitable for large river turtles. This has resulted in all species of this genus being severely depleted across all of their former range. It is now necessary that assurance colonies be created for all six Batagur species. Integrating assurance colonies and subsequent captive born offspring with field conservation programs are essential for their long-term survival and eventual population recovery. As unregulated take and over hunting still occurs with little or no law enforcement, establishment of these assurance colonies must be completed quickly as for some of the species since few wild *Batagur* specimens/ individuals and/or populations still exist. Additionally, all efforts should be made to reduce the illegal take of these species.

b. *Cuora*

Photo by Chen Tien-Hsi

Yellow-margined Box Turtle *Cuora flavomarginata* is facing increased hunting pressure as its value in the pet trade is on the rise.

Asian Box Turtles within the genus *Cuora* represent one of the greatest challenges in the goal of preventing extinction of any species of turtles within the next decade. Numerous species are on the precipice of extinction with only a handful of specimens being known to science and often the few animals that are within assurance colonies have limited captive breeding success and/or produce a biased sex ratio of hatchlings. One species still lacks reliable/confirmed locality data and several species may be nearly or fully extinct in the wild. In addition, the species within this genus often command the highest prices of any turtles within both the international pet trade, the investment trade for turtle farming, and the trade of turtle products (flesh and bones) for traditional eastern medicine. All this coupled with habitat destruction and near insatiable demand for the rarest specimens has created a critical situation for this genus' conservation.

IV. Emerging Threats

a. Internet Trade

There is an increasing volume and variety of turtles being sold as pets on the internet, with much of this trade appearing to be originating in Asia. It is worrisome that many of these turtles are some of the most Critically Endangered species from across the globe. Numerous accounts of species such as wild caught adult Ploughshare Tortoises, *Astrochelys yniphora*, Philippine Pond Turtle, *Siebenrockiella leytensis*, and the Sulawesi Forest Turtle, *Leucocephalon yuwonoi* being offered for sale have been reported. All three of these species are Critically Endangered with highly restricted ranges. Furthermore, very limited numbers if any are being reproduced in captivity hence the majority seen for sale are almost certainly wild caught individuals. This marks a major shift in the way wildlife dealers are promoting the sale of these species. The internet enables the two parties to remain anonymous throughout the transaction. Conventional trade monitoring is limited in its ability to accurately account for the numbers of species and individuals traded, while law enforcement is limited in what it can do to halt such trade.

Recommendation

Relevant national authorities and internet forum operators (nationally and internationally) need to place more attention on controlling illegal trade in wildlife over the internet.

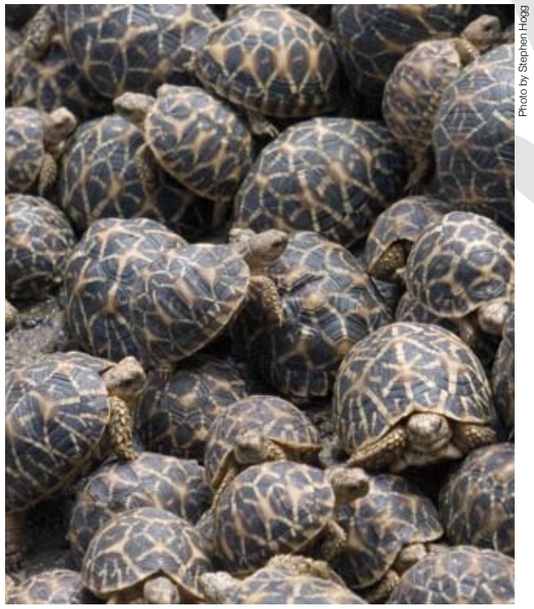

Photo by Stephen Hogg

Large numbers of juvenile Indian Star Tortoises *Geochelone elegans* are smuggled from India, Pakistan, and Sri Lanka to the pet markets in Asia, Europe, and the United States. Confiscations of several hundred in a single consignment are becoming more frequent in cities like Bangkok, Kuala Lumpur, and Jakarta.

b. Increase in Turtle Farming and Resulting Changes in Market Structure

A notable change in the market structure of freshwater turtles and tortoises has appeared in China. Previously 'wet markets' where turtles were openly sold, primarily comprised imported wild caught stock from surrounding Asian countries. Today the majority of the market specimens are from in-country turtle farms that are producing vast numbers of the Chinese Softshell Turtle, *Pelodiscus sinensis*, the Chinese Pond Turtle, *Mauremys reevesii*, as well as the North American Red-eared Slider, *Trachemys scripta*, the Common Snapping Turtle, *Chelydra serpentina*, the Florida Softshell, *Apalone ferox*, and River Cooters, *Pseudemys concinna*. It is not clear what the exact mechanism was that led to the market shift but it is probably due to a combination of declining wild populations of turtles throughout Southeast Asia accompanied by the growing sophistication of turtle farming on a large industrial scale and better regulations. However, a significant volume of wild-caught turtles can still be seen for sale in the markets in Guangxi, Guangdong, and Hainan provinces of China, and especially in the Chinese cities of Guangzhou and Shenzhen. Also, many wild caught turtles, instead of being sold directly to the public for consumption, are now being sent directly to these large commercial turtle farms. This is due in part to the general belief of turtle farmers that wild caught turtles breed more readily than second-generation offspring of the farm bred animals. An additional factor in this trend of more wild caught animals being sent directly to farms is that many of the farms have high mortality of their breeding stock due to insufficient husbandry. There has also been a rise in the number of turtles and tortoises being sold for the high-end pet trade industry, not just in Europe and North America but also in Asia. The increased demand for rare and unique freshwater turtles and tortoises has been noted by an increased number of juvenile specimens illegally imported to Asia from countries such as Madagascar. Two of the most highly sought tortoise species are the Indian Star Tortoise, *Geochelone elegans*, and the Ploughshare Tortoise, *Astrochelys yniphora*. In addition, wild caught adults of small species such as the Black-breasted Leaf Turtle, *Geoemyda spengleri*, which is consumed for food or traditional eastern medicine to a much less degree than many of the larger species, are still frequently encountered during market surveys and are more likely intended for the pet trade than had been previously traded. Another example that shows an increase in trade is the brightly colored hatchlings of the Big-headed Turtle, *Platysternon megacephalum*.

Recommendation

Governments, academic and independent researchers, and NGO conservationists must continue researching, monitoring, and regulating, particularly in southern China, the growing turtle farming industry as well as the high-end pet trade to ensure that these industries are not negatively affecting wild turtle populations.

Photo by Win Ko Ko

Gold mining along the upper Chindwin River destroys nesting areas for the critically endangered and endemic Burmese Roofed Turtle *Batagur trivittata*.

c. Impacts of Commercial Riverine Sand and Gold Mining

The incidence of commercial riverine sand and gold mining appears to be growing across the region. Sand mining has an immediate effect as it destroys the nesting habitat for many of the large river turtles that are obligated to nest on high sandy beaches. A less obvious effect of the mining process is changes to riverbank structure, water flow, and increased water turbidity that ultimately result in loss of submerged aquatic plant growth. Associated with these changes to the system, the mining can cause reduced dissolved oxygen levels with resulting few aquatic organisms for the turtles to prey upon. Coupling these changes to the physical structure of the system, fewer prey items, and increased turbidity, the habitats become less than suitable for most turtles; hence, incapable of sustaining viable turtle populations. Gold mining also results in high levels of mercury contamination of the river system and turtles have been shown to bio-accumulate mercury. High levels of mercury have been associated with numerous developmental abnormalities.

Recommendation

Government and other authorities need to protect important sections of rivers as well as key nesting and foraging sites from commercial sand, gold, and other mining activities. The establishment of protected areas may be warranted, as it is imperative that these activities be banned from occurring in, or upstream from, sensitive habitats of Critically Endangered and Endangered river turtles.

d. Calipee Trade

Recent reports from South Asia have shown an increasing trend of trade in the dried calipee (the cartilaginous parts of a softshell turtle's shell) to China where it is consumed in a soup that has rendered the turtle cartilage into a gelatinous substance. Turtles are often slaughtered merely for this cartilage (meat and bones are often not utilized as consumption of these is prohibited under the tenets of a predominant religion in the region). Because the dried cartilage can be stored and stockpiled for lengthy periods before middlemen purchase them from rural traders it has become a lucrative industry. Furthering the problem is that enforcement is limited as it is often difficult to ascertain not only if the dried substance is calipee but also which species the dried cartilage originated from. Adding to the confusion and hiding the problem, it is often shipped in consignments labeled as something entirely different, for example 'buffalo horn'.

Photo by Péter Praschag

Dried and cleaned calippee from Ganges Softshell Turtles *Nilssonia gangeticus* is often difficult for customs officials to identify and is frequently labelled "buffalo horn" by smugglers in attempts to hide its identity.

Recommendation

Law enforcement personnel need training to identify calipee as being from softshell turtles and how to properly collect samples for DNA analysis. A DNA bar coding system to aid in species identification from such material is being developed and access to it should be made available to appropriate law enforcement agencies.

V. Emerging Opportunities

a. Conservation Genetics

With the increasing importance of assurance colonies, there is an associated increase in the need for better management of these colonies in terms of maximizing the retention of genetic diversity. In the near future, conservation genetics will play a greater role in determining the influences of in-breeding and out-breeding depression in assurance colonies with limited numbers of founders. It will also help demonstrate localized adaptations of meta-populations to specific localities. But perhaps most importantly, it will be a crucial aspect of planning re-introduction programs both in how the release animals will influence the genetic pool of the remaining wild populations as well as how the retention of specific offspring in assurance colonies will be selected. The development of micro-satellite libraries and/or species-specific genotyping will be a critical component of any program when it is necessary to institute captive breeding programs as well as programs aimed at supplementing wild populations.

Recommendation

In-depth genomic profiling needs to be developed for all 36 Critically Endangered species requiring assurance colonies. Conservation organizations, zoos, state run institutions, and private individuals that maintain such colonies must work with the academic, private, and/or state run research laboratories to achieve this goal.

b. Building Collaborations with Relevant Global and Regional Multi-national Agencies and Initiatives

In order to better combat the trade and address the escalating conservation need, especially for turtle species that have ranges that extend across geo-political borders (e.g., *Batagur affinis*, *Pelochelys cantorii*, *and Platysternon megacephalum*), there is an urgent need to raise awareness and develop better partnerships between national governments, NGOs and the developing global and regional multi-national agencies and initiatives concerning wildlife crime. Globally this should involve the International Consortium on Combating Wildlife Crime (ICCWC) which brings together the CITES Secretariat, INTERPOL, the United Nations Office on Drugs and Crime (UNODC), the World Bank and the World Customs Organization (WCO). Regionally this should involve the South Asia Wildlife Enforcement Network (SAWEN) and the Association of Southeast Asian Nations Wildlife Enforcement Network (ASEAN WEN).

Recommendation

Through targeted materials and briefings, conservationists and the NGO sector must increase the awareness of senior officials in appropriate global and regional initiatives, such as ICCWC, SAWEN, and ASEAN WEN, that wildlife trade is 'not just about tigers'. Information must be provided not only on the severity of the international turtle trade, but also on the actions necessary to prevent extinctions.

Photo by Elizabeth Bennett

South and Southeast Asia has experienced an increase in the capacity to study and conserve the regions' turtles through multi-national exchange programs aimed at training the next generation of Asian turtle biologist.

Photo by Allan Michaud

Community based turtle conservation projects such as this for Southern River Terrapin *Batagur affinis* at Sre Ambel, Cambodia are on the rise and are critical to the future of turtle populations in the region.

c. Development and Utilization of Rescue Centers

With the mounting number of conservation-dependent species being seized by law enforcement actions, it is necessary that the appropriate use of rescue centers be addressed. In-depth planning is necessary for their construction and utilization as the eco-physiological requirements of the turtles often varies widely amongst species, as well as species-specific behaviors (e.g., male-male aggression that can lead to death). However, in-range rescue facilities may also serve as quarantine center for turtles freshly removed from the trade before the transfer of these animals to appropriate assurance colonies. Or, in some cases, in-country rescue facilities may also be the base of assurance colonies, and/or head-starting facilities. Coupling this type of use for rescue facilities would underscore the importance of well-designed and managed facilities due to the potential of cross-contamination from newly arriving animals from confiscations.

Recommendation

Regional training workshops and exchanges need to be conducted and best practice manuals created by NGO's such as TSA, WCS, and WRS in conjunction with members of the Tortoise and Freshwater Specialist Group to ensure proper in-depth planning and operation of rescue centers. Existing materials from KFBG could be adapted for such use.

Photo by Rick Hudson

The use of in-range captive breeding facilities for Burmese Star Tortoise *Geochelone platynota* will play an important role in the re-establishment of wild populations of these tortoises in Myanmar.

Photo by WCS Myanmar Program

Local education, here in northern Myanmar, is critical to reducing the threats of wild turtle populations.

d. Awareness and Training Materials

There is a continuing need for up-to-date species identification materials and species identification training workshops for law enforcement officials. Such material needs to be produced in multiple languages and be well illustrated. In addition, there exists a need for training manuals that detail how best to deal with confiscated turtles in the most humane manner as well as guidelines based on individual laws of each Asian country on how to repatriate animals in appropriate locations. Such material should also cover basic husbandry requirements on a species-specific basis.

The use of new technology, especially the widespread use of cellular telephones with the ability to capture digital photographs and smartphones using urban 3G networks, should be encouraged. A centralized website for aiding with close to real-time species identification via photograph sharing software may prove to be a powerful means of assisting law enforcement officers across the region.

Recommendation

Simple and easy to use identification materials and contact networks as well as training manuals for best practices for dealing with confiscated turtles should be created by organizations such as the Asian Turtle Conservation Network as well as the Tortoise and Freshwater Turtle Specialist Group in digital and paper formats in the region's relevant local languages.

e. Evaluation of Conservation Actions

With the rapid economic and human population growth in Asia it would be prudent to not wait another ten years before reconvening this group of specialists. We suggest that a maximum of five years should elapse before another meeting is held. It is crucial that the conclusions and recommendations resulting from this 2011 meeting be re-evaluated at the next workshop of the region's turtle conservation efforts as to best focus the group's efforts and assure that these efforts are properly prioritized.

Recommendation

Meetings of the region's turtle experts and conservation practitioners should occur at no greater than five-year intervals.

Photo by Brian D. Horne

Burmese Star Tortoise *Geochelone platynota*, functionally extinct in the wild, is at a turning point of its conservation. Preparations are underway to begin re-introducing captive bred juveniles into protect habitats within Myanmar's central dry zone.

f. Re-introduction Projects

At the first Asian turtle conservation workshop in Phnom Penh, re-introduction of species from captive breeding programs was discussed particularly for species such as the Vietnamese Pond Turtle (*Mauremys annamensis*). However, this practice has yet to become highly adopted. With today's advances in captive husbandry, it is now more feasible than ever to plan for such actions. The re-introduction of captive raised turtles from both rescue centers and assurance colonies will play an important role in Asian turtle conservation, especially when captive breeding programs begin to produce more offspring than what can be adequately housed in such facilities. It is imperative that such programs are well planned and researched as there will soon be a greater need for implementing such programs for a wide number of species. Additionally such programs should begin soon so that enough data can be gathered to evaluate and if necessary adjust re-introduction protocols.

Two restricted range species, the Vietnamese Pond Turtle, *Mauremys annamensis* and the Roti Island Snake-necked Turtle, *Chelodina mccordi*, are good candidates for pilot programs aimed at establishing semi-wild to wild colonies within their former ranges from captive produced stock from Asia, the United States, and Europe. Both species reproduce readily in captivity and have AZA (Association of Zoos and Aquariums) and EAZA (European Association of Zoos and Aquariums) managed breeding programs and studbooks.

It is also important to draw on the re-introduction and relocation protocols and experiences outside of Asia, e.g., the Brazilian programs for Giant Amazonian River Turtle (*Podocnemis expansa*), numerous European programs for re-introducing the European Pond Turtle (*Emys orbicularis*), as well as programs in the United States that focused on translocations of tortoises in the genus *Gopherus*. Yet, it is essential that before such re-introduction programs begin, illegal collection of animals from the wild for traditional medicine and for the pet trade must be addressed. Viable wild populations cannot be created unless targeted hunting is halted.

Recommendation

Pilot re-introduction projects need to be initiated for these two priority species in the near future in order that there is adequate time to study and refine the methodologies for conducting such projects. Lessons learned from these projects then need to be disseminated, modified, and applied to other species and localities. Organizations such as WCS, TSA, and WRS should help facilitate and direct these projects.

VI. Taxon Specific Recommendations for Critically Endangered Species

Most of Asia's turtle species are inadequately studied for effective conservation actions to be properly planned and managed. It is imperative that field studies on all Critically Endangered species that focus on life history data collection be initiated as soon as possible. This is especially relevant when such species are being heavily hunted and their habitats destroyed at an accelerated pace. Without basic information such as diet, movement patterns, and habitat usage, age to sexual maturity, reproductive potential, nesting habitat, incubation temperature regimes, and sources of natural mortality, successful management will prove to be extremely difficult, and population restoration measures will be slowed.

Hence, with the wide spectrum of both field research and conservation actions needed for the turtles of the region, we have outlined key activities that are strategically important in ensuring that no species of turtles goes extinct within the immediate future. Below is an alphabetical list of species and key activities that need to be address within a five-year period.

Batagur affinis, Southern River Terrapin
In addition to the need for establishment of assurance colonies, this species is in a position to benefit from head-starting population supplementation. The protection of entire nesting sites will be critical to the long-term survival of this species, as *B. affinis* apparently often only utilizes specific sandbars. In some river drainages, habitat conservation and rehabilitation will be necessary, especially where sand mining have changed water flow and quality as well as altered or destroyed nesting beaches.

Batagur baska, Northern River Terrapin

Photo by Rupali Ghosh

Northern River Terrapin *Batagur baska* may be one of the most endangered of all turtles as there is currently no known wild nesting population and only a small number are being maintained in captivity.

This species has virtually been extirpated from the wild. Currently there are no known wild breeding populations in India, Bangladesh, or Myanmar. Surveys are desperately needed to locate any remaining wild individuals so that they may be incorporated into assurance colonies. A male *B. baska* was observed in 2010 being slaughtered in a market in Dhaka, Bangladesh suggesting that a few individuals may still exist in the wild. Historic nesting beaches need to be identified before local knowledge is lost. Additionally, such areas need to be protected for potential future release of captive born animals back into the wild.

Batagur borneoensis, Painted Terrapin
In addition to the need for establishment of assurance colonies, little is known about the natural history/biology of this species outside of grey literature; therefore, there is a clear need for research to understand its basic biology in the wild. Unlike other members of this genus, this species leaves the rivers where it resides most of the year and nests on ocean beaches, often used by sea turtles at other times of the year. Habitat conservation and rehabilitation will be important in the survival of this species. Healthy, intact rivers will not only benefit this species, but also *B. affinis* with which it often occurs sympatrically. In addition, international commercial trade in the species probably needs to be closed, through inclusion in CITES Appendix I.

Batagur kachuga, Red-Crowned Roofed Turtle

Photo by Sheena Koeth

Red-crowned Roofed Turtle *Batagur kachuga* appears to have only one sizeable population with no verified reports from Nepal or Bangladesh in recent years.

Much like the Painted Terrapin, little is known about the natural history/biology of this species. Truly effective conservation activities will benefit from research efforts to gather this missing information. A program of community awareness and education, especially in the areas that still have nesting populations, is crucial to the continued survival of these remaining populations. As with almost all of the Batagurs, a network of assurance colonies both within its natural range and abroad is needed.

Batagur trivittata, Burmese Roofed Turtle

Photo by Andrew Odum

This image, at this size, is not so sharp. Consider replace with better quality photo if possible.

The international pet trade has made Roti Island Snake-necked Turtle *Chelodina mccordi* extremely rare in the wild. Yet as habitat remains there is potential for offspring produced at US and European zoos to be re-introduced once anti-poacher measures are in place.

Once thought to be extinct, its rediscovery in 2002 underscores the need for additional surveys of this species so that extant wild populations and their habitats can be effectively protected. Besides the on-going conservation efforts on the Chindwin River, there needs to be follow up efforts on conservations of the remnant population that may or may not still exist on the Dokhtawady River. There is a pressing need to diversify the captive holdings of this species as all of the captive individuals are housed within two facilities inside Myanmar. No breeding groups exist outside of Myanmar.

Chelodina mccordi, Roti Island Snake-necked Turtle
Since its description less than 20 years ago, this extremely range restricted species (known from a limited number of shallow wetlands on Roti Island, Indonesia) has been heavily collected for the pet trade. There is a strong need for monitoring of these isolated populations as well as research into the basic biology of this species. Due to the pressure of the international pet trade, it will require establishment of protected areas within its range as well as habitat conservation and rehabilitation as some of the few wetlands where it is found have been drained for agriculture or converted to rice fields. This species would benefit greatly from strict legal protection and the embargo of all international export, both of which are necessary precursors to the initiation of any reintroduction projects.

Chitra chitra, Asian Narrow-headed Softshell Turtle
Hatching success of wild nests has been severely reduced due to changes in the flow patterns of many of the rivers that once supported large populations of this species as a result of the creation of dams. The planned release of large amounts of water during times of the year when the rivers historically had low water levels are inundating sandbars that historically remained above the water line for the entirety of the nesting season. The developing embryos of this species cannot survive these inundation events; hence, the low levels of annual recruitment. Conservation management for this species needs to focus on creative means for preventing nest inundation as well as reduction of the number of adults animals hunted each year for human consumption. Although the species is capable of extremely large clutch sizes captive breeding for the sake of head-starting turtles is proving to be difficult as the hatchlings and juveniles are very susceptible to bacterial infections. In addition, the juveniles are very sensitive to changes in temperature. It is recommended that the majority of hatchlings produced from captive breeding be immediately released into suitable habitat to avoid the high levels of mortality often associated with captive rearing.

Chitra vandijki, Burmese Narrow-headed Softshell Turtle

Photo by WCS Myanmar Program

Burmese Narrow-headed Softshell Turtle *Chitra vandijki* is endemic to Myanmar and is in dire need of a range wide population estimate.

Commercial sand and gold mining, as well as fishing with high explosives, are affecting both the near term and long term survival of this species. Increased environmental protection of this species' riverine habitats needs to be given greater emphasis in the conservation planning for this species. In addition, further investigations into how best to rear this species in captivity is warranted. To date this species has not been bred in captivity and it remains unknown if, much like the other species in this genus, the juveniles will prove to be difficult to maintain in modest in-country facilities.

Cuora aurocapitata, Yellow-headed Box Turtle
Described as a new species only a little more than two decades ago, this species has garnered much attention by the international pet trade. Although the species was probably never abundant in recent times, the collection for the pet trade has left possibly as few as 150 animals in the wild. It is of the utmost importance that globally integrated assurance colonies continue to exchange offspring in order to maintain the highest genetic diversity as possible. Remaining wild animals need to be both protected and studied as knowledge of much of the basic biology of this species is lacking robust analysis. Specific research attention needs to be directed at better understanding the reproductive biology and nesting ecology of both wild and captive animals so that planning/implementation of programs aimed at supplementing and/or creating new wild populations can be most effective. The limited annual reproductive potential of this species and the small number of founder animals in breeding programs will slow initial growth of conservation efforts. Hence, management plans need to be aligned towards long-term sustained recovery efforts, some of which may benefit from additional survey efforts. In addition, illegal trade in this and the other *Cuora* species noted below needs to be addressed by a variety of measures, including possibly uplisting to CITES Appendix I and applying the stronger enforcement options that this entails.

Photo by Orlo Hagen

Yellow-headed Box Turtle *Cuora aurocapitata* is one of the last rare Chinese aquatic Cuora species that are still found occasionally for sale in markets and attention needs to be placed on securing remaining wild populations of before they are extirpated.

Photo by Tim McCormack

Indochinese Box Turtle *Cuora galbinifrons* is an extraordinarily beautiful turtle that has long been prized by hobbyist but it is still collected in large numbers for the Chinese food markets. In addition to the thousands sold in the food markets each year similar numbers are sold in the pet markets of southern China, but without expert care many die quickly.

Cuora bourreti, Bourret's Box Turtle
Overhunting for food markets has greatly diminished the largest historical wild populations of this species in Vietnam, although small populations may exist in Cambodia and Laos. Current *ex situ* (within the natural range of the species) breeding projects in Vietnam are having modest success. However, in order to recover this species to its former population levels, not only will there need to be greater enforcement of anti-poaching laws via better targeted patrolling and increased CITES compliance, the captive breeding programs will need to be on a greater scale as the females of this species have a relatively limited annual reproductive potential. Hence, the rate of recovery for this species will be more heavily reliant on reducing the mortality rates of adult breeding females in the wild than supplementing wild populations with head-started captive born individuals.

Cuora flavomarginata, Yellow-margined Box Turtle
One of the more common species within this genus in terms of sheer numbers (substantial numbers are produced each year in commercial turtle farms in China and Taiwan with little attention to geographic origin of their stock) this species has still suffered great declines in wild populations. Yet, some wild populations still exist in China, Taiwan, and Japan (southern Ryukyus Islands) and these should be closely monitored and protected. Surveys should also be carried out in the mainland in order to identify viable wild populations for strict protection and ecological and genetic study as these populations continue to be under pressure from poachers hunting for additional wild stock for the commercial turtle farms. Genetic studies on biogeography of this species are needed to best determine how to properly segregate captive populations to assure that regional genetic differences are accounted for in the captive management of this species.

Cuora galbinifrons, Indochinese Box Turtle
Habitat destruction and intensive hunting have caused rapid declines in this species, and until recently, this species had low survival rates in captivity. However, with recent advances in captive husbandry techniques there is hope that captive breeding may eventually play a larger role in the conservation of this species. Yet, due to this species' relatively limited annual reproductive potential, a decrease in the human-induced adult mortality will have the greatest positive impact on the recovery of wild populations. Hence, greater protection of the remaining wild populations should be of the highest priority for this species. This may entail greater habitat protection along with increased anti-poaching programs. Surveys to identify additional localities should be a secondary priority.

Cuora mccordi, McCord's Box Turtle
Only recently has this species been physically documented in the field, thereby verifying the first reports that were based only on locals making identifications from photographs. Sadly, it appears that perhaps only a scattered few individuals may remain in the wild. With approximately 150 animals remaining in captivity it is extremely important to design and implement captive breeding programs that will exchange animals in order to maintain the highest levels of genetic diversity as possible. Field surveys should be carried out in known site(s) and nearby suitable habitats with an aim to determine the present wild status of this species and come up with the most appropriate actions for the wild individuals. Remaining habitat needs to be set aside and protected for future reintroduction programs.

Photo by Tim McCormack

Keeled Box Turtle *Cuora mouhotii* is one of the last rare aquatic Cuora species that are still found occasionally for sale in Chinese markets and attention needs to be placed on securing remaining wild populations of before they are extirpated.

Cuora mouhotii, Keeled Box Turtle
Although it is a widely dispersed species with numerous isolated populations, it has suffered greatly due to collection for both the pet trade and for human consumption along with widespread habitat loss. To date wild-caught adult specimens of this species remain prevalent in Chinese pet markets. Currently Cuc Phuong National Park in Vietnam is the only actively protected area for this species although its range extends west to Assam, India. Additional areas that still have viable wild populations need to be identified and effective protection measures in the field and against illegal trade need to be adopted. In addition, analysis of genetic diversity should be conducted to determine if in fact this species is one wide ranging highly phenotypically varying species or if it is indeed multiple species yet to be described.

Cuora pani, Pan's Box Turtle
Habitat destruction coupled with the pet trade has greatly affected the population size of this species. These actions have been particularly damaging, as it appears that this species was never known to be locally abundant within living memory. Very few specimens of this species in captivity have known locality data as most were sold into the pet trade via middlemen with the total known number of specimens totaling less than 250 animals. No known extant populations are currently being heavily managed, hence it is a priority to identify and protect any remnant populations, particularly in the provinces of Gansu and Shaanxi, and in the Shennongjia Forest district (some parts of which are a nature reserve) of the Hubei province. The creation of such protected areas may allow for future reintroductions of this species from captive breeding projects as with recent advances in captive husbandry this species is now breeding fairly well in captivity.

Cuora picturata, Southern Vietnamese Box Turtle
The type locality (area of origin) of this species has only very recently been reported to science. In addition to the creation of assurance colonies within the natural range of the species, there is a great need to assure that the small wild population(s) is/are not hunted to extinction. Increased anti-poaching programs need to be supported/expanded and efforts need to be made to curb its illegal trade. Following these actions, in depth natural history studies are warranted.

Cuora trifasciata, Chinese Three Striped Box Turtle

Photo by Chen Tien-Hsi

With limited wild populations remaining in Hong Kong and poaching pressures still very high, uplisting Chinese Three-striped Box Turtle *Cuora trifasciata* to CITES appendix 1 may be warranted to help prevent the poaching of the few remaining wild animals.

Very few animals are believed to remain in the wild, as this species is highly valued in traditional eastern medicine. Turtle farms in mainland China are continuing to purchase wild caught animals including some smuggled from Hong Kong even though such farms literally have thousands of animals as breeding stock. The notion that a species is 'conserved' even when there are no viable wild population that can continue to experience natural selection is widely held and can be a major hurdle for the true conservation of this species. It is imperative that the last remaining wild populations be afforded greater protection (e.g., the population in Hong Kong); including attempts to reduce poaching pressure by increasing CITES status to Appendix I. Additional actions should include the creation of species-specific reserves and exhaustive enforcement efforts including anti-poaching patrols in both the field and markets. With on-going as well as future genetic work, it will hopefully be possible to reintroduce animals to appropriate geographic ranges in the near future.

Cuora yunnanensis, Yunnan Box Turtle
Thought to be extinct for numerous decades this species has only recently been 'rediscovered' to science. A very limited number of animals are now being safely guarded in a protected location. Due to the highly justifiable fears of theft, the exact location of these animals is undisclosed. Although this species is not highly fecund, captive breeding will play the central role in its recovery as less than 30 animals are known to exist and the possibility of greater numbers remaining in the wild is slim. Improved captive conditions and careful record taking are recommended for this species to aid future assurance colonies. Furthermore, it is feared that any remaining wild populations have limited growth potential due to habitat destruction and the incredible demand for this species by 'high end' turtle hobbyists who are willing to pay tens of thousands of US dollars for a single individual. Turtle researchers, wildlife managers, and the local villagers are monitoring the habitat but further protection measures are still warranted.

Cuora zhoui, Zhou's Box Turtle
With less than 100 animals surviving in captivity (less than 30 are from wild origin) and the absence of verified type locality information this species has limited chances for recovery of wild populations. It is of the highest priority to find this species in the wild before local wildlife hunters remove any remaining specimens. Very few specimens have entered the pet trade in the past several years indicating that this species is becoming even scarcer in the wild. With the limited number of animals within AZA (Association of Zoos and Aquariums) and EAZA (European Association of Zoos and Aquariums) there needs to be greater effort in coordinating with private turtle breeders to assure that important founder individuals are well represented in the breeding programs. If the type locality is found, it will be important to immediately create protected areas for safeguarding the remaining wild animals as well as maintaining habitat for future re-introduction programs.

Geochelone platynota, Burmese Star Tortoise
Currently, this species is thought to have no viable populations left in the wild. It has even been effectively eliminated from two protected wildlife sanctuaries. The demand for this species in the high-end pet trade has pushed this species to near extinction. There is an immediate need for expanded *in-situ* and *ex-situ* assurance colonies (albeit four government-run facilities and one private-run one have modest assurance colonies that are producing hundreds of hatchlings per year). However, there needs to be creative planning on how to begin to return juveniles to areas where appropriate habitat remains. Community based planning that institutes economic incentives to the people living within the tortoise habitat may be best way to prevent poaching of re-introduced juveniles. Stricter regulation of trade, including effective enforcement to combat illegal trade in destination countries, is an essential supporting measure to reduce poaching.

Heosemys annandalii, Yellow-headed Temple Turtle
This relatively large wetland turtle is often traded in large quantities, as evidenced by the size of recent trade seizures. Yet, there are no estimates of the sizes of wild populations. In addition, to the creation of assurance colonies within the natural range of the species, greater effort is needed in identifying populations in protected areas for long-term management of viable populations. Targeted local enforcement and international cooperation is needed to prevent animals from entering the international trade of turtles to China; transfer to CITES Appendix I would assist this.

Heosemys depressa, Arakan Forest Turtle

Photo by Brian D. Horne

Arakan Forest Turtle *Heosemys depressa* although endemic to Myanmar is frequently encountered in the markets of southern China.

Only recently rediscovered to science after many decades of absence this endemic species has atypically garnered little sustained interest in the international pet trade. However, export from Myanmar to China for human consumption continues and this needs to be effectively addressed. Habitat destruction and local consumption is also playing a key role in its decline. Recent fieldwork has identified populations within protected areas that are in need of greater conservation planning and management. It is a priority to continue this field research as well as expand it to include detailed studies on its reproductive biology and nesting ecology. CITES Appendix I listing appears justified to enable effective enforcement once animals are smuggled out of Myanmar.

Leucocephalon yuwonoi, Sulawesi Forest Turtle
A limited number of field studies have been conducted on this species with very little being known about the biology and natural history of this recently described species. Therefore, research is needed to elucidate specific habitat requirements of this species as they relate to how best to design and manage captive assurance colonies. Stricter regulation of international trade appears needed to complement Indonesia's domestic measures.

Photo by WCS Myanmar Program

Asian Brown Tortoise *Manouria emys* as the largest tortoise in Asia is highly sought after for human consumption, particularly during Lunar New Year festivals.

Manouria emys, Asian Giant Tortoise
While there is an immediate need for additional surveys and research on this species, concerted effort needs to be directed towards education and community awareness as well as stricter trade regulation and enforcement to reduce and eventually halt the trade in this species. As a large tortoise, it is commonly harvested for food, especially for special events and festivals. Habitat conservation and rehabilitation will be needed as considerable logging and forest conversion for agriculture has occurred throughout its known range.

Manouria impressa, Impressed Tortoise
Recent advances in captive husbandry as it pertains to mimicking the tortoises natural diet has resulted in an increased number of tortoises being produced in captivity. Thus, there is now greater potential to have assurance colonies (both within the species natural range and abroad) for this species that was once considered too delicate to maintain in captivity. However, few autecology studies have been conducted on this species and no range wide comparisons have been made. The creation of protected areas specifically for this species is greatly warranted as is upgrading its CITES status to Appendix I, as this species is still regularly traded within Asia.

Mauremys annamensis, Vietnamese Pond Turtle
This species has suffered from habitat destruction that has coincided with the rapid human population growth in central Vietnam, which has resulted in much of its habitat being converted into paddy fields. Additionally the demand for the turtle's blood as a traditional remedy for heart disease has cause wild populations to be under exceedingly high collection pressure. Yet, approximately 100 hectares of habitat near the type locality for the species has been identified for a reintroduction program and establishment of a community based wildlife protected area. This program's research into how best to conduct re-introduction programs will provide much needed insight into similar programs for additional turtle species. The species is currently included in CITES Appendix II; an evaluation whether it warrants inclusion in Appendix I is desirable.

Mauremys mutica, Yellow Pond Turtle
This species is farmed in large numbers but there are now few reports of finding wild individuals in habitats where it previously occurred exclusive of Japan. Finding and protecting remnant populations is a priority for maintaining genetic diversity of this relatively widely dispersed turtle. In addition, genetic studies need to be conducted to document possible differences between populations in Vietnam and China. As a critically endangered species subject to an unknown but believed significant level of illegal trade, transfer from CITES Appendix II to Appendix I would be appropriate.

Mauremys nigricans, Chinese Red-necked Turtle
Not seen in the wild for many years, this is another species for which intensive field surveys are required to ascertain if any functioning populations remain in the wild. If located, additional research into their basic biology and natural history could aid conservation efforts. Additionally, phylogenetic studies are required to identify possible variability within the species, information that may direct future release and conservation projects. However, this species does breed well in captivity. Better management of assurance colonies with an aim to produce juvenile individuals for future reintroduction should be initiated once sufficient habitat has been identified and properly protected.

Nilssonia leithii, Leith's Softshell

Photo by Deepak Veerappan

Leith's Softshell Turtle *Nilssonia leithii* having been greatly reduced across its range in peninsular India is lacking in dedicated conservation efforts, populations need to be identified for targeted anti-poaching programs.

Much like the other softshells, this species would benefit from nest site protection, hatch-and-release type programs, or possibly even head starting. In conjunction with nest site protection, there is a need for additional surveys and assurance colonies within the species natural range. The softshells are highly sought after for domestic and international trade in their body parts, therefore trade control is needed along with law enforcement and additional legal measures. Education and community awareness activities along sections of river where this species occurs could be effective at reducing adult mortality. Nest-site/egg remuneration programs could help the population grow. In addition, improvements to ponds at religious sites including the creation of adequate nesting areas, basking locations, and removal of hatchling and juvenile predators (i.e., large predatory fish) are highly warranted as often these ponds contain substantial number of adult animals.

Nilssonia nigricans, Indian Black Softshell
Once thought to be extinct in the wild; this species has been confirmed from a handful of localities underscoring the lack of complete distribution data in this part of the world. Further surveys are needed to potentially locate additional remote populations. Nest site protection along known rivers is essential for this species survival. As locals gather eggs as well as eat adult turtles, education and community awareness will be necessary. In addition, improvements to ponds at religious sites including the creation of adequate nesting areas, basking locations, and removal of hatchling and juvenile predators (i.e., large predator fish) is highly warranted as often these ponds contain substantial number of adult animals.

Orlitia borneensis, Giant Asian River Turtle
Enigmatically this species (the largest hardshelled turtle in Southeast Asia) is extremely poorly studied. To date, there is no detailed study on its reproductive biology or nesting ecology. Furthermore, as a large aquatic turtle it is being greatly impacted by hunting for export to China. To date no known viable populations are found within protected habitats; thus, it is a priority to identify populations for the possible creation of protected areas. Stricter trade regulation and enforcement are also required.

Pelochelys cantorii, Asian Giant Softshell Turtle
This softshell turtle suffers from a host of issues from habitat destruction and pollution to over-exploitation of its adults for meat and calipee for traditional eastern medicine as well as egg harvesting. This wide-ranging species needs conservation efforts on several fronts including basic surveys to better understand its distribution and research into its basic biology, particularly in the existing protected areas. An understanding of the genetic diversity is warranted as sub-populations (and possibly species) may exist which would be important from a management perspective. Because of its presence in the trade, it is recommended that a Rescue Center(s) be established to hold animals confiscated due to increased trade control. These animals can be the basis for assurance colonies, and/or head-starting programs. Without cooperation from local communities, these efforts will fail so an integrated community education program coupled with nest site protection is needed. This species is also in need of stricter trade regulation as it is often heavily traded under the pretense of being a more common species (e.g., being improperly identified as the Asian Giant Softshell, *Amyda cartilaginea*).

Platysternon megacephalum, Big-headed Turtle
This highly recognizable species continues to garner high prices on both the international pet market (juveniles) and in food markets (adults). Recently, there has been a rise in the number of hatchlings for sale in pet markets in China, but it is highly unlikely that these specimens are resulting from captive breeding and are more likely a result of a shift in what animals are being removed from the wild. Hatchlings are now commanding higher prices than adults due to their bright vivid colors that are lacking in the larger adults. Due to the relatively low annual reproductive potential and the difficulty in maintaining large numbers of this mountain stream species, conservation of this species should not rely on captive breeding to supplement wild populations. Increased efforts to protect wild populations and their

Photo by Kouevan Pipatsawasdikul

Adult Big-headed Turtles *Platysternon megacephalum* are hunted across their range for local consumption and for the food markets in China.

Photo by Sung Yik Hei

Juvenile Big-headed Turtles *Platysternon megacephalum* are strikingly colored thus the capture of wild caught juveniles is on the rise for the pet trade.

associated habitat should be prioritized along with increase anti-poaching efforts. Due to the isolated nature of this species' habitat, the taxonomic status needs study to better direct conservation efforts. Ultimately, better enforcement of existing laws at known localities is needed if this species is to remain extant at these sites. Transfer to CITES Appendix I would assist these efforts, by resulting in increased enforcement efforts and higher penalties for those caught trafficking in the species.

Rafetus swinhoei, Yangtze Giant Softshell Turtle
With only four known individuals, the situation is dire. The only known female is currently paired with a male; however, no viable eggs have been produced. One hypothesis for the lack of breeding success is that the male may be too old to produce quality and/or adequate sperm. An additional hypothesis is that the breeding pair is being maintained too far north of its natural range and that this is curtailing sperm production. Surveys must be conducted across the entire former range of this species in hopes of locating additional animals for the breeding program. The establishment of a Chinese/Vietnamese collaboration to bring together the remaining animals to increase the chances of successful reproduction and viable eggs may be extremely difficult due to the political differences between the two countries. Yet, this may provide the last hope for this species to avoid extinction.

Sacalia bealei, Beal's Eyed Turtle
This small stream turtle has garnered little attention by the turtle conservation community up until this workshop. Although this species does appear in Chinese food and pet markets it does so in rather small numbers. However, it is not known if this is the result of a lack of demand for this species or of its relative rarity in the wild. A recent field survey in its native habitats in South China has failed to produce any wild individual. Targeted surveys are needed to establish both its estimated population size and its current distribution so that appropriate conservation measures can be planned and implemented after which the designation of

Photo by Cris Hagen

Over exploitation of Beal's Eyed Turtle *Sacalia bealei* has resulted in drastic declines of animals being reported from the wild.

protected areas can be enacted. The relatively limited annual reproductive potential does not make this species a good candidate for captive breeding as a primary conservation tool to increase wild populations. Conservation efforts should focus on maintaining viable wild populations and reducing harvest for human consumption and the pet trade, including international trade regulation by inclusion in Appendix I or II CITES.

Siebenrockiella leytensis, Philippine Forest Turtle
Wild populations have only been documented relatively recently. This has spurred a high level of demand for the species in international pet trade. Although the species is also hunted for consumption locally, the illegal international pet trade in this species is the primary factor in its decline, and CITES Appendix I listing is warranted. Conservation efforts need to focus on preventing additional wild caught animals from entering the trade at the local level. Community education and locally based conservation programs are highly warranted. In addition, targeted studies on the turtles' natural history are a priority.

There is still space for a few more species photos .

VII. Life History Data Collection on Species Ranked as Data Deficient

Eight species are still listed as Data Deficient or in draft assessment by the IUCN. Targeted population studies must be initiated to determine if their populations are being adversely impacted by hunting and/or habitat destruction. With nearly all species of turtles within the region declining in numbers, it would be prudent to assume that some of these species are already in serious decline.

These species include:
1. *Cyclemys dentata*, Asian Leaf Turtle;
2. *Cyclemys enigmatica*, Enigmatic Leaf Turtle;
3. *Cyclemys fusca*, Myanmar Brown Leaf Turtle;
4. *Cyclemys gemeli*, Assam Leaf Turtle;
5. *Cyclemys oldhamii*, Southeast Asian Leaf Turtle;
6. *Cyclemys pulchristriata*, Eastern Black Bridged Leaf Turtle;
7. *Pelodiscus axenaria*, Hunan Softshell Turtle;
8. *Pelodiscus maackii*, Northern Chinese Softshell Turtle.

With reference to the species in the genera Cyclemys and Pelodiscus there needs to be more adequate and detailed guides for distinguishing between the various species, as they are difficult for the untrained individual to distinguish.

Recommendation

Government, academic, and/or NGO conservationists should initiate field research including distribution and population estimates and the impact of trade for these species lacking enough data to determine population status. Additionally, appropriate reference materials need to be developed in relevant languages to avoid confusing species identification.

Photo by Liana Joseph

Yellow-headed Temple Turtle *Heosemys annandalii* is highly sought after and often appears in shockingly large numbers in the food markets of China. Populations of these large river turtles cannot possibly sustain this high level of exploitation.

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Photo by Anders Rhodin

Large amounts of the original habitat for Roti Island Snake-necked Turtle *Chelodina mccordi* still remains relatively intact, making re-introduction projects for this species feasible.

Table 1 A List of all Critically Endangered Tortoises and Freshwater Turtle Species in Southeast Asia based on both the current Red-List and Draft Assessments.

Species	Assurance Colony(s)*	Colony(s) in Multiple Countries	Breeding Success	Surveys Needed†
Batagur affinis	>5	Y	Y	N
Batagur baska	0	Y	Y**	Y
Batagur borneoensis	>5	Y	Y	Y
Batagur kachuga	0	N	Y	N
Batagur trivittata	2§	N	Y	Y
Chelodina mccordi	>3	Y	Y	N
Chitra chitra	0	N	Y	N
Chitra vandijki	0	N	N	Y
Cuora aurocapitata	0	Y	Y	Y
Cuora bourreti	1	Y	Y	N
Cuora flavomarginata	>10‡	Y	Y	N
Cuora galbinifrons	1	Y	Y	N
Cuora mccordi	0	Y	Y	Y
Cuora mouhotii	0	Y	Y	N
Cuora pani	0	Y	Y***	Y
Cuora picturata	0	Y	Y	Y
Cuora trifasciata	>5‡	Y	Y	Y
Cuora yunnanensis	0	N	Y	Y
Cuora zhoui	0	Y	Y***	Y
Geochelone platynota	>5	Y	Y	N
Heosemys annandalii	2	Y	Y	Y
Heosemys depressa	0	Y	Y	N
Leucocephalon yuwonoi	0	Y	N	Y
Manouria emys	>5	Y	Y	Y
Mauremys annamensis	3	Y	Y	Y
Mauremys mutica	>10‡	Y	Y	Y
Mauremys nigricans	<3	Y	Y	Y
Nilssonia formosa	0	N	N	N
Nilssonia leithii	0	N	N	Y
Nilssonia nigricans	1	N	Y	Y
Orlitia borneensis	>5	Y	Y	Y
Pelochelys cantorii	0	N	N	Y
Platysternon megacephalum	0	Y	Y	N
Rafetus swinhoei	0	N	N	Y
Sacalia bealei	0	Y	Y	Y
Siebenrockiella leytensis	1	N	N	Y

* Colonies with greater than 25 adult male and 25 adult female founders,

** female mated in wild,

*** limited number of males being produced,

† Need is define by species distribution being largely unknown and/or the act of surveying will greatly reduce the imminent risk of extinction,

‡ A large proportion of these are maintained in commercial turtle farming operations,

§ All the founders in one and the majority of the founders in second assurance colony are juveniles

Table 2 A List of all Endangered Tortoises and Freshwater Turtle Species in Southeast Asia.

Species	Assurance Colony(s)*	Colony(s) in Multiple Countries	Breeding Success	Surveys Needed**
Batagur dhongoka	0	0	Y	N
Chitra indica	0	0	N	N
Geoclemys hamiltonii	0	Y	Y	N
Geoemyda spengleri	0	Y	Y	N
Hardella thurjii	0	Y	Y	N
Heosemys grandis	<5	Y	Y	N
Heosemys spinosa	0	Y	Y	N
Indotestudo elongata	<5	Y	Y	N
Indotestudo forstenii	0	Y	Y	Y
Indotestudo travancorica	0	N	Y	N
Mauremys reevesii	>10†	Y	Y	N
Mauremys sinensis	>10†	Y	Y	N
Manouria impressa	0	Y	Y	Y
Nilssonia gangetica	<5	Y	Y	N
Nilssonia hurum	<5	Y	Y	N
Palea steindachneri	>10†	Y	Y	N
Pangshura sylhetensis	0	N	Y	Y
Sacalia quadriocellata	0	Y	Y	N
Siebenrockiella crassicollis	0	Y	Y	Y
Vijachelys silvatica	0	N	N	Y

* Colonies with greater than 25 adult male and 25 adult female founders,

** Need is define by species distribution being largely unknown and/or the act of surveying will greatly reduce the imminent risk of extinction,

† A large proportion of these are maintained in commercial turtle farming operations

Table 3 Recommendations from the Red-Listing session for species that necessitate being 'up-listed' to a higher category of endangered status.

Species	Previous Status	Proposed Status
Batagur trivittata	EN	CR
Mauremys mutica	EN	CR
Mauremys nigricans	EN	CR
Orlitia borneensis	EN	CR
Sacalia bealei	EN	CR
Platysternon megacephalum	EN	CR
Manouria emys	EN	CR
*Chitra vandijki**	---	CR
Nilssonia formosa	EN	CR
Nilssonia leithii	VU	CR
Pelochelys cantorii	EN	CR
Heosemys annandalii	EN	EN or CR**
Geoclemys hamiltonii	NT	EN
Hardella thurjii	VU	EN
Heosemys grandis	VU	EN
Siebenrockiella crassicollis	VU	EN
Indotestudo travancorica	VU	EN
Manouria impressa	VU	EN
Nilssonia gangetica	VU	EN
Nilssonia hurum	VU	EN
Pangshura tecta	LC	NT
Geochelone elegans	LC	VU

* Species not previously evaluated,

** Species status still under review

Critically Endangered (CR) is the highest risk category assigned by the IUCN Red List for wild species. The Critically Endangered designation means that a species' numbers have decreased, or will decrease, by > 80% within three generations.

Endangered (E) is the second highest risk category assigned by the IUCN Red List for wild species. The Endangered designation means that a species' numbers have decreased, or will decrease, by >50% within three generations.

Vulnerable (V) is the third highest risk category assigned by the IUCN Red List for wild species. The Vulnerable designation means that a species' numbers have decreased, or will decrease, by > 35% over the last 10 years or three generations.

Near Threatened (NT) is the category assigned to a taxon when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, or Vulnerable now, but is close to qualifying, or is likely to qualify in the near future for a threatened category.

Least Concern (LC) is the category assigned to a taxon when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable, or Near Threatened. Widespread and abundant taxa are included in this category.

Data Deficient (DD) is the category assigned to a taxon when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking.

Table 4 Recommendations of CITES status changes for Tortoises and Freshwater Turtle Species.

Candidate Species for Inclusion in Appendix I (currently not CITES-listed):

Species	Current Status	Country(s) of Origin
Geoemyda japonica	-	*JP*

Candidate Species for transfer from Appendix II to Appendix I:

Species	Current Status	Country(s) of Origin
Batagur borneoensis	II	BN, ID, MY, TH
Chelodina mccordi (incl. *timorensis*)	II	ID [TL]
Cuora aurocapitata	II	CN
Cuora flavomarginata	II	CN, HK
*Cuora galbinifrons**	II	CN, VN
Cuora mccordi	II	CN
Cuora pani	II	CN
Cuora trifasciata	II	CN, HK, LA, VN
Cuora yunnanensis	II	CN
Cuora zhoui	II	CN, VN, LA?
Heosemys annandalii	II	KH, LA, MM? MY, TH, VN
Heosemys depressa	II	MM
Leucocephalon yuwonoi	II	ID
Lissemys punctata	II	BD, LK, IN, NP, MM
Geochelone elegans	II	IN, LK, PK
Geochelone platynota	II	MM
Manouria emys	II	BD, ID, IN, MM, MY, TH
Manouria impressa	II	CN, KH, LA, MM, MY, TH, VN
Mauremys annamensis	II	VN
Mauremys mutica	II	CN, VN
Orlitia borneensis	II	ID, MY, BN?
Pelochelys bibroni	II	ID, PNG
Pelochelys cantorii	II	BD, CN, ID, IN, KH, LA?, MY, MM, PH, TH, VN
Platysternon megacephalum	II	CN, KH, LA, MM, TH, VN
Siebenrockiella leytensis	II	PH

Candidate Species for Inclusion in Appendix II:

Species	Current Status	Country(s) of Origin
*Chelodina spp***	---	AU, ID, PNG [TL]
Cyclemys spp **	---	BD, BN, CN?, ID, IN, KH, LA, MM, MY, PH, SG, TH, VN
Elseya spp ****	---	AU, ID, PNG [Palau]
Geoemyda spengleri	III (China)	CN, LA, VN
Hardella thurjii	---	BD, IN, NP, PK
Dogania subplana	---	BN, ID, MM, MY, PH, SG, TH
Melanochelys trijuga	---	BD, IN, LK, MM
Morenia petersi	---	BD, IN, NP
Nilssonia leithii	---	IN – possible candidate for App. I
Nilssonia formosa	---	MM – possible candidate for App. I
Palea steindachneri	III (China)	CN, LA, VN (USA*)
Sacalia spp	III (China)	CN, LA, VN
Vijayachelys silvatica	---	IN – possible candidate for App. I

* Establish introduced population,

** All species within the genus,

*** both *C. rugosa/siebenrocki* (species differentiation disputed) and *C. reimanni* as significantly traded species, other species in genus to be evaluated for look-alike reasons,

**** including the genus *Myuchelys*

AU	= Australia,	IN	= Indonesia,	NP	= Nepal,	TH	= Thailand,
BD	= Bangladesh,	KH	= Hong Kong,	Palau	= Republic of Palau,	TL	= Timor Leste,
BN	= Brunei,	LA	= Laos,	PH	= Philippines,	VN	= Vietnam
KH	= Cambodia,	LK	= Sir Lanka,	PK	= Pakistan,		
CN	= China,	MM	= Myanmar,	PNG	= Papua New Guinea,		
ID	= India,	MY	= Malaysia,	SG	= Singapore,		

Appendix I. Participant List

Country	Participant Name	Country	Participant Name
Australia	Arthur Georges	Myanmar	Win Ko Ko
Australia	Rohan Holloway	Myanmar	Khin Myo Myo
Australia	Gerald Kuchling	Myanmar	Kalyar Platt
Austria	Torsten Blanck	Singapore	David Bickford
Austria	Peter Praschag	Singapore	Saskia Lafebre
Austria	Peter Valentin	Singapore	Colin Poole
Bangladesh	SMA Rashid	Singapore	Leong Tzi Ming
Cambodia	Sitha Som	Singapore	Benjamin Lee
Cambodia	Sovannara Heng	Singapore	Janice Yap
Cambodia	Alistair Mould	Singapore	John Sha
China	Rao Dingqi	Taiwan	ChenTien-Hsi
China	Zhang Fang	Thailand	Nantarika Chansue
China	Gong Shiping	Thailand	Yodchaiy Chuaynkern
China	Lu Shunqing	Thailand	Wachira Kitimasak
China	Zhou Ting	Thailand	Kruwan Pipatsawasdikul
China	Zhang Mingxia	Thailand	Saowakhon Runruang
China (Hong Kong SAR)	Bosco Chan	Thailand	Pattarapol Maneeorn
China (Hong Kong SAR)	Jay Wan	Vietnam	Doug Hendrie
China (Hong Kong SAR)	Gary Ades	Vietnam	Tim McCormack
China (Hong Kong SAR)	Paul Crow	Vietnam	Hoang Van Thai
China (Hong Kong SAR)	Michael Lau	Vietnam	Hoang Van Ha
China (Hong Kong SAR)	Sung Yik Hei	USA	Christina Castellano
East Timor	Venancio Carvalho	USA	Eric Goode
East Timor	Hinrich Kaiser	USA	Cris Hagen
East Timor	Scott Heacox	USA	Brian D. Horne
India	Khalid Pasha	USA	Rick Hudson
India	Shailendra Singh	USA	Jim Juvik
Indonesia	Mistar Kamsi	USA	Charles Landrey
Indonesia	Mirza Kusrini	USA	John Mitchell
Indonesia	Awal Riyanto	USA	Bonnie Raphael
Japan	Kahoru Kanari	USA	Anders Rhodin
Malaysia	Chan Eng Heng	USA	Walter Sedgwick
Malaysia	Chen Pelf Nyok	USA	Peter Paul van Dijk
Malaysia	Chris Shepherd	USA	Andrew Walde
Malaysia	Loretta Shepherd		
Malaysia	Carrie Stengel		

Photo by Andrew Walde

Conservation of Asian Tortoises and Freshwater Turtles: Setting Priorities for the Next Ten Years

Turtle Survival Alliance (TSA)

The mission of the Turtle Survival Alliance 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 (head-starting, 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.

www.turtlesurvival.org

Wildlife Conservation Society (WCS)

The Wildlife Conservation Society saves wildlife and wild places worldwide. It does so 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

Wildlife Reserves Singapore (WRS)

Wildlife Reserves Singapore is the parent company of award-winning attractions Jurong Bird Park, Night Safari, Singapore Zoo and the upcoming River Safari. WRS parks strive to be world-class leisure attractions, providing excellent exhibits of animals and birds presented in their natural environment for the purpose of conservation, education and recreation. The Wildlife Reserves Singapore Conservation Fund's (WRSCF) mission is to protect wildlife and habitats and provide sustainability through: education and public outreach, breeding of endangered animals and research and field conservation projects.

www.wrs.com.sg
www.wrscf.org.sg

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

Established in 1981 by the IUCN and the SSC, the mission of the Tortoise and Freshwater Turtle Specialist Group 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

Kadoorie Farm and Botanic Garden (KFBG)

Guided by a mission statement, 'To harmonise our relationship with the environment', the focus of Kadoorie Farm and Botanic Garden is on promoting conservation of biodiversity and sustainable living in Hong Kong and beyond, with programmes on fauna and flora conservation, promotion of sustainable lifestyles, and awareness-raising in local schools and communities. KFBG established a Fauna Conservation Department in 1994, the main goals of which are to help protect local and regional biodiversity, through wildlife rescue work, breeding programmes and educational projects. A particular focus of this has been working to help conserve the growing number of endangered turtle species in the region.

http://www.kfbg.org.hk

I chose 3 photos - you can suggest any as you see fit for this outside back cover page.

This photo is "Crate of Torts" in "Brian" folder.

This photo is "OBC-turtle trade in the pet market Guangzhou-by Gong Shiping!"

This photo is "HTR4" from "Myanmar>Confiscation 2010" folder.

CONSERVATION OF ASIAN TORTOISES & FRESHWATER TURTLES WORKSHOP

Hosted by

Wildlife Reserves SINGAPORE

WILDLIFE CONSERVATION SOCIETY

In collaboration with

IUCN/SSC Tortoise and Freshwater Turtle Specialist Group

KFBG

RED LIST

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TSA turtle survival alliance