

A PUBLICATION OF THE TURTLE SURVIVAL ALLIANCE

# Turtle Survival

2012



RICK HUDSON

## FROM THE PRESIDENT'S DESK

# New Turtle Survival Center brings TSA Back to its Roots



PHOTO CREDIT: BILL HOLMSTROM

continue to watch as turtle species slowly vanish before our eyes. For some species, the Asian box turtles (*Cuora*) for example, the market value is so extraordinarily high that they have no future in the wild. Every specimen encountered is collected for breeding stock, and the collecting pressures are intense. Restricted range endemics, such as the Roti Island snakeneck, are another example of species that will not survive in the wild. Many of these species were once considered common, and were widely available and inexpensive (the *Cuora galbinifrons* complex for example). As wild populations have disappeared, market prices have climbed, fueling an unsustainable cycle of exploitation. The time is now upon us to develop a specialized facility capable of preserving these species in captivity, but the window of opportunity is rapidly closing. If the TSA is to make good on its commitment to zero turtle extinctions, *we don't have a choice!* We must develop the TSC now. The situation becomes clear when you consider the impact of this Center: 17 of the 20 species selected for the TSC collection are ranked Critically Endangered by the IUCN Red List, and nine of those can be found on the list of the World's Top 25+ Most Endangered Tortoises and Freshwater Turtles, 2011. The TSC will help ensure a future for those species. Please join us in helping us build the TSC into a world class facility.

In other news, please join me in welcoming our four newest TSA team members: Sylvain Mahazotahy (Madagascar), German Forero-Medina (Colombia), Me Me Soe (Myanmar) and Shashwat Sirsi (India). As our team continues to grow, so does our impact and effectiveness in these countries. We are also excited to announce a new program for Colombia, launched in partnership with the Wildlife Conservation Society, representing our first official "program" in South America.

I hope that you enjoy reading about the great work that is being done around the world to benefit turtles. Based on feedback from our members and supporters, we've made a concerted effort to make this year's issue more concise and streamlined. We hope that you find this format more palatable and we are confident that the great content that you've come to expect is still there. And to everyone who makes turtles and tortoise care part of their daily routine, and includes them in their landscapes and personal lives, thank you. The TSA needs you now more than ever.

**Excitement continues** to build for the TSA's planned **Turtle Survival Center** (TSC) in South Carolina, an ambitious undertaking that will "get us back to our roots." The TSA was organized with the goal of managing captive breeding populations in response to Asia's rapidly worsening turtle crisis, and since 2001 this has been at the core of our mission. Over the years our strategy for developing assurance colonies has evolved, with the emphasis on some programs shifting overseas to help build community involvement, simplify logistics and take advantage of local expertise. However, for U.S. based programs, we have struggled with the complexity of using a diffuse membership to manage populations for us, which has been, at best, an imperfect situation. Lacking a home base facility, the TSA has been unable to effectively demonstrate how a true assurance colony functions. The new South Carolina facility will finally give us that special place to call home, a place where we can consolidate captive holdings and concentrate our activities. We envision a hub for turtle conservation work including international training programs, workshops, collaborative research projects and, most importantly, opportunities for TSA member involvement.

For many years we have recognized the need

for a specialized facility and we have considered various properties in the southeastern U.S. Until now, all of the potential sites have lacked the infrastructure for a world-class turtle conservation operation. When Dr. Sam Seashole presented us with the opportunity to buy his property in October 2011, we immediately recognized that this site, with its incredible veterinary infrastructure, was the perfect choice for a turtle breeding center. Despite tough financial times, the TSC was something that we had to do. Armed with an initial \$50,000 challenge grant from long-time TSA supporter Dr. Ab Abercrombie, we began trying to raise funds. Struggling with the question of "if we can do this" the dynamic quickly shifted to "when we will do this" after TSA Board member Pat Koval generously committed \$200,000 toward the purchase price - half the amount needed!

The decision to proceed with the purchase and development of this facility is not one that we took lightly. How can TSA develop and operate such a facility while continuing to maintain the important conservation programs around the globe in which we have invested so heavily? The answer is quite simple: *we don't have a choice.* Despite the best efforts of the TSA and the rest of the global turtle conservation community, we

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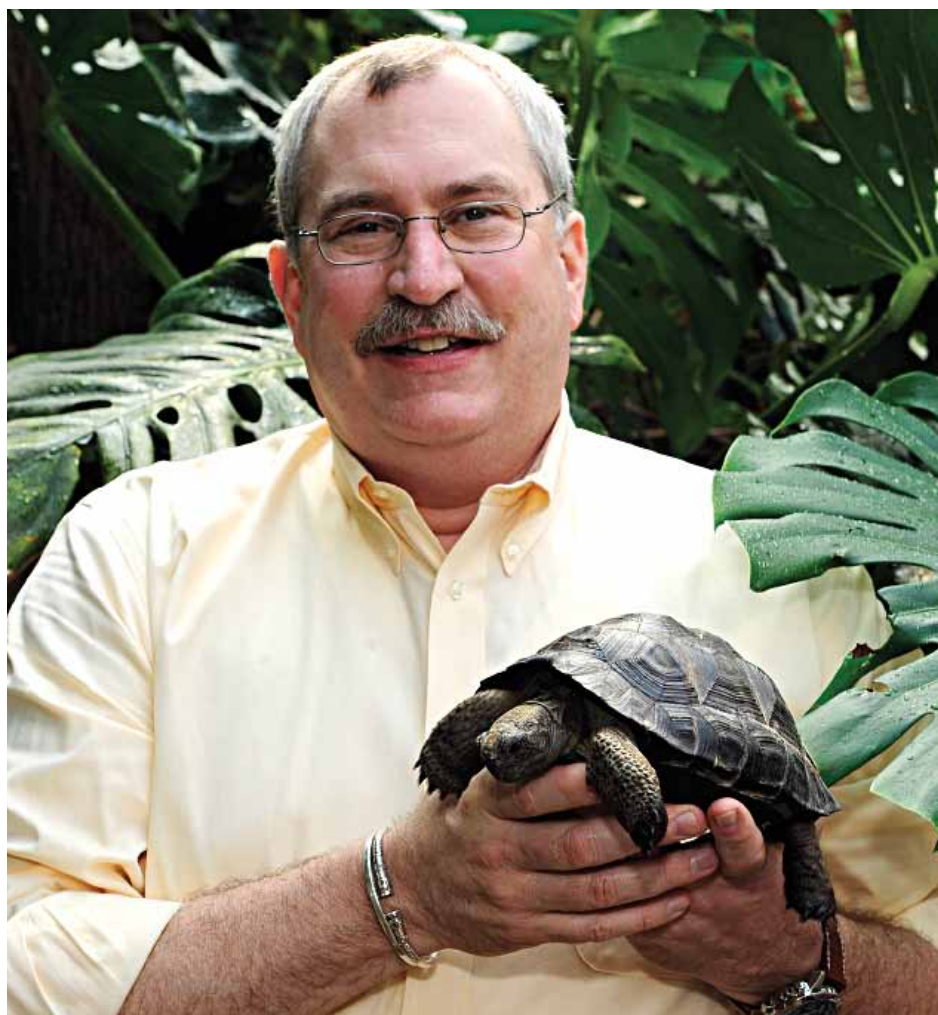
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**ABOUT THE COVER:** The Sulawesi Forest Turtle, *Leucocephalon yuwonoi*, is endemic to the Indonesian island of Sulawesi and is the single representative of a monotypic genus. Ranked critically endangered by the IUCN Red List, *L. yuwonoi* has been high on the TSA's priority list of species in need of both *in situ* and *ex situ* conservation programs. However meaningful progress towards that goal has proved elusive, though 2012 may well represent the turning point for this enigmatic species. TSA Director of Animal Management Cris Hagen, accompanied by Indonesian biologist Awal Riyanto, recently sowed the early seeds of collaboration with Tadulako University in Palu where an enthusiastic group of students and faculty is ready to embark on turtle and tortoise research projects. We envision this program unfolding under a collaborative agreement with WCS Indonesia that will expand our impact on both *L. yuwonoi* and the other Sulawesi endemic, Forsten's Tortoise, *Indotestudo forstenii*. Unfortunately both of these species continue to decline due to local and illegal international trade. Cris and his team located a trader holding ~300 wild-caught adults under crowded and stressful conditions, in what will ostensibly become an approved "captive breeding" operation. On a brighter note, we reported cautious optimism earlier this year as *ex situ* captive breeding success continues to improve for *L. yuwonoi*, both in the U.S. and Europe. At least five private breeders in the U.S. and three zoos in Europe and the U.S. – Muenster, Atlanta and Denver – have reported hatchlings since 2003, and we are aware of at least 12 surviving captive bred juveniles in the U.S. PHOTO CREDIT ADAM THOMPSON, ZOO ATLANTA

# TSA Welcomes a New Board Member



The Turtle Survival Alliance (TSA) is pleased to announce the appointment of Jim Breheny to the TSA Board of Directors. Jim is the Executive Vice President and General Director of WCS Zoos & Aquarium and Director of the Bronx Zoo. He received his undergraduate degree from Manhattan College where he was also an adjunct in the Biology Department from 1998 through 2005 and a M.Sc. from Fordham University in 1984. Jim has been with the Wildlife Conservation Society at its Bronx Zoo headquarters in New York for 39 years. A former Curatorial Science Fellow and Curator, he was named General Curator in 2004, Director of the Bronx Zoo in 2005 and appointed General Director in 2011. Jim is responsible for the operation and management of the Bronx Zoo, Central Park Zoo, Prospect Park Zoo, Queens Zoo and the New York Aquarium.

Jim has served on the Association of Zoos and Aquariums (AZA) Membership Committee, Professional Development Committee and is a member of the Field Conservation Committee. He is a member of the Zoos Advisory Board of the Zoological Society of London (ZSL), and a board member of the Behler Chelonian Center (BCC) and the International Iguana Foundation. But first and foremost Jim is passionate about turtles and their survival, and is a vocal champion for the TSA / WCS strategic partnership. We are excited about the leadership and experience that he will bring to the TSA.

## About the Turtle Survival Alliance

The **Turtle Survival Alliance (TSA)** was created in 2001 in response to the rampant and unsustainable harvest of Asian turtles to supply Chinese markets, a situation that came to be known as “The Asian Turtle Crisis.” For its first seven years, the TSA worked under the umbrella of the World Conservation Union (IUCN). In 2005, it was registered as an independent 501(c)(3) non-profit, based in Fort Worth, Texas and a dedicated Board of Directors was selected in January 2009. From the day it was founded until today, the TSA has remained focused on a single goal: no turtle extinctions in the 21st century

The TSA is an action-oriented global partnership, focusing on species that are at high risk of extinction, and working in turtle diversity hotspots around the world. Working in collaboration with zoos, aquariums, universities, private turtle enthusiasts, veterinarians, government agencies, and conservation organizations, the TSA is widely recognized as a catalyst for turtle conservation with a reputation for swift and decisive action. With projects or programs in Belize, Colombia, Europe, Madagascar, Senegal,

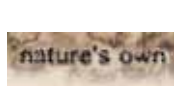
and throughout Asia, the TSA has grown into a global force for turtle conservation. The opening of the Turtle Survival Center in South Carolina in 2012 will greatly enhance our ability to protect the most vulnerable species through *ex-situ* captive breeding.

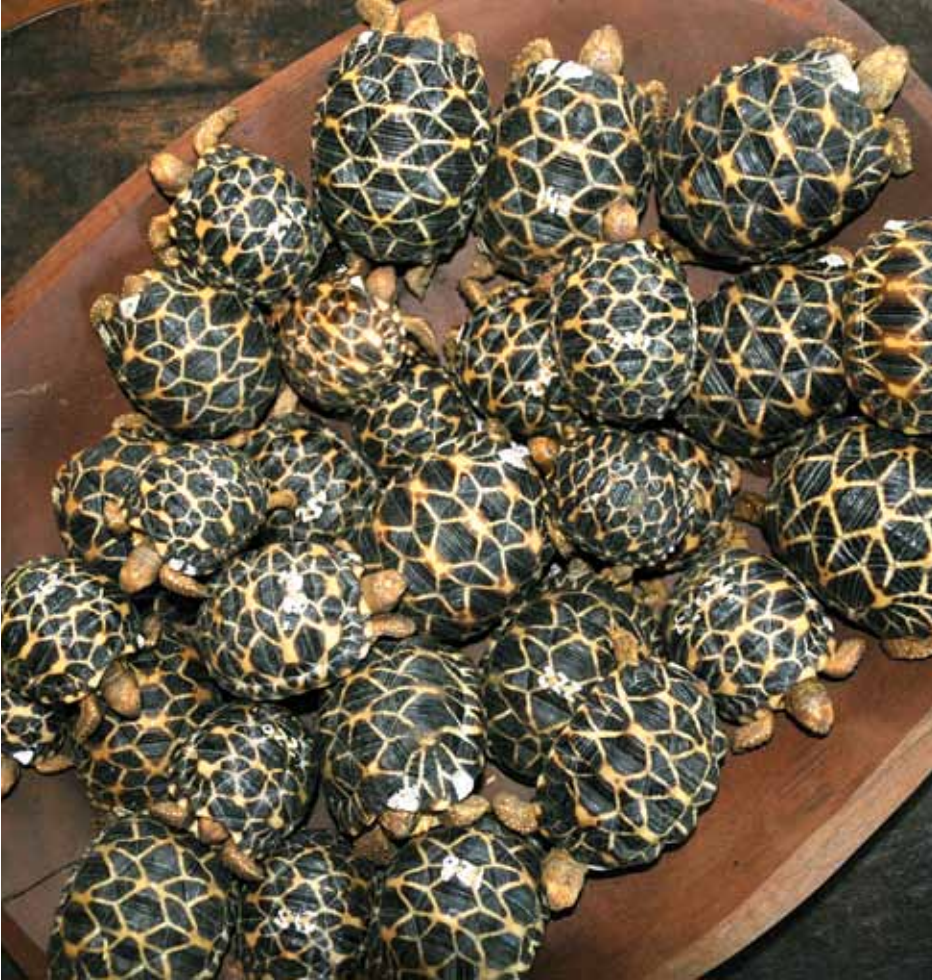


# Partners are the Key to Our Success

From our inception, the TSA was intended to be an alliance of partners that shared in a common goal – *zero turtle extinctions*. Since our formation in 2001, partnerships have proven to be the secret to our success. The organizations listed here provide a range of services to our collective mission, including: guidance, networking, strategic planning, funding, turtle care and rescue facilities,

animal management, marketing and public relations, field research, logistical and technical support, salaried positions, and a host of other resources. Significantly, some of these have been with us since the early days and were there when the TSA was born. All are integral to our success. On behalf of the Board of Directors of the TSA, we salute this remarkable group of dedicated partners.





Young Burmese Star Tortoises at the Behler Chelonian Center. PHOTO CREDIT: TURTLE CONSERVANCY.



animals is that there are five kinds of action we can take. The different actions must be matched with the situation of each species, both *in situ* and *ex situ*. In rough order of preference they are:

### 1. REPATRIATION AND REINTRODUCTION.

Our best candidate for this action is the Burmese Star Tortoise, *Geochelone platynota*. Providing that several significant challenges can be overcome – both political and with regard to health and disease concerns – we hope to participate in a repatriation of *G. platynota* to Myanmar. WCS and TSA biologists have determined that the Minzontaung Wildlife Sanctuary stands a good chance of being sustainably repopulated with this tortoise. We regard this action as the optimal method to create conservation success with our hatchlings. If this project is successful, it will be the first time a turtle or tortoise species has been sent from the United States back into the wild of a range country.

### 2. RESTORATION AND REWILDING.

Although the BCC does not breed Bolson Tortoises (*Gopherus flavomarginatus*), Turner Endangered Species Fund (TESF) does so very successfully. They have produced more than 200 hatchlings over the last six years and are planning on releasing this species into areas that have not been occupied since the end of the Pleistocene, a process known as “rewilding.” As a complement to this program, the Turtle Conservancy is purchasing land in the Mapimi Biosphere Reserve, in the heart of the tortoise’s last remaining range. Release of TEF tortoises on this land in areas where it has disappeared over the last 50 years will inform the rewilding that is planned in the United States.

### 3. THE RIGHT TURTLE IN THE WRONG PLACE.

There are several ecosystems around the world where now extinct tortoises played

# Turtle Conservancy and Behler Chelonian Center

ROSS KIESTER, PAUL GIBBONS AND ERIC GOODE

The Turtle Conservancy’s goal is simply to produce as many offspring as possible for target endangered species and to use these offspring for conservation action. Over the last year, production of hatchlings of several species has reached flood stage. We have now produced 211 Burmese Star Tortoises (*Geochelone platynota*), 206 Radiated Tortoises (*Astrochelys radiata*), 159 Burmese

Black Mountain Tortoises (*Manouria emys phayrei*), 75 Indian Spotted Turtles (*Geoclemmys hamiltonii*), and 50 Spider Tortoises (*Pyxis arachnoides*). Our success at captive breeding these species certainly does not mean our task is easy. Producing animals is only the first step. It is the next steps that are hard.

Our current view on what to do with these

Radiated Tortoises at the Behler Chelonian Center.  
PHOTO CREDIT: TURTLE CONSERVANCY.





Burmese Black Mountain Tortoises at the Behler Chelonian Center. PHOTO CREDIT: TURTLE CONSERVANCY.

important ecological roles. Imported tortoises of other species can possibly take on those roles. For example, Radiated Tortoises and Aldabra Tortoises have been released on Round Island near Mauritius and on Rodrigues Island in the Indian Ocean in order to replace the native *Cylindraspis* species that are long extinct. Preliminary results from these experiments indicate that these surrogate species may be performing the ecological roles of their unfortunate cousins, helping to restore native plants and, indeed, entire ecosystems. Could our Radiated Tortoises play this role in the Bahama and Turks and Caicos Islands that had medium-sized tortoises on them just as recently as a few hundred years ago? A controversial idea to be sure, but one that needs further investigation.

#### 4. MULTIPLE ASSURANCE COLONIES.

Even the most successful *ex situ* breeding program is vulnerable to catastrophe: theft, disease, natural and political disasters are always a possibility. Any individual colony is also subject

to a lack of support over time as institutional priorities change, experienced keepers retire or move and economic hard times force cutbacks. Multiple assurance colonies provide a crucial backup and individuals of several of our species could be used to create a network of colonies.

#### 5. PETS, THE PRIVATE SECTOR AND SULCATAIZATION.

There are just not enough zoos and dedicated conservation facilities in the world to maintain all of the species that need help. One of the founding ideas of the TSA and also a core principle of the TC is that dedicated and skillful private breeders can provide the numbers of people that are needed to maintain many species, especially species not too large in size. We believe the Radiated Tortoise is on the cusp of becoming a domesticated species as has happened with the African Spurred Tortoise (*Geochelone* or *Centrochelys sulcata*). Rare in its native range, this species is now so common as a pet that we can be assured it will not go extinct and that the United States market for wild

caught animals is now non-existent. The Radiated Tortoise is the single most common species on the Endangered Species Act Captive Bred Wildlife list and there are a great many more not on the list. Although it is in dire trouble in its native Madagascar, it is close to becoming “Sulcataized,” as we like to call what has happened with the African Spurred Tortoise. This is a kind of conservation success. Maybe it’s not the ideal success, but it is one nonetheless. We do not foresee that we will ever be able to send Radiated Tortoises back to Madagascar and, indeed, Malagasy government officials have indicated that they would much prefer money to tortoises. By engaging the private sector through sales of this species we can be sure of sending financial support to *in situ* tortoise conservation in Madagascar.

These are the conservation actions that we have identified. We are constantly looking for new ways to create conservation successes out of captive breeding. In the meantime, having a large number of tortoises available for new and old options is the goal we are achieving.



## TURTLE CONSERVATION FUND



TCF has supported nine projects representing over \$43,000 for conservation activities of the Critically Endangered Central American River Turtle (*Dermatemys mawii*) in Belize, Guatemala, and Mexico. PHOTO CREDIT: THOMAS RAINWATER.



# The Turtle Conservation Fund (TCF) Celebrates a Decade of Turtle Conservation

HUGH QUINN AND ANDERS RHODIN

**This year, the TCF** celebrates its tenth anniversary. It was formed in 2002 as a strategizing and funding coalition of leading turtle conservation organizations and individuals focused on ensuring the long-term survival of tortoises and freshwater turtles.

The first course of action that first year was to produce a global conservation action plan in partnership with the Turtle Survival Alliance, Tortoise and Freshwater Turtle Specialist

Group, Conservation International and several other affiliated partners. TCF's global turtle conservation impact continued the following year when it awarded its first grants. Since that time, awards have been given twice a year, with funding decisions made by the TCF's 27-member Board, which provides representatives from nine nations. Over the past ten years, TCF has received 385 grant proposals, of which 131 (34%) were funded. Total requests were US \$2,053,426,

with US \$620,162 (30%) awarded to projects in 38 nations. Grants ranged from US \$1,000 – 10,000, with an average of US \$4,734.

Grants have been awarded for an array of activities such as headstarting, field surveys, educational programming, status assessment workshops, captive breeding programs, trade monitoring, capacity building, community involvement, genetic analyses, population estimates, and much more. Many imperiled species have benefited from these grants.

For example, TCF-funded projects representing 23 (92%) of the Turtle Conservation Coalition's "Turtles in Trouble: The World's Top 25+ Most Endangered Tortoises and Freshwater Turtles – 2011." Of TCF's 56 Target Species (2011 list), projects representing 36 (64%) have been supported. Of the 68 taxa listed by IUCN as Critically Endangered (CR) or Endangered (EN), TCF has supported projects for 44 (65%). However, the Top 25, CR, EN and Target Species figures do not include support for facilities or projects that impact additional species.

The above TCF-supported projects exemplify the organization's holistic approach to turtle conservation, which involves both *ex situ* and *in situ* programs. Such efforts can only be possible through partnerships with the various organizations, institutions and individuals who create and conduct the supported projects. These partnerships form a coordinated, effective, global network with a mission to conserve the world's tortoises and freshwater turtles so that no species becomes extinct in our lifetime.

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One of the larger turtle facilities was subdivided into six compartments to separate male individuals of *Cuora galbinifrons* and *C. mouhotii*. PHOTO CREDIT: THOMAS ZIEGLER.

# New Facilities Created for Threatened Vietnamese Turtles

TRUONG QUANG NGUYEN, PHUONG DANG HUY, AND THOMAS ZIEGLER

In May 2012, existing enclosures and facilities at the Melinh Station for Biodiversity were improved and new ones built to house rescued turtles, mostly derived from confiscations. The station, located in northern Vietnam's Vinh Phuc Province close to Tam Dao National Park, is maintained by the Institute of Ecology and Biological Resources (IEBR) of the Vietnamese Academy of Sciences and Technology based in Hanoi.

The work was carried out as part of a Memorandum of Understanding made between IEBR and the Cologne Zoo, covering herpetological diversity research and conservation activities. Staff from Melinh Station were trained in the proper use of the new facilities during a short visit by two keepers from the Cologne Zoo's Ter-

rarium Department, Anna Rauhaus and Detlef Karbe, and also by Thomas Ziegler, the Cologne Zoo's Aquarium Curator and Vietnam Nature Conservation Project Coordinator.

The team's five-day project at Melinh, supported by funds from the Nederlands-Belgische Schildpadden Vereniging, resulted in the construction of a new amphibian unit, the development of a preliminary quarantine station for amphibians and reptiles, the construction of a lizard enclosure, and an improved primate facility.

The team worked quickly to aid and house confiscated turtles already at the station. They examined individual animals, sexed them, divided them into appropriate groups, and

settled them into existing facilities. A number of Indochinese Box Turtles (*Cuora galbinifrons*) and Keeled Box Turtles (*C. mouhotii*) were held by the station, so small female groups were created with only one male each and housed in enclosures. Surplus males were isolated in single enclosures to avoid aggressive interactions.

There weren't enough turtle facilities available to properly house all the individuals currently kept at the station. So we built new enclosures in cooperation with station staff. Three extensive outdoor enclosures were built to shelter three Elongated Tortoises (*Indotestudo elongata*). A facility originally used for the keeping of porcupines was refurbished to house confiscated turtles of the *Cyclanops* complex (*C. cf. atripons*, and *C. cf. oldhamii*).

The remaining turtles at Melinh Station were mostly pond turtles including Black-breasted Leaf Turtles (*Geoemyda spengleri*), Giant Asian Hill Turtles (*Heosemys grandis*), Mekong Snail-eating Turtles (*Malayemys subtrijuga*), Vietnamese Pond Turtles (*Mauremys annamensis*), Chinese Stripe-necked Turtles (*M. sinensis*), Big-headed Turtles (*Platysternon megacephalum*), and Four-eyed Turtles (*Sacalia quadriocellata*). Existing facilities were cleaned and improved for these chelonians, giving them better access to water and shelter.

Of course, the improvements made during the first short visit of the Cologne Zoo team are only a beginning. We hope to find funds to continue with this work in early 2013. During the next phase, we intend to offer an extended staff training in techniques for dealing with quarantine, husbandry management, and conservation breeding.

Another turtle conservation project of IEBR focused on the *Cuora trifasciata* species complex. An adult female, deriving from a confiscation made in central Vietnam's Nghe An Province, is currently available for future conservation breeding projects. Outdoor enclosures for this and other individuals will be built in future with the kind support of the Nederlands-Belgische Schildpadden Vereniging.

We also have plans to check the compatibility, i.e., molecular identity, of individuals of the *Cuora trifasciata* species complex bred at the Allwetterzoo Münster turtle station in Germany for potential subsequent transfer to Vietnam to help build up breeding groups.

While many challenges remain for turtle conservation in Vietnam, very good work was done over the past year, and we expect more progress in the year to come.

#### ACKNOWLEDGEMENTS

We thank the Cologne Zoo's animal keepers Anna Rauhaus and Detlef Karbe for their support and input, not only during their stay at the Melinh Station, but also during their long advance preparations in Germany. We are also indebted to Le Quang Tuan, Pham The Cuong, and Chu Thi Thao (Hanoi) for their help with translations. Last but not least, the station team strongly contributed to making the first mission of the Cologne Zoo team at Melinh a successful one. We are also thankful to Le Xuan Canh (IEBR, Hanoi), Bernd Marcordes (Cologne Zoo), Elmar Meier (Zoo Münster), Theo Pagel (Cologne Zoo), and Henk Zwartepoorte (Zoo Rotterdam) for constructive discussions and support. Henk Zwartepoorte also kindly arranged key financial support from the Nederlands-Belgische Schildpadden Vereniging. We also acknowledge SERA for the donation of food and equipment.

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We renovated this former porcupine enclosure with a new pond, leaf litter, and hiding places. It is now inhabited by pond turtles of the genus *Cyclemys*. PHOTO CREDIT: THOMAS ZIEGLER.



The German-Vietnamese working team at Melinh Station in May 2012. PHOTO CREDIT: PHAM THE CUONG.

# Golden Coin Turtle Transfer Completed

TORSTEN BLANCK, MARTINA RAFFEL, ELMAR MEIER, PAUL CROW AND GARY ADES



A *Cuora c. cf. cyclornata* female in its new enclosure. PHOTO CREDIT: TORSTEN BLANCK

In a joint effort of the Kadoorie Farm and Botanic Garden (KFBG) in Hong Kong, the International Centre for Turtle Conservation (IZS) at Münster Zoo, Germany, the studbook keepers within the European Studbook Foundation (ESF) for *Cuora trifasciata* and *Cuora cyclornata* and TSA Europe, breeding groups of *Cuora cyclornata cyclornata*, *Cuora cyclornata cf. cyclornata* and *Cuora cyclornata meieri*, turtles were transferred from KFBG to the IZS on 19 April 2012, arriving in Münster on 20 April. The groups consist of long-term captive founders as well as specimens bred at

KFBG, some of them having been in their care for more than 15 years. This transfer enables KFBG to focus even more on the conservation of Hong Kong's native *Cuora trifasciata* form while European studbook participants will focus further on *Cuora cyclornata*. The European Studbook currently holds 5.7.9 *C. c. meieri*, 1.7 *C. c. cyclornata* and 13.20.15 *C. c. cf. cyclornata* including these new specimens.

Once considered to belong to one and the same species, i.e. *Cuora trifasciata sensu lato*, it was shown that different species were hidden

within this taxon. While some studies hypothesize that this is not the case, the most up to date study from Potsdam University, Germany, using microsatellite markers, substantiates the distinctiveness of at least five evolutionary significant units and a minimum of two good species within the *Cuora trifasciata sensu lato* complex.

The Vietnamese Golden Coin Turtle (*Cuora cyclornata*) originates from Vietnam and Laos, whereas the Chinese Golden Coin Turtle (*Cuora trifasciata*) is endemic to China, inhabiting the southern provinces including Hainan Island and

Hong Kong. The IZS has focused its efforts since 2003 on conservation breeding of the Vietnamese Golden Coin Turtle besides more than a dozen of other critically endangered Asian turtle species, with a special focus on the genus *Cuora*. While both species are bred by the thousands in Chinese turtle farms, they are virtually extinct throughout their range. To serve the traditional Chinese medicine as a claimed cure of cancer, a talisman, status symbol and pets has led to the collapse of both species within the last three decades. The species is now listed as critically endangered by the IUCN and Appendix II of CITES, which aims to protect endangered species from over-exploitation by international trade.

In farms, these species and subspecies hybridize due to lack of control, thus the potential founder stock for conservation projects is very limited. This transfer between KFBG and the IZS has increased the current number of specimens of the three forms/subspecies of *Cuora cyclornata* in Europe by nearly 25 percent. The groups were distributed by recommendation of the ESF Studbook



Unpacking the turtles at the Allwetter Zoo in Münster. PHOTO CREDIT: GIACOMO CECCARELLI

Keepers and placed in two German zoological gardens and three private breeders to establish geographically separated assurance colonies, minimizing the risk of losing the entire groups due to disease or other catastrophe. It is hoped

that these groups will yield first breeding results in 2013. Since all animals arrived in very healthy conditions at the IZS this goal seems achievable.

Torsten Blanck, [cuora\\_yunnanensis@yahoo.com](mailto:cuora_yunnanensis@yahoo.com)

# CALL FOR CUORA DATA

RICHARD STRUIJK, HENK ZWARTEPOORTE, AND PETER PAUL VAN DIJK

**We have been working** since 2010 on a book encompassing the genus *Cuora*. The volume will bundle available information and provide interesting new data as well. It is our hope that this book will consolidate and improve the overall knowledge of this genus and contribute to their conservation.

An important part of the book will deal with captive propagation of all *Cuora* species. Therefore, data has been gathered from many hobbyists. For some species we have a good dataset, such as for *C.galbinifrons* where we have data from 209 clutches. However, because we aim for large datasets, we require extra data on specific issues for most species.

The table with this article shows the type of data most needed for each species. For example, in regard to clutch data, there's a strong need for information about *C.aurocapitata*, *C.trifasciata/cyclornata* and *C.yunnanensis*. For most species, extra incubation data will be useful, as would biometrical data. This doesn't mean we don't appreciate the contribution of other data, it merely shows what is most

Species	Clutch Data <sup>1</sup>	Incubation Data <sup>2</sup>	Biometrical Data <sup>3</sup>
<i>amboinensis</i>	+ (except for <i>C.a.kamaroma</i> )	++	
<i>aurocapitata</i>	++	++	++
<i>bourreti</i>		+	+
<i>flavomarginata</i>		+	++
<i>galbinifrons</i>		++	+ (subadults)
<i>mccordi</i>	+	++	++
<i>mouhotii</i>	+	++ (especially <i>C.m.obsti</i> )	++
<i>pani</i>	+	+	++
<i>picturata</i>	+	++	+
<i>trifasciata/cyclornata</i>	++	++	++
<i>yunnanensis</i>	++	++	++
<i>zhoui</i>	+	+	+

<sup>1</sup> Clutch data: date, clutch size, egg size, egg weight

<sup>2</sup> Incubation data: incubator type, temperature (regime), humidity, substrate, clutch size, fertility percentage, incubation length, hatch rate

<sup>3</sup> Biometrical data: length, width, height, weight

needed (+ or ++). We prefer raw data instead of average values. All data provided will be used within the book, so please don't hesitate to contribute!

We are also interested in *high quality* images

to illustrate the volume, especially pictures of natural habitat, terrarium setup, outdoor enclosures, breeding, etc.

If you'd like to contribute data or photos please send to Richard Struijk, [r.struijk@yahoo.com](mailto:r.struijk@yahoo.com).

# Breeding Update from the International Centre for the Conservation of Turtles (IZS) in the Muenster Zoo

DR. MARTINA RAFFEL AND ELMAR MEIER

In 2011, a total of 37 turtle offspring were produced, of which 36 hatchlings survived at the International Centre for the Conservation of Turtles (IZS). The IZS is a joint project of the Muenster Zoo, the Zoological Society for the Conservation of Species and Populations (ZGAP), and the German Herpetological Society (DGHT).

The primary focus of the IZS project continues to be the breeding of box turtles of the genus *Cuora*, with a total of 29 hatchlings in 2011. However, eggs of the Red-Necked Pond Turtle (*Chinemys nigricans*) and the Vietnamese Pond Turtle (*Mauremys annamensis*) were also incubated.

Unfortunately, the first fertilized eggs of the Tricarinata Hill Turtle (*Melanochelys tricarinata*) announced in the 2011 issue of *Turtle Survival Journal* did not develop into hatchlings, so this species still has not been bred successfully. However, the year 2012 started promisingly, when a Sulawesi Forest Turtle (*Leucocephalon yuwonoi*)

## OFFSPRING HATCHED AT IZS IN 2011

No. of hatchlings	English name	Scientific name
3	Red-Necked Pond Turtle	<i>Chinemys nigricans</i>
7	Yellow-Headed Box Turtle	<i>Cuora aurocapitata</i>
3	Golden Coin Box Turtle	<i>Cuora cf. cyclornata</i>
1	Meier's Golden Coin Box Turtle	<i>Cuora cyclornata meieri</i>
3	Indochinese Box Turtle	<i>Cuora galbinifrons</i>
11	McCord's Box Turtle	<i>Cuora mccordi</i>
1	Southern Vietnam Box Turtle	<i>Cuora picturata</i>
3	Zhou's Box Turtle	<i>Cuora zhoui</i>
5	Vietnamese Pond Turtle	<i>Mauremys annamensis</i>

hatched on 7 January, and three Arakan Forest Turtles (*Heosemys depressa*) hatched in late March. IZS is thus regularly breeding 13 of the 40 species and subspecies that are currently at



Three Arakan Forest Turtles (*Heosemys depressa*) hatched at the end of March 2012 at IZS.

PHOTO CREDIT: ALINA LOTH

highest risk for extinction.

Between the start of operations in 2003 and December 2011, the program hatched a total of 334 specimens, with 329 of those hatchlings surviving up to now.

Dr. Martina Raffel, Curator for *in situ* Conservation, Allwetterzoo Muenster, Sentruper Strasse 315, 48161 Muenster, Germany, raffel@allwetterzoo.de; Elmar Meier, Volunteer Project Manager IZS.

## We're serious about saving turtles—join us!

Visit [turtlesurvival.org](http://turtlesurvival.org) to become a TSA member. Or, complete this form and send, with a check (payable to TSA) to:  
 TSA, 1989 Colonial Parkway, Fort Worth, Texas 76110

NAME

COMPANY / ORGANIZATION

ADDRESS

CITY, STATE, ZIP, COUNTRY (IF OUTSIDE U.S.)

E-MAIL

PHONE NUMBER

How did you hear about the TSA? \_\_\_\_\_

Membership Levels (figures represent annual dues):

Student (\$25)    Individual (\$50)

Would you like to make your membership "green?" Green members will not receive a hard copy of the TSA's annual publication in the mail. Instead, they are invited to read it online.  Yes  No

Please visit [turtlesurvival.org](http://turtlesurvival.org) to learn more about options for Organizational Memberships.

Thanks for your support!



TSA members are eligible for discounts on registration at our annual conference and other specials throughout the year. In addition, members receive our annual full-color publication, along with a bi-weekly e-newsletter featuring the latest in turtle conservation news. Membership funds allow the TSA to do work around the world including:

- Awarding small grants and conducting training opportunities to expand conservation work with endangered tortoises and freshwater turtles globally
- Hosting our annual symposium and providing support to speakers and special guests
- Supporting conservation work and recovery programs for critically endangered chelonians around the world



The Animal Management Program acquired two adult pairs of long-term captive Southern Keeled Box Turtles (*Cuora mouhotii obsti*) this year. PHOTO CREDIT: CRIS HAGEN.

# 2012 Animal Management Report

CRIS HAGEN

The TSA's Animal Management Program experienced an extremely busy and productive year. In our quest to streamline and prioritize the TSA's living collections, a master collection plan was completed and implemented. This plan will serve as the foundation for all future assurance colony management, acquisition, and disposition within the TSA's captive collections.

During the past 12 months, the TSA placed more than 100 turtles and tortoises with members through breeding loans, loan transfers, adoptions, and new acquisitions. Several significant collections of priority species were

donated and placed, thanks to the generosity and commitment of our membership. In addition, the TSA received animals from three confiscations by the U.S. Fish and Wildlife Service. I am also pleased to announce that in the past year we saw more captive bred hatchlings of the critically endangered Sulawesi Forest Turtle (*Leucocephalon yuwonoi*) than in all previous years combined.

Lastly, and most importantly, I am extremely excited by the decision to acquire a new Turtle Survival Center as a home base for the TSA and its Animal Management program. As detailed facility planning has progressed, it

has become clear that the Center will be transformational in the TSA's commitment to zero turtle extinctions (see page 18).

## CAPTIVE REPRODUCTION OF THE SULAWESI FOREST TURTLE (*LEUCOCEPHALON YUWONOI*)

It has been a great year for *L. yuwonoi* reproduction in captivity. Hatchlings were produced by TSA member Frank Passamonte (2), Dr. Greg Fleming (2), the Denver Zoo (2), Zoo Atlanta (1), and the Muenster Zoo (1). Eggs were generally incubated on moistened vermiculite and/or sphagnum moss at temperatures of 24 – 28 C

Sulawesi Forest Turtle (*Leucocephalon yuwonoi*)  
hatched in captivity on 5 September 2011 by  
TSA member Frank Passamonte. PHOTO CREDIT: CRIS HAGEN.







The TSA is building up its holdings of Chinese Big-headed Turtles (*Platysternon megacephalum*) through donations. This cool-adapted, mountain stream dwelling species has proven difficult to successfully reproduce in captivity but with focused attention, we hope that images like this will become more commonplace. PHOTO CREDIT: CRIS HAGEN.

(75 – 82 F) and hatched after four or five months. This species has proven to be very difficult to keep and breed in captivity and the hatchling success numbers are a significant development in captive husbandry. We hope this trend continues and signifies a turning point for *Leucocephalon* assurance colonies.

#### CONFISCATIONS

A small confiscation of 0.4 Spek's Hinge-backed Tortoises (*Kinixys spekii*) was received in January 2012. A confiscation of 22 Pancake Tortoises (*Malacochersus tornieri*) that occurred in 2009 was recently officially released to the TSA. Finally, a group of juvenile Ploughshare Tortoises (*Astrochelys yniphora*) that were confiscated in Hong Kong were imported into the U.S. in March 2012 (see text box).

#### ANIMAL DONATIONS

Over the past year, the TSA has received several generous donations from members, many of them priority species. These include, 5.2.16 *Chelodina mccordi*, 2.3 *Cuora galbinifrons*, 2.4 *Cuora mouhotii*, 0.0.13 *Cuora trifasciata*, 0.0.2 *Heosemys depressa*, 2.1 *Heosemys spinosa*, 1.1.2 *Leucocephalon yuwonoi*, 1.1 *Manouria impressa*, 4.1 *Notochelys platynota*, 2.1 *Platysternon megacephalum*, and 1.9.10 *Testudo kleinmanni*. (Notation expresses the sex ratios among the donated animals, e.g. 5 male, 2 female and 16 unsexed juveniles of *Chelodina mccordi*).

Donations like these help the TSA build *ex situ* captive assurance colonies of priority species while preserving critical operating funds. With the extremely low numbers of existing individuals of some species and the rapid decline of others, every individual has the potential to make a difference in maintaining the genetic diversity of captive populations.

## Ploughshare Tortoises Arrive in the U.S.

Michael Ogle

The Ploughshare or Angonoka Tortoise (*Astrochelys yniphora*) is one of the rarest chelonians in the world today. *A. yniphora* is endemic to a small section of remnant bamboo-scrub habitat surrounding Baly Bay in northwest Madagascar. Slash and burn agriculture, along with smuggling for the Southeast Asian black market pet trade, has reduced the wild population to an estimated 400 adult tortoises. The Durrell Wildlife Conservation Trust (DWCT) has worked to save this species from extinction for the last 25 years. Without their commitment to the Ploughshare, the tortoise would have disappeared years ago. Unfortunately, illegal trade in this species has increased significantly since a 2009 coup changed the Madagascar government. This increased trade prompted DWCT to ask for assistance from the international conservation community to prevent further catastrophic declines. Eric Goode and his organization, the Turtle Conservancy/Behler Chelonian Center (TC/BCC), have risen to the challenge. Protecting the tortoises *in situ* is of the utmost importance, and DWCT and TC, with support from the TSA, are working to do just that. They are pursuing a multifaceted approach, working with local communities, building additional quarantine facilities in Madagascar for confiscated Ploughshares, and purchasing a high speed boat to more effectively patrol the northwest Madagascar coastline for smugglers.

One recommendation made at the 2008 IUCN Red List meeting in Antananarivo, Madagascar called for the establishment of an *ex situ* population as a safety net for the species' long-term survival. On 14 March 2012, the Turtle Survival Alliance, in conjunction with Zoo Atlanta and the Knoxville Zoo, imported eight juvenile Ploughshare Tortoises from our partner Kadoorie Farm and Botanical Garden in Hong Kong (KFBG).

The tortoises were initially confiscated



Confiscated Madagascar Ploughshare Tortoises (*Astrochelys yniphora*) being held and cared for at Kadoorie Farm and Botanic Garden (KFBG) in May 2011. These tortoises will ultimately be transferred to institutions in the U.S. forming important *ex situ* assurance colonies. PHOTO CREDIT: CRIS HAGEN.

by authorities in Hong Kong in 2010 and then maintained by KFBG until they were shipped to the United States. The Hong Kong authorities selected Kadoorie because of its long history of working with turtles and tortoises confiscated from illegal traffickers. The keeper staff at Kadoorie did an excellent job nursing these tortoises back to health and getting them accustomed to captive conditions. Without their hard work, these tortoises would surely have succumbed. KFBG cannot be thanked enough for their willingness to work with these and other confiscated chelonians.

The Ploughshare shipment to the United States was a milestone achievement for our organizations, this being only the second time that the U.S. Fish & Wildlife Service has approved an import permit for this species. These eight tortoises, plus the ten imported in 2011 by the Behler Chelonian Center, will form the nucleus of the U.S. assurance colony. The opportunity now exists to further develop breeding groups in Europe and the United States, as additional confiscated tortoises become available. In an ideal situation, confiscated tortoises would be returned to Madagascar. However, for now, the decision has been made that all confiscated Ploughshares in Asia should, when possible, enter into the Association of Zoos and Aquariums (AZA) or European Association of Zoos and Aquaria (EAZA) breeding programs.

Michael Ogle, Knoxville Zoo, mogle@knoxvillezoo.org



On 23 January 2012, the Denver Zoo successfully hatched its first Sulawesi Forest Turtle (*Leucocephalon yuwonoi*). PHOTO CREDIT: RICK HAEFFNER.



One of five adult Indochinese Box Turtles (*Cuora galbinifrons*) donated to the TSA's Animal Management Program in 2012. PHOTO CREDIT: CRIS HAGEN.



22 Pancake Tortoises (*Malacochersus tornieri*) confiscated in a shipment from Zambia in 2009 were recently released to the TSA. They will be integrated into the TSA's existing captive program for this species. PHOTO CREDIT: CRIS HAGEN.

#### ANIMAL ACQUISITIONS

The TSA purchased 2.2 long-term captive Southern Keeled Box Turtles (*Cuora mouhotii obsti*) and 4.8 Philippine Box Turtles (*Cuora amboinensis*) to be managed in the captive program.

#### ANIMAL LOANS

A total of 135 individual turtles and tortoises were placed with members (35 private and 6 institutional) through the TSA's Animal Management Program. These include the following species: *Carettochelys insculpta*, *Chelodina mccordi*, *Cuora mccordi*, *Cuora galbinifrons*, *Cuora mouhotii*, *Cuora trifasciata*, *Geochelone elegans*, *Geochelone platynota*, *Heosemys depressa*, *Heosemys spinosa*, *Kinixys spekii*, *Leucocephalon yuwonoi*, *Malacochersus tornieri*, *Manouria emys phayrei*, *Manouria impressa*, *Mauremys annamensis*, *Notochelys platynota*, *Platysternon megacephalum*, and *Pyxis arachnoides*.

#### ANIMAL ADOPTIONS

Several members received animals through the Animal Management Program's permanent adoption process, including Egyptian Tortoises (*Testudo kleinmanni*) and Asian Brown Tortoises (*Manouria emys emys*).

#### PLANS FOR THE COMING YEAR

We are currently organizing our first international reintroduction project, returning Vietnamese Pond Turtles (*Mauremys annamensis*) to protected areas in their home range. Before reintroductions begin, all captive founders will be screened genetically to ensure none are hybrids. Genetic screening will be carried out at molecular laboratories in the U.S., Europe, and Asia, with completion set for the end of 2012. Once the genetic background of the founders is known, only non-hybrid individuals will be bred to provide offspring for headstarting and release programs in Vietnam.

Obviously, the primary focal point of the Animal Management Program in 2013 will be the development of the new Turtle Survival Center in South Carolina. This facility will serve as a turning point for The TSA's animal management efforts, allowing us to more effectively manage groups of priority species, handle confiscations, and conduct captive husbandry training for foreign turtle conservationists working with rescue centers and assurance colonies.

Cris Hagen, Turtle Survival Alliance, Drawer E, Aiken, SC 29802, USA [chagen@turtlesurvival.org](mailto:chagen@turtlesurvival.org)

ANIMAL MANAGEMENT  
**TURTLE SURVIVAL CENTER**



The heart of the Turtle Survival Center, housing the vet clinic, quarantine rooms and other amenities, with ponds in the foreground. PHOTO CREDIT: CRIS HAGEN

# Transforming the Turtle Survival Alliance

**The Turtle Survival Alliance (TSA)** was founded in 2001 in response to the magnitude of the turtle extinction crisis. Even then, it was clear that some critically endangered species would not survive without long-term captive assurance colonies. Historically, the TSA's assurance colonies have been spread over multiple locations as a hedge against a catastrophic loss due to a disease outbreak, fire, or other disaster. Although this policy will continue, we have long recognized the need for a dedicated center to serve as a focal point for our living collections. However, we



The Golden Coin Box Turtle (*Cuora trifasciata*) is one of the species included in the collection plan for the TSC. PHOTO CREDIT: PETER PRASCHAG



This proposed master plan lays out TSA's vision for a truly world-class turtle and tortoise facility. DRAWING BY NEVIN LASH.



Dr. Sam Seashole poses with one of the previous residents of the facility. PHOTO CREDIT: CRIS HAGEN



The facility's already existing quarantine room will allow the Collection Manager to bring new animals into the collection safely. PHOTO CREDIT: CRIS HAGEN

have not actively pursued this goal as the cost of buying land and building a facility from scratch was considered far too great.

The situation changed dramatically in March when Sam Seashole, DVM, offered to sell the TSA a wonderful property which is ideal for our dedicated center. This 50-acre property is located in South Carolina, where the climate is moderate coastal lowland, with mostly warm sunny days and occasional overnight freezes in the winter. The site climate is comparable to a number of the areas in Asia where many of our target species are found, and most of the species in our collection plan should thrive outdoors at the site. In fact, turtle specialists in this region of South Carolina routinely keep subtropical and temperate Asian species outdoors year round.

The site, originally developed for crocodylians, is an amazing fit to our needs and comes with much of the infrastructure and equipment required for a successful turtle and tortoise breeding operation, including fenced ponds, pastures, and other outdoor enclosures. It also has a modern, fully-equipped veterinary facility designed for wildlife rescue which is perfect for treating animals confiscated from the illegal wildlife trade and for training vets from the U.S. and abroad in the latest turtle veterinary techniques. The facility also provides significant opportunities for expansion, with only four acres currently developed.

Once in operation, this facility will enable the TSA to develop a world-class Turtle Survival Center (TSC) with assurance colonies for critically

## TSC TAILOR-MADE FOR CHELONIANS

The facility currently boasts the following:

- » **Veterinary Clinic** — A new, fully equipped small animal/exotic facility, with two exam rooms, pharmacy, fully equipped clinical lab, surgical suite with new modern equipment, and portable X-ray unit with developing room.
- » **Conference Center** — A 1,000 square foot conference room, plus guest living quarters that include a full bath and kitchenette.
- » **Barn** — The barn has four stalls and two treatment/isolation rooms with caging facilities.
- » **Quarantine Room** — The quarantine facility is fully heated and cooled.
- » **Wells** — Four wells on the property include a deep well with tepid water to supply reptile ponds in winter.
- » **Generator** — Available in the event of power outages in winter.
- » **Concrete ponds** — There are eleven securely fenced ponds on the property.
- » **Tortoise enclosure** — Includes a heated house and six modular carports that provide shade.
- » **House** — The 2,000 square foot home has four bedrooms, two bathrooms and a separate, but attached apartment.
- » **Mobile home** — A mobile home on the property provides additional living quarters.

endangered chelonians that depend on captive management for their survival. The TSC will also handle confiscations and rescues as well as stage reintroduction efforts from captive bred offspring. Utilizing fenced outdoor enclosures, ponds, and greenhouses, the TSC will provide high-quality animal care with world class veterinary support.

Of course, TSA's policy of maintaining far-flung assurance colonies in countries around the globe will continue. Those colonies will function in conjunction with the TSC, allowing us to expand the sizes of our assurance colonies while continuing to offer critical insurance against a disaster wiping out any one colony.

We expect the TSC will ultimately become a hub for our captive breeding activities, especially with the help and involvement of members, students and volunteers. The Center will also provide an excellent venue for conducting training workshops as part of the TSA's commitment to expand opportunities for our international colleagues. Student research projects will also be encouraged.

Volunteer opportunities will also abound in the near future, as we gear up to get the property "turtle ready". Weekend volunteer trips will present a great chance to pitch in for turtle conservation, while also attracting turtle enthusiasts from near and far. We have no doubt that the Turtle Survival Center will transform the TSA, offering extraordinary new and enhanced capabilities and capacities for turtle conservation.



The on-site veterinary clinic includes two examination rooms, along with a host of modern equipment.

PHOTO CREDIT: CRIS HAGEN

## Ensuring a Future for Turtles and Tortoises

The targeted collection plan for the Turtle Survival Center comprises seven species of tortoises and 20 species of freshwater turtles – primarily Asian – carefully selected for assurance colonies based on the critical need of captive breeding for survival, and suitability to the South Carolina climate.

Four of the tortoises and 16 of the turtle species are ranked by the IUCN Red List as being Critically Endangered, the category with the highest risk of extinction. And 17 are on the list of the World's 25+ Most Endangered Tortoises and Freshwater Turtles, compiled by the Turtle Conservation Coalition in 2011. Nine species are listed in the top 25 and the remaining eight are listed in the top 40 at the highest risk of extinction.

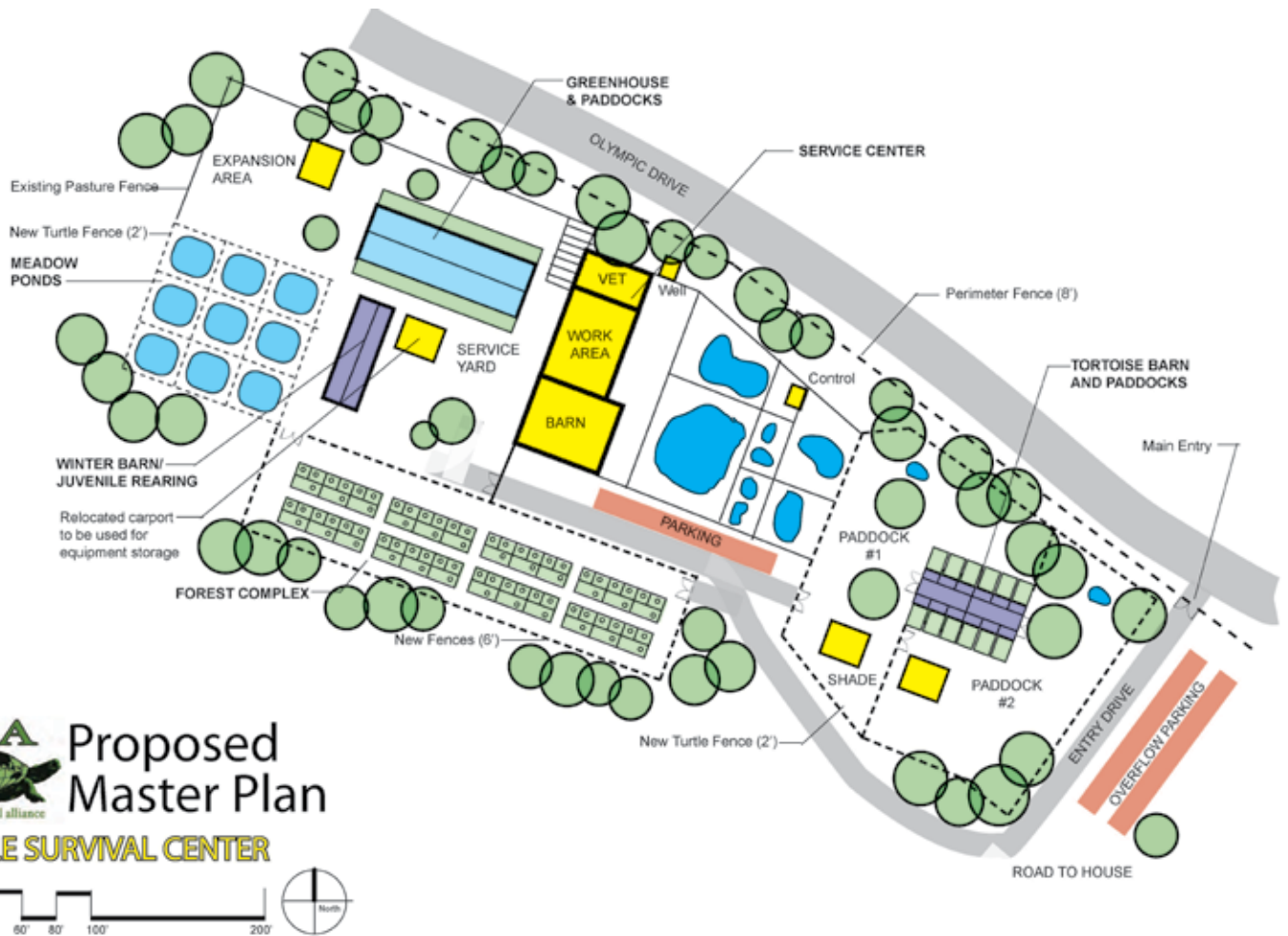
Tortoise and Turtle Species in the Turtle Survival Center Collection Plan	IUCN Red List Status	Top 25 Most at Risk of Extinction
---------------------------------------------------------------------------	----------------------	-----------------------------------


### TORTOISES

Asian Mountain Tortoise, <i>Manouria emys phayrei</i>	Critically Endangered	
Impressed Tortoise, <i>Manouria impressa</i>	Vulnerable	
Forsten's Tortoise, <i>Indotestudo forsteni</i>	Endangered	
Home's Hinge-Back Tortoise, <i>Kinixys homeana</i>	Vulnerable	
Burmese Star Tortoise, <i>Geochelone platynota</i>	Critically Endangered	X
Madagascar Spider Tortoise, <i>Pyxis arachnoides</i>	Critically Endangered	
Madagascar Flat-Tailed Tortoise, <i>Pyxis planicauda</i>	Critically Endangered	

### TURTLES

Beale's Eyed Turtle, <i>Sacalia bealei</i>	Critically Endangered	
Four-Eyed Turtle, <i>Sacalia quadriocellata</i>	Endangered	
Arakan Forest Turtle, <i>Heosemys depressa</i>	Critically Endangered	
Vietnam Pond Turtle, <i>Mauremys annamensis</i>	Critically Endangered	X
Red-Necked Pond Turtle, <i>Mauremys nigricans</i>	Critically Endangered	
Golden-Headed Box Turtle, <i>Cuora aurocapitata</i>	Critically Endangered	X
McCord's Box Turtle, <i>Cuora mccordi</i>	Critically Endangered	X
Keeled Box Turtle, <i>Cuora mouhotii</i>	Critically Endangered	
Pan's Box Turtle, <i>Cuora pani</i>	Critically Endangered	
Golden Coin Box Turtle, <i>Cuora trifasciata</i> / <i>C. cyclornata</i>	Critically Endangered	X
Indochinese Box Turtle, <i>Cuora galbinifrons</i>	Critically Endangered	
Bourret's Box Turtle, <i>Cuora bourreti</i>	Critically Endangered	
Southern Vietnamese Box Turtle, <i>Cuora picturata</i>	Critically Endangered	
Zhou's Box Turtle, <i>Cuora zhoui</i>	Critically Endangered	X
Sulawesi Forest Turtle, <i>Leucocephalon yuwonoi</i>	Critically Endangered	X
Big Headed Turtle, <i>Platysternon megacephalon</i>	Endangered	
Rote Island Snake-Necked Turtle, <i>Chelodina mccordi</i>	Critically Endangered	X
Madagascar Helmeted Turtle, <i>Erymnochelys madagascariensis</i>	Critically Endangered	X
Indochinese Serrated Turtle, <i>Geoemyda spengleri</i>	Endangered	
Spiny Hill Turtle, <i>Heosemys spinosa</i>	Endangered	




**Proposed Master Plan**  
**TURTLE SURVIVAL CENTER**

# Opportunities for Support

The mission of the TSA is rooted in the need to keep and maintain assurance colonies to secure the future of the world's most endangered chelonians. We are pleased to be presented with the opportunity to purchase a property in South Carolina that is ideally suited to our goals. We envision the development of the Turtle Survival

Center on this property, where assurance colonies for critically endangered turtles and tortoises that depend on captive management for their survival can be developed. There are plans to expand the infrastructure and facilities of this property in 2013 to turn it into a truly world-class facility.

By becoming a supporter of the Center, you have

the opportunity to partner with a program that will save many species from extinction. Your legacy will be that you were direct, integral in helping the TSA's Turtle Survival Center guarantee the survival of not one, but a number of species that are nearing extinction.

To learn more about giving opportunities, please contact Heather Lowe at (817)759-7262.



Can you identify all of these Graptemys? Answer key on p. 63 PHOTO BY CRIS HAGEN

# Turtles in Dixie: Map Turtles and Sawbacks

WILL SELMAN, PH.D.<sup>1</sup> AND CRIS HAGEN

The genus *Graptemys*, commonly referred to as map or sawback turtles, contains the most turtle species of any North American turtle genus. With such an incredible taxonomic diversity, as well as their intricate patterns, shapes, and colors, map turtles as a group have been a favorite of hobbyists for a very long time. Of the 14 species, eight are endemic to single river drainages of the southeastern United States, with two endemic species occurring together in three of the Gulf of Mexico river systems: the Mobile River system (*G. pulchra*, Alabama Map Turtle; *G. nigrinoda*, Black-knobbed Sawback), the Pascagoula River system (*G. gibbonsi*, Pascagoula Map Turtle; *G. flavimaculata*, Yellow-blotched Sawback), and the Pearl River system (*G. pearlensis*, Pearl River Map Turtle; *G. oculifera*, Ringed Sawback; Buhlmann et al. 2008).

Three species of *Graptemys* occur within the Cahaba River system of Alabama (Alabama Map Turtle, Black-knobbed Sawback, and the Common Map Turtle, *G. geographica*), but researchers have only found localities where two of the three species occur. The epicenter for *Graptemys* diversity is in the state of Mississippi, which boasts

nine species, while Alabama and Louisiana host six and five species, respectively. Most map and sawback turtle species are primarily found in rivers, streams, bayous, or oxbow lakes that drain into the Gulf of Mexico (Ernst and Lovich, 2009).

Even though the genus *Graptemys* has a large number of species, researchers still know little about their basic life history and ecology. Their taxonomy has been equally challenging, with six *Graptemys* species described between 1950 and 2000 (*G. ouachitensis*, Ouachita Map Turtle 1953; *G. flavimaculata* 1954; *G. nigrinoda* 1954; *G. caglei*, Cagle's Map Turtle 1974; *G. ernsti*, Escambia Map Turtle 1992; *G. gibbonsi* 1992). The last species to be formally described

was the Pearl River Map Turtle, *G. pearlensis* (Ennen et al. 2010), further underscoring the relative little we know about the genus. It is possible that additional "cryptic species" may occur and may be described in the future.

Unfortunately, many of these attractive turtle species are considered species of concern or are considered state threatened/endangered. Population declines in the 1980's and 1990's of the Ringed Sawback and Yellow-blotched Sawback led to these species being listed as federally threatened under the Endangered Species Act (USFWS 1986, 1991).

There are many threats to the genus and most are associated with loss of riverine habitat and habitat alteration, which includes the desnagging of river systems (removal of fallen trees which provide basking and prey species habitats), construction of reservoirs, river channelization, excessive water withdrawal, and water quality degradation. Additional threats include shooting of turtles as target practice, collisions with boats, collection for the pet trade, fisherman by-catch, and the destruction of nests on sandbars by recreational ATV riding (Buhlmann et al., 2008; Lindeman, *in press*).

All 16 currently recognized species and subspecies of map turtles are being maintained and bred in captivity. Several species of narrow-headed map turtles are reproducing regularly in many captive collections and large scale turtle farms in the Southeastern United States have been mass-producing a few species, including the Mississippi Map Turtle and Ouachita Map turtle for decades. As a result, these two species have been commonplace in pet stores and reptile trade shows across the U.S. for a many years, as well as available in international pet markets. In addition to private keepers, public institutions such as the Tennessee Aquarium continue to safeguard species like the federally threatened Yellow-blotched Map Turtle through successful captive breeding programs.

## REFERENCES

- Buhlmann, K., T. Tuberville, and W. Gibbons. 2008. Turtles of the southeast. University of Georgia Press, Athens and London.
- Ennen, J. R., J.E. Lovich, B.R. Kreiser, W. Selman, and C.P. Qualls. 2010. Genetic and morphological variation between populations of the Pascagoula map turtle (*Graptemys gibbonsi*) in the Pearl and Pascagoula rivers with description of a new species. *Chelonian Conservation and Biology* 9:98-113.
- Ernst, C.H., and J.E. Lovich. 2009. Turtles of the United States and Canada. 2nd ed. Smithsonian Institution Press, Washington D.C., USA.
- Lindeman, P.V. *In press*. The Map Turtle and Sawback Atlas: Ecology, Evolution, Distribution, and Conservation of the Genus *Graptemys*. Norman, OK: University of Oklahoma Press.
- U.S. Fish and Wildlife Service. 1986. Determination for threatened status for the ringed sawback turtle. *Federal Register* 51(246):45907-45910.
- U.S. Fish and Wildlife Service. 1991. Determination for threatened status for the yellow-blotched map turtle. *Federal Register* 56(9):1459-1463.
- Will Selman, Ph.D., Research Coordinator and Wildlife Biologist, Rockefeller Wildlife Refuge, Louisiana Department of Wildlife and Fisheries, Grand Chenier, LA 70643, USA, wselman@wfla.gov



1. Cagle's Map Turtle, *Graptemys caglei*, PHOTO CREDIT: BILL HUGHES
2. Sabine Map Turtle, *Graptemys sabinensis*, PHOTO CREDIT: PAUL VANDER SCHOUW
3. Ouachita Map Turtle, *Graptemys ouachitensis*, PHOTO CREDIT: PAUL VANDER SCHOUW
4. False Map Turtle, *Graptemys pseudogeographica*, PHOTO CREDIT: PAUL VANDER SCHOUW
5. Northern Map Turtle, *Graptemys geographica*, PHOTO CREDIT: PAUL VANDER SCHOUW
6. Barbour's Map Turtle, *Graptemys barbouri*, PHOTO CREDIT: CRIS HAGEN
7. Escambia Map Turtle, *Graptemys ernsti*, PHOTO CREDIT: JIM GODWIN
8. Northern Black-knobbed Map Turtle, *Graptemys nigrinoda nigrinoda*, PHOTO CREDIT: JIM GODWIN
9. Southern Black-knobbed Map Turtle, *Graptemys nigrinoda delticola*, PHOTO CREDIT: CRIS HAGEN
10. Alabama Map Turtle, *Graptemys pulchra*, PHOTO CREDIT: TIM MIEDEMA
11. Yellow-blotched Map Turtle, *Graptemys flavimaculata*, PHOTO CREDIT: PAUL VANDER SCHOUW
12. Pascagoula Map Turtle, *Graptemys gibbonsi*, PHOTO CREDIT: TIM MIEDEMA
13. Ringed Map Turtle, *Graptemys oculifera*, PHOTO CREDIT: BOB JONES
14. Pearl River Map Turtle, *Graptemys pearlensis*, PHOTO CREDIT: PAUL VANDER SCHOUW
15. Mississippi Map Turtle, *Graptemys pseudogeographica kohni*, PHOTO CREDIT: CRIS HAGEN
16. Texas Map Turtle, *Graptemys versa*, PHOTO CREDIT: PAUL VANDER SCHOUW







## MADAGASCAR

# TSA Madagascar Leads Fight to Conserve Imperiled Radiated Tortoise

HERILALA RANDRIAMHAZO, RICK HUDSON, AND CHRISTINA CASTELLANO



Ribbon cutting ceremony to officially open the new primary school at Antsakoamasy. PHOTO CREDIT: CHRISTINA CASTELLANO

The TSA is implementing a comprehensive strategy to save Madagascar's Radiated Tortoise, launching major infrastructure initiatives, an extensive public awareness campaign, crucial education and training workshops, support for law enforcement, and sponsorship of scientific research. Our goal is a science-based reintroduction program, embraced and managed by local communities and law enforcement agencies, to effectively restore healthy tortoise populations. The future of the Radiated Tortoise hangs in the balance; its survival depends on our ability

to find solutions to the current crisis and garner support for the cause.

## TSA BUILDS NEW SCHOOL AT ANTSAKOAMASY

A new primary school at Antsakoamasy, built with TSA support, opened in March. A huge crowd attended the ribbon cutting ceremony, and local political leaders reflected on the new school's significance. The Regional Director of National Education said that the event, "marks a special occasion for us in

Androy, because a conservation organization [TSA] managed to bring us together to refresh our memory about the culture linked to the taboo," against harming tortoises. The official noted how the taboo, biodiversity preservation, and the need for a new school all joined together to create "a strong basis for the future of our children. All three in one, we have never seen that before. I did not expect that tortoise conservation would construct a school!" He committed to hiring the current teacher at Antsakoamasy as a permanent government employee, and promised to request an additional teacher next year. The school demonstrates the TSA's commitment to building lasting partnerships with local communities to ensure a brighter future for tortoises and people.

## TORTOISE HUSBANDRY WORKSHOPS

TSA Madagascar conducted two husbandry training workshops in March in response to the growing number of tortoise confiscations, and as a step toward developing more tortoise-care personnel and dedicated facilities. The workshops, funded by a World Wildlife Fund Education for Nature grant, aimed at improving care and survival of seized tortoises.

The first workshop was held in the newly dedicated school at Antsakoamasy, and the second at SOPTOM's Village des Tortues in Ifaty. Fifty people attended, representing Madagascar National Parks (MNP), the Forestry Department, Gendarmes (police), and local communities with potential tortoise release sites. Topic highlights included species identification and distribution, threats to tortoise populations, national and international laws protecting tortoises, group responsibilities regarding tortoise confiscations, best practices for transporting tortoises seized from the trade, triage, housing construction and husbandry considerations. Lectures reviewed proper data collection during confiscations, and the reintroduction of tortoises. Of particular interest, participants learned about the establishment of temporary holding facilities in Beloha and the other four districts in the Androy region. Participants also shared their experiences regarding regional obstacles to tortoise conservation, especially the lack of financial resources for local tortoise protection, enforcement, and confiscations. These workshops resulted in groups of empowered advocates; the TSA's challenge will be to identify resources allowing the groups to have direct and immediate impacts on tortoise conservation.



## FILM RAISES AWARENESS OF RADIATED TORTOISE

In 2011, the TSA, The Orianne Society, MNP, and MOZ Images, a South African film company, joined forces to document the battle to save Madagascar's Radiated Tortoise. *Tortoises in Trouble* is a nine-minute film highlighting the social and political barriers to tortoise conservation, and it emphasizes the key roles communities can play to ensure survival. The film targets three audiences: local tribes who can offer the species protection, regional city dwellers who drive the collection of tortoise meat, and government officials responsible for poacher apprehension and prosecution. *Tortoises in Trouble* is just one element of the TSA's far-reaching public awareness campaign to tear down barriers to conservation in Madagascar.

The film tracks a group of 140 confiscated Radiated Tortoises as they move from the capital city of Antananarivo to be repatriated in their southern homeland, a protected forest near the village of Ampotoka. Interviews with stakeholders – everyday citizens, community leaders, resource managers, poachers, law enforcement agents, and conservationists – offer varied perspectives on the crisis, and identify barriers to action. *Tortoises in Trouble* has already been shown on movie nights in nine villages. Hundreds of people have come to watch the film, and thousands of armbands and stickers have been passed out proclaiming the message: “*Protect the Sokake!*” (the local name for the Radiated Tortoise). Hundreds of posters with similar messages have also been distributed. Visit the TSA video library to view *Tortoises in Trouble* at <http://turtlesurvival.org/resources/video-library>.

## THE WORST TORTOISE MASSACRE ON RECORD

In October 2011, more than 100 men, women and children from the Antanosy tribe walked more than 100 kilometers from their homes in Lazarivo and Fotadrevo in southern Madagascar to Tragnavaho, a Tandroy community, to illegally collect Radiated Tortoises for their meat. The Tandroy people, in contrast to the Antanosy tribe, believe that harming tortoises is taboo, and have lived in harmony with the species for centuries. Sadly this intact tortoise population was targeted by poachers.

The Antanosy quickly set up a forest base camp where they massacred nearly 2,000 tortoises. Two Tandroy villagers reported this illegal activity to the mayor of Tragnavaho to get it stopped, while others unfortunately aided

This illegal shipment of Spider Tortoises revealed a new smuggling technique not seen before in Madagascar: each tortoise was individually wrapped in cellophane to prevent movement. Fortunately holes were cut to allow for breathing; unfortunately two female tortoises died trying to push out eggs against the plastic. PHOTO CREDIT: HERILALA RANDRIAMHAZO



Part of the remains of the largest tortoise massacre ever reported in Madagascar, where nearly 2000 Radiated Tortoises were slaughtered for meat near Tragnavaho.



Participants in the second WWF sponsored tortoise husbandry workshop held at the Village des Tortues at Ifaty. PHOTO CREDIT: RICK HUDSON



Christina Castellano and Herilala Randriamahazo demonstrate shell notching techniques to workshop participants in the new school at Antsakoamasy. PHOTO CREDIT: RICK HUDSON

the poachers in exchange for money. Ultimately, the national police and forestry agents arrived to support Tragnovaho's mayor and the villagers. The raid on the poacher camp was financially supported by the TSA and the World Wildlife Fund. Law enforcement agents found the remains of 2,000 tortoises, but discovered more than 200 live individuals. Six poachers were apprehended, but the rest vanished into the forest. The poachers were jailed in Ampanihy, but were not forced to pay the fine for killing tortoises. However, the TSA, MNP, and national police

aided the mayor in implementing the traditional punishment on the community for assisting the poachers. Consequently, one zebu was offered to clean the land, two goats were given to the mayor because he upheld his duties, and 20,000 Ariary (US \$10) was given as reward to each of the two informants who reported the poachers.

In February, the TSA responded to the incident by helping to establish a Tortoise Conservation Committee for the Androy Region. Committee members include the Ministry of Environment and Forests, Directorate General



Thousands of stickers were handed out and proudly displayed around town. This one was placed on a candy jar in a local shop in Beloha. PHOTO CREDIT: CHRISTINA CASTELLANO

of Forests, Regional Directorate of Environment and Forests, Madagascar National Parks, and non-governmental organizations Alliance Voahary Gasy and the TSA. It is charged with enforcing traditional laws, eradicating consumption, and eliminating the tortoise trafficking network in the region.

#### TORTOISE TRAFFICKING CONTINUES

In March, two boxes containing 139 Spider Tortoises (*Pyxis arachnoides*) were confiscated in Antsirabe from a passenger bus traveling between Tulear and Antananarivo. The authorities couldn't accept the seized animals due to a lack of resources, but TSA Madagascar was alerted and took custody of the animals. The contraband tortoises were almost certainly bound for international pet markets. Three Malagasy smugglers based in Antananarivo were arrested and the police identified another from Tulear. According to passenger records, one of the smugglers had travelled the same route three times since the year's start.

In April, 19 Radiated Tortoises were confiscated at a house in Antananarivo. Officials authorized the TSA to hold them temporarily before transferring them to the Village des Tortues in Ifaty, where a permanent enclosure for confiscated tortoises exists. The tortoises will be released into the wild later this year as part of the TSA's reintroduction program.

#### REINTRODUCTION STRATEGY FOR ESTABLISHING TORTOISE POPULATIONS

Madagascar law enforcement officials confiscate hundreds of live Radiated Tortoises annually. Unfortunately, there is currently no place to house them, or little expertise to

## Meet the Staff: Sylvain Mahazotahy

*Rick Hudson*

Sylvain Mahazotahy is a Malagasy conservation biologist whose main professional interests are plant conservation – particularly the spiny forest – and community-based conservation. He has a Master's Degree in Plant Ecology from the University of Toliara, and is a native speaker of the Tandroy dialect, the predominant spoken language in southern Madagascar where TSA is currently working to save threatened tortoises. His intimate understanding of Tandroy culture has made him a key player in the TSA conservation effort to empower local communities through their respect for the tortoise-related taboo known as “faly sokake”. In addition to building community relations, Sylvain will significantly contribute to monitoring habitat at sites where tortoise populations are being protected and reintroduced. In September 2011, Sylvain guided our film team during the making of the movie *Turtles in Trouble*. Since November 2011, he has worked as a Social Mobilization Officer, a fulltime position based in Ambovombe. There he works closely with TSA's Madagascar Tortoise Conservation Coordinator, Herilala Randriamahazo, effectively allowing us a fulltime presence in the south, which is proving critical to our success there.



TSA's "Man in the South" Sylvain Mahazotahy hands out arm bands to children in Beloha. PHOTO CREDIT: RICK HUDSON

care for them, and the tortoises often perish under poor conditions. If rehabilitated, these individuals could play a very important role in securing the future of the species. Consequently, the TSA is developing a reintroduction strategy to return rehabilitated tortoises to the wild to re-establish locally extinct populations and bolster populations severely depleted by illegal collection.

The reintroduction plan includes the development of temporary housing facilities at law enforcement centers to triage confiscated tortoises, a regional rescue facility for long-term care and rehabilitation, and a research program to identify the most effective practices and best protected locations for tortoise release and population establishment.

Also this year, the TSA is supporting Soary Randrianjafizanaka, a Ph.D. candidate at the University of Toliara in Madagascar. Soary will investigate survival rates of confiscated tortoises released at two locations, and evaluate release strategies by comparing hard and soft release techniques and duration of penning on site fidelity. The knowledge gained will help formulate standardized reintroduction guidelines for the Radiated Tortoise and assist local authorities in developing regional conservation plans.

### YOUR SUPPORT MAKES THIS POSSIBLE

We sincerely appreciate the Andrew Sabin Family Foundation, the Erwin-Warth-Stiftung für Flora, Fauna, Umwelt, Radiated Tortoise Species Survival Plan, Tom Motlow, and Ross Popenoe for supporting the production of *Tortoises in Trouble*. We also thank Chris Scarffe and Aaron Gekoski of MOZ Images for creating the film, and Liz Ball, Kate Freund, Charles Huang, Zegeye Kibret, and Taldi Walter from the Emerging Wildlife Conservation Leaders program for spearheading the public awareness campaign. We thank the Turtle Conservation Fund for supporting the creation of education materials, and Drew Harkey and Mike Jackson for designing campaign posters. We appreciate Mr. Tahina Randriamanantsoa for safely transporting the confiscated tortoises to Ifaty. We also thank the World Wildlife Fund for supporting the husbandry workshops, Michael Ogle, Robert Blome and the Knoxville Zoo for the husbandry manual and education materials for the new school. We gratefully acknowledge Andriahery Randriamalaza, Riana Rakotondrainy, Sylvain Mahazotahy, and Soary Randrianjafizanaka for their dedication and support in the field.

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## MADAGASCAR



Spider Tortoises typically forage on small, herbaceous, ground-level plants, however the species appears to require some canopy cover in its dry forest habitat. PHOTO CREDIT: RYAN WALKER

# Monitoring Reveals Habitat Loss as Serious Long Term Threat to Madagascar Spider Tortoise

RYAN C.J. WALKER AND TSILAVO H. RAFELIARISOA

**The Critically Endangered Madagascar Spider Tortoise** (*Pyxis arachnoides*) is a focal species of TSA Madagascar's Conservation Program. It is endemic to the dry, coastal forests of southwest Madagascar; a biologically unique ecoregion

severely threatened by unsustainable subsistence agricultural practices such as livestock herding, charcoal production and arable planting (Seddon et al., 2000). The species appears to be very sensitive to habitat loss (Walker et al., 2012a), so

the authors, with support from the TSA, have assessed the degree of species vulnerability to anthropogenic habitat loss.

Using remotely sensed data we found that vegetation loss continues unabated in our study area – the core range of *P. arachnoides* in Southwest Madagascar near the coastal community of Anakoa. Vegetation clearing for livestock corrals there has resulted in extensive habitat disruption. Mean vegetation loss was calculated at 1.2% year<sup>-1</sup> between 2003 and 2009; consistent with ecoregion-wide vegetation loss between 1990 and 2000 (Harper et al., 2007).

We monitored tortoise population density four times over eight years (2003, 2009, 2010 and 2011), across 15 one hectare quadrants, using a sweep search technique to find tortoises and a mark capture recapture technique to assess mean annual survival. Our data established that the mean annual survival of the adult cohort within the population was comparatively low, at 0.823 (SE0.15) (Walker et al., 2012b). We combined this with surrogate data for juvenile hatchling and fecundity and developed a stage class projection matrix to model the population's finite growth rate, matrix sensitivities and elasticities.

Monitoring revealed an actual mean tortoise population decline of 10.8% between 2003 and 2011. Our projection matrix model suggested the finite rate of growth to be  $\lambda=0.986$ , indicative of 1.4% year<sup>-1</sup> decline (Walker et al., 2012c) (Fig. 3) for the duration of the existence of the population, with adult survival as the most sensitive parameter to overall survival of the population – typical for long lived species such as chelonians with low fecundity. This projection modelling suggests that the population will likely become functionally nonviable in approximately 170 years when population drops below 0.5 tortoises per hectare. This is a worrying prospect for the long term survival of the species. However, because our study relied heavily on surrogate data, more information is needed on pre-adult survival and wild reproductive rates to improve the model's precision. Also, as in the case of most models, these results do not allow for the accumulative effects of habitat loss and population decline.

Our study site currently has a population greater than the range average density. Therefore, other less dense populations, subjected to the added stresses of poaching, will likely become functionally nonviable much sooner. Though poaching for food and the pet trade in certain regions is intense, habitat loss still seems to be the greatest threat facing this species; the speed



The carapace pattern of Spider Tortoises can vary greatly. However, this photograph shows a particularly handsome specimen. PHOTO CREDIT: RYAN WALKER

of forest removal makes this the most threatened ecosystem in Madagascar (Harper et al., 2007).

Well-coordinated development programs and better protected area management are required to address the poverty induced drivers forcing this species closer to extinction. Community empowerment is at the core of the TSA's Madagascar program and it needs to be both strengthened and extended over a larger geographical range to aid the conservation of this species. *Pyxis arachnoides* is currently at a cross roads in terms of its long term survival, whereby workable conservation strategies must be strengthened to allow for the continued existence of viable populations within its coastal southwest Madagascar range.

#### ACKNOWLEDGMENTS

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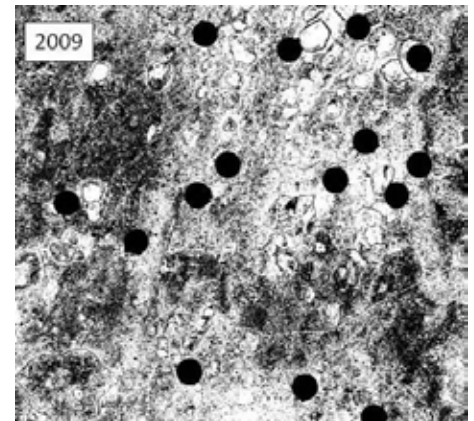


The spiny forests of coastal southwest Madagascar are increasingly being denuded by small-scale charcoal production as seen here. These primitive methods consume large areas of vegetation with comparatively little charcoal produced. PHOTO CREDIT: RYAN WALKER.

Logistical support and assistance with field work was provided by Inge Smith, Andy Woods-Ballard, Charley Rix, Mike Cummings, Matt Perkins, Riana Rakotondrainy, Eddie Louis, Jean Caude Rakotoniaina, Athanase Maminirina, Gervais Sylvestre Rakotoarivelo, and the Madagascar Biodiversity Partnership. The GeoEye Foundation supplied high resolution remotely sensed IKONOS 2 imagery as a part of a GIS data grant.

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Satellite view of the twenty-two 1 hectare monitoring sites in a 38 square kilometer forest block near Anakao. Cleared vegetation patches can be clearly seen, as can circular livestock corrals. PHOTO CREDIT: IKONOS REMOTELY SENSED IMAGERY, 2009.

#### REFERENCES

- Harper, G., Steininger, M., Tucker, C., Juhn, D. & Hawkins, F. (2007) Fifty years of deforestation and forest fragmentation in Madagascar. *Environmental Conservation*, 34, 325–333.
- Seddon, N., Tobias, J., Yount, J.W., Ramanampamonjy, J.R., Butchart, S & Randrianzahana, H. (2000) Conservation issues and priorities in the Mikea Forest of South-west Madagascar. *Oryx*, 34, 287–304.
- Walker, R.C.J., Luiselli, L., Woods-Ballard, A.J. & Rix, C.E. (2012a) Microhabitat use by the Critically Endangered Madagascar endemic tortoise, *Pyxis arachnoides*. *Herpetological Journal*, 22, 63–66.
- Walker, R.C.J., Luiselli, L. & Rafelarisoa, T.H. (2012b) Survival probability of a population of spider tortoises (*Pyxis arachnoides*). *Amphibia Reptilia*, 33, 141–144.
- Walker, R.C.J., Whitmore, N., Rafelarisoa, T.H. and Hamylton, S. (2012c) The effects of habitat deterioration on the long term survival of the Critically Endangered Madagascar spider tortoise (*Pyxis arachnoides*). *Biological Conservation*. <http://dx.doi.org/10.1016/j.biocon.2012.03.035>

## BANGLADESH



Northern River Terrapin hatchlings in the hatchery. PHOTO CREDIT: RUPALI GHOSH.

captive breeding program at Bhawal National Park near Dhaka. In the last two years, 14 male and five female *B. baska* were acquired there. (The disproportionate number of males being located is because they rarely leave the water, while gravid females must emerge to nest and become vulnerable. Also, the fattier meat of females is more highly prized).

The Bangladesh Forest Department provided two ponds at Bhawal for managing the turtles. The bigger pond was used to hold a group of males, while the smaller pond was modified as a breeding facility for a small breeding group. During the winter months of 2011-12, we enlarged and improved the artificial nesting beach in the breeding pond and renovated the run-down hatchery. An animal keeper from the local community and a custodian were hired to staff the facility fulltime.

Three male terrapins were placed with the five females in the breeding pond. An established feeding protocol was strictly followed, with all specimens given water hyacinth, watercress, *Allocasia sp.*, shrimp and fish six times per week.

Remarkably all five females nested and used the artificial sand beach, even though two of the females were acquired only a very short time before the breeding season, and given that long-term captives generally suffer from malnutrition.

Females started to leave the water in the second week of March, and the first nest was laid on 22 March, the last on 15 April 2012. One nest was deposited too close to the water and was relocated. We split that nest – consisting of 15 eggs – with eight eggs moved to a higher spot in the nesting area, and seven eggs transferred to the hatchery. All nests were protected with a metal cage to guard against predation by monitor lizards, mongooses and monkeys.

On 7 June, the first hatchling emerged after 64 days of incubation. The clutches consisted of a minimum of eleven eggs and a maximum of 26 eggs. In total the five females laid 92 eggs, with 27 hatchlings emerging from four nests; two hatchlings died a short time after hatching. The incubation period lasted 59 to 77 days. The hatchlings are being kept strictly separated according to their nest numbers and are being reared in the renovated hatchery.

In India, the Northern River Terrapin is being kept in two different locations. Two females were collected in the 1980's from the Howra Market in Kolkata and have been maintained at the Madras Crocodile Bank Trust (MCBT) ever since. All attempts failed to successfully shift males to MCBT from the Sundarbans Tiger Re-

# First Northern River Terrapin Breeding Successes Achieved in Bangladesh and India

PETER PRASCHAG, RUPALI GHOSH, AGJ MORSHED AND SMA RASHID

“Project *Batagur baska*” was initiated with a lofty but daunting goal: to save one of the rarest vertebrate species in the world, the Northern River Terrapin. This species – in dire need of conservation action, both *in* and *ex situ* – is beginning to see a remarkable turnaround thanks to an international collaboration between the TSA, Zoo Vienna, CARINAM Bangladesh and the Bangladesh Forest Department. The project has also benefitted tremendously from the endorsement and support of the prestigious World Association of Zoos and Aquariums.

In 2012, our captive breeding programs in both Bangladesh and in India, achieved an extraordinary milestone: the first successful cap-

tive breeding of *Batagur baska*. In June, a grand total of 50 healthy *Batagur baska* were hatched, 25 in Bangladesh, and 25 in India.

Ranked among the World's Top 25 Most Endangered Turtles and Freshwater Turtles in 2011, *B. baska* is believed to be functionally extinct throughout their former range. Fortunately this river terrapin, also known as the Sundarbans Batagur, is a hearty turtle and a few captive specimens survived in private ponds, remnants of days when the species was abundant.

In Bangladesh, surveys throughout fishing and fish breeding communities resulted in a slowly, but consistently rising number of known captive specimens. This led to our launch of a





serve visitor center in Sanjekhali, West Bengal. As a result, a male will be sent from the Vienna Zoo to round out this small breeding group.

Last year we were informed of the death of all three females at the Sanjekhali visitor center. But fortunately that report proved false. A small TSA India team visiting the center this spring found that all the females were alive and, in fact, gravid. The team caught 6.3.1 specimens.

The three females were transferred first to a rearing facility for Olive Ridley Sea Turtles (*Lepidochelys olivacea*) and later to a rearing facility for crocodiles, where the staff established a small nesting area. After numerous nesting attempts, some eggs were dropped into the water and spoiled. At the end of May, the females were put back into the holding pond. Then on the night of 12 June the staff made a startling discovery: they found *Batagur baska* hatchlings swimming in the water of the crocodile facility. Over the next two days the pool yielded 23 hatchlings; another two emerged from a nest. Whether the 25 hatchlings originated from multiple females is unknown.

Although the nests in Bangladesh and India were established in different calendar weeks, and incubation periods varied, almost all hatchlings in both countries emerged in the same general time period in early June.

With 50 living hatchlings now bred in captivity, we have successfully completed Phase One of “Project *Batagur baska*”. However, to assure the long-term survival of the species we must now shift the emphasis of the program to more sophisticated breeding and conservation measures.

We now know from experience that vertebrate species with very small effective population sizes (reproducing specimens) of even less than ten females can recover providing that independent breeding lines are established and managed according to studbook guidelines, and if the population rapidly expands. Therefore it is crucial to conduct genetic microsatellite studies to look into the status of the species as a basis for creating *Batagur baska* breeding lines and to determine the parental origin of the 50 hatchlings in India and Bangladesh.

To keep those designated breeding lines separate, we will need to establish several smaller ponds with nesting beaches and fencing at the sites in Bangladesh and India. We must also decide whether we are going to expand the existing facility at Bhawal National Park or whether it is more reasonable to shift the effort to southern Bangladesh, closer to the species’ natural distribution. We placed data loggers at the national

This year’s breeding success can, in large part, be attributed to AGJ Morshed who dedicated himself to oversight of the breeding center and effectively communicated with team members in Austria and the U.S. during the nesting and hatching process. PHOTO CREDIT: SMA RASHID



The five nests on the nesting beach, before they were doubly protected with an additional stabile cage. PHOTO CREDIT: PETER PRASCHAG.



(From left to right) Peter Praschag, Rupali Ghosh, Anton Weissenbacher, and SMA Rashid examine the breeding group of *B. baska* at Bhawal National Park. PHOTO CREDIT: PETER PRASCHAG.



From left to right, Peter Praschag, SMA Rashid, and Rupali Ghosh monitor nest temperatures using a remote sensing thermometer. PHOTO CREDIT: AGJ MORSHED

park and in the Sundarbans, both historic distribution locations, to compare nesting temperature regimes. It is important to get a sense of nest temperature profiles in both areas for comparison, to help select incubation temperatures for future years. We will also need to sex hatchlings via endoscopy before the next breeding season so that we can make adjustments and avoid the production of one sex, particularly males.

With a total of 50 hatchlings in Bangladesh and India, 2012 was an incredibly successful year for “Project *Batagur baska*.” We could not have asked for a better start. However, we cannot rest on our laurels, as we now face the immediate challenges of transitioning the breeding programs to a scientifically based pedigree operation.

#### ACKNOWLEDGMENTS

This program has achieved amazing triumphs in a very short time, which is a reflection of both the urgent need for conservation, coupled with a generous and caring donor community. We gratefully acknowledge the following for their previous and ongoing support: Patricia Koval/WWF Canada, Fagus Foundation, Columbus Zoo, Toronto Zoo, AAZK - Henry Doorly Zoo, Wade Foundation through the Cleveland Metroparks Zoo, Natural Encounters Conservation Fund, San Diego Zoo, Toronto Zoo, Cassidy Johnson and Walter Sedgwick.

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Hatchlings (*Batagur kachuga* and *Batagur dhongoka*) being released into the Chambal River from the riverside hatcheries. PHOTO CREDIT: ASHUTOSH TRIPATHI

# TSA India Turtle Conservation Program Implements National Turtle Priority Recommendations

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SHAILENDRA SINGH, SHASHWAT SIRSI, ASHUTOSH TRIPATHI, LINTHOI NAOREM, RUPALI GHOSH, RK SHARMA, PRADEEP SAXENA, AND BRIAN D. HORNE. WITH INPUTS FROM: HABIBULLAH QUISER, BIJOY KUMAR DAS, SUPRAJA DHARINI, SANJAY SHARMA, GOWRI MALLAPUR, SURESH PAL SINGH AND BHASKAR M. DIXIT

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To say simply that India is a land of contrasts fails to fully capture the underlying social and environmental complexities, both inextricably linked, that lie within its borders. Rivers of clear water run through stark deserts and muddy backwaters lap against vast lush mangrove forests. Lands that appear harshly unsuitable for humans are some of the most densely populated areas on the planet,

yet there remain large tracks of virgin forests and pristine mountains. Not surprisingly throughout this vast mosaic of habitats and human settlements, one of the world's greatest diversity of chelonians struggle to survive the pressures of habitat degradation and the perils of hunting associated with the burgeoning international wildlife trade.

The Turtle Survival Alliance (TSA) has - for

the past seven years - actively and strategically sought to reverse these trends for India's most imperiled freshwater turtles and tortoises in five priority areas (see TSA 2011 magazine). With an ambitious five-year plan, TSA is now poised to embark on actions that we hope will demonstrate positive population growth of five flagship chelonian species within these priority areas.

## CHAMBAL AND UPPER GANGES-YAMUNA REGION, NORTH-CENTRAL INDIA TURTLE PRIORITY AREA:

We exceeded our 2011 nest protection records for the Red Crowned Roofed Turtle (*Batagur ka-*



Large confiscations of live turtles, such as this truckload of softshell turtles, are particularly challenging for authorities to properly handle. There are no adequate facilities or qualified staff to triage a shipment of this magnitude, which often leads to animals being released into unsuitable habitats at inappropriate times of the year. PHOTO CREDIT: NAVEED DADAN

*chuga*), the Three Striped Roofed Turtle (*Batagur dhongoka*), and the Indian Narrow-Headed Softshell Turtle (*Chitra indica*).

Although we were only able to protect a few nests of *C. indica* (4) these nests had an incredible number (586) of eggs. We located the nests along the middle Chambal River (3) and another on the Son River. An *in-situ* hatchery was used to monitor nests from the Chambal River, while the nest from the Son River was transferred to

the Deori Eco Center for incubation. Hatchlings emerged from all nests with a 92.5% success rate. However, the group of hatchlings at the Deori Eco-Center suffered high mortality before being released. In September, a boat survey on the upper Ganges River, from Farrukhabad to Kanpur, identified suitable *C. indica* nesting sites based on observations and conversations with local fishermen. This survey is a first step toward protecting additional nests, assessing threats to



A recently hatched Northern River Terrapin (*Batagur baska*) at the Sundarbans Tiger Reserve in West Bengal. PHOTO CREDIT: JAYANTA BASU.

individuals and habitat, and charting a course for conservation through community support.

We were also able to protect 174 nests (3,182 eggs) of *B. kachuga*, and 329 nests (7,657 eggs) of *B. dhongoka*, along the middle and lower Chambal River. Hatching success exceeded 90%, and over 9,000 hatchlings were released into the Chambal River. We retained a total of 100 *B. kachuga* hatchlings for headstarting at the Deori Eco-Center and at the Garhaita facilities (see previous years' articles).

Our next goal is to begin trial releases of headstarted turtles and see how they disperse and survive the monsoon season when the Chambal River is in flood. So in December 2011, we test fitted five juvenile *B. kachuga* with sonic transmitters and retained them in captivity to monitor their behavior. None of the turtles demonstrated any ill effects from the transmitter attachment. Therefore, we have approached the Madhya Pradesh Forest Department for permission to initiate a three-year telemetry study on 25 head-started turtles in the middle section of the Chambal River.

We are currently raising over 350 *B. kachuga* juveniles at the Garhaita headstarting facility, while developing plans to create additional populations of this critically endangered river turtle outside the Chambal National River Sanctuary. Potential release sites would be in areas documented within the species' former range. To aid in this project, we funded the local NGO Enviro-Aid to conduct a population and habitat viability assessment on the Ken, Betwa, and Son rivers in Central India. We are now working on a pilot plan to reintroduce 50 sub-adult headstarted *B. kachuga* into protected stretches of these rivers. By developing additional populations we hope to safeguard the species from local catastrophic declines.

This year we have been able to make improve-

## Meet the Staff: Shashwat Sirsi

*Shailendra Singh*

Shashwat Sirsi or “Shash” has been associated with TSA India since 2005 as a volunteer. He was instrumental in compiling inventories of north Indian chelonian fauna. Later he earned an MS degree in Wildlife Ecology from the University of Kent, U.K. In 2010, he received a TSA seed grant for the south Indian softshell turtle status surveys. In 2011, Shash was hired by TSA as a fulltime biologist to lead TSA’s efforts in the South Indian Turtle Priority Area and to intensify surveys on endangered softshell turtles. Throughout his tenure with TSA, Shash has proved to be a dedicated, hard-working and keen biologist, brimming with new ideas. Given his long, capable association with TSA India, Shash has recently been appointed Assistant Director for the India Turtle Conservation Program, where he will assist Shai in leading program development. Besides turtling, Shash’s hobbies include trekking, swimming and poetry.



TSA India biologist Shashwat Sirsi holding an adult Leith's Softshell turtle along the Kali River.  
PHOTO CREDIT: JUSTIN TUJIL



This massive Narrow-headed Softshell, *Chitra indica*, was captured by fishermen in the state of Karnataka and weighed 130 Kg. PHOTO CREDIT: BHC MURTHY/ZSI

ments to both the Garhaita facility itself and our captive husbandry techniques. These include better protein and calcium supply to the turtles, improved water quality monitoring, more efficient biological filtration, and a solar powered water heater to help keep the pools warm during the winter. Also during the cooler periods of the year, the pools are now being covered with clear, thick plastic tarpaulins. This greenhouse effect has resulted in an increased overall winter water temperature that has reduced the winter mortality in *B. kachuga* juveniles to 5.6%.

A grant from Disney Worldwide Conservation Fund in 2010 enabled us to equip the John Thorbjarnarson Memorial Chambal Conservation Centre with solar panels, new furniture, and educational aids. Furthermore, we expanded our educational outreach program to include a total of 75 schools and 75 villages.

We conducted 28 educational events, involving 3,100 children from the Chambal and another 39 community outreach programs that reached over 3,000 adult participants. We also conducted eight poaching prevention workshops. Two hundred former poachers attended and we were able to convince 80% to halt capturing turtles. To address capacity building within the state forest department we held two training courses on turtle identification to 82 members of the frontline forest department staff.

A pilot alternative sustainable livelihood program, designed to educate riverside farmers, sand collectors, fishermen, and other residents

of five riparian villages, was launched as a collaboration between the Gharial Conservation Alliance and Development Alternatives (DA). TSA/DA workshops were conducted to help villagers adopt benign livelihoods, such as rope-mat and artificial jewelry making.

### SUNDERBANS AND ORISSA REGION, EASTERN INDIA TURTLE PRIORITY AREA:

March is a significant time for the critically endangered Northern River Terrapin (*Batagur baska*). This year, we surveyed the tidal creeks and historic nesting beaches around Bolkhali, Jambodeep, Pachmai, Frazerganj, and Henry Island in the hopes of locating any remaining wild reproductive adults. After interviewing more than 90 fishermen/fish contractors we received important information about potential nesting areas for both *B. baska* and Cantor's Giant Softshell Turtle (*Pelochelys cantorii*).

Although the fate of remaining wild *B. baska* remains unknown, some encouraging developments have occurred with the last captive breeding population within India. The Sajnekhali Interpretation Centre of the Sunderban Tiger (and Biosphere) Reserve, operated by the West Bengal Forest Department, houses 7 male, 3 female, and a juvenile *B. baska*. Despite having lived here in captivity for well over two decades, this group had never reproduced successfully, owing largely to deficiencies in facility design. Under TSA's guidance, a new nesting area was created in 2012. Incredibly this resulted in two nests being laid



A group of basking Assam Roofed Turtles (*Pangshura sylhetensis*), in northern West Bengal; this is the flagship species for the Northeastern India priority region. PHOTO CREDIT: TONMOY GHOSH

that resulted in 25 hatchlings. Along with the 25 *B. baska* hatchlings produced this season at the facility in the Bhawal National Park in Bangladesh (see related Bangladesh article, pages 30-32, this volume) this species has made great strides toward recovery.

Currently all the *B. baska* hatchlings at the Sajnekhali facility are in good health. TSA India will continue to advise and offer assistance to the West Bengal Forest Department on the turtles' husbandry and management. Encouraged by this successful breeding event, the Forest Department invited TSA India to help develop a comprehensive plan for the captive breeding and conservation of the species.

#### WESTERN GHATS AND PENINSULAR REGION, SOUTH INDIA TURTLE PRIORITY AREA:

Our South India project assessed the status of three endangered soft-shell turtles: Leith's Softshell Turtle (*Nilssonina leithii*), Cantor's Giant Softshell Turtle (*Pelochelys cantorii*), and the Indian Narrow-headed Turtle (*Chitra indica*). Our surveys located a few *P. cantorii* in captivity and a few individuals at three sites on the River Netravathi in the state of Karnataka. New records for *C. indica* were obtained from the Krishna and Tungabhadra rivers, including a behemoth weighing in at a 130 kg and measuring 160 cm in length!

Our biologists located two males and three female *N. leithii* on the Kali and Cauvery rivers. This is a vital find as populations continue to be



A brilliantly colored Leith's Softshell Turtle (*Nilssonina leithii*) encountered in the state of Karnataka. PHOTO CREDIT: SHASHWAT SIRSI

decimated by commercial calipee (cartilage from the carapace) trade in northern Karnataka. Our plan is not only to reduce adult mortality by decreasing hunting rates, but to also conduct *in situ* nest protection, as well as develop captive assurance colonies. Future projects aim to supplement depleted turtle populations and help guide local villagers toward viable, alternative livelihoods.

TSA offered financial and technical support to the TREE Foundation (Trust for Environment, Education, Conservation & Community Development) for turtle surveys in the Nellore district of Andhra Pradesh. The project assessed the status and distribution of *P. cantorii* in a coastal area of Nellore through surveys of tidal creeks and upstream riverine sites, and through collection of secondary information from villages. Findings will help initiate a community conservation effort for freshwater turtles in association with the TREE Foundation's ongoing sea turtle conservation effort. Awareness building activities were also

conducted under this initiative, and a plan calls for the sampling of local wetlands late in 2012.

#### ASSAM REGION, NORTHEASTERN INDIA TURTLE PRIORITY AREA:

The Brahmaputra floodplain in Assam is a major turtle diversity hotspot, with 21 non-marine chelonians. Thus TSA, in association with Aaranayak, a regional NGO, held a Northeastern India turtle conservation planning meeting in June 2012 to review current knowledge, identify key species and populations in need of immediate conservation, and determine partner activities. Fifty participants attended, including regional NGOs, wildlife experts, academicians, researchers, government officials, and representatives of temple pond committees. Ten species were identified in immediate need of conservation, including the Black Softshell Turtle (*Nilssonina nigricans*), the Indian Narrow-headed Softshell Turtle (*Chitra indica*), the Assam Roofed Turtle (*Pangshura syl-*

*hetensis*), the Keeled Box Turtle (*Cuora mouhotii*), the Asian Mountain Tortoise (*Manouria emys*), and the Yellow Tortoise (*Indotestudo elongata*).

On the basis of decisions made at this meeting, the TSA launched a three year project for enrichment of temple ponds holding captive colonies of *N. nigricans*. This project is a collaboration between Aaranyak, the Turtle Conservation and Research Project of the Zoology Department at Guwahati University as well as local temple leaders. We aim to monitor nesting activity and survivorship within these ponds, and hope to formulate/implement a long term strategy for the conservation of *N. nigricans* not only within the local temples but also in the wild.

#### TARAI, FOOTHILLS OF THE HIMALAYAN REGION, NORTHERN INDIA TURTLE PRIORITY AREA:

For the past four years, we have worked regionally through community-based conservation initiatives to safeguard populations of the Crowned River Turtle (*Hardella thurjii*), the Indian Narrow-headed Softshell Turtle (*Chitra indica*), the Spotted Pond Turtle (*Geochlemys hamiltonii*), the Peacock Softshell Turtle (*Nilssonia hurum*), and the Indian Eyed Turtle (*Morenia petersii*). We focused on stakeholders and engaging local communities in conservation incentives such as poacher conversion workshops and education events.

This year we initiated “River Clubs”, a school education program for children at 50 schools along the Ghaghra River, informing them about threatened river vertebrates. A teachers’ training program taught environmental education, conservation curricula and methodologies. The project was funded under the Dolphin Conservation Education Initiative of the Ministry of Environment and Forests through the Centre for Environment Education-North.

Despite community outreach efforts, turtle poachers sporadically raided project sites and even once dared to poach at our temporary transit turtle rescue facility in Gonda District, which houses Ganges Softshells (*Nilssonia gangetica*). Fortunately, a strong network of cooperative villagers alerted us and enabled us to prevent any poaching from occurring.

#### FUTURE INITIATIVES:

Although we are making headway toward conservation of India’s turtles, we continue to witness widespread poaching, increases in live animals being traded, and lack of proper quarantine and/or reintroduction protocols when releasing confiscated turtles. To curb this crisis, we need to increase

## A Home for TSA India?

A major TSA India goal is to find a central home for Indian turtle conservation. Such a home base recently became a possibility when we were offered the chance to co-manage the Kukrail Gharial and Turtle Rehabilitation Center near Lucknow, in association with the Uttar Pradesh Forest Department. This facility was established to recover the critically endangered Gharial (*Gavialis gangeticus*), and has served as a breeding site for threatened north Indian turtles. From 1987 to 1993, it headstarted over 18,000 Indian Soft-shell Turtles (*Nilssonia gangetica*). Currently the facility houses over 165 turtles from eleven north India species.

The facility is ideal for TSA India purposes. It includes at least 12 unused crocodile/turtle nursery and rearing pools, isolation and quarantine enclosures, an education center and a research lab. Our goal would be to refurbish these facilities to manage assurance colonies of threatened freshwater turtles, and to handle the increasing number of largescale turtle confiscations. The ultimate goal is to link this facility with other turtle/reptile rehabilitation centers in the state and throughout India, and to transform the center into a regional hub for river reptile conservation.

The decision on whether we will be allowed to co-manage the Kukrail Gharial Center is pending, with a final determination to come from the Uttar Pradesh State Forest Department. In anticipation of a favorable ruling, we are actively raising revenue to establish this new home for TSA India.



The Kukrail Gharial Center has numerous unused crocodile rearing and breeding pools that can be refurbished to support breeding groups of turtles. PHOTO CREDIT: SHAILENDRA SINGH

the number of trained personnel and build better infrastructure to house confiscated live animals, as well as build a stronger collaboration with government enforcement agencies and key national/regional partners to help curb illegal hunting.

Although a “one size fits all” solution is inappropriate for India, our observations of habitat loss and exploitation patterns over many years are helping us to devise and implement both standardized and specialized response strategies, that ad-

dress key threats and conservation opportunities in a phased, systematic, and measurable manner.

As we prepare ourselves for the next field season, we will continue dedicating ourselves to TSA’s global mission of “Zero Turtle Extinctions in the 21<sup>st</sup> Century.”

Our top five goals for next year include:

1. Collaborate with TRAFFIC India to develop a comprehensive plan to control turtle trade, confiscation of live animals, post-confiscation



A woman's village cooperative learns to make craft jewelry as an alternative livelihood option for the rural poor.



TSA staff winterizing the head-starting ponds within plastic sheeting to help keep turtles warm during the cold winter nights. PHOTO CREDIT: BRIAN D. HORNE

care, and repatriation protocols.

2. Renovate and/or create new facilities – including the Kukrail Gharial Center – in the five turtle priority areas to hold confiscated turtles as well as captive assurance colonies for *Batagur kachuga*, *Chitra indica*, *Nilsonia leithii* and *Manouria emys*.

3. Develop a mobile veterinary unit to assist forest department and other enforcement agencies with the increasing number of turtle confiscations.

4. Survey temple ponds and historic locales for *Batagur baska* (historical nesting sites), *Nilsonia leithii*, *Pelochelys cantorii*, *Manouria emys*, and

*Pangshura sylhetensis*.

5. Post-release monitoring of head-started *Batagur kachuga* via sonic telemetry.

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## MYANMAR



Burmese Star Tortoises adapt well to captive conditions and breed readily if provided with an adequate diet and environment. These tortoises are among the 1500 animals currently maintained in three assurance colonies in Myanmar. PHOTO CREDIT: RICK HUDSON

# Turtle Conservation Forges Ahead in Myanmar

KALYAR PLATT, STEVEN G. PLATT, WIN KO KO, KYAW MOE, KHIN MYO MYO, AND ME ME SOE

The past year has been especially busy for the Turtle Survival Alliance/Wildlife Conservation Society (TSA/WCS) Team in Myanmar, as *ex situ* programs delivered results, and field projects sent the team into far-flung reaches of the country.

A major emphasis of our Myanmar work is *ex situ* conservation of critically endangered species. Foremost of these efforts are captive propagation programs for the Burmese Star Tortoise (*Geochelone platynota*), now thought to be “ecologically extinct” in the wild. Assurance colonies at Lawkanandar, Shwe Settaw, and Minzontaung

wildlife sanctuaries (WS) have produced so many offspring that each facility is nearing saturation capacity, creating an urgent need to reintroduce captive bred tortoises back into suitably protected habitat. As in previous years, the 2011-12 breeding season yielded a bumper crop of eggs, with 688 deposited at Lawkanandar, 328 at Minzontaung, and at least 100 laid at Shwe Settaw. Several hundred hatchlings have already emerged this season with more sure to come. These young animals will join more than 1500 star tortoises already housed in assurance colonies.

Another exciting development looms as the long-planned Turtle Rescue Center (TRC) moves closer to becoming a reality. In April, a TSA/WCS delegation consisting of Rick Hudson, Kalyar Platt, Cris Hagen, Shailendra Singh, Bill Holmstrom, and Me Me Soe met with government officials and selected a site near May Myo where construction will soon begin. The site sits astride the road from Mandalay to Lashio, a major conduit for illegal turtle shipments destined for wildlife markets in southern China. Confiscations of contraband turtles by the Myanmar Forest Department have steadily increased over the years, but no designated facility currently exists where seized turtles can be rehabilitated. In lieu of such a facility, confiscated turtles are sent to the Mandalay Zoo, which lacks space and personnel to deal with a sudden influx of numerous turtles requiring immediate and often intensive care. The TRC will meet this acute need with specially designed enclosures to house confiscated turtles, with trained TSA/WCS personnel working alongside the Forest Department to care for the animals. Eventually rehabilitated turtles will be released to protected areas, while endangered species will be



In April a TSA/WCS Team visited Myanmar to finalize plans for a Turtle Rescue Center to be constructed in May Myo. From left to right: Rick Hudson, Cris Hagen, Me Me Soe, Kalyar Platt, Khin Myo Myo, Bill Holmstrom, Kyaw Moe, and Win Ko Ko. PHOTO CREDIT: SHAILENDRA SINGH.



Kyaw Moe (holding tortoise) and Steven Platt (writing) with a group of Forest Department Rangers during a survey of Shwe Settaw Wildlife Sanctuary in September 2011. PHOTO CREDIT: KALYAR PLATT.

moved to captive assurance colonies.

Efforts are underway to establish assurance colonies of Burmese Brown Tortoise (*Manouria emys phayrei*). Populations of *M. emys* in Myanmar are gravely threatened by hunting and large-scale forest clearance for oil palm plantations. A group of 54 confiscated tortoises is currently held at the Yadanabon Zoo, another 12 at Lawkanandar WS, ten at Yangon Zoo, and four additional adults were recently obtained in southern Myanmar after being caught in snares set for wild pigs. Myanmar Airways agreed to fly the tortoises to Yangon at no cost, and the necessary paperwork to transfer them is being



Kalyar Platt, Rick Hudson and Cris Hagen designing the new Turtle Rescue Center near May Myo. This Center will be built along a major trade route into China, and will provide a second chance for countless turtles that are seized from the wildlife trade.

processed. An enclosure is also being constructed at the Rakhine Yoma Elephant Reserve in Gwa to house another breeding group of *M. emys*. A small assurance colony of Arakan Forest Turtles (*Heosemys depressa*), a poorly known and critically endangered species endemic to western Myanmar, was created several years ago at the same facility, and although mating behavior has frequently been observed, these turtles have yet to reproduce. The heavily vegetated enclosure housing the colony was tripled in size during the past year in hopes of spurring reproduction.

Field projects occupied much time this year. As the wet season rains slackened in early September, the Team headed into central Myanmar to determine whether Shwe Settaw and Minzon-



Kyaw Moe (far right) and Steven Platt (center wearing hat) with two local field assistants excavating a clutch of Roofed Turtle eggs from a sandbank along the upper Chindwin River. PHOTO CREDIT: KALYAR PLATT.

taung wildlife sanctuaries might prove suitable as release sites for the hundreds of captive bred *G. platynota* now held in assurance colonies. The Team first journeyed to Shwe Settaw, where wild *G. platynota* were last seen in the late 1990s. Significant agricultural clearance and livestock grazing was found in the sanctuary, and reintroduction was deemed a feasible, albeit difficult undertaking fraught with challenges.

Our visit to Minzontaung was more promising for here tortoises already receive considerable protection thanks to local *Nat* worshiping practices. *Nats* are spirits believed to dwell in the landscape. According to local beliefs, *Nats* inhabiting a large hill in the center of the sanctuary act as tortoise guardians. Anyone harming or even unduly disturbing a tortoise runs the risk of divine retribution in the form of sickness, misfortune, or death. Such powerful beliefs provide an umbrella of protection under which we hope to begin reintroducing captive bred tortoises within the next 12 months.

The New Year found the Team boarding a riverboat and traveling up the mighty Chindwin River, the last redoubt of the critically endangered Burmese Roofed Turtle (*Batagur trivittata*). Estimates vary, but less than 25 breeding females are thought to remain in the wild. The Team found life aboard the 37-meter long riverboat comfortable, but cramped! Fortunately, the daily routine was punctuated by frequent stops at riverside villages to stretch our legs and query residents about the local occurrence of these big river turtles. Villagers along the “lower” Chindwin painted a bleak picture of environmental devastation, declining fish catches, and pollution by toxic wastes from gold mining. Despite these problems, a few *B. trivittata* continue to hang on in the lower Chindwin, although nesting has not occurred in years. Because the remaining *B.*



Habitat destruction in Tanintharyi Division.



Kyaw Moe reburies Roofed Turtle eggs in a secure incubation area near Linpha Village. PHOTO CREDIT: KALYAR PLATT.

*trivittata* no longer constitute a viable population, we hope to purchase turtles caught by fishermen and move them into captive assurance colonies where each can make a valuable genetic contribution to the next generation.

The Team continued upriver, linking up with Kyaw Moe, project leader for Roofed Turtle recovery efforts on the upper Chindwin River. With Kyaw Moe, the Team surveyed Nam Thalet Chaung and concluded that at least a few female Roofed Turtles are still nesting along this Chindwin River tributary. Because the sediments of Nam Thalet Chaung have never yielded gold, this stream has been spared the mining ravages commonly seen in the region. In fact, Nam Thalet Chaung seems nearly pristine in most places and will likely prove a suitable place for reintroducing headstarted *B. trivittata*.

The *B. trivittata* headstarting program along the upper Chindwin River continues to safeguard nests and produce hatchlings. Every nesting season, local wardens are hired to monitor known nesting sites along the river. Whenever a female emerges from the water to lay her clutch of up to 40 eggs, the wardens immediately contact Kyaw Moe, who quickly seeks and unearths the eggs. This is no easy task given that each clutch is deposited in several widely scattered holes amidst a confusing array of tracks and drag marks. The eggs are transported to a secure incubation area on a natural sandbank at Linpha Village. Here Kyaw Moe reburies the eggs in a fenced enclosure. Upon hatching about two months later, the hatchlings are placed in a village headstarting facility where they are reared to a size suitable for release.

During the 2011-12 breeding season 71 eggs successfully hatched, with another 20 eggs due



Kalyar and Steven Platt with three Asian Brown Tortoises rescued from a village in southern Myanmar. The Tortoises were captured in snares set for wild pigs and will soon be transferred to an assurance colony. PHOTO CREDIT: KALYAR PLATT.



An extremely rare Arakan Forest Turtle (*Heosemys depressa*) rescued from a pagoda pond in Mandalay. The turtle was transferred to the assurance colony at the Rakhine Yoma Elephant Range in Gwa. This critically endangered species is known only from the hills in western Myanmar. PHOTO CREDIT: KHIN MYO MYO

to hatch at the time of this writing. These most recent hatchlings are something of a conservation milestone, bringing the total number of *B. trivittata* hatched by the program to 560. That's an impressive accomplishment considering that ten years ago less than 20 living *B. trivittata* were known to exist in all of Myanmar! *Ex situ* conservation efforts have truly pulled the Burmese Roofed Turtle back from the extinction abyss.

Still, we must guard against complacency. Great hurdles must be overcome before Roofed Turtles again populate the large rivers of Myanmar. To meet these challenges, we continue to focus our efforts on the upper Chindwin River. Plans are underway to expand the Linpha head-starting facility. A grant from the Miami Zoo has enabled us to emplace a tube well that will supply fresh water directly to the turtle tanks rather than pumping from the river, an expensive and difficult approach, especially during low water. A trial release of headstarted *B. trivittata* is being considered for next year.

The Team hardly had time to relax upon arrival in Yangon, before we were off to Tanintharyi Division, the southernmost part of Myanmar where Mangrove Terrapins (*Batagur affinis*) are rumored to survive in coastal swamps and rivers. A 2004 survey by Kalyar Platt found evidence of these critically endangered river turtles in several areas, although fishermen were harvesting the turtles and their eggs. Our Tanintharyi expedition proved challenging, and at times frustrating. Local authorities – responding to a tenuous security situation and with concern for our welfare – denied Team access to some of the most promising areas, which unfortunately, are

under the control of guerilla chieftains. Unable to visit these areas, we could only rely on local reports, which tantalizingly suggest a handful of terrapins remain. Using GPS coordinates collected in 2004, we relocated a nesting beach identified during the earlier survey – or rather we found what remained of it. The beach is now buried in thick mud, deposited after the surrounding watershed was deforested. Even more alarming, a boat survey of the lower Tanintharyi River found no beaches offering adequate nest sites to female terrapins. That said, area fishermen continue to see terrapins in the river, but where these turtles are nesting is a mystery. These findings highlight rapid changes occurring in the region and underscore the urgent need for immediate conservation action if river turtles are to be saved from extinction.

Heavy rains signaling the onset of the 2012 wet season forced us to return to Yangon, but we plan to return and continue the quest in the coming dry season. We also hope to secure some remaining terrapins as founders for an *in situ* breeding colony.

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## Meet the Staff: Me Me Soe

**Kalyar Platt**

Me Me Soe received a BSc. in Zoology from Yangon University (1994) and MSc. in Zoology from the Arts and Science University of Yangon (2000). From 1995 to 1998 she worked as a tutor in Biology and served as a part-time lecturer in zoology at Yangon University. Prior to her TSA employment, Me Me Soe worked as a technician at Yuzana Shrimp Farm in Kyauktan. She joined TSA as a field assistant in 2011 and has proven herself adept and durable in the field, where she has participated in a chelonian survey of Natma Taung National Park, an assessment of Minzontaung and Shwe Settaw wildlife sanctuaries for star tortoises, population assessments of *Batagur baska* in Tanintharyi Division, chelonian surveys along Chindwin river, and learned management techniques for captive chelonians at assurance colonies in Myanmar, including Lawkanandar, Rakhine Yoma, and Minzontaung wildlife sanctuaries. Me Me Soe works closely with TSA Coordinator Kalyar Platt.



PHOTO CREDIT: BILL HOLMSTROM

## VIETNAM



A *Cuora picturata* found in the wild, Khanh Hoa province, September 2011.

PHOTO CREDIT: HOANG VAN HA, ASIAN TURTLE PROGRAM

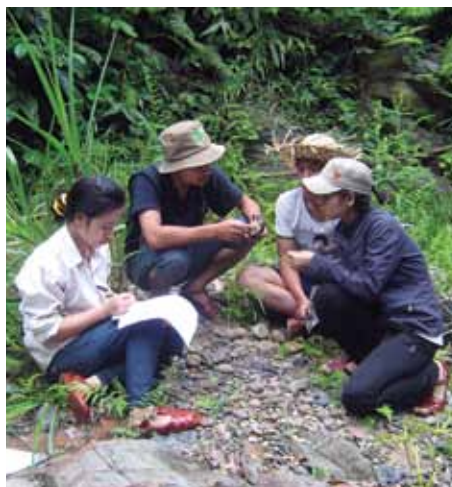
# Survey Successes Lead to Conservation and Local Awareness-Building

BY TIM MCCORMACK & HOANG VAN HA

Vietnam has always been important to turtle conservation, with 25 species of tortoise and freshwater turtles, 16 of which are Endangered or Critically Endangered (IUCN 2011) and three endemics. Its proximity to major consumer markets in China, Hong Kong and Taiwan, meant that Vietnam bore the initial brunt of the Asian turtle crisis. Today, Vietnam's growing human population and rapid development is putting sustained pressure on wild turtle populations, and efforts are ongoing to conserve critically important Asian species.

The Asian Turtle Program (ATP) of the Cleveland Metroparks Zoo has been conducting intensive surveys since 2009, focusing on priority species including the Vietnamese Pond Turtle (*Mauremys annamensis*), Swinhoe's Softshell Turtle (*Rafetus swinhoi*) and Indochinese Box Turtles (*Cuora galbinifrons*, *Cuora bourreti* and *Cuora picturata*).

Notable survey results include discovery of all three Indochinese Box turtles in the wild, along with the Keeled Box Turtle (*Cuora mouhotii*). The



Students with the field team in Sao La Nature Reserve learn how to take turtle measurements and complete field record forms. PHOTO CREDIT: NGUYEN TAI THANG, ASIAN TURTLE PROGRAM

range for *Cuora bourreti* has been defined. It extends from Thua Thien Hue province (where it was found in the Sao La Nature Reserve), south to Phu Yen Province, where *Cuora picturata* also occurs.

In 2011, *Cuora galbinifrons* was found in the wild at the Pu Hu Nature Reserve in Thanh Hoa Province. The ATP is partnering with the local Centre for Natural Resources and Environmental Studies (CRES) to initiate conservation at the site.

A major surprise came when a *Platysternon megacephalum*, *Manouria impress*, and two *Geoemyda spengleri* were found in the wild at the Xuan Nga Nature Reserve in Son La province.

The historic range of the Vietnamese Pond Turtle (*Mauremys annamensis*) has been more clearly defined in lowland coastal wetland areas of central Vietnam, extending from Da Nang south to Phu Yen province. However, Quang Ngai province remains a key focus for species conservation.

Now, with ranges and priority areas better defined, site-based conservation and local awareness building efforts are getting underway. Of course, this is no easy task, considering that the average annual per capita income is just \$1,168, and that prices and demand for wild caught turtles remain high.

School programs and community meetings are key to local support. The ATP and a local NGO, Education for Nature Vietnam (ENV), are organizing conservation awareness activities at key sites. In February 2012, more than 1,700 pupils participated in the first *Cuora*-focused school programs, held around *picturata* habitat in Phu Yen province. In March, a special arts competition held for schools around Dong Mo Lake for the *Rafetus swinhoi* received 3,200 entries. The contest coincided with the rescue and treatment of the Hoan Kiem Turtle in Hanoi.

Ongoing community support and improved enforcement is crucial if Vietnam's most endangered turtle species are to survive in the wild.

We wish to thank our supporters, the Critical Ecosystems Partnership Fund (CEPF), Birdlife International, Turtle Conservation Fund (TCF), The Mohamed bin Zayed Species Conservation Fund (MBZ), Columbus Zoo, US Fish and Wildlife Service, Wade Foundation, and Disney Worldwide Conservation Fund.

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Industrial-scale sand mining at a sandbank on the Red River, Yunnan. PHOTO CREDIT: GERALD KUCHLING.

# Rescuing the Giant Yangtze and Red River Softshell Turtle (*Rafetus swinhoei*)

GERALD KUCHLING, RAO DINGQI, AND LU SHUNQING

**The death of Lonesome George** in the Galapagos Islands in June 2012 and the resulting extinction of the taxon *Chelonoidis nigra abingdonii* moved the giant Yangtze Softshell Turtle (*Rafetus swinhoei*) to the highest rank in the list of the world's "Top 25 Endangered Tortoises and Freshwater Turtles".

The only known female *R. swinhoei* in the world, housed at the Changsha Zoo, is currently paired with the last known male in China at the

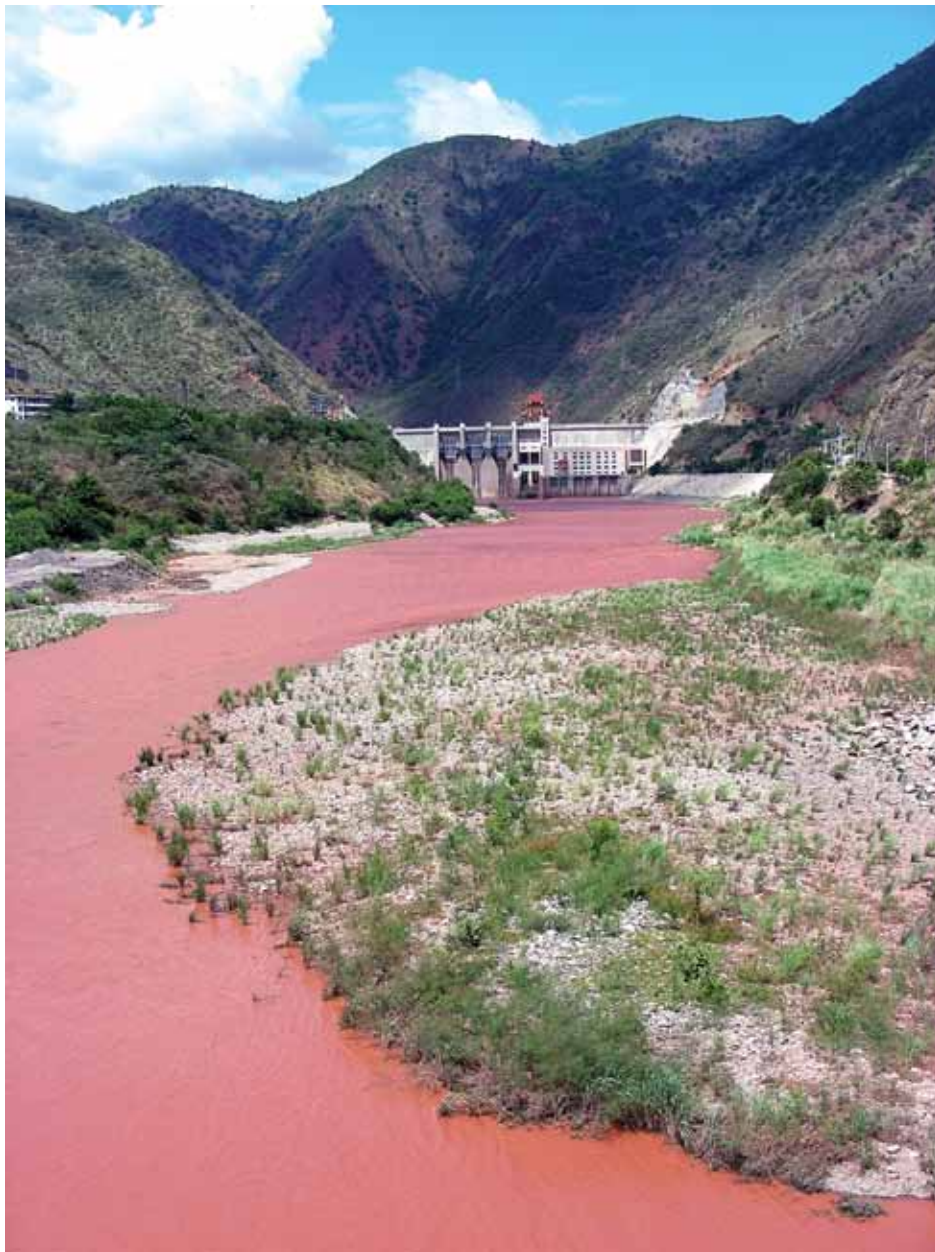
Suzhou Zoo. This female laid clutches of eggs in June and July 2012, but candling of the eggs suggests that most or all are infertile, a repeat of the unfortunate events of past years. With only two other live specimens of *R. swinhoei* known – both in Vietnam and unavailable to China's captive breeding program – finding more specimens is paramount to species survival.

Interview-based surveys in China from 2007

to 2010 suggested that the only place *Rafetus swinhoei* is likely to be found is in the Red River system, but this population too – if it exists – must certainly be on the brink of extinction due to overharvesting and habitat degradation.

A journal recommendation has been made to continue attempts to find live specimens (see Wang, J., Shi, H-T., Wen C., Han, L-X in Press. "Habitat Selection and Conservation Suggestions for *Rafetus swinhoei* in Upper Red River, China." *Chelonian Conservation and Biology*). Following that recommendation, the TSA and TCF funded the authors of this article to make surveys of the Red River in Yunnan in September 2011 and June 2012.

The first of our surveys revealed that "huge size" is the only characteristic used to identify and rescue *R. swinhoei* by forestry officials monitoring turtle hunting and trade at local markets on the Red River. They reported that no "huge size" *R. swinhoei* had been recorded since 1998. The officials claimed to be unable to distinguish specimens smaller than 20-30 kg body mass from other species of softshell turtles. To aid them in detecting smaller class size *R. swinhoei* in the local trade, we created an identification kit, "Softshell Turtles of Yunnan (P.R. China) and Adjacent Areas". The booklet was written in both English



A hydroelectric dam on the Red River, Yunnan. PHOTO CREDIT: GERALD KUCHLING.

and Chinese with illustrations clearly showing the characteristics of the different size classes of all species, including the smallest known *R. swinhoei*, the holotype of *Oscaria swinhoei* (Gray 1873) with a carapace length of 330 mm and a juvenile alcohol-preserved specimen of 380 mm carapace length in the Vienna Natural History Museum. During our second survey in June 2012, we distributed more than 30 of these identification booklets to forestry bureaus, other government agencies, and traders on the Red River.

Our surveys confirmed the results of the previous surveys (Wang et al. in press, see above), namely that the Red River habitat of *R. swinhoei* has been largely destroyed or drastically altered

by hydroelectric dams and sand mining. This and the continuing exploitation of softshell turtles, combined with the inability of monitoring authorities to identify smaller specimens of *R. swinhoei* in the local food trade, have led the species to the brink of extinction. Only a few local farmers and fishermen reported occasionally seeing large softshell turtles. Given the continuing deterioration of habitat, it appears that any surviving *R. swinhoei* must now roam widely through marginal and largely unsuitable habitat, such as lake impoundments. This makes the finding and rescue of any surviving individuals very challenging, although incredibly urgent due to the continuing destructive pressures of fishing



This softshell turtle identification booklet was prepared and distributed to Forestry Department officials to help them identify juvenile *Rafetus swinhoei*. Currently, large size is the only criteria used to determine if a softshell is *Rafetus*, thus smaller specimens may not be detected. PHOTO CREDIT: GERALD KUCHLING.

and hunting by local people and the dangers posed by hydroelectric operations (e.g., being trapped underwater and killed on the upstream side of reservoir pipe filter grids).

Locating and rescuing remaining *R. swinhoei* will require both time and money. We propose that the best way to proceed is to build large, custom-made, collapsible cathedral traps (see Kuchling, G. 2003. "A new underwater trap for catching turtles." *Herpetological Review* 34: 126-128). This will require the hiring and training of a field technician to conduct trapping efforts in areas where local people have reported sightings. A motorboat will be needed as well to deploy and monitor traps efficiently in the large impoundments. We also propose the modification of existing concrete water storage ponds near the Red River to serve as a temporary and secure housing facility for any *R. swinhoei* that are caught, pending decisions to launch captive breeding efforts.

Unfortunately there appears to be no quick fix for the rescue of *R. swinhoei* from extinction. Instead we must commit significant money and effort. Otherwise we will forever lose this species, and the world's "Top 25 Endangered Tortoises and Freshwater Turtles" – now there are only 24 – will get even shorter.

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Male Hicatee turtles develop a brilliant yellow coloration on their head during the breeding season. PHOTO CREDIT: THOMAS RAINWATER

# Hicatee Conservation Research Center Takes Shape in Belize

JACOB MARLIN

**The Central American River Turtle** (*Dermatemys mawii*), known locally in Belize as the Hicatee is the only living representative of a formerly widespread group of turtles of the family Dermatemydidae. Hence from a biodiversity preservation perspective this monotypic species ranks extremely high. It currently has a very restricted range, confined to the lowlands of northern Guatemala, southern Mexico, and Belize.

The Hicatee has traditionally been heavily

harvested for its meat – hunted with nets, harpooned or collected by hand – to the point that many populations have been extirpated. This continued downward spiraling trend has resulted in *D. mawii* being ranked Critically Endangered by the IUCN Red List, which calls it “the most endangered species, genus, and family of turtles in Mexico, and possibly elsewhere in its limited range.” Despite intense collection pressures, Belize still supports some healthy popula-

tions, though generally these are in remote and sparsely populated areas.

A regional initiative to save the species from extinction has been launched in Belize. The TSA is playing a leading role in that initiative, partnering with the Belize Foundation for Research and Environmental Education (BFREE) to establish the Hicatee Conservation and Research Center (HCRC) at the BFREE biological field station in southern Belize. Construction of the center began in 2011, with initial work focused on the creation of ponds and a freshwater well and solar powered pumping system to provide clean fresh water to the ponds. Material acquisition for infrastructure development is also underway.

Work currently continues on pond stabilization. Initially, a decision was made to dig the ponds, then use clay as a natural liner, a process that requires time for the ponds to seal. Large amounts of clay have been brought to the pond site, and layered using heavy machinery, along with wheelbarrows and a lot of hand labor. The



# Hicatee Outreach Making Big Impact in Belize

Lee McLoughlin

Pressure on the Hicatee – the Central American River Turtle – has been significantly reduced in Belize thanks to a successful awareness raising campaign that began in 2011. To build on that momentum, the Ya'axché Conservation Trust (Ya'axché), with the help of the TSA, secured funding from the Turtle Conservation Fund to sustain the campaign.

Ya'axché again teamed up with Belize's number one radio and television station, Love FM, to sponsor the three biggest social events in Belize – La Ruta Maya, a 175-mile kayak race; The Belize Agriculture Show; and the National Bicycle Race. A song highlighting the plight of the Hicatee and what Belizeans can do to reverse its decline was written in Kriol (the national dialect), and played on Love FM throughout the events.

This coverage was supported on the ground by the Belize Fisheries Department. The agency conducted enforcement patrols and distributed awareness-raising materials to restaurants and food vendors that often illegally sell Hicatee meat. Ya'axché reports that, for the first time ever, no vendors were caught selling Hicatee. Many vendors and restaurants say they learned about the threats to Hicatee survival through the campaign.

While the survival of the Hicatee is still not guaranteed, it is clear that progress is being made. A continued awareness campaign in 2013 will be essential.

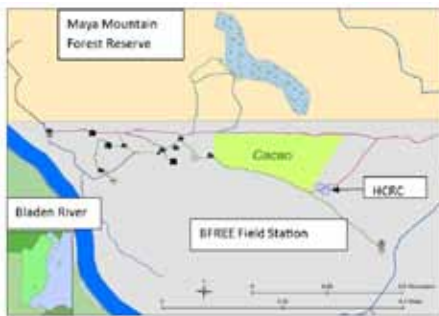
Lee McLoughlin, [lee.mcloughlin@yaaxche.org](mailto:lee.mcloughlin@yaaxche.org)



This large 10' x 20' billboard is visible to all drivers leaving Belize City and is seen by those heading north into the Belize river valley, the region of highest Hicatee consumption.



The pond at the HCRC, the future home for the Hicatee. PHOTO CREDIT: JACOB MARLIN



Location of the Hicatee Conservation and Research Center in southern Belize.

clay has been tightly compacted using a variety of methods including driving atop it with an ATV. Unfortunately, the ponds have yet to seal, and continue leaking for reasons unknown. Though the seepage is slight, it is enough to delay construction. We are seeking a solution, and expect to have the ponds ready for the Hicatee in the next few months.

Concurrent with pond construction, we have spent the past months preparing for the dietary needs of the River Turtles to be housed at the new center. Previous Hicatee surveys conducted by Don Moll (1980s) and John Polisar (1990s) found

that a large proportion of the turtle's diet consists of angel grass (*Paspalum paniculatum*). Dr. Steven Brewer, a plant ecologist who has worked in Belize for 20 years and who resides at BFREE for part of the year, volunteered to propagate angel grass at the HCRC in order to offer a steady, self-maintaining on-site supply of this food source.

Seed "heads" (infructescences) from the BFREE garden were collected and dispersed around the perimeter of both breeding ponds, and around the bio-filtration and food-rearing pond. The seeds have germinated, and angel grass is now becoming part of the ground cover vegetation within the HCRC. As the Belize rainy season moves into full swing, BFREE staff will tend the grass and encourage its abundance, so that the Hicatee will be well provided for when they arrive. Thank you to Dr. Brewer for aiding in this important aspect of the care and husbandry of this critically endangered species.

It is our hope and expectation that when the HCRC is fully operational it will play an important role in conserving the Central American River Turtle.

Jacob Marlin, Belize Foundation for Research and Environmental Education. [jmarlin@bfreebz.org](mailto:jmarlin@bfreebz.org)



An adult male of *Kinosternon dunni* captured during the survey, showing the characteristic and peculiar bulbous nose. Very few individuals of this species had ever been photographed in the wild. PHOTO CREDIT: GERMAN-FORERO MEDINA

# Tracking Down Colombia's Most Elusive Turtle

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GERMAN FORERO-MEDINA

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**Dunn's Mud Turtle** (*Kinosternon dunni*) is one of the least known species in the family Kinosternidae. It was described by Karl Schmidt in 1947 on the basis of only two female specimens, and has been known since from only about ten localities

in the Departamento del Chocó near the Pacific coast of western Colombia. Since Fred Medem's work in the early 1960's, less than five individuals have been observed or collected in the field. The species is threatened by a combination of factors, including small geographic range and rarity, local consumption, and increasing habitat pressure

from logging and gold mining.

The TSA sponsored a *Kinosternon dunni* survey in western Colombia through a seed grant in 2011. The work was conducted in response to the urgent need to collect information on the distribution and population status of this little known species. Researchers German Forero-Medina

and Eladio Renteria led the survey, which was conducted in collaboration with the Herpetological Studies Group from the local Universidad Tecnológica del Chocó. This alliance was key, as it planted the seed for a new research group on the ecology and conservation of the turtles of Chocó, in western Colombia.

Preliminary project results indicate great success and a number of interesting surprises. Six localities in the Departamento del Chocó were visited, including sites with previous records of *Kinosternon dunni*, as well as sites outside its known range where local people reported the mud turtle. Baited traps were used to capture individuals at each site for three consecutive nights. Surprisingly, the species was not found at localities with previous records. However, it was recorded in two new localities in the drainage basin of the Atrato River, which flows into the Caribbean Sea. This varies from all previous records, which are in the Pacific drainage.

A particularly interesting population was found in a marshy area dominated by palm trees of the genus *Euterpe* near a sparsely populated village. At this site, researchers were able to capture 17 individuals in three nights, more than had ever been recorded previously. The sex ratio was 9 (females): 7 (males):1 (juvenile) and the maximum size and weight recorded were 180 millimeters of carapace length and 800 grams for a male, respectively. The species was sympatric with the White-Lipped Mud Turtle (*K. leucostomum*) and the Colombian Wood Turtle (*Rhinoclemmys melanosterna*). These exciting finds indicate that although the species may be very rare and difficult to detect, there are still likely undiscovered populations in areas not yet surveyed. The task of understanding the species ecology and preserving it in its highly threatened habitat is just beginning.

The survey served as the start of a long term project in collaboration with local organizations to monitor the populations identified, collect information on the natural history of the species, and identify potential mechanisms for its conservation. Students and conservation practitioners from the Chocó region will be involved in this project, which is also aimed at capacity building and establishing a local group for the study and conservation of the chelonians of the Chocó region.

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Students from the Universidad Tecnológica del Chocó learn how to capture and mark turtles during a workshop demonstrating field techniques for the conservation of freshwater turtles in Quibdó, Chocó, Colombia. PHOTO CREDIT: GERMAN-FORERO MEDINA



An adult male *Kinosternon dunni* showing the reduced plastron characteristic of the species. PHOTO CREDIT: GERMAN-FORERO MEDINA



The rainforest of Chocó in western Colombia conceals the habitat of *Kinosternon dunni*. Even though large areas of forest remain intact, the species is being threatened by hunting, illegal logging and gold mining. PHOTO CREDIT: GERMAN-FORERO MEDINA



Sixty-two people participated in a two-day workshop at the Santa Fe Zoo in Medellin, in July 2011, and drafted an outline for a comprehensive strategy for protecting Colombia's diverse turtle fauna. PHOTO CREDIT: RICK HUDSON

## TSA Colombia Program Targets Chelonian Diversity Hotspot

RICK HUDSON

In July 2012, the TSA launched a vital new program in Colombia in recognition of the key role that nation must play in the conservation of South American freshwater turtles and tortoises. The new program is expected to face major challenges, since Colombia's turtle species face imminent threats. However, the effort will be significantly strengthened due to a collaborative agreement between the Wildlife Conservation Society (WCS) and the TSA – expanding on the proven cooperative model the two organizations are implementing successfully in Myanmar and China.

Colombia is widely recognized as a strategic location for turtle conservation in South America, and with 27 species, is considered one of the world's turtle diversity hotspots, ranked sixth in species richness with three endemic species. In South America, only Brazil has more species, with 29. Located at the intersection of Central and South America, Colombia is biogeographically remarkable. It supports the highest number of chelonian families, with seven. But Colombia's diverse chelonian fauna is under threat from a range of human factors including consumption, habitat loss, and pollution.

German Forero-Medina has been selected program coordinator for the joint TSA / WCS Colombia Turtle Program (see sidebar). He will be responsible for implementing specific recommendations identified in the *Strategic Plan for the Conservation of Colombian Continental Turtles*, a strategy developed in a July 2011 workshop

in Medellin and sponsored in part by the TSA. This plan was compiled by Dr. Vivian Paez and launched recently under the auspices of the Colombian Herpetological Association (ACH).

One of German's primary responsibilities is to ensure that chelonians are included in higher level discussions regarding new protected areas, and in decisions prioritizing species and research areas for future funding. He'll also be tasked with expanding the capacity for turtle conservation work in Colombia by organizing training workshops that teach field research and captive management techniques. Perhaps his most daunting challenge will be the development of a plan for dealing with the thousands of turtles and tortoises confiscated annually. This can best be accomplished by strengthening the zoo and rescue center network, improving its capacity to deal with the ongoing problem of overcrowded facilities.

On a species-specific level, German will develop long-term monitoring programs for endemic species considered rare (Dunn's Mud Turtle, *Kinosternon dunnii*), and endangered (Dahl's Toad-Head Turtle, *Mesoclemmys dahli*). A leading priority species is the endemic Magdalena River Turtle (*Podocnemis lewyana*). German will encourage coordination of research and conservation activities that will hopefully lead to a Recovery Plan for this critically endangered species.

Rick Hudson, rhudson@fortworthzoo.org

## Meet the Staff: German Forero-Medina

German is the new program coordinator for the joint TSA / WCS Colombia Turtle Program, and he will be based in Cali, at the headquarters of WCS Colombia. German is a young Colombian biologist who has studied endangered and endemic species in South America, particularly freshwater turtles. He received his Master's degree from the Universidade Federal do Rio de Janeiro, in Brazil, and earned his PhD in Ecology from Duke University. German's experience with South American conservation issues, his strong scientific background, and motivation will contribute heavily to making this new program a success.



PHOTO CREDIT: NICOLAS PALACIOS

# Building Partnerships to Conserve Indonesia's Endemic Turtles



Wild adult male Sulawesi Forest Turtle encountered at night in Central Sulawesi, 7 June 2012. PHOTO CREDIT: CRIS HAGEN

CRIS HAGEN

The TSA has long sought program collaborators to conserve Indonesia's chelonians. Over the past year, that effort met with some success on the Indonesian island of Sulawesi.

The island is of high priority for conservation. Sulawesi, formerly known as Celebes and located east of Borneo and south of the Philippines,

has two threatened endemic species, Forsten's Tortoise (*Indotestudo forstenii*) and the Sulawesi Forest Turtle (*Leucocephalon yuwonoi*).

The range of these two species is centered in the remote province of Central Sulawesi. Both species have been heavily exploited for the local food trade and international pet trade, and have been negatively impacted by extensive habitat alteration for agriculture.

Not surprisingly, both species are now rare in

areas where they were once relatively common. With a small geographic distribution and high levels of exploitation and habitat destruction, *L. yuwonoi* is Critically Endangered and considered one of the top 25 most endangered turtles in the world. *I. forstenii* is currently listed as Endangered but the trajectory of decline may result in it becoming Critically Endangered in the near future.

Since 2002, Indonesia has prohibited all international trade for *L. yuwonoi* and this law



Students and faculty gather for a group photo outside Tadulako University, Palu, Central Sulawesi, with visiting turtle biologists Awal Riyanto and Cris Hagen.



Juvenile Sulawesi Forest Turtle photographed exactly as it was encountered in its habitat, midday 7 June 2012. PHOTO CREDIT: CRIS HAGEN



At the new commercial turtle facility, Forsten's Tortoises and Sulawesi Forest Turtles pile together under small bamboo shelters in an effort to cool down from the Palu Valley's sweltering midday heat. PHOTO CREDIT: CRIS HAGEN

appears to be strictly enforced. Over the years, the export quota for *I. forstenii* has been gradually reduced to a current level of 150 individuals annually. While international export of these species has mostly ceased, observations at animal dealers in Jakarta and elsewhere indicate that there is still some trade within Indonesia.

#### CAPACITY BUILDING

In May and June 2012, I set out with Awal Riyanto, of the Indonesian Institute of Science in Jakarta, to meet with local NGO's, government agencies, and universities to discuss developing a research and conservation program for Sulawesi's endemic turtles. We received a very positive

response from the staff of the regional Wildlife Conservation Society (WCS) office in Manado (North Sulawesi), as well as from faculty and students at Sam Ratulangi University in Manado, and Tadulako University in Palu (Central Sulawesi).

Enthusiasm and interest was especially strong at Tadulako University in Palu, where we made a presentation to 70 students and faculty. Even though this university is in close proximity to wild populations of both species, not a person in attendance had ever seen these turtles or knew of their conservation concerns. People were surprised to learn that two outsiders had extensive knowledge of these turtles, while many locals are completely unaware that the animals exist. This is a situation that these academics seemed eager to change.

The next step will be to develop a formal collaborative agreement between the TSA, WCS's Indonesia Program, and local universities on Sulawesi. Within a year we hope to have dedicated students and regional WCS staff conducting field studies on these turtles to acquire a deeper understanding of their distribution, natural history, and ecology. This data will help us initiate sound conservation plans, including the development of protected areas and perhaps *in situ* captive assurance colonies as needed.

#### CURRENT TRADE

Based upon initial inquiries, we believed that the commercial turtle trade in Palu had stopped with the death of the primary turtle trader in Central Sulawesi in June 2009. However, on 5 June 2012, Eric Goode and Max Maurer of the



Very young hatchling of a Sulawesi Forest Turtle encountered in the wild, midmorning 7 June 2012. PHOTO CREDIT: CRIS HAGEN



Pools and waterfalls in forested small stream habitat of the Sulawesi Forest Turtle. PHOTO CREDIT: CRIS HAGEN

## IN THE FIELD

We looked for wild turtles in habitats around Palu, and in forested areas in the north near the town of Moutong. All turtles encountered were left in the wild where they were found. Despite our efforts, we were unable to locate a single *I. forstenii* in the wild. Based on interviews with local residents and personal observations, it appears that over collection, city sprawl, and agricultural conversion have all contributed to the species' severe depletion in its preferred lowland habitat in the dry Palu Valley. Remaining populations are scattered on the steep arid hillsides surrounding the valley. There are also reported scattered populations farther north in hilly rainforest and lowland coastal habitats between Palu and the town of Gorontalo.

In our search for the Sulawesi Forest Turtle in the wild, we travelled to a remote locality that I visited ten years ago while conducting one of the first surveys for *L. yuwonoi*. The Ganonggol River in the north, its tributaries, and surrounding forest are home to both *L. yuwonoi* and *I. forstenii*. We had little trouble finding three hatchlings and eight juvenile *L. yuwonoi* in the small, shallow and flowing, 25 C (77 F) creeks. However, we found only two adult males in stream pools at night. During my 2002 survey, adults were encountered more frequently and were more accessible. It appears that a decade of heavy collection, deforestation, and agriculture (coffee trees planted down to the edge of streams) have negatively impacted this population. We believe that the relative abundance of hatchlings and juveniles that we observed recently is a result of flooding that washed the animals downstream from where they hatched – that's because the animals spent most, if not all, of their time in the small pools of the creeks. We believe that as human activities persist, adult populations will only survive deeper in the forest. Considering their small geographic range, it will not be long before these turtles have nowhere left to go.

The future of the turtles of Sulawesi is not promising. If conservation actions are not implemented soon, time will run out, and we will surely lose these species from the wild. Collaborations are crucial to gaining a better understanding of the true status of these species in the wild, regarding their natural history and the extent of local and national trade. We hope that these efforts come to fruition soon and that field studies will quickly lead to conservation programs that secure a protected existence for some of Indonesia's most endangered turtles.

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Behler Chelonian Center informed us otherwise. During their plane flight to Palu to meet us, a passenger informed Eric that a trader in Palu was setting up a new commercial turtle business.

Using this lead, we tracked down the newly established commercial captive breeding facility in Palu. In February 2012, this facility first began collecting adult turtles as breeding stock, all reportedly from the region of Bangkir, Central Sulawesi. In just a few months they amassed a collection of approximately 100 *I. forstenii*, 200 *L. yuwonoi*, and 25 Sulawesi Box Turtles (*Coura amboinensis*).

We visited the facility, finding that these turtles were being maintained in temporary outdoor holding enclosures while construction was completed on permanent breeding enclosures. Unfortunately, stress from overcrowding and exposure to high temperatures in the temporary pens will undoubtedly result in mortality, especially with *L. yuwonoi*. This loss of breeding stock

will almost certainly result in additional collection of wild caught turtles as replacements.

The facility owner is working with the local forestry department to obtain permits for captive breeding and commercialization. He claims to have been dealing *L. yuwonoi* locally since 1977, eighteen years before the species' formal description. In future, this facility has the potential to successfully breed *I. forstenii*, provided that permanent enclosures are completed, shade trees grown, and proper husbandry implemented. However, we believe the hot, dry conditions at this location will be inappropriate for *L. yuwonoi*, making acclimation and successful propagation very difficult. In addition, the true intent of this facility remains unclear. Many such commercial captive breeding facilities around the world are little more than laundering facilities for wild caught animals. Hopefully, this facility will not turn out to be yet another drain on wild turtle populations.



Heng Sovannara (wearing WCS hat) and H.E Nao Thuok, Delegate of Royal Government of Cambodia and Director General of Fisheries Administration (in suit) joins villagers celebrating the release of the female *Batagur affinis* into the Sre Ambel River. PHOTO CREDIT: ELEANOR BRIGGS.

# Tracking Cambodia's Southern River Terrapin Via Satellite Telemetry is a Dramatic First

BRIAN D. HORNE AND HENG SOVANNARA

In early January 2012, one of the most endangered turtles on earth – an adult female Southern River Terrapin (*Batagur affinis*) – was successfully released into the Sre Ambel River of Cam-

bodia. The female turtle was fixed with a satellite transmitter (Model: F4G 291A) from SirTrack Limited – the first-ever satellite monitoring study for this species and one of the very first for

freshwater turtles. This landmark tracking study is being led by The Wildlife Conservation Society (WCS), in conjunction with the Cambodian Fisheries Administration, Wildlife Reserves Singapore, and the Angkor Center for Conservation of Biodiversity.

The female turtle was captured in the Sre Ambel River by local fishermen in April 2011, and is one of an estimated 200 adults remaining in the wilds of Cambodia, Malaysia, and Indonesia. It was voluntarily turned over to the WCS Cambodia turtle team, rather than being sold into the black market trade, where it would have most likely been shipped to China food markets. Minor injuries sustained by the turtle during capture resulted in WCS transferring it temporarily to the Angkor Center for Conservation of Biodiversity near Siem Reap for convalescing. There the turtle was maintained in a large earthen pond with abundant vegetation and deep clean water. After earning a clean bill of health from the center's veterinarian, the turtle was affixed with the satellite transmitter using Powers T308+ epoxy and readied for release.

The population of *B. affinis* in the Sre Ambel River is estimated at less than ten nesting females. Thus, this individual is extremely important for maintaining genetic diversity of a species that has suffered drastic population declines. *B. affinis* was once considered solely the property of the King of Cambodia. However, following the Khmer Rouge and Pol Pot regime, the Cambodian people were left in dire poverty. To survive, some responded by capturing tens of thousands of terrapins to meet the growing international demand for turtles in China for human consumption. The species was decimated over the past two decades and was considered locally extinct in the Sre Ambel. Fortunately, in 2000, a small population of *B. affinis* was found there.

WCS believes this population has an excellent chance of recovery because the coastal mangrove forests of southeastern Cambodia are some of the largest and most pristine in Southeast Asia, covering more than 45,000 hectares (roughly 175 square miles). These habitats are crucial to numerous aquatic and terrestrial animals and are vital nursery areas for marine fisheries.

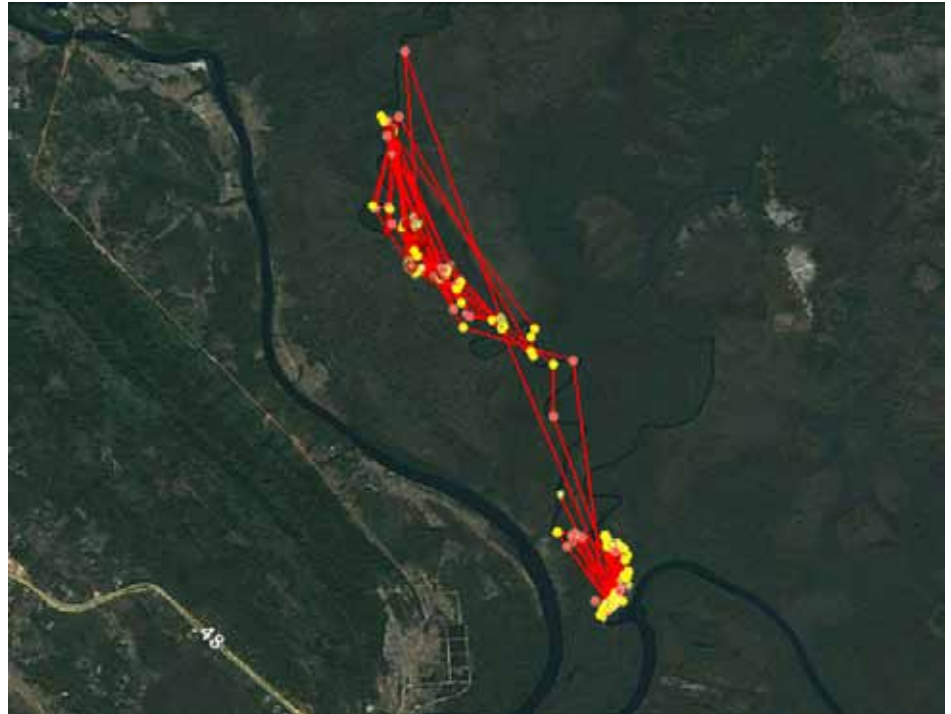
In coming months, the female turtle's movements will be analyzed to determine how it utilizes both the upstream freshwater habitats and the downstream brackish habitats dominated by mangrove forests. Of particular interest



to researchers is how well the turtle navigates through commercial fishing grounds, as well as through areas where habitat has been destroyed by sand mining or by the conversion of mangrove forests into shrimp farming facilities. Identification of the areas utilized by the turtle will help WCS to better focus its efforts to reduce the number of *B. affinis* being caught as fishery by-catch and by targeted hunting.

The tracking study is already yielding significant data. To date, the female has moved more than 50 river kilometers and has had three areas of concentrated residency in mostly freshwater habitats. WCS scientists are especially looking forward to the upcoming monsoon season in October and November, to see if and how the turtle utilizes the mangrove habitats in the lower Sre Ambel River.

Brian D. Horne: Wildlife Conservation Society, 2300 Southern Blvd, Bronx, New York, 10460, USA, [bhorne@wcs.org](mailto:bhorne@wcs.org); Heng Sovannara: Wildlife Conservation Society Cambodia, #21 Street 21, Sangkat Tonle Bassac, Khan Chamkarmorn, Phnom Penh, Kingdom of Cambodia, [h.sovannara@gmail.com](mailto:h.sovannara@gmail.com)



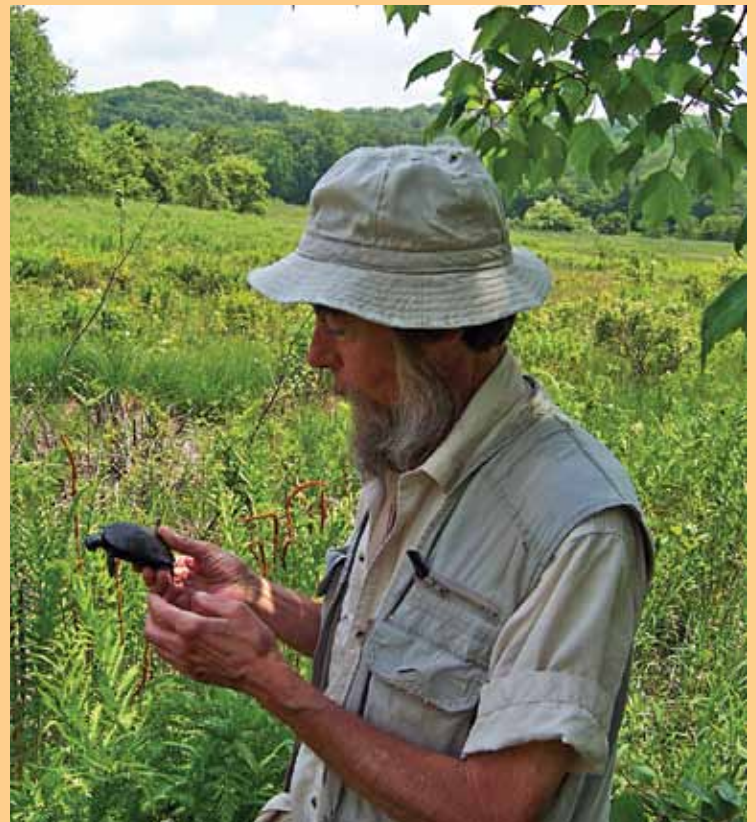
Recent Turtle Movement within the Sre Ambel River complex.

## A Lasting Legacy

The turtle conservation community lost one of its staunchest allies when Bern Tryon passed away on May 6, 2011. He is best known for his pioneering work with the Southern Bog Turtle (*Glyptemys muhlenbergii*), particularly in Tennessee where he wrote and helped implement a conservation and recovery plan for the species. He developed a model program merging field and captive management techniques. Bern's 25 year commitment to the Southern Bog Turtle is being sustained as he bequeathed his significant herpetological library to the TSA to create an endowment to fund bog turtle research and conservation.

At the time of his death, Bern was the Director of Animal Collections/Herpetology at the Knoxville Zoo. At the 8<sup>th</sup> Annual Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles, he was awarded a Lifetime Achievement Award, presented jointly by the TSA and the IUCN Tortoise and Freshwater Turtle Specialist Group. Bern will forever be remembered for his dedication and passion for herpetology and uncompromising commitment to turtle conservation.

In its first year, the library has generated more than \$35,000 for Bog Turtle conservation. However, there are still a number of wonderful books and reprints available, many of which are out of print. All proceeds from library sales directly benefit the fund. To view the full catalog online, please visit <http://pondturtle.com/btlMain.html>



Bern holding the last Bog Turtle he would ever collect, September 2009 in North Carolina.

PHOTO CREDIT: DENNIS HERMAN



Up to her ears in turtles, Nantarika begins processing Yellow-Headed Temple Turtles (*Heosemys annandalii*), which represent the majority of native turtles found in temple ponds.

# Turtle Love Rescues Temple Turtles in Thailand

DR. NANTARIKA CHANSUE

**Across Asia**, tourists are charmed by numerous turtles swimming about in Buddhist temple ponds. Those turtles are there due to an ancient Buddhist ritual called “merit-making”. Buddhists see the turtle as a symbol of health and longevity, so to “make merit” they buy turtles from local street vendors then release them into temple ponds.

Unfortunately this particular “merit-making” ritual has little merit. It is a misinformed tradition leading to the suffering and death of

uncounted thousands of turtles. In Thailand a group known as Turtle Love is determined to give these temple turtles a better life.

The life of a temple turtle is brutal. Temple ponds are designed primarily as sewage systems, and are polluted by fungus, filth, trash and chemicals. They’re typically overcrowded with turtles, many infested with leeches and other parasites, and often suffering from liver and kidney damage. The captives live on an erratic and improper

diet, tossed to them by merit-seeking visitors as bits of stale bread or vegetable scraps rife with pesticides. Some ponds have encircling concrete walls, so turtles that need land for nesting find themselves perpetually swimming and floating.

Even though the sale and purchase of all native Thai freshwater turtle and tortoise species is illegal, vendors continue harvesting wild turtles for merit-seekers. Or they ‘recycle’ turtles, releasing and recapturing turtles from temple ponds within hours and then reselling them, a stressful cycle that eventually leads to death from infection, dehydration, or starvation

Turtle Love, an enthusiastic team of veterinarians and volunteers organized by the Veterinary Medicine Department of Chulalongkorn University in Bangkok, is seeking to change these grim facts. They go to temples, respectfully negotiate with monks for the release of turtles, then remove the animals from the ponds and assess their health. Unhealthy temple turtles are treated at the Veterinary Aquatic Animal Research Center at Chulalongkorn University. Healthy animals are divided into native and exotic freshwater species. Exotics, such as Red-Eared Sliders, are sent to the fishery department for care in captivity. Native freshwater and softshell species are quarantined in a clean water pool for a time and tagged with microchips before release in national parks.

Among the species rescued are the Yellow Headed Temple Turtle (*Heosemys annandalii*), Malayan Snail-Eating Turtle (*Malayemys macrocephala*), Red-Eared Slider (*Trachemys scripta elegans*), Black Pond Terrapin (*Geoclemys hamiltonii*), Asian Box Turtles (*Cuora spp.*) and various softshell turtles.

Temple Turtle rescue is just a starting point. Turtle Love’s intent is to end the temple turtle merit-seeking practice. They hope to instill knowledge of the harmful effects with the public, and offer alternatives that do not negatively impact turtles. Volunteers interact directly at temple turtle rescues, passing on the conservation message with signs, tee shirts, and buttons.

It is the hope of Turtle Love, and my hope, that the public becomes the greatest driving force behind this project, recognizing that the most meritorious act one can commit for a turtle is to set it free in the wild. We also hope that through microchip tracking, we can help establish and maintain healthy native Thai turtle populations in protected areas and humanely relocate invasive species.

Dr. Nantarika Chansue, Associate Professor Chulalongkorn University, Bangkok Thailand, nantarika.c@gmail.com

# Callin' All Rednecks!

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 BEN ANDERS
 

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A male Red-necked Pond Turtle (*Mauremys nigricans*) in non-breeding coloration – still a colorful critter. PHOTO BY AUTHOR.

**Most species of Asian pond turtles** (genus *Mauremys*) are in peril, but they have received comparatively little attention from conservation, both institutionally and privately. The Red-necked Pond Turtle (*Mauremys nigricans*) has perhaps the most precarious status of all members of the genus because of its restricted distribution, in which no wild population is known, and because of the value placed on it by collectors in its native southern China.

Thus, the TSA drafted a Taxon Management Plan (TMP) for *M. nigricans* in August 2010, and is still seeking notice among TSA members.

The purpose of the *M. nigricans* Taxon Management Group (TMG), as stated in the TMP, is to establish and maintain *ex situ* genetic diversity through assurance colonies with the aim of securing the availability of viable specimens for reintroductions. The TMP provides guidelines

for scientifically managed reintroductions, although this objective is unlikely to be achieved in the near future, further underscoring the importance of developing a TMG for the “Rednecks.”

The status of *M. nigricans* in captivity is not good despite its being a model species for *ex situ* management. Consequently, immediate development of assurance colonies is needed on behalf of TSA members.

The largest colonies of founder specimens in the U.S. are not held by active TSA members, and as a result, F<sub>1</sub> offspring produced by the majority of captive *M. nigricans* in the U.S. are unavailable for TMG purposes. Only one institution affiliated with the Association of Zoos and Aquariums (AZA) in the U.S. maintains *M. nigricans*, and AZA discontinued its Population Management Plan for the species several years ago. A recent report to the TSA suggested similar lack of inter-



Red-necked Pond Turtle males four years of age with vivid breeding coloration. PHOTO BY AUTHOR.

est for *M. nigricans* in the European Association of Zoos and Aquaria (EAZA). This is unfortunate since the number of founders owned by EAZA is larger than that of AZA.

The *M. nigricans* TMG is comprised of approximately 100 privately owned F<sub>1</sub> subadults representing bloodlines from most private and public U.S. founder collections, in addition



The bright plastron of a hatchling. PHOTO BY AUTHOR.



Red-necked Pond Turtles use two holes during nesting, which is unique to this species. PHOTOV BY PAUL VANDER SCHOUW.



An aged pair of Red-necked Pond Turtles exemplifying sexual dichromatism and size dimorphism; male in the foreground. PHOTO BY AUTHOR, COURTESY OF DENNIS UHRIG.

to two privately owned founders and 15 TSA owned founders. The TMG specimens are in static groups and are not available for placement among TSA members, but  $F_2$  hatchlings may become available for placement in the future as  $F_1$  specimens mature and breed. Exchange of stocks between U.S. and European collections has not occurred, in part due to the difficulty of international shipment of CITES Appendix III species (*M. nigricans* is listed for China).

TSA members should strongly consider adding *M. nigricans* to their rosters of species to breed, and if interested, should have little trouble finding specimens through private breeders. The importance of using  $F_1$  specimens from founder collections to establish all TSA assurance colonies is discussed in

the TMP. In short, use of  $F_2$  specimens parented by TMG  $F_1$ 's to achieve the target assurance population size is more feasible given the expense of purchasing  $F_1$ 's from private breeders, but the use of  $F_1$ 's should prove more genetically sound.

TSA members already working with *M. nigricans* under the radar are strongly encouraged to consult the TMP and consider participating in the TMG.

Use of multiple assurance colonies to hedge against natural disaster and/or disease outbreak is of particular importance to the *ex situ* management of *M. nigricans* since the TMP was designed with the expectation that rigorous implementation will be required for a minimum of 21 years. This long yet highly optimistic timeframe assumes China will secure the diverse require-

ments for scientifically coordinated reintroductions immediately, which is unlikely to happen. Consequently, assurance colony managers must anticipate an indefinite temporal obligation for *M. nigricans* recovery.

Members who wish to become involved with the *M. nigricans* TMG should consider the biology of the species in designing their personal/institutional courses of action for managing an assurance colony. The TMP recommends assurance colony sex ratio production to be 1:1 – not often sought with captive turtle colonies, but likely important for *M. nigricans*' reproductive viability; further discussion on this rationale is provided in the TMP. Research is under way to establish the threshold temperature(s) (provided the species demonstrates temperature dependent sex determination) for egg incubation. TSA 2007 and 2010 Partner Grants and a Chelonian Research Foundation 2007 Linnaeus Fund Award have supported this research and development of the *M. nigricans* TMG.

The future of *M. nigricans* will require hands on management of captive stocks, and while the *ex situ* status of *M. nigricans* is better defined than it was two years ago, a substantial amount of capacity building remains.

The success of *M. nigricans* through assurance colonies will require additional TMG supporters. Interested parties may request an electronic copy of the *M. nigricans* TMP from the author:

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# We Are the TSA

HEATHER LOWE

The foundation of the TSA is our partnerships, including those with our many individual members. With that in mind, we are pleased to announce that our membership has grown in 2012. Funds generated by membership dues help to offset TSA operating costs and provide available funds for unexpected costs of conservation projects around the world. In short, your support is critical to our success.

We hope every member and donor feels engaged in the grassroots work that is being done on their behalf for turtles globally. In addition to the magazine, you can keep up with the TSA and our field projects through the website, e-mail newsletter and our Facebook page.

We firmly believe that anyone can contribute to turtle conservation, regardless of background or experience. Everyone can advocate in their local community and increase the TSA's presence around the world. We have highlighted three exceptional members here who do just that. We hope that you enjoy getting to know them.



## ROBERT A. VILLA

**Hometown:** Tucson, Arizona

**Occupation:** Student, musician, field biologist/naturalist, interpretive naturalist

**What first sparked your interest in turtles?**

At the age of five I walked into my great grandmother's adobe house in old south Tucson as she was making tortillas and was drawn to a yellow box in the corner of the kitchen. As I peered in, I was captivated by a desert tortoise. Nana Mary said that I could take "Virgil" home and he lives with me still.

**Have you educated others about turtles and turtle conservation?**

I have worked three times as the Interpretive Naturalist at the Desert Tortoise Natural Area for the Desert Tortoise Preserve Committee. My contribution to conservation in the Mohave Desert is to foster people's appreciation and understanding about the tortoise and its fragile ecosystem.

**What are your hobbies/interests?**

I enjoy gardening, maintaining unusual plants, writing, photography/videography, riding my bike, cooking, reading and collecting books, visiting my grandmother, and being involved in my neighborhood. I also keep desert box turtles, a one-eyed 3-toed box turtle, two spotted turtles, a Roti Island snake-necked turtle, several native snakes and two Gila Monsters.

PHOTO CREDIT: ANDREW HOWLEY

**How did you first learn about the TSA?**

I first “met” the TSA in 2008 at the 6th Annual Symposium in Tucson. I was recruited to pitch in and have volunteered for the meeting every year since. This year’s meeting is in Tucson again and I hope everyone enjoys the Sonoran Desert as much as I do, especially during the wet monsoon season when everything is vibrant with life.



PHOTO CREDIT: MARCO MARSILI

## ALESSANDRO NATI FORNETTI

**Hometown:** Roma, Italy

**Occupation:** Publisher

**Do you keep turtles at home?**

Yes, but just a few. I have had some *Testudo hermanni* since I was a kid — 35 years. The only turtle I have purchased was a *Pelodiscus sinensis*, which I found at a pet shop in Poland around Christmas one year. How can you leave a soft-shell with three meters of snow on the ground?

**How did you first learn about the TSA?**

Online. When I felt the urge to do something for turtle conservation, the TSA seemed to be a good fit. The idea of creating assurance colonies was definitely fascinating.

**Have you educated others about turtles and turtle conservation?**

I work to introduce the TSA to hobbyists in Italy and try to educate them on ways that they can contribute to conservation. “Spend 800 Euros for your next turtle if you really need it, but set aside 40 of that for conservation.”

**What is your personal conservation philosophy?**

Turtles are better left in the wild and protected *in situ*. On the other hand, if a certain specimen could contribute to effective *ex situ* conservation, I can understand. The important thing is that we manage it in the right way.

## CASSIDY BROWN JOHNSON

**Hometown:** Kerrville, Texas

**Occupation:** Conservation Associate at the Houston Zoo. Cassidy works with the Houston toad (*Bufo houstonensis*) in the captive propagation and headstart facility.

**What first sparked your interest in turtles?**

I was always interested in reptiles, but it wasn’t until I was in college and I made good friends with a guy who had rescued a male 3-toed box turtle. The unfortunately named “Gladys” followed us around the apartment and sat on our textbooks when we did homework and from that

time on I was hooked on turtles.

**What are your hobbies/interests?**

Kayaking, gardening, biking, hiking, bird watching; basically anything that involves me being outside! And, I really love science: In recent years I’ve decided that I want to put my passion for science to work for conservation.

**Do you have pets?**

Yes, two dogs, a blue-tongued skink, two 3-toed box turtles, a White’s (dumpy) tree frog, a leopard gecko, and a bearded dragon. All are rescues.

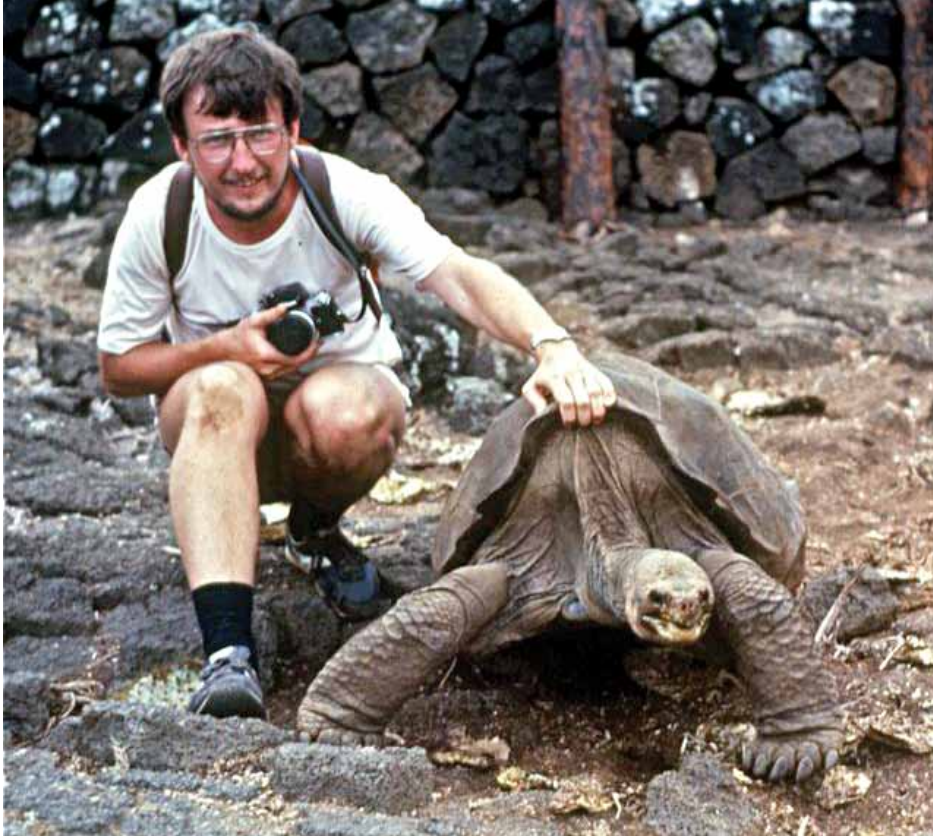
**What do you enjoy about being a member of the TSA?**

I love the wealth of information the TSA provides about so many species of turtles and tortoises across the globe. I have really enjoyed learning about these unique animals at TSA conferences and through the newsletter. Organizations like the TSA give me hope that none of these amazing creatures will fall to extinction.

Heather Lowe, hlowe@turtlesurvival.org



PHOTO CREDIT: SHIVAS AMIN



Anders Rhodin with Lonesome George, the last survivor of the recently extinct Pinta Island Giant Tortoise, *Chelonoidis abingdonii*, at the Charles Darwin Research Station, Galapagos Islands, Ecuador, in 1982. PHOTO BY PETER PRITCHARD.

# Anders G.J. Rhodin – an Appreciation

RUSSELL A. MITTERMEIER AND PETER PAUL VAN DIJK

**Anders Rhodin was born** in Sweden but came to the United States when he was 8 years old. His undergraduate education was at Dartmouth College, where he and Russ Mittermeier were dormmates, friends, and co-adventurers, traveling together to the Amazon in 1971 in search of monkeys and turtles. There, on a canoe trip with Russ into the wilds along the Rio Negro, he was given a small pet tortoise by a native family—a gift that transformed his life as he became increasingly interested in caring for this animal and then learning as much as he could about turtles and tortoises. During this time it became evident that he had two professional passions: medicine and turtles, and a major career choice lay ahead.

After sage advice from his M.D./Ph.D father, Johannes Rhodin, that a physician can always work on turtles on the side, but a turtle biologist can never be a part-time physician, he chose medicine as his primary career but kept herpetology and the study of turtles as a strong second professional avocation. He attended medical school first at the University of Göteborg in Sweden, then at New York Medical College, and ultimately received his M.D. degree at the University of Michigan. During this time he also spent considerable time working at the Department of Herpetology at the Museum of Comparative Zoology at Harvard University, under the informal mentorship of Ernest Williams, where he continued his collabora-

tive turtle work with Russ Mittermeier.

He completed his medical training and worked for several months at a hospital in the interior highlands of Papua New Guinea. This not only fulfilled his medical training requirements, but also allowed Anders convenient access to the turtle fauna of New Guinea and led to the discovery and descriptions of the two new species *Chelodina parkeri* and *C. pritchardi*, as well as a series of publications on other turtles of the New Guinea region. Other taxonomic research on the side-necked turtles of the family Chelidae eventually led to the descriptions of another four new taxa from Roti, Indonesia, Timor-Leste, and South America (*Chelodina mccordi*, *C. timorlestensis* [now *C. timorensis*], *Acanthochelys macrocephala*, and *Phrynops williamsi*). Most of these were described in collaboration with Russ Mittermeier, but some were solo productions and others included other co-authors, including one with Gerald Kuchling.

After his medical school work, Anders completed an internship and residency program in orthopedic surgery at Yale University, where he also pursued comparative anatomical research on marine mammals and turtles with his mentor there, John Ogden. While at Yale he made the major discovery that leatherback turtles possess thick vascularized cartilages, a most unusual and important finding that he reported in the journal *Nature*, and he provided anatomic and histologic evidence for the mammalian-like rapid bone growth in leatherback turtles as well as several fossil marine turtles, including an important article on the electron microscopy of these cartilage canal vessels co-authored with his electron microscopist father, Johannes.

For several years he was also actively involved in the study of nesting and migrating leatherback sea turtles on Culebra, Puerto Rico, with Molly Lutcavage, bringing the latest orthopedic surgical techniques to bear on experimental satellite transmitter attachments to leatherback turtle shells. More recently he has been the lead author of the annual checklist of turtles compiled by the Turtle Taxonomy Working Group, helping to establish a common baseline for turtle research as well as attempting to stabilize and standardize nomenclatural and taxonomic issues concerning turtles. Over the length of his career from the early 1970s until now, he has published about 175 articles on turtles and tortoises and co-edited several books.

Anders established Chelonian Research Foundation (CRF) in 1992 to produce, publish and support worldwide tortoise and turtle research, with an emphasis on the scientific basis

of chelonian diversity and conservation biology. His love of books and journals and his editorial skills, combined with the need for a dedicated publication venue for scholarly articles on the biology and conservation of turtles, inspired him to establish the professional peer-reviewed journal *Chelonian Conservation and Biology* (CCB) in 1993. The journal has been a major success and has at times achieved one of the highest ISI impact factors of any herpetological journal worldwide. Every issue is eagerly awaited by turtle researchers and conservationists, and pdf's whiz across email networks soon after publication. Publication management of CCB was transferred to Allen Press a few years ago, clearly demonstrating how frugal and economical Anders was when its production and distribution were managed in-house solely by himself.

In addition, CRF publishes the occasional series *Chelonian Research Monographs* (CRM), including the loose-leaf *Conservation Biology of Freshwater Turtles and Tortoises* (CBFTT) accounts, and the *Turtle and Tortoise Newsletter* (TTN) from 2000 to 2011. Both CBFTT and TTN are open access and freely downloadable by anyone worldwide. The CRM series has produced such important works as the *Galapagos Tortoises* by Anders' friend and co-traveler Peter Pritchard, and the *Asian Turtle Trade* co-edited with his friends and collaborators Peter Paul van Dijk and Bryan Stuart. The latter volume became the clarion call and best-documented source identifying the rapidly expanding consumptive turtle trade in Asia, and was used by CITES as its roadmap for improving trade regulations in the region in an effort to control and minimize the devastating damage to turtle populations caused by this trade.

Through Chelonian Research Foundation, Anders has also provided direct support for turtle research and conservation through his personal Linnaeus Fund, named in honor of the Swedish founder of modern systematics who also described turtles over two centuries earlier. Over the 20 years of the Fund's existence to date, it has funded 118 projects around the world for over \$140,000 in support.

Anders Rhodin devotes much of his time and efforts to working with others in the turtle conservation community, both marine and terrestrial and freshwater. He has been a long-term member of the IUCN/SSC Marine Turtle Specialist Group and was a Board Member of the International Sea Turtle Society. He was a founding member of the IUCN/SSC Freshwater Chelonian Specialist Group in 1981, and served as Deputy Chair of the combined Tortoise and



Anders Rhodin in the llanos of southern Venezuela, 2010, collecting Savanna Sideneck Turtles, *Podocnemis vogli*. PHOTO BY RUSS MITTERMEIER.

Freshwater Turtle Specialist Group (TFTSG) from 1991–2000, as Co-Chair with John Behler during 2000–2005, and as Chair from 2005 to 2012. He was instrumental in helping to establish the Turtle Survival Alliance (TSA) in 2001 with Rick Hudson, Kurt Buhlmann, and others, and the Turtle Conservation Fund (TCF) in 2002 with Russ Mittermeier, Walter Sedgwick, Kurt Buhlmann, Rick Hudson, and others, and continues to serve on the Board of Directors of these organizations, currently Co-Chairing the TCF with Hugh Quinn, as well as being a Chairman's Council member of Conservation International with Russ Mittermeier, and a Board member of the Turtle Conservancy with Eric Goode.

He has also been a member of a variety of IUCN and CITES leadership committees, including the Steering and Red List Committees of the Species Survival Commission with Simon Stuart and Jeff McNeely and the Advisory Board of the Mohamed bin Zayed Endangered Species Conservation Fund with Russ Mittermeier. In February of this year, the IUCN Species Survival Commission honored him for his long-standing efforts on behalf of turtle and tortoise conservation by presenting him with the Sir Peter Scott Award for Conservation Merit, the most senior SSC award.

Of particular note have been his continuous efforts to build a series of comprehensive, coordinated and strategic alliances among the various organizations and individuals engaged in

turtle conservation, including the establishment of the Turtle Conservation Fund and the Turtle Conservation Coalition. Equally noteworthy is his appreciation of the role that policy and laws can play in turtle conservation, and his resulting tireless engagement with and support for efforts to extend the protection of CITES and United States federal laws to tortoises and freshwater turtles.

Throughout his lifetime of involvement with turtle biology and conservation, Anders Rhodin has placed collaboration and encouragement at the core of his activities. He has seen himself as being a facilitator and an organizer, as well as a cheerleader, devoted to helping bring the international turtle community closer together and to growing an increasingly effective ground-swell of support and action and inspiring it to reach new heights of collaboration and success in its efforts. His signature advice to all of us in the turtle conservation community, in his oft-repeated poetic litany inspired by Robert Frost, has always been that “we must work together, I tell you from the heart, whether we work together, or apart.”

Engaging and empowering promising young scientists at home and abroad has also been, and continues to be, a hallmark of his career and a foundation for his CRF Linnaeus Fund annual turtle grants. In addition, Anders and CRF have encouraged student scholarship by funding Student Presentation Awards for many years at both the International Sea Turtle Symposium and more recently at the Annual Symposium of the Turtle Survival Alliance and the TFTSG.

This past year, in order to devote more time and effort to his practice of orthopedic surgery as well as to his personal life and interest in his roots in Sweden, Anders began a process of gradually stepping down from his various turtle endeavors. He transferred CCB editorial responsibilities to Jeff Seminoff, Jeff Lovich, and Peter Lindeman, and stepped down from his position as TFTSG Chair to encourage Peter Paul van Dijk and Brian Horne to become Co-Chairs, and resigned from the IUCN/SSC Steering Committee. He did this with the clear understanding that the best time to step down is when one is still at the peak of one's abilities and still able to mentor and shepherd new leadership into positions of influence. By facilitating the next generation of turtle people into conservation and editorial leadership, as Chairman Emeritus of the TFTSG, and by remaining a Board member of many of the organizations he helped found and support, his guidance and influence will continue to validate his outstanding achievements as an inspiring turtle conservation and research leader.



# Thank you for your support!

The TSA gratefully acknowledges the following donors and organizations for their generous support over the past year (July 2011-July 2012):

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Disney's Animal Kingdom, John Iverson, Matt Frankel, Nature's Own, San Diego Zoo, Taipei Forestry Bureau, Toronto Zoo, Turtle Conservancy, Walter Sedgwick, William Dennler, WWF Canada/ Patricia Koval, Zoo Atlanta

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Andrew Sabin Family Foundation, Beneficia Foundation

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## 2012 Behler Turtle Conservation Award Sponsors

Chelonian Research Foundation, Turtle Conservancy, Deborah Behler, Conservation International, Wildlife Conservation Society, Brett and Nancy Stearns

The TSA would also like to extend special thanks to the following members who have found unique ways to support turtle conservation:

**Sheena Koeth** sold merchandise on the behalf of the TSA throughout the year, raising funds for turtle conservation.

**Eric Goode** and **the Maritime Hotel** provided special assistance to the TSA again this year by hosting the annual Board of Directors meeting. His hospitality and generosity is very much appreciated.

**Curtis Ippolito** and **Glenn Scherer** provided editorial services for Turtle Survival, with **Matt Weltnack** coordinating design and layout.

**Cassidy Johnson**, **Stefanie Spivey** and **Rachel Rommel** provided invaluable support in launching the TSA Kids Club as contributing authors.

**Robert Villa**, **Michael** and **Emily Hance**, **Sheena Koeth**, **Rose Tremblay**, **Wendy Crofut** and **Nancy Reinert** returned as our all-star volunteer team for the 2012 symposium.

**Ben Anders**, **Molly Culnane** and **Ann Hirschfeld** shared their artistic skills and provided us with t-shirt designs and other graphic design help throughout the year.

## HOW CAN YOU HELP?

There are many ways that YOU can contribute to turtle conservation and support the TSA's mission of zero turtle extinctions. Visit the TSA website to learn about how you can:

- **Make a Donation** Donations can be dedicated to a specific project or program, just let us know what you'd like to support!
- **Purchase Equipment** Check out the TSA's "wish list" to purchase equipment that is needed by our staff in the field.
- **Adopt a Turtle** By symbolically adopting an endangered species for yourself or as a gift, you can support turtle conservation globally.
- **Join the TSA** Become a member of the TSA or buy a gift membership for a friend.
- **Support the TSA at No Cost to You!** There are several programs available in which you can support the TSA's mission by doing what you do every day – shopping, banking or selling items on eBay.
- **Shop for the Cause** Visit the TSA's online store to purchase t-shirts, art, publications or other merchandise to support conservation projects around the world.

[www.turtlesurvival.org](http://www.turtlesurvival.org)



One of the newest t-shirt designs in the TSA's online store, designed by Ben Anders.

## ANSWER KEY FROM PAGE 21



1. *G. sabinensis*; 2. *G. geographica*; 3. *G. caglei*  
 4, 8, 9, 12, 13, 15. *G. flavimaculata*  
 5, 14. *G. pulchra*; 6, 7. *G. ps. kohni*  
 10, 11, 16. *G. n. delticola*



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With the recent passing of Lonesome George, the Ploughshare Tortoise (*Astrochelys yniphora*), now has the unfortunate distinction of being *the world's rarest tortoise*. And while the remnant wild populations continue to wither under unrelenting black market collecting pressures, there is at least some good news from the captive side. *Ex situ* captive populations are finally being assembled in both the U.S. and Europe, built from animals confiscated from the illegal trade in Asia. In March 2012 the TSA imported eight young tortoises from Kadoorie Farm and Botanic Garden in Hong Kong, that now reside at zoos in Atlanta and Knoxville. They augment the group of ten animals imported by the Turtle Conservancy in 2011, bringing the total U.S. captive population to 1.2.16. In time this captive nucleus will expand and serve as a backup to Durrell's successful captive program in Madagascar. Regrettably because of the threat of poaching and theft, each tortoise – both wild and captive – must be permanently and visibly etched with a prominent mark on the carapace. That such defacing of these beautiful tortoises has become necessary is a sad commentary on this species' precarious future.

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