Putting Boots on the Ground in Times of Need: It’s What We Do

From Texas to Madagascar, it seems that when turtles are in trouble, the TSA is there to lend a hand. It’s just what we do, and I believe that we do it well. I’m incredibly proud of our network of staff and volunteers that rise to the occasion time and again when duty calls.

It was a Saturday afternoon, mid-September, when the TSA got a call from Sal Scibetta of the Hill Country in New Braunfels, Texas. They had just received a confiscation of over 300 Mexican turtles, including some pretty rare box turtles, and were a bit overwhelmed with the task at hand. After speaking with Sal, I called Jordan Gray, who had just started as the TSA’s Communications Coordinator, and asked if he could lend a hand as he was already in Austin preparing for a Drink Beer, Save Turtles event. Jordan swung into action and quickly mobilized an A-Team of some of the best husbandry and veterinary talent that the Lone Star State has to offer. A few days later I spoke with Sal again and he reflected in glowing terms about the role that the TSA played in helping to bring some structure to a previously chaotic situation.

“Being able to reach out to the TSA and receive assistance with manpower and expertise was critical in the success of triaging and setting up long-term care regimes for over 300 turtles in a matter of days,” he said. “This was not something that could have been done solely in-house.”

His words got me thinking...this is what sets the TSA apart: our ability to quickly mobilize resources and put boots on the ground. At our core, we are a grassroots organization, accessible to anyone who wants to help turtles, fueled by a collective passion that drives us to try and create a better world for our chelonian friends.

Fast forward one month. I am spending my last day in Madagascar in the capital city of Antananarivo, writing my overdue articles for the magazine and working on budget with our Director, Herilala Randriamahazo. I count on this “down time” after every October trip to compose my thoughts and articulate my experiences from the past ten days into an article that accurately reflects this increasingly complex program.

When we started working in Madagascar in 2010, and became aware of the growing trade with Radiated Tortoises and knew we had to do something to bring awareness to the situation and try to curb poaching. We accomplished that fairly effectively, with the unfortunate (though not totally unexpected) consequence of THOUSANDS of confiscated tortoises. We knew we would see confiscations and would need to prepare to handle them, but nothing could have prepared us for the volume that we are currently managing: over 8,000 tortoises under the TSA’s care in Madagascar! We are effectively running refugee centers for displaced tortoises.

The impact of that number on our budget is huge, in terms of new staff, new facilities, and vet care, but we have managed to rise to the occasion and care for them well, thanks to our many donors and supporters. In fact, once tortoises arrive at our Tortoise Conservation Center, the mortality rate is less than 1%, an impressive stat by anyone’s standards.

We didn’t ask to be placed in this situation, but rising to the occasion is entirely necessary if we are to prevail in saving the Radiated Tortoise from extinction in the wild. Make no mistake: in ten years, we could potentially be looking at another Ploughshare Tortoise disaster where we are scrambling to save the last remnant wild populations. The last thing I want is to look back at this time in my career with regrets. I want to know that we fought the good fight and did all we could to save this iconic species.

Please lock arms with us and help us make good on our pledge to save this species.

Many thanks, or as we say in Madagascar, Misotra Besaka.
ABOUT THE COVER: By the time the Northern River Terrapin (Batagur baska) was formally described and recognized as a distinct species by science in 2007, it was ranked Critically Endangered by the IUCN Red List. With no known wild nesting populations remaining, this denizen of the vast Sundarbans region of India and Bangladesh (and formerly Myanmar) is regarded as one of the most threatened chelonians on the planet. However, in 2010 the TSA and their partners in Bangladesh (Peter Praschag, Rupali Ghosh, Vienna Zoo) and India (West Bengal Forest Dept.) begin establishing breeding groups of B. baska with terrapins that had been in captive situations long-term. The first successful captive reproduction occurred in both countries in 2012 and since then nearly 600 terrapins have been hatched to date. This bi-national collaborative conservation effort has brought a species from the cusp of extinction, and through captive breeding has assured that this species will not be lost. See full story pp.48.
MEET THE STAFF

JORDAN GRAY

Jordan joined the TSA in February 2017 as the new Communications and Outreach Coordinator. A native of Virginia, he has lived in numerous American states and abroad, all of which have provided various opportunities for him to cultivate his passion for chelonians. Involvement with conservation and wildlife research began early for Jordan as he would regularly accompany his father into the woods to perform field research. While studying at Armstrong State University in Savannah, Georgia, Jordan cofounded the Terrapin Educational Research Program of Savannah (T.E.R.P.S). After graduation, he relocated to Texas to become an animal care and outreach technician for the Houston Zoo. There he began working with the Turtle Survival Alliance through the North American Freshwater Turtle Research Group. Ultimately, Jordan hopes to utilize his passion for educational outreach to foster an appreciation for turtles and tortoises as well as promote stewardship of their habitats.

ABOUT THE TURTLE SURVIVAL ALLIANCE

“Zero turtle extinctions in the 21st century” – a bold pledge by an emboldened group of chelonian conservationists. The Turtle Survival Alliance (TSA) is in its 17th year of this commitment to the tortoise and freshwater turtle species of the six continents on which they reside. Created in 2001 in response to “The Asian Turtle Crisis,” the title given to the rampant and unsustainable harvest of Asian turtles, the TSA has since expanded to create a global chelonian conservation network.

During its first four years, the TSA operated as a task force for the IUCN’s (World Conservation Union) Tortoise and Freshwater Turtle Specialist Group (TFTSG). In 2005, the TSA sought an independent 501(c)(3) nonprofit status, with a home base at the Fort Worth Zoo, Texas. As the TSA’s global reach grew, so did its need for restructuring, and a Board of Directors was instituted in 2009. With this growth also came the need for the construction of a facility to house and provide assurance colonies for some of the world’s most endangered species of chelonians. Thus, the Turtle Survival Center, now home to 700 specimens, was created in the backwoods of coastal South Carolina.

The Turtle Survival Alliance continues to be a global force in the effort to provide dynamic in situ and ex situ conservation initiatives including breeding programs, assurance colonies, and management plans; field research and culturally sensitive conservation initiatives; hands on, readable, and viewable public outreach; and sharing information, techniques, and communication throughout the chelonian conservation community. Through working collaborations 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.

As anthropogenic threats such as habitat loss, poaching, and pollution continue to wreak havoc on turtle and tortoise populations worldwide, the TSA is committed, now more than ever, to fight for the preservation of these animals.
Partners are the Key to Our Success

The Turtle Survival Alliance is proud to acknowledge the following organizations that make our work possible. The organizations listed here provide a range of services supporting our mission, including guidance, networking, strategic planning, funding, husbandry, rescue, animal management, marketing and public relations, field research, logistical and technical support, salaried positions, and other resources.
The TSA welcomed two new members this year to our Board of Directors, Kim Lovich and Tim Gregory, PhD. Kim continues to uphold the tradition of solid support and backing of San Diego Zoo Global. Tim “hit the ground running” and has already made a huge impact on the TSA and now chairs our Development Committee. We look forward to many years of working with these energetic and resourceful champions for turtle conservation.

KIM LOVICH is currently San Diego Zoo Global’s Curator of Herpetology & Ichthyology where she manages one of the world’s largest and most diverse living herpetological collections. Kim has over 27 years’ experience working at Association of Zoos and Aquariums (AZA) facilities. She has managed and helped establish head-start programs for Green Sea Turtles and Tailed Frogs in Canada, Fiji Iguanas in Fiji, West African Slender-snouted Crocodiles in Cote d’Ivoire, and Mountain Yellow-legged Frogs and Western Pond Turtles in California. Kim is an accomplished scientific illustrator and has published drawings, book chapters, and papers, all relating to reptile and amphibian taxonomy, husbandry standards, and field monitoring techniques. She manages the Fijian Banded Iguana SSP and conservation fund and is actively involved in crocodilian conservation initiatives as well, serving in leadership roles for both the Gharial and the West African Slender-snouted Crocodile and in the IUCN’s Iguana and Crocodile Specialist Groups. Kim’s primary focus continues to be on the managed care of herpetological collections with emphasis on head-start and assurance colony capacity building with the ultimate goal of recovery of endangered and threatened species.

TIM GREGORY retired in 2007 after 24 years in the biopharmaceutical industry. His primary area of research was vaccine development for the prevention of HIV infection and AIDS, and he has more than 75 peer reviewed publications to his name. He was progressively promoted to positions of increased responsibility, to Staff Scientist and Senior Director of Process Sciences at one of the nation’s leading biotechnology companies, Genentech, Inc. Since 2007, Tim has been an entrepreneur in the biopharmaceutical industry and was an initial investor and active advisor in StemCentrx, Inc., focusing on development of oncology drugs designed to eliminate cancer stem cells.

But Tim has two true passions in life: cheloniens and plants. He has botanical expertise in multiple plant groups with special emphasis in the cycads, having described five species from Mexico. He is an advisor on cycad taxonomy and horticulture to the U.C. Botanical Garden (UCBG) and is a founding member of the Directors Advisory Board for UCBG and Chairman 2011-2015. He is a principal Scientific Advisor on botanical research at The Huntington Library and Botanical Garden, San Marino, CA. Tim loves Mexico and since 2004 has participated in numerous botanical exploration trips there. He has been a member of the IUCN Cycad Specialist Group since 2000 and is Chairman of the Conservation Committee. Tim currently serves on the BOD of the Cactus and Succulent Society of America and is Chairman of their Conservation Committee. Most importantly, Tim has loved turtles since age eight.
TSA Programs make an Impact for 20 of the Top 25 Most Endangered Tortoises and Freshwater Turtles

Rick Hudson, Andrew Walde, Patricia Koval, and Jordan Gray

The conservation organizations collectively known as the Turtle Conservation Coalition released “Turtles in Trouble: The World’s 25+ Most Endangered Tortoises and Freshwater Turtles—2018” in February 2018. This report, which follows the previous report published in 2011, reviews the top 50 most at-risk species of tortoises and freshwater turtles. These 50 chelonians are selected based on survival prospects and extinction risks for the individual species. The Turtle Conservation Coalition is composed of biologists from the Chelonian Research Foundation, Conservation International, Global Wildlife Conservation, IUCN/SSC—Tortoise and Freshwater Turtle Specialist Group, Turtle Conservancy, Turtle Conservation Fund, Turtle Survival Alliance, and Wildlife Conservation Society.

Turn the page to see how the TSA makes an impact for 20 of the top 25 chelonians listed in the 2018 report!
Central American River Turtle (Dermatemys mawii) - The TSA collaborates with the Belize Foundation for Research and Environmental Education (BFREE) to maintain an assurance colony, conduct field surveys, and promote community awareness activities for this species in Belize.

Photo credit: Dustin Smith

Dahl’s Toad-headed Turtle (Mesoclemmys dahlii) - The TSA-Columbia program in collaboration with the Wildlife Conservation Society and university partners studies this species in Colombia, and works to protect critical habitat.

Photo credit: German Forero-Medina

Hoge’s Side-necked Turtle (Mesoclemmys hogeii) - The TSA collaborates with Rainforest Trust and the NGO Biodiversitas to protect critical habitat and study the ecology of this species in Brazil.

Photo credit: Brian Horne

Burmese Star Tortoise (Geochelone platynota) - The TSA works in collaboration with the Wildlife Conservation Society and Forest Department to restore wild populations in Myanmar. Additionally, we maintain multiple assurance colonies for this species in Myanmar and the United States.

Photo credit: Kalyar Platt

Burmese Roofed Turtle (Batagur baska) - Our TSA-India and Bangladesh programs work to re-establish this species in the Sundarbans, as well as maintain assurance colonies for the species at multiple locations in both countries.

Photo credit: Shailendra Singh

Red-crowned Roofed Turtle (Batagur kachuga) - The TSA-India program works to protect this species in the Chambal River of India through nest protection and head-starting efforts.

Photo credit: Saurav Gawan

Northern River Terrapin (Batagur trivittata) - The TSA-Myanmar program works in collaboration with the Wildlife Conservation Society, Myanmar Forest Department, and the Yadanaung Zoo to protect the last remaining individuals of this species in the wild and maintain captive assurance colonies in Myanmar.

Photo credit: Brian Horne

Yunnan Box Turtle (Cuora yunnanensis) - Long feared extinct, this species was recently rediscovered. The TSA assisted the Kunming Institute of Zoology in creating captive habitats for breeding this species in China.

Photo credit: Cris Hagen

The TSA directly impacts the survival of 20 of the world’s Top 25 most endangered tortoises and freshwater turtles.
The TSA positively impacts approximately 1/3 of all species of tortoises and turtles on Earth.

Zhou's Box Turtle (Cuora zhouii) - Wild populations of this turtle are not known to exist. The TSA maintains an assurance colony of this species at our Turtle Survival Center, and works with the Münster Zoo to manage genetic diversity in the captive population. Photo credit: Torsten Emrich

McCord’s Box Turtle (Cuora mccordi) - Functionally extinct in the wild, the TSA maintains an assurance colony to ensure the survival of this species at our Turtle Survival Center. Photo credit: Cris Hagen

Three-striped Box Turtle (Cuora trifasciata) - Near extinct in the wild, the TSA maintains this species at our Turtle Survival Center. Photo credit: Peter Praschag

Golden-headed Box Turtle (Cuora aurocapitata) - Near extinct in the wild, the TSA maintains an assurance colony of this species at our Turtle Survival Center to help ensure their survival. Photo credit: Jordan Gray

Yangtze Giant Softshell Turtle (Rafetus swinhoei) - The world’s rarest and most endangered turtle, the TSA works in collaboration with the Wildlife Conservation Society and Suzhou Zoo to reproduce the last pair of this species through artificial reproductive technology. Photo credit: Gerald Kuchling

Palawan Forest Turtle (Siebenrockiella leytensis) - The TSA assisted in a multi-organizational effort to triage and return nearly 4,000 confiscated turtles to the streams of Palawan, Philippines. Photo credit: Turtle Conservancy

Vietnamese Pond Turtle (Mauremys annamensis) - Extinct in the wild, the TSA maintains an assurance colony of this species at our Turtle Survival Center to help ensure their survival. Photo credit: Rick Reed

Rote Island Snake-necked Turtle (Chelodina mccordi) - Functionally extinct in the wild, the TSA maintains an assurance colony of this species at our Turtle Survival Center to ensure their survival. Photo credit: Cris Hagen

Southeast Asian Narrow-headed Softshell Turtle (Chitra chitra) - The TSA has sent veterinary support to assist with high-mortality issues with this species in Thailand. Photo credit: Gerald Kuchling

Southern River Terrapin (Batagur affinis) - The TSA collaborates with the Wildlife Conservation Society, The Royal Government of Cambodia’s Fisheries Administration, and Wildlife Reserves Singapore to protect, repatriate, and maintain assurance colonies for the last known population of this species in Cambodia. Photo credit: Menggey Eng

Sulawesi Forest Turtle (Leucocephalon yuwonoi) - The TSA supports field initiatives for this species in Sulawesi as well as maintains an assurance colony at our Turtle Survival Center. Photo credit: Cris Hagen
In early June 2017, the TSA’s Cris Hagen, Director of Animal Management, and Clinton Doak, Chelonian Keeper, escorted the first international exchange of captive bred Zhou’s Box Turtles (*Cuora zhoui*). This critically endangered box turtle has a known total worldwide population of less than 150 individuals. Only about 30 of those individuals are wild caught animals. The rest are the result of captive breeding, with a high percentage of those offspring coming from just two wild-caught adult pairs in Germany. This is the only described species of turtle in the world that has yet to be documented in the wild and is currently believed to originate somewhere along the border area of northern Vietnam and Guangxi Province, China.

The International Center for the Conservation of Turtles (IZS) at the Münster Zoo is managed by Elmar Meier and is one of the most successful endangered turtle breeding facilities in the world. The Münster Zoo received three captive-bred subadult females bred from wild-caught parents in the U.S. in exchange for two unrelated captive-bred males. Now the last known females residing in the U.S. have a renewed chance to contribute offspring for the future of the species, and the IZS has obtained a valuable new bloodline to bolster the genetic diversity in their highly successful breeding program.

TSA staff spent one week in Germany and Austria visiting and exchanging information with three institutional and nine private turtle collections, including the top *Cuora* breeders in Europe. This type of networking is crucial to gain experience and knowledge about the many different ways of successfully managing captive populations of turtles.
From left to right, Cris Hagen (TSA Director of Animal Management), Dr. Thomas Wilms (Director, Allwetterzoo Münster), and Elmar Meier (ICCT) unpack three captive bred female Zhou’s Box Turtle (Cuora zhoui) upon their arrival from the United States to Germany for the first international bloodline exchange for one of the world’s most critically endangered turtle species. PHOTO CREDIT: CLINTON DOAK

A Zhou’s Box Turtle peers out of its habitat at the International Centre for the Conservation of Turtles (ICCT) at the Münster Zoo. The ICCT has been maintaining breeding groups of Zhou’s Box Turtles since its inception in 2003. To date, the ICCT has produced ~100 offspring, which is by far the most successful captive conservation breeding effort of C. zhoui anywhere in the world. Continued collaborative efforts and bloodline exchanges will be crucial for the long-term management of this extremely rare species. PHOTO CREDIT: CRIS HAGEN

Typical mating behavior, including neck biting, is exhibited between a captive pair of Zhou’s Box Turtles at the Turtle Survival Center in South Carolina. Captive reproduction of C. zhoui in the United States has been sporadic and limited. The first successful hatching took place in 2004 at David Lee’s Tortoise Reserve in North Carolina. In total, 11 offspring have been produced in the United States; all but two from a single founder pair. PHOTO CREDIT: CRIS HAGEN
Now in its fifth year, the Turtle Survival Center (TSC) continues to grow in size and in number of successfully bred species. Captive reproduction at the TSC was lower in the 2017 season than expected. However, there were a few species that did very well, such as Vietnamese Pond Turtles (Mauremys annamensis), Red-necked Pond Turtles (Mauremys nigricans), and Big-headed Turtles (Platysternon megacephalum). Other hatchlings include the Southeast Asian Box Turtle (Cuora amboinensis), Indochinese Box Turtle (Cuora galbinifrons), Yellow-margined Box Turtle (Cuora flavomarginata), McCord’s Box Turtle (Cuora mccordi), Southern Vietnam Box Turtle (Cuora picturata), Indian Spotted Pond Turtle (Geoclemys hamiltonii), Spiny Hill Turtle (Heosemys spinosa), Serrated Hinge-back Tortoise (Kinixys erosa), and Beale’s Eyed Turtle (Sacalia bealei). Successful reproduction of Cuora mccordi, Cuora picturata, and Geoclemys hamiltonii are firsts for the TSC.
One of seven Forsten’s Tortoises hatched at the Turtle Survival Center since 2016. PHOTO CREDIT: JORDAN GRAY
Construction at the Turtle Survival Center

Nathan Haislip

The Turtle Survival Center (TSC) continues to grow in leaps and bounds. For the 2016/2017 construction cycle, we broke ground on two major construction projects. Our largest project to date, we began construction of a second Cuora Complex in October 2016. When completed, this complex will provide enough enclosures for the remaining founder pairs of the genus *Cuora* currently at the TSC, as well as provide some additional rearing space for juveniles. The finished complex will contain a total of 90 enclosures - including 75 semi-terrestrial and 15 aquatic enclosures - and measure 33.5 m by 12.2 m (110 ft. by 40 ft.). Throughout the winter months (i.e., construction season), we focused on the foundation, including laying concrete block, installing drainage and fill lines, handcrafting concrete ponds, and erecting the steel frame for fencing and shade cloth. None of this would have been possible without numerous volunteers spending countless hours helping at every stage. This complex is scheduled to be completed in the 2017/2018 construction season in time for breeding pairs to move in mid-spring.

In 2016, we began outlining an intern program at the TSC. We were very fortunate to secure funding to establish housing needed to implement the program. When we initially renovated the site of the TSC, a residence was removed so a site was available. However, after several years of growth, we had to remove trees and grade the site with heavy machinery, ensure the septic and water lines were still properly working, and more. After site preparation was complete and the house landed, we called on a few local contractors who assisted us when we needed expert advice and skill sets. After installing a handicap accessible deck, new HVAC system, and electric meter, we were ready for interns. This housing unit immediately expanded our educational capacity. Our first two interns completed the summer 2017 program and we were able to host international staff after the TSA conference. For more information about the TSC internship program, be sure to see the call for applicants on page 14.
TSC TOUR

This August, the Turtle Survival Alliance provided an exclusive opportunity for TSA Members to tour our Turtle Survival Center in Cross, South Carolina. Attended by over 180 guests, the tour of our flagship assurance facility kicked off this year’s 15th Annual Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles. Split into 7 more intimate groups, the attendees were given the opportunity to closely view, photograph, and learn about the facility and its roughly 700 inhabitants by the TSC’s expert staff. After touring the facilities, guests were treated to a catered lunch and cocktails, providing an opportune environment for symposium goers to make new connections and reconnect with past ones. The TSA could not be more proud of the hard work put in by our employees and volunteers to share an instrumental piece toward our mission of “zero turtle extinctions”.

This new housing facility was completed in May 2017 and allows the TSC to host an intern program as well as conduct training programs.

PHOTO CREDIT: NATHAN HAISLIP
Deadline for Spring 2018 internship application is April 15th
Start Date can vary based on availability after May 1st

The Chelonian Internship Program is perfect for undergraduates and graduate students who plan to pursue a career in conservation and captive management of turtles and tortoises.

Key Benefits:
• Gain hands-on experience with the day to day operations of a chelonian conservation center.
• Work with and learn about many aspects of some of the most endangered chelons in the world.
• Develop basic veterinary care techniques as they apply to captive chelonian husbandry.

For more information including responsibilities, expectations, qualifications, costs, and how to apply visit our website, www.turtlesurvival.org/get-involved/chelonian-internships.
2017: A Year of Expansion in Unexpected Places

Eric Munsch

The 2017 survey year for the Turtle Survival Alliance’s North American Freshwater Turtle Research Group (TSA-NAFTRG) was extremely eventful. Since joining the TSA in 2010, the group has found ways to expand our reach through new study sites, participants, and target species. 2017 continued this trend, experiencing growth in all three areas.

TSA-NAFTRG embarked upon our 18th year of continued study at our Florida springs sites this March, beginning with a collaborative project with Dr. Jerry Johnston and Dr. Joe Mitchell at Ichetucknee Springs. We successfully sampled this site for the 4th year, capturing over 300 turtles in two days. This same trip continued with samples at Wekiwa, Rock, Blue, Weeki Wachee, Manatee, Fanning, and Peacock springs, resulting in the capture of over 1,000 turtles in a 10-day sampling session. Unfortunately, for the first time in our 18-year monitoring, this year’s research has exposed a systemic health issue among a number of the Loggerhead Musk Turtles (*Sternotherus minor minor*) in Blue Springs. Additionally, we have quantified a statistical drop-off in occurrences of this species at Wekiwa and Rock Springs. We are in the process of looking into these issues and hope to have answers soon.

Meanwhile, Texas saw the 5th year of sampling at Comal Springs in New Braunfels. During four quarterly trips to the site this year, over 1,400 turtles were captured and processed. Additionally, we have begun a new off-shoot project at Comal Springs examining the health of the local population of Common Snapping Turtles (*Chelydra serpentina*). Throughout the history of this project, only 22 snappers have been documented, nearly all with carapace pitting, skin lesions, and extensive leech loads. This issue presents a source of intrigue as a congruent spring-fed habitat in close proximity to our site has an abundance of this species with minimal afflictions. To assist us in this effort, Oklahoma City Zoo veterinarian Jennifer D’Agostino successfully began taking blood samples from specimens at the site this November. We look forward to getting a better understanding of what is occurring in Comal. Stay tuned!
2017 also marked the second year of sampling Bull Creek, a tributary of Lake Austin. Adjacent to the County Line on the Lake barbecue restaurant in Austin, Texas, this tributary is an extremely productive area for freshwater turtles. Having performed only three sampling sessions since September 2016, we’ve been able to capture and mark over 500 individual specimens representing six species. Moreover, the hospitality and enthusiasm of The County Line® owners and patrons has been equally incredible. The County Line®, in collaboration with Hops and Grain Brewing and the TSA, hosted “Turtlemania” on World Turtle Day® in May, and “Turtlemania 2” during our September sampling event there. Both events were celebrated under the TSA’s popular theme of “Drink Beer, Save Turtles!”

In Harris County, Texas, Eric Munscher and his team have made new discoveries in their studies of the Western Alligator Snapping Turtle (*Macrochelys temminckii*). The August and September trapping sessions for this research project were unfortunately canceled due to the landfall of Hurricane Harvey, a Category 4 hurricane that brought historic flooding and devastation not only to Harris County but other large parts of East Texas. More than a week after the hurricane flooded the area, Texas Parks and Wildlife Department contacted TSA-NAFTRG Director Eric Munscher and scientist Jordan Gray about a large, 90lb Western Alligator Snapping Turtle that had been rescued off of Memorial Drive adjacent to the Buffalo Bayou at 4:00 AM that morning. The turtle was taken to the Wildlife Center of Texas where Eric and Jordan discovered that the individual had been previously marked by the team in February. The animal had moved approximately 2,000 feet (600 m) from its original collection location. Because this was a historically significant flooding event in the United States’ history, this and future data we collect may potentially provide quantitative and qualitative information regarding this species’ ability to handle extreme flooding events. Trapping will commence at this site once water levels return to normal.

Up in Pennsylvania, TSA-NAFTRG scientist Andrew Weber and the TurtleRoom Executive Director Steve Enders officially kicked off our long-term North American Wood Turtle (*Glyptemys insculpta*) monitoring project. In September, the team captured a number of Wood Turtles at both of our study sites. Continued sampling of these locations will occur throughout the Autumn and start again in the early Spring of 2018.

Lastly, we were able to welcome Marc Dupuis-Désormeaux into the TSA-NAFTRG fold. The TSA-NAFTRG owes much of its expansion and success to its ability to broaden our reach through volunteers and collaboration. We invite everyone to join us for our sampling sessions and find out what it means when we say “We are turtle rich.”

**ACKNOWLEDGEMENTS:** Disney Wildlife Conservation Fund, Disney VoluntEARS grant, The Turtle Room, Sante Fe College

**CONTACT:** Eric Munscher, SWCA Environmental Consultants 10245 West Little York Road, Suite 600 Houston, Texas 77040 [emunscher@swca.com]

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Marc Dupuis-Désormeaux is a spatial ecologist who works both in Kenya and in Canada. His PhD work was conducted at the Lewa Wildlife Conservancy, where he studied landscape prey-traps at openings in electrical fences meant for migrating elephants. His work now focuses on hyena and lion landscape partitioning as well as human-wildlife conflicts at community sites near wildlife conservancies. In Canada, Marc has studied raccoons (look for his research on PBS Nature: Raccoon Nation), squirrels, birds, and of course turtles! His turtle work is three-fold: road mortality mitigation, population studies, and habitat colonization. He leads a group of citizen scientists who monitor roads in Toronto for wildlife mortality in order to identify hot spots and plan future mitigation. Marc is currently a postdoctoral visitor at York University working with the Toronto and Region Conservation Authority, where he is examining how various turtle species have colonized a wetland complex on a 500-ha artificial peninsula in downtown Toronto.
TSA-NAFTRG Director Eric Munscher and Carl J. Franklin measure the shell depth of a 70lb (32kg) male Western Alligator Snapping Turtle.

PHOTO CREDIT: JULIA SCRUGGS
The imperative to halt the extinction crisis of Madagascar’s imperiled Radiated Tortoise (*Astrochelys radiata*) has grown into the TSA’s largest and most complex range country program. Together with our partner, Utah’s Hogle Zoo (UHZ), we launched an ambitious and comprehensive Confiscation to Reintroduction Strategy that involves four critical components, each of which must work in tandem for the plan to be successful over the long term. These components include: law enforcement, community engagement, reintroduction/field site conservation, and at the heart of all these activities, our Tortoise Conservation Center (TCC). Recent strategic planning exercises have identified the need to expand each of these elements, including new staff, facilities, training, equipment, and resources, all of which translate to the need to greatly expand our budget for this program.

**A REFUGEE CAMP FOR TORTOISES: CONFISCATIONS CONTINUE TO MOUNT**

While the number of tortoise confiscations decreased in 2017, TSA Madagascar is now responsible for the care of over 8,000 tortoises with 6,700 of these at the TCC, another 1,000 at the new center in Itampolo, and the rest at our triage center in Antananarivo (Tana). We are essentially running refugee camps for tortoises that have been displaced by an incessant trade in both adults for bush meat and juveniles for illegal pet markets in Asia.

The vast majority are Radiated Tortoises, but also include 100 Northern Spider Tortoises (*Pyxis arachnoides brygooi*), eight Southern Spider Tortoises (*Pyxis arachnoides oblonga*), and 16 Ploughshare Tortoises (*Astrochelys yniphora*). We had to significantly increase our animal care staff and now have ten tortoise keepers, including two Leads, at the TCC and Tana, with another Lead needed in Itampolo within the foreseeable future.

Despite the escalating tortoise poaching crisis and the need for continuous expansion, the exceptionally low mortality rate that we
are experiencing (less than 1% once tortoises reach the TCC) is a cause for hope in our fight to preserve Madagascar’s beleaguered tortoises. The astonishingly high survival rate is due primarily to the expertise and dedication of our staff veterinarian, Ny Aina Tiana Rakotoarisoa, who works tirelessly to ensure proper husbandry and veterinary care for our tortoises immediately following confiscations at the Ivato airport in Tana, and while visiting the TCC and various triage centers in the south on a regular basis. The 8,000+ population of tortoises that the TSA currently cares for will certainly grow while we refine our reintroduction strategy in 2018.

**Tortoise Conservation Center**

New facilities at the TCC include a tortoise hospital and treatment center, courtesy of our friends at the British Chelonia Group, a dining/meeting pavilion, and expanded staff quarters and office space. We also have two four-wheel drive trucks donated by Utah’s Hogle Zoo, which have become essential as we are increasingly called upon to move tortoise confiscations or respond to poaching threats.

In addition to the constant need to build new Radiated Tortoise enclosures, we now have a home for our group of *Pyxis a. oblonga*. We expect this group to thrive here as the natural forest within the TCC supports a free-ranging population of this subspecies.

As well as providing refuge for confiscated endangered tortoises, the TCC provides protected thorn forest habitat to other native fauna, integrating the center’s primary role with broader ecosystem preservation. Along with the discovery of wild Southern Spider Tortoises within the TCC, the protected forest area serves as a corridor for ranging troupes of Ring-tailed Lemurs and provides refuge to at least one species of nocturnal lemur. The bird life is particularly diverse and abundant here as well, largely because of the availability of water. Unfortunately, our water supply was interrupted this year because of a pump failure down the line and staff are spending valuable time transporting water from a nearby river, necessitating improvements to our water catchment and storage capacity in 2018.

Plans for 2018 include Phase I of our Community Outreach Center (COC), which was supported by a special fundraising event called ZooBrew at UHZ. To be built on a site just outside the fenced core TCC area, the COC will help us engage the four local communities, collectively known as the Ala Mahavelo Association. This coalition has donated 200+ hectares of good spiny-forest habitat for our tortoise sanctuary, of which eleven are fenced and under development.

It is imperative that we build strong and lasting relations with the Association so they regard the TCC as an asset which they are proud of and want to protect. Currently, these four communities benefit from receiving water from the TCC while selling us tortoise food; we also employ village members as keepers, guards and gardeners.

Another important need for 2018 is to vastly expand our solar power storage capacity which is closely tied to our need to improve security at the TCC. In the not-too-distant future we will build dormitory space for senior staff and visiting scientists and guests, a permanent kitchen/cooking area, and security stations for our guards.

**Enforcement Activities Having an Impact**

The brave work of our Enforcement Officer Sylvain Mahazotahy is beginning to be felt throughout the southern region. A film crew led by Chris Scarffe was trying to capture evidence of tortoise poaching on camera recently and found that this had become increasingly difficult to do. In towns such as Beloha, where just a few years ago signs of poaching, selling, and eating tortoises were blatant, these activities had been pushed underground or shifted to other areas. People interviewed were jumpy and reported that it had gotten too dangerous and too many people had been jailed.

Mahazotahy reported that in 2016, within the Beloha district, 2,770 tortoises were confiscated with 14 poachers arrested and eleven of them imprisoned, whereas in 2017, only 211 tortoises were confiscated with eleven poachers being arrested and jailed. He believes the decline in tortoise trafficking is due the fact that many poachers are already in jail. Our challenge is to keep the pressure...
up on poachers by expanding our network of informants while providing them with greater incentive.

We now know that many tortoises leave the south via taxi-brousse headed north for Mahajunga where they then leave the island by boat. As a result of increased confiscations at the Ivato airport, trade routes are also shifting north in response. Mahazotahy needs new staff with motorbikes based in poaching hotspots, as well as funds to insert members of our Tortoise Patrol on key taxi-brousse routes. This program is working, but with the end of a major foundation grant in 2017, our challenge is to find resources to not only continue our anti-poaching efforts but ramp them up. It is also our responsibility to improve security for Mahazotahy and his family while he undertakes this increasingly dangerous mission.

In addition to Mahazotahy’s personal efforts, Malagasy law enforcement must continue to be proactive, for which UHZ recently donated a motorbike to the mayor of Lavanono to enable his team to more effectively patrol for poaching activity. Lavanono is located nearby to one of the most notorious poaching villages in the south, a settlement uncomfortably close to Cap Sainte Marie Special Reserve (CSM), arguably the most important tortoise population in Madagascar. Improved patrolling in this area is essential.

ENGAGING COMMUNITIES IS CRITICAL TO LONG-TERM SUCCESS

There can be no mistake that the struggle to preserve viable wild populations of Radiated Tortoises will depend on the willingness of local communities to protect them. Some communities need little incentive to protect tortoise populations on their land and keep poachers out, while others require some carrots. Our challenge going forward is to identify healthy tortoise populations on their land and keep poachers out, while others require some carrots. Our challenge going forward is to identify healthy tortoise populations and to learn from the nearby villages why they protect them, or, if they are not protecting them, what can be done to improve their willingness to do so. This is closely tied to our reintroduction strategy which involves finding populations of tortoises that have been depleted by poaching that can be restored by releases, a tactic that can only succeed if the local community is a willing participant.

Determining this is the responsibility of our community outreach team who conducts surveys to identify sites in need of protection or that are suitable for a reintroduction. Currently we engage the following communities: Antsakoamasy, strategically located near CSM, where we built a school in 2012; Lavanono (see above); Ampotaka, the site of our soft-release research by Andrea Currylow; Tranovaho, the site of several large-scale poaching incidents; Antanimora, a potential future reintroduction site with good forests but depleted populations. Investigating these sites and associated communities is the responsibility of Riana Rakotondrainy, Sylvain Mahazotahy, and Monja Rampanarivo who conduct both faunal and floral surveys and speak with community leaders to better understand their needs, concerns, and most importantly, feelings about having tortoises in their communities.

REFINING OUR REINTRODUCTION STRATEGY: LOCATION, LOCATION, LOCATION

Building on the lessons learned by Andrea Currylow’s research at Ampotaka, where she tested the effects of penning for varying periods (soft release) to increase site fidelity following reintroduction, we plan to refine our strategy for this very important component before proceeding further. For reintroductions to be successful, there must be a careful interplay between good science and sound community engagement.

Despite some challenges with collection of radio-tracking and GPS data following our soft releases at Ampotaka, our findings in Madagascar coupled with information gained from the Burmese Star Tortoise recovery program have provided a basis for moving forward with reintroductions. What is missing is a coherent strategy whereby we systematically identify potential sites, based largely on intact habitat, and then evaluate them based on a set of objective criteria. Those criteria include the presence or absence of tortoises, recent poaching activity, presence of feral dogs, attitudes of local communities toward tortoises, and community willingness to support and participate in tortoise reintroductions. Site identification and
TCC keepers Maharavo Augustin, left, and Mbala help care for tortoises that recently arrived from Antananarivo. Soaking to rehydrate tortoises following transport is an important step before being released into the large natural enclosures. PHOTO BY CHRIS SCARFFE
careful evaluation are critical to this process, and building strong relationships with local communities does not happen quickly. Based on these factors we have decided to step back and more thoroughly refine our strategy in 2018 before proceeding with another tortoise reintroduction.

IT’S FINALLY OFFICIAL!

After years of working with the Madagascar government on handling confiscated tortoises, the Ministry of Environment, Ecology and Forestry (MEEF) has formalized a new ten-year accord with the TSA. This agreement includes recognition of an official role for the TSA in Ploughshare Tortoise conservation, a long-awaited step. We will soon be expected to present a management plan to MEEF, and discussions are already underway to develop a highly secure facility at the TCC for Angonoka, provide training for our security staff, hire gendarmes, and vastly expand our solar capacity to permit improved security measures such as motion-activated lights, alarms, and cameras.

ACKNOWLEDGEMENTS: The TSA extends its gratitude to the following organizations and donors for their support to the Madagascar Tortoise Conservation Program: Leona M. and Harry B. Helmsley Charitable Trust, British Chelonia Group, Turtle Conservation Fund, Owen Griffiths/Francois Leguat Ltd., Nature’s Own, Knoxville Zoo, Radiated Tortoise SSP, and Utah’s Hogle Zoo.

CONTACT: Rick Hudson, Turtle Survival Alliance, 1989 Colonial Parkway, Fort Worth, TX 76110 [RHudson@turtlesurvival.org]

Engaging Zoos and Aquariums in Radiated Tortoise Conservation through AZA SAFE: Saving Animals from Extinction

SAFE: Saving Animals From Extinction is a conservation initiative created by the Association of Zoos and Aquariums (AZA). The goal of SAFE is to build collaborative networks of zoos and aquariums to drive field-based conservation actions for threatened species. The Radiated Tortoise SAFE program was established in 2017 by the TSA, UHZ and Knoxville Zoo, to engage all AZA institutions that participate in the Species Survival Program (SSP) for the Radiated Tortoise in its conservation. This SAFE program will focus on leveraging the collective resources and expertise within the SSP community to successfully implement the Confiscation to Reintroduction Strategy. The Radiated Tortoise SAFE program moving forward will provide exciting, hands-on opportunities for these institutions to help ensure a future for this species in the wild.
Improved Breeding Success Leads to Growing Pains at the Hicatee Conservation and Research Center

Heather Barrett

The Central American River Turtle (Dermatemys mawii) is the only living species in the family Dermatemydidae, an ancient lineage dating back 65 million years. Once abundant across southern Mexico, Belize, and northern Guatemala, this Critically Endangered species has been reduced to remnant populations due to overhunting for human consumption, with Belize as its final stronghold. Locally known as Hicatee, populations continue to decline, and the species is in need of greater protection and innovative conservation actions.

Starting in 2010, the TSA began a fruitful partnership with the Belize Foundation for Research and Environmental Education (BFREE), a US-based conservation organization that operates a biological field station in southern Belize. Accomplishments include the development of the Hicatee Conservation and Research Center (HCRC) and the development of a Belizean Hicatee stakeholder group, the Hicatee Conservation Network, which has held two important international Hicatee symposia and continues to develop outreach and education programs.

CAPTIVE BREEDING AT THE HCRC

Since 2014, HCRC has acquired 45 adult turtles through confiscations, rehabs, and wild stock. Along with protection of wild populations, establishing captive breeding colonies is critical to Hicatee conservation. So little was known about the Hicatee that prior to the creation of HCRC, this species was considered difficult to maintain in captivity, with a dismal captive breeding record. The results of the HCRC have been spectacular. Successful nesting has taken place each year, with a total of 137 eggs deposited to date, reflecting 13 nests, with high rates of hatching (80%). For the first time, captive husbandry protocols have been established, and information has been gathered about nesting site preferences, clutch sizes, egg incubation, diet preferences, growth rates of juveniles including onset of sexual maturity, and best management practices for reliably breeding the species in a captive environment.

This has been a breakout year for the HCRC. The addition of 19 adult females from confiscations in 2016, plus further improvements to nesting areas, resulted in eleven nests deposited between November 2016 and April 2017, a much wider window than previously
recorded for the species. Unlike the two previous nests in 2014 and 2015 that occurred on dry soil within a few feet of the water’s edge, all eleven nests this past season were found underwater in nest cavities deposited in wet mud just below the surface of the water.

Nests were found in each of two breeding ponds and seemed to be placed randomly. A total of 113 eggs were deposited, of which 79 hatched; clutches ranged in size from seven to fourteen eggs (average of ten). Also of note, we believe that one of the females double clutched this year, a great sign for the future production of this species in captivity. We are expecting another ten to 20 clutches of eggs starting later this year.

Next steps for the program include the development of an integrated management and recovery plan for the species.

**FIRST ANNUAL HICATEE AWARENESS MONTH**

BFREE, the TSA, and members of the Hicatee Conservation Network celebrated the first ever Hicatee Awareness Month in October 2017. The centerpiece was the film “Hope for Belize’s Hicatee: Central American River Turtle.” Produced by Emmy-award winning filmmakers Richard and Carol Foster, the film is a short natural history documentary produced entirely in Belize. It highlights the significance of *D. mawii* as a traditional food and describes how overharvesting is propelling the species toward extinction. Viewers are introduced to the current work being done to save the Hicatee and are encouraged to become active participants.

The film was distributed both physically and online. One hundred film DVDs along with Hicatee Fact Sheets were mailed to primary and secondary schools throughout the Belize River Valley, and the film was sent via email to over one thousand principals at schools throughout Belize. Additionally, BFREE worked closely with Belize media outlets to produce Hicatee articles and make the film available on television.

A strong social media presence was critical to the success of this campaign, while an online Hicatee Toolkit advised supporters on how they could be a part of the month’s activities. Special dates of celebration, like the first annual National Hicatee Day on 17 October, also played an important role in keeping the momentum going by asking followers to wear green and post #shellfies to show their support for Hicatee conservation.

With the help of dedicated partners like University of Belize’s Environmental Research Institute, Independence Junior College, Sacred Heart Junior College, and Crocodile Research Coalition, physical film viewing events took place in addition to the online push.

Although the long ingrained tradition of eating Hicatee is the primary cause of its decline, it is also precisely because of the Hicatee’s tremendous cultural value that many Belizeans, including most Hicatee hunters, are supportive of preserving the species as both a valuable resource and a point of national pride. With the success of the breeding program at the HCRC and the first ever Hicatee Awareness Month, the Hicatee mantra, “The hicatee is disappearing, but together we can save it,” continues to gain traction and support as new turtles are born and attitudes and habits shift.

**ACKNOWLEDGEMENTS:** We would like to thank Columbus Zoo and Aquarium Conservation Fund, Jacksonville Zoo and Gardens, and Turtle Conservation Fund for program funding and support. Special thanks are in order to Nichole Bishop, Dr. Thomas Rainwater, Mark Mummaw and Grant Clay for their efforts in the acquisition and installation of the new hatchling tanks. Additionally, we acknowledge the following organizations and individuals: Members of the Hicatee Conservation Network, Richard and Carol Foster, Dr. Shane Boylan, DVM, Dr. Isabelle Paquet-Durand, Tyler Sanville, Jaren Serano, Manuel Balona, Mallory Clark and Natalie Steckler.

**CONTACT:** Jacob Marlin, Belize Foundation for Research & Environmental Education (BFREE), 2602 NW 6th Street, Suite D, Gainesville, FL 32609 [jmarlin@bfreebz.org]
HCRC manager, Thomas Pop, literally has his hands full! Over 80 Dermatemys mawii hatched at the Hicatee Conservation & Research Center this year.

PHOTO CREDIT: SHAMAN MARLIN
The Royal Turtle of Cambodia Mounts a Comeback

Som Sitha and Brian Horne

Thirteen November 2017 marked a special day in the recovery of the Southern River Terrapin (Batagur affinis) in Cambodia. For the second time ever, the Royal Government of Cambodia’s Fisheries Administration (FiA), WCS (Wildlife Conservation Society), Wildlife Reserves Singapore (WRS), and the Turtle Survival Alliance (TSA) released a group of headstarted Southern River Terrapins into their natural habitat in the Sre Ambel River system—the only place in Cambodia where this species is found.

These turtles, locally known as the Royal Turtle, hatched from nests protected in the wild from nest predators and poachers. After safely hatching, they were transferred to our nearby headstarting facility. Since 2002, nearly 300 turtles have been part of this program.

“FiA, in collaboration with WCS, has been working to conserve the Royal Turtles for nearly 20 years,” said Mr. Ouk Vibol, Director of Fisheries Conservation Department of the FiA. “Efforts have ranged from nest and habitat protection, to education and awareness, to the construction by WCS and FiA of the Koh Kong Reptile Conservation Center for housing, rearing and breeding the turtle species.”

After undergoing health examinations by WCS veterinarians, all 25 subadult turtles were fitted with acoustic transmitters. These transmitters will allow researchers to monitor the turtles’ survival and seasonal movements, as well as gain a better understand of the turtles’ habitat use within the river.

We are optimistic about this most recent release because we had success in 2015 when we released 21 Royal Turtles into the Sre Ambel system. After nearly two years of regular monitoring of this group we saw that they were able survive in the wild after being headstarted for five to seven years. Initially, all but one turtle were relocated within 25 km of the release site, however, three turtles then made long distance movements of greater than 100 km. These three turtles crossed the Bay of Kampong Som and moved to a separate river system, the Preak Piphot River. This is noteworthy as it demonstrated the ability of the turtles to withstand the ocean’s salinity. The turtles use all parts of the river from the headwaters to coastal mangrove, and there is potential for turtles released in the Sre Ambel River to recolonize other river systems in Cambodia, if protection is sufficient.

To underscore the long-term potential for recovery of this species in Cambodia, three of the released turtles were accidentally captured by local people; all were returned unharmed and subsequently released back into the river. These encouraging results...
show that our outreach and education efforts have been effective in increasing the understanding of the importance of the Southern River Terrapin among local communities.

SAND MINING BANNED

Working with the Fisheries Administration (FiA) and Ministry of Mines and Energy (MME), we set out to stop sand mining in the Sre Ambel River system. Sand mining is a major threat to turtles in the water, and it also disrupts the natural river flow and destroys nesting beaches. We provided information on the movement of the released headstarted turtles to MME as a means to demonstrate how the turtles use the entire river system and how disruptive sand mining is to the ecology of the turtles. As a result, MME issued a proclamation to cancel all types of dredging in the river system. This is a major milestone for the conservation of the Southern River Terrapin in Cambodia and is fundamental to the long-term survival of the species.

NEST PROTECTION PROGRAM

In 2017, only one Southern River Terrapin nest was found. Although this is down from previous years, we believe the turtles may be nesting in new locations and we plan to expand our nesting surveys in 2018. Our community nest protector team guarded this lone nest, which resulted in nine hatchlings. Shortly after hatching, the turtles were transferred to the Koh Kong Reptile Conservation Center (KKRCC) for rearing.

Local people also located one nest of 51 eggs of Cantor’s Giant Softshell Turtle (Pelochelys cantorii) on the same beach as the Southern River Terrapin nest. However, like all nests of this species found since 2013, these eggs did not show any signs of embryonic development. It is possible that this is because there is no longer an adult male in the area.

KOH KONG REPTILE CONSERVATION CENTRE (KKRCC) UPDATE

The year was filled with many new advancements at the KKRCC. Notably, during 2017 we finished the construction of three breeding ponds and one quarantine pond. A team of volunteers from the United States, Singapore, and Cambodia aided in the laborious task of lining the ponds with imported pond liners. We also increased the capacity of our rainwater catchment pond and prepared a new area for future construction of smaller, more specialized ponds for additional species. Lastly, and very importantly, we have been granted the transfer of two turtles (a large female and a subadult male) from a private individual within Cambodia. These two turtles were ceremoniously donated to the KKRCC during the grand opening of the center in November 2017. They will aid greatly in increasing the genetic diversity of our breeding program.

Cantor’s Giant Softshell Turtle (Pelochelys cantorii) Protection on the Mekong in Cambodia

The TSA/WCS team, in collaboration with Cambodian Fisheries Administration (FiA), is now responsible for managing the Mekong Turtle Conservation Project. Since the rediscovery of P. cantorii in 2007, Conservation International (CI) has been working to conserve the species in the Mekong River through a program of nest protection and headstart/release. The TSA/WCS program will focus primarily on nest protection and outreach, working with local communities along a stretch of river that supports good nesting habitat.

Since its rediscovery, the number of P. cantorii nests found has fluctuated. After a sharp increase from nine nests (87 hatchlings) in 2007-2008 to 83 nests (1915 hatchlings) in 2012-2013, numbers decreased from 2013 due to funding. The 2016-2017 nesting season resulted in 49 nests with 819 hatchlings. Since inception, the project has protected 378 nests, producing a total of 8,528 hatchlings.

DONOR ACKNOWLEDGEMENT: For donor support we want to gratefully recognize the Turtle Conservation Fund, Critical Ecosystem Partnership Fund, and Conservation International for recognizing the importance of this program.
August 2017 marked the fifth anniversary of the TSA/WCS Colombia Program. In those five years, the program has focused on the country’s most endangered and rare tortoise and turtle species, developing science based, on-the-ground approaches to solve some of the most pressing challenges and knowledge gaps for these species. We summarize here some of the most significant achievements and future directions of the program.

**Dunn’s Mud Turtle**

In 2012, we went on an expedition to gather information on the Dunn’s Mud Turtle (*Kinosternon dunni*). Less than five specimens of this elusive and endemic species had been seen since its description by Fred Medem in the late 1960’s. Along with colleagues from a local university and research institute, we documented several new localities for the species, including some that belong to a Caribbean drainage, as opposed to the Pacific ones previously reported. This initiative resulted in a group of local biologists gaining interest and developing skills for turtle research, eventually documenting the species in several other localities in the region. Unfortunately, the population being studied has been affected by gold mining. Future initiatives for this species include studying its natural history and population parameters and evaluating the effects of gold mining across its range.

**Magdalena River Turtle**

The Sinú River is home to the Magdalena River Turtle (*Podocnemis lewyana*), which for the fifth consecutive year was protected by a community-based conservation program supported by the TSA. This species is endemic to Colombia and is classified as Critically Endangered by the IUCN. It is threatened by overexploitation, and, at the Sinú River, by nest loss due to floods caused by a hydroelectric dam. In response, one of the main initiatives of the program is the collection of clutches from flood-prone sites, their artificial incubation, and the release of the hatchlings at the nesting sites where they were previously collected.

During these five years, the program has rescued more than 400 nests and released more than 6,300 hatchlings to the river, which would have been lost to floods otherwise (Table 1). In 2016, we conducted a study to evaluate egg viability when submerged under water and demonstrated that after 36 hours, embryo survival dropped to nearly zero. This confirms the importance of egg rescue in this particular situation in the Sinú River. We also started a mark-recapture study to monitor different population parameters.
parameters and to evaluate the effectiveness of the conservation actions that have been implemented in the long term.

We are currently working on attaining financial sustainability for the conservation program by supporting ecotourism entrepreneurship created by the local organization leading conservation activities, Econbiba. Last year, Luis Carlos Negrete, manager of Econbiba and community leader, was awarded a Conservation Leadership Program Internship Grant to develop a business plan for the ecotourism initiative. The expectation is to use part of the income generated through tourism to support the conservation activities run by the community. Luis Carlos will implement the business plan with the technical and financial support of the TSA.

GIANT SOUTH AMERICAN RIVER TURTLE

The TSA/WCS team, working together with Fundación Omacha, identified in 2014 a significant population of the species in La Virgen in the Orinoco Region of Colombia. With over 1,500 nesting females, this represents the second largest known population of Giant South American River Turtle (*Podocnemis expansa*) in the country and the largest one outside of the Amazon region. This species, the largest river turtle in South America, is listed as Critically Endangered by the IUCN. The exploitation of adult females for consumption and trade has vastly reduced its populations and threatens its survival. Consequently, identifying populations like the one in La Virgen, and working with them to conserve the species, is crucial.

During the last three years of the TSA’s work in La Virgen, the community has protected more than 1,000 females every year, with no harvest of adult females occurring on the protected beaches. Nest harvesting by people from other areas was also reduced significantly. Only 0.34% nests were harvested in protected beaches versus 31.8% in nearby non-protected beaches, showing the success of the surveillance during the nesting season. The nesting female population seems to be stable during this period (Figure). Natural rates of nest loss are very high, due to sudden increases in the level of the river (Table 2), while hatching success is very high (82.8%).

While protection of females and nests has been a success so far, the future of this initiative will focus on achieving sustainability. In the coming years, the TSA/WCS will work with the community to develop strategies that allow the community to benefit from the conservation program. One first step

<table>
<thead>
<tr>
<th>Year</th>
<th>Community</th>
<th>Total eggs</th>
<th>Hatchlings</th>
<th>Mean Hatching Success Per Nest</th>
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<tbody>
<tr>
<td>2013</td>
<td>Caño Viejo</td>
<td>1261</td>
<td>1056</td>
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<tr>
<td></td>
<td>Cotoca Arriba</td>
<td>82</td>
<td>58</td>
<td>68.80</td>
</tr>
<tr>
<td>2014</td>
<td>Caño Viejo</td>
<td>1831</td>
<td>1581</td>
<td>95.40</td>
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<td></td>
<td>Cotoca Arriba</td>
<td>216</td>
<td>172</td>
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<td>1766</td>
<td>1505</td>
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<td></td>
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</tr>
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<td>515</td>
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<tr>
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<td>1104</td>
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**TABLE 2.**

<table>
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<tr>
<th>Year</th>
<th># Nests</th>
<th># Nests Lost</th>
<th># Successful Nests</th>
<th>% of Successful Nests</th>
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<td>1018</td>
<td>286</td>
<td>392</td>
<td>38.5</td>
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<tr>
<td>2016</td>
<td>831</td>
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<tr>
<td>2017</td>
<td>1670</td>
<td>1279</td>
<td>337</td>
<td>20.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3519</td>
<td>1742</td>
<td>1113</td>
<td>31.6</td>
</tr>
</tbody>
</table>
is to develop a harvest model for the eggs, which will allow the community to use this resource in a sustainable and legal fashion. Additionally, we will work to identify and implement productive alternatives that can bring income to the community to support conservation activities. One such alternative that will be evaluated is ecotourism, as this is one of the few places in Colombia where it is possible to observe large groups of basking turtles in the wild.

**DAHL’S TOAD-HEADED TURTLE**

Work with Dahl’s Toad-headed Turtle (*Mesoclemmys dahlii*) has moved from research on the species’ range, abundance, movements, and habitat requirements to on-the-ground actions for its conservation. Based on the science produced by the team, we have implemented multiple strategies in different localities across its range. In 2014, we started a restoration project on 1.5 ha of riparian vegetation in Cesar, where we had been studying the population for over four years. More recently, in 2016, we continued this exercise, adding over 25 additional hectares along streams in the same area the species inhabit. Vegetation is growing and improving the quality of the forests along the streams, however, there is still no observed response in the population of the species. From 2014 to 2015, we thoroughly sampled across the species range to evaluate its abundance and collected samples for genetic analyses. Results from this study indicate high levels of inbreeding in all subpopulations and very low population sizes. These genetic and mark-recapture studies point to a few localities where a protected area could help maintain a population of individuals. This species does not occur in any protected area, so a priority in the near future is to find a property to establish the first protected area for the species. This preserve would be essential to assure long-term survival of the species and to implement genetic rescue programs to reduce the potential negative effects of inbreeding in the population. This is where the efforts will be focused on the following years for this species.

**ACKNOWLEDGEMENTS:** Tim Gregory, Disney Conservation Fund, Fundación Mario Santodomingo, Ecopetrol, Wildlife Conservation Society, Fundación Omacha, People’s Trust for Endangered Species.

**CONTACT:** Turtle Survival Alliance, WildLife Conservation Society, Cali, Colombia [gforero@wcs.org]

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**NEW MEMBER OF TSA COLOMBIA**

Igor Valencia is the new Turtle Researcher for the TSA Colombia Program. He is a Biologist from Universidad Javeriana, who started working with turtles during an internship with TSA/WCS for the *P. lewyana* project in Cotocá Arriba. Igor has also worked with population viability analysis for his undergraduate research. He will be supporting all activities in the field, communications and analysis of data. His skill and enthusiasm will sure help to move this program forward.

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The community in Cotocá Arriba lead the community-based conservation program for Magdalena River Turtle in the Sinú River. PHOTO CREDIT: TSA
3rd Attempt to Artificially Inseminate the Last Female Yangtze Giant Softshell Turtle

Gerald Kuchling

Semen collection by electro-ejaculation and artificial insemination of the last pair of Yangtze Giant Softshell Turtle (*Rafetus swinhoei*) in China unfortunately did not produce any fertilized eggs in 2015 and 2016. In preparation for the new attempt on 15 April 2017, the male and the female were separated in mid-October 2016 so that the male would not lose sperm through unsuccessful mating attempts during winter and early spring.

The team and procedures underwent some changes in 2017. Thomas Hildebrandt and Susanne Holtze of the Department of Reproduction Management of the Leibniz Institute for Zoo & Wildlife Research in Berlin teamed up with Paul Calle of the Wildlife Conservation Society (WCS), Gerald Kuchling of the Turtle Survival Alliance (TSA), veterinarians from the Suzhou Zoo and Changsha Zoo, and representatives of WCS-China and the China Zoo Society. Due to the male turtle’s heavily damaged penis, semen collection, this time with a flexible probe, was again challenging and only a small amount of uncontaminated, high-quality semen could be secured. State-of-the-art equipment – not available during previous insemination attempts – included a 3D-ultrasound system and a flexible, battery-driven video-chip endoscope with an integrated LED light source. The light is necessary to position golden-tipped guide wires through the cloaca and into the openings of the oviducts. These wires are then used as guides to push insemination catheters into the oviducts. We considered this method less invasive and preferable to the insemination through coelioscopy performed in 2016, however the female had to be kept anaesthetized for much longer to complete the procedure.

An additional challenge occurred for our reproductive attempts in 2017: The Suzhou Zoo relocated to a new location. The day following the artificial insemination, the *Rafetus* pair had to be moved into a temporary pond at a different location. Despite video surveillance, nesting was not observed in this set up and it is currently unknown if any eggs were fertilized in 2017. The *Rafetus* pair is expected to move again into a new enclosure in the new Suzhou Zoo prior to the winter of 2017/2018 where the male and the female can again be separated for hibernation.

Assisted reproductive technology remains our only hope to propagate a new generation of the Giant Yangtze Softshell Turtle, and we plan to repeat artificial insemination in the spring of 2018 after additional trials with other softshell turtle species.

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Indonesia is a vast nation of over 17,000 islands that spans both sides of the equator from near the Malay Peninsula in southeast Asia to the province of Papua on the west side of the island of New Guinea. The biodiversity is similarly expansive, with a high turtle diversity that includes at least three endemic species.

Unfortunately, Indonesia also has one of the most threatened turtle faunas in the world, with five species listed in the 2011 IUCN’s 25 World’s Most Endangered Tortoises and Freshwater Turtles. The Painted Terrapin (*Batagur borneoensis*), the Southern River Terrapin (*Batagur affinis*), the Rote Island Snake-necked Turtle (*Chelodina mccordi*), the Asian Narrow-Headed Softshell (*Chitra chitra*), and the Sulawesi Forest Turtle (*Leucocephalon yuwonoi*), as well as other threatened species, make Indonesia a top-priority country for the TSA.

The organization’s first *in situ* initiative in Indonesia focused on the Painted Terrapin. Once widespread throughout southern Thailand, Peninsular Malaysia, Malaysian Borneo, and Sumatra, the Painted Terrapin has disappeared from most of its former range due to the unrestricted hunting of adults, the collection of eggs, and habitat destruction. One of the last and largest viable populations of *B. borneoensis* is found within the District of Aceh Tamiang in Sumatra, Indonesia.

Since the TSA began its Painted Terrapin conservation initiative with the first population study in 2009, efforts to preserve this beautiful river turtle have faced a number of challenges including a near lack of scientific literature about this species when the program began. Other significant challenges were financial and cultural. Working in different ways with the 13 different villages in the conservation area without arousing jealousy or suspicions of favoritism amongst them required expert social navigation. Convincing fishermen to change their practices to avoid drowning terrapins and limiting consumption of turtle eggs among villages that have harvested terrapin nests for hundreds of years are other examples of issues that demand cultural sensitivity and correct social diplomacy. Fortunately, TSA Indonesia’s adaptability and continuous commitment to improvements have resulted in a Painted Terrapin conservation program that has been largely embraced by the local population.

**HATCHLINGS RELEASED AND SURVIVAL**

As of April 2017, 1,204 Painted Terrapin hatchlings have been released into the wild. Patrols seeking turtle nests are important to this effort, and 317 of the total hatchlings resulted from nest patrols conducted...
between December 2016 and April 2017. During this time, 26 nests were successfully secured and 424 eggs were incubated at the hatchery on the nesting beach, Pusong Putus, near our patrol camp. The hatching rate was 87.5%, a significant increase over the 73% hatching in 2016. However, the number of nests found decreased from 2016, resulting in less than half the overall number of hatchlings for 2017.

We believe that the decreasing numbers of discovered nesting sites in 2017 was influenced by three factors: 1) excessive trash on the beach, 2) beach erosion resulting in less potential nesting area, and 3) increased adult female mortality caused by drowning in shrimp traps. We know of three females, including a tagged individual, found dead as a result of shrimp traps.

Despite this, there is more good news. During field survey and monitoring, we successfully recaptured a hatching in March 2017 that had been tagged with a microchip and released back in August 2016. In addition, six sub-juvenile Painted Terrapins were sighted basking on logs. Although their position prevented us from seeing any identification marks they may have had on their marginal carapaces, we estimated from their size that these turtles were all between two and three years old.

These two events mark our first recapture of released hatchlings and first sighting of sub-juvenile individuals since the Painted Terrapin Conservation Project began. We are extremely encouraged by these indications of survivorship and, it is hoped, eventual recruitment into the adult population. In addition, we are also investigating the genetic variation among this year’s hatchlings, with genetic samples from 33 hatchlings collected from saliva and marginal carapace scutes.

There is also good news regarding legal protection. To better protect the Painted Terrapin in Aceh Tamiang, the local government has issued a regulation prohibiting all harvesting of turtles. Because locals have eaten turtle eggs for many generations as an important cultural tradition, a total ban on egg collecting is not politically or socially feasible at this time. However, new regulations have been put in place permitting villagers to consume 40% of eggs found in a nest, while 60% must be given to the government to be hatched for conservation. Furthermore, egg collectors must now possess a government license. We helped draft the new regulations by providing scientific guidance, and promoted the new rules at public hearings.

**COMMUNITY-BASED CONSERVATION**

Our Painted Terrapin awareness programs have reached hundreds of villagers and we are continually seeking to expand this education initiative. Among our most ambitious new programs to increase villager engagement, empowerment, and sustainability for the preservation of the Painted Terrapin and its habitat will be setting the groundwork for educational tourism. Although the logistics and practical considerations of implementing a successful ecotourism model are considerable, we believe that it is possible in the long run.

As an initial step, a Painted Terrapin Information Center is being built, sponsored by Pertamina EP Rantau, in Pusong Kapal Village, Subdistrict of Seruway. This facility will function as an information center and entry point for visitors to learn about Painted Terrapins and other local wildlife through videos, presentations, and guide books before being taken to see the nesting beaches by boat. This conservation area is rich in wildlife, and travel along the river will afford visitors the opportunity to see Painted Terrapins, Saltwater Crocodiles, Monitor Lizards, numerous birds, and primates, such as Thomas’ Leaf Monkey and the Silvery Langur.

The Information Center will be owned by the village government and managed by a government approved community group that we will advise and work with from the onset. Profits from the Center will fund conservation activities such as nest patrols. Through the Center and its wildlife tourism, we aim to empower local people to manage their wildlife and biodiversity, including the Painted Terrapin, as valuable resources and icons of local cultural pride.

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India is a vast country with diverse wildlife, including one of the richest chelonian faunal assemblages in the world, with 28 species of non-marine turtles recorded within its borders.

Unfortunately, India’s turtles face significant conservation challenges, from habitat destruction to illegal collection. Many species are critically endangered. In response to this crisis, the TSA’s India program was initiated in 2005. It was expanded in 2010, currently targeting ten threatened turtle species through six conservation projects in four Turtle Priority Areas (TPA).

IUCN RED-LIST CONFERENCE

We hosted the National Conservation Action Planning and Red-list Assessment Workshop in February 2017 in New Delhi, India, in association with the Ministry of Environment, Forests and Climate Change, and other partners. The three-day IUCN Red-list session concluded with the recommendations to reclassify the Crowned River Turtle (*Hardella thurjii*) and Keeled Box Turtle (*Cuora mouhotii*) as Critically Endangered, and the Indian Flap-shelled Turtle (*Lissemys punctata*) from Least Concern to Near Threatened. Accordingly, the IUCN will petition the Ministry of Environment, Forests and Climate Change to increase protections for these species under the Indian Wildlife Protection Act.

NORTHEAST INDIA PROJECT

In honor of International Biodiversity Day, 22 May, the project team signed a long-term memorandum of understanding (MoU) with the Assam Tourism Development Corporation to set up a Nature Discovery Center at Biswanath Ghat along the northern bank of the Brahmaputra River. The center will serve as our future conservation and research facility.
The center is being built with generous support from the Disney Conservation Fund and is set to open 2 February 2018.

The TSA signed another MoU, with the Dimapur Zoo, Nagaland, in January 2017 to help insure the survival of the Asian Black Giant Tortoise (*Manouria emys phayrei*) in northeastern India by initiating a breeding program there. This zoo houses six males and five females and is very keen to lead the regional species recovery program with the TSA. The TSA and Dimapur Zoo started preliminary husbandry improvements, marked all the turtles with Passive Integrated Transponder (PIT) tags, and collected morphometric measurements. As per a pre-accorded permit from the Central Zoo Authority to the TSA in India, our project team will survey all the zoos of northeast India for Asian Black Giant Tortoises and assess each zoo’s housing facilities to establish an integrated conservation breeding program across the region.

**THE RED-CROWNED ROOFED TURTLE**

The spectacularly colored Red-crowned Roofed Turtle (*Batagur kachuga*) is the second most endangered turtle species in India. The Chambal River is possibly the last stronghold of the species. In 2017, through our ongoing hatch-and-release programs, we protected 450 nests of two *Batagur* species and released over 8,000 hatchlings, with 125 hatchlings translocated to our rearing centers in Garhaita and Deori.

In the field, our team sampled the middle Chambal River in Madhya Pradesh within a ten kilometer stretch. Over a period of three
weeks we sampled 61 turtles representing seven species. Our team measured and PIT tagged all animals and fitted ten wild *B. kachuga* with acoustic transmitters. A wildlife veterinarian was present during the sampling, and we experienced no animal injuries or mortalities. All turtles were released at their precise point-of-capture.

Additionally, we discovered a male-dominated semi-wild population of *B. kachuga* confined to a river pool in front of the Bhashwari temple. We physically marked 11 individuals for future study.

**THE NORTHERN RIVER TERRAPIN**

The Northern River Terrapin (*Batagur baska*) breeding program continues at our facility in Sajnekhali within the Indian Sundarbans, with four females nesting in March 2017, and eggs hatching with an 87% success rate in June. The Sunderban Tiger Reserve and the West Bengal Forest Department used technical information provided by the TSA to develop a second earthen pond within facility to split the colony at Sajnekhali. Several other Northern River Terrapin colonies are maintained within the Sunderbans Tiger Reserve, and after receiving a health assessment, 20 animals (seven males and 13 females) were translocated to join additional colonies. Another 80 animals were slated for transfer among three facilities in the Tiger Reserve in the winter.

**THE CROWNED RIVER TURTLE**

We continued sampling the Sarju-Ghaghra river system in the Tarai region for our ongoing studies of the endangered Crowned River Turtle (*Hardella thurjii*). A total of 50 turtles were sampled, measured, and tagged in September. From this sample, four female *H. thurjii* with carapace width of 50 cm or greater were taken for an x-ray examination to determine the presence of calcified eggs. Three of the females were gravid and were administered oxytocin and PG alpha to induce artificial oviposition at our River Conservation Center. We were able to retrieve a total of 29 eggs from this endangered species, whose nesting locations and behaviors are still unknown. Perhaps most excitingly, two new viable populations of *H. thurjii* were discovered in the Gomti River near Lucknow, Uttar Pradesh, during the spring surveys.

**RESCUE AND REHABILITATION**

Better networking and more effective enforcement has allowed Indian agencies to crack some big illegal turtle consignments. We combined our efforts with Uttar Pradesh Special Task Force (UPSTF) as well as the Wildlife Crime Control Bureau (WCCB) and were able to provide assistance in identification, on-site treatment, and rehabilitation of over 10,000 turtles of eight species. The biggest haul included over 6,000 Flap-Shell Turtles (*Lissemys punctata*). All the hard-shell turtles were translocated to the Kukrail Gharial and Turtle Center for a quarantine period and were later released into protected areas. In addition, 23 *B. kachuga*, mainly males in breeding colors, were confiscated from Agra and rehabilitated, with a 90% survival rate.

**EDUCATION AND OUTREACH PROGRAM**

All our projects are socially integrated and promote participatory conservation. The TSA in India is helping to alleviate the pressure on rivers by developing alternative livelihood programs for riverside fishing communities at our centers in Tarai and Chambal. The models include pond-based pisciculture, organic agriculture, fuel-cake making, chicken farming, handicraft production, and arid horticulture. To further consolidate and network with like-minded organizations in northern India, we hosted a one-day stakeholder workshop in Lucknow to integrate alternate livelihoods into conservation strategies. The recommendations from this meeting will be submitted to the government and partner agencies.

In addition, we continued our education programs both in Chambal and Tarai, including a teachers’ training program, school follow-up activities, and a cluster-level event in which over 60 riverside schools in the Agra and Bahraich Districts participated. We conducted training programs and held two
workshops in September in which we trained over 60 naturalists for projects at the Kukrail and Lucknow zoos.

We sustained our Kukrail Guided Nature Tour (KGNT) at the Gharial and Turtle Center, celebrated World Turtle Day, and developed three low-cost, on-site nature interpretation centers in the Chambal region. These projects have reached over 10,000 people, and we intend to increase this to over 20,000 in 2018.

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Progress Continues in the Fight to Save Myanmar’s Critically Endangered Turtles

Steven G. Platt & Kalyar Platt

With 27 species of tortoises and freshwater turtles - almost a third of which are endemic – Myanmar is among the most important chelonian diversity countries in the world. It has also become Ground Zero for turtle conservation in Southeast Asia, as its extraordinary turtle fauna is threatened by subsistence harvesting, widespread habitat destruction, and most insidious of all, entrenched networks of illegal traffickers with direct lines to wildlife markets in bordering China and Thailand.

Beginning in the early 2000s, the Turtle Survival Alliance (TSA) working together in partnership with the Wildlife Conservation Society (WCS) has sought to stem the seemingly inevitable tide of extinction with a combination of in situ and ex situ programs focused on the most critically endangered species. These efforts are increasingly showing signs of success, although the battle to save Myanmar’s imperiled turtles is far from won.

The 2016-2017 year was another banner year with a major confiscation of Big-headed Turtles (*Platysternon megacephalum*), record-breaking reproduction by Burmese Roofed Turtles (*Batagur trivittata*), continuing reintroductions of Burmese Star Tortoises (*Geochelone platynota*) into the national protected area system, and notable breakthroughs in the captive breeding of Burmese Eyed Turtles (*Morenia ocellata*) and Asian Black Giant Tortoises (*Manouria emys phayrei*).

**BIG-HEADED TURTLE CONFISCATION**

In early November 2016, while investigating complaints about noxious odors emanating from a ramshackle building in a small town on the Myanmar-Thailand Border, police and Forest Department officials stumbled on almost 1,000 dead and dying Big-headed
Turtles, a critically endangered species inhabiting cool, fast-flowing mountain streams of Southeast Asia.

The compound belonged to a shadowy, Hong Kong-based underworld figure whose two lieutenants-in-residence were charged with illegally purchasing turtles and smuggling them to China. With neither the means nor the expertise necessary to care for this number of turtles, Myanmar authorities immediately contacted the TSA/WCS team for assistance.

Assembling from far-flung locations throughout the country, we converged on the border town within 24 hours. What we found was sickening: crude cages stuffed with dehydrated and starving turtles, many of which were already dead or in the throes of death, and a pervasive overpowering stench. Our immediate task was to move the turtles from the border to the Turtle Rescue Center (TRC) in the cool highlands above Mandalay. This proved easier said than done when we learned the only domestic air carrier serving the region no longer carried animal cargo. After a series of frenzied late night calls to their CEO, the airline relented and temporarily lifted the prohibition. Shortly after dawn the following morning, we had the turtles in the air.

Landing at Mandalay, the closely packed crates of turtles were transferred to waiting trucks for the final leg of the journey to the TRC. In the meantime, a call to action went out to the global turtle community and the response was immediate. Veterinarians, medical technicians, and experienced husbandry technicians were soon inbound to Mandalay from the Bronx Zoo, Smithsonian Institution, Turtle Survival Center, and Wildlife Reserves of Singapore, bringing urgently needed medical supplies along with a formidable body of expertise.

The following week was harrowing. Even when healthy, Big-headed Turtles are considered one of the more delicate and challenging species to maintain in captivity.

After being subjected to weeks of abuse and neglect, these turtles were especially difficult patients. Hours were spent diagnosing, treating, and nursing our charges back to health. On more than one night, we worked around the clock without sleep and only short breaks for brief meals.

Worse yet, Big-headed Turtles are territorial and anti-social (except during the breeding season), meaning that turtles must be housed individually, or else viscous fights will ensue. Lacking facilities to provide 1,000 turtles with individual living quarters, we improvised; each turtle was placed under an overturned wicker basket in the shallows of a repurposed softshell turtle pool. Most of our charges required hand feeding, at least initially, which entailed patiently dangling a bit of shrimp or fish in front of the turtle, hoping it would take a bite and begin eating. Refusing to eat was inevitably a sign of impending death, and even with the best care, many turtles ultimately succumbed.

We came to dread morning rounds at the field clinic when we learned just how many turtles had not made it through the night. Within a few days, however, the situation grew less bleak; stronger turtles began responding to treatment and mortality tapered off. In the end, just over 100 survivors remained from almost 1,000 turtles originally confiscated.

The survivors are now being temporarily held in improvised, albeit adequate, quarters at the TRC. Originally, we planned to

A recovering Big-headed Turtle at the Turtle Rescue Center. These beautiful albeit Critically Endangered stream-dwelling turtles are now the focus of the illegal wildlife trade in Southeast Asia. Even populations within protected areas are being decimated by poachers. PHOTO CREDIT: NAY WIN KYAW
return the rehabilitated turtles to the wild, but two factors caused us to reconsider this course of action. First, several subspecies of unknown provenance appear to be represented among the survivors and releasing these animals into the wild would risk genetically contaminating any resident population of Big-headed Turtles. Second, the survivors have no doubt been exposed to a variety of infectious pathogens, and releasing these turtles could result in a disease outbreak among wild populations.

Rather than releasing the survivors, we decided to use them as the nucleus of an assurance colony with the dedicated objective of producing offspring for reintroduction to the wild, after genetic and health issues have been addressed. Currently, the search is underway for donors to underwrite construction of the new facility as a first step towards securing a future for Big-headed Turtles in Myanmar.

BURMESE ROOFED TURTLE CONSERVATION

The Burmese Roofed Turtle is endemic to Myanmar where, according to early 20th century accounts, it once congregated in “herds” to bask and nest on sandbars along large rivers. Widespread and intensive harvesting of the eggs by riverside communities led to a slow but steady decline. By the late 1990s, the species was feared extinct. Then, in 2001, remnant populations were re-discovered in the Dokhtawady and upper Chindwin rivers. In situ and ex situ conservation programs initiated shortly thereafter by Gerald Kuchling together with the follow-up efforts of the TSA and WCS arrested the downward spiral and pulled this species back from the edge of extinction.
Nonetheless, our efforts to restore the Burmese Roofed Turtle as an ecologically functional species within its native rivers continue to be a challenge. A captive breeding group of turtles rescued from pagoda ponds and confiscated from fishermen has formed the nucleus of a breeding colony at the Mandalay Zoo. The colony produces a handful of offspring every year, insuring the Roofed Turtle faces no immediate prospect of biological extinction, but the status of the sole remaining wild population remains precarious.

Recent genetic studies by Gözde Çilingir and colleagues confirmed that fewer than ten breeding turtles remain in the Chindwin River. Every year we collect eggs from these turtles and headstart the offspring at a TSA/WCS facility in Limpah Village, a remote outpost on the upper Chindwin River. A trial release of 60 headstarted Roofed Turtles in 2015, from eggs hatched prior to 2014, yielded mixed results when many of the transmitters attached to turtles failed and other turtles dispersed long distances up and down the river, with some falling victim to monofilament fishing nets.

Then disaster struck. In 2014 and again in 2015, only a single fertile egg was laid by the wild females, leading us to speculate that one or more males remaining in the river had perished, leaving a population composed of only one sex. However, in 2016 we were relieved when one of five clutches laid by the wild females proved fertile and 27 of the 30 eggs subsequently hatched. In 2017 we again waited anxiously during February and March for the females to crawl from the river and deposit their eggs.

Three females emerged from the river on moonlit nights, excavated multiple deep pits in the sand (Burmese Roofed Turtles lay a single clutch in multiple holes), and deposited eggs in each hole. We arrived on the scene within hours, alerted by our network of local “beach wardens” who monitor known nesting sites, carefully excavated the eggs, and transferred them to a natural sandbank at Limpah Village.

A week later we carefully dug up and inspected a few eggs, searching for opaque bands on the shell, a sure sign that an embryo is developing within. Thankfully, two of the three clutches consisted of fertile eggs. These were hurriedly reburied and two months later, just as the river began its annual rise with the onset of the wet season, 39 hatchlings crawled from the sand and are now being headstarted.

Although it is impossible to be certain without genetic analysis, we consider it likely that one or more of the headstarted males released in 2015 is responsible for inseminating the wild females. If so, it demonstrates the success and importance of the headstarting program to long-term conservation of wild terrapins.

More good news was to follow. In late 2016, together with our partners at the Mandalay Zoo, we made two significant modifications to our husbandry protocols. First, we constructed a second artificial beach on the shore of a pond housing the breeding colony. Second, we augmented the diet of these turtles with high protein cat chow in hopes of boosting reproduction.

These efforts paid off when 91 eggs hatched in May and June, nearly a four-fold increase in reproduction compared to previous years. Even more significant, an 11-year-old female that nested in 2017 was herself hatched at Me Me Soe holding five recently hatched Burmese Roofed Turtles at the Mandalay Zoo. Ninety-two Burmese Roofed Turtles hatched at the Mandalay Zoo in 2017, making it a milestone year in the captive propagation of this Critically Endangered species. PHOTO CREDIT: KALYAR PLATT
the zoo, the progeny of captive adults. Taken together with the renewed nesting success on the Chindwin River, these events give reason for optimism and suggest brighter prospects for the Roofed Turtle than we would have dared to imagine 20 years ago.

BURMESE STAR TORTOISE REINTRODUCTIONS

The Burmese Star Tortoise is endemic to the dry zone of Myanmar, a desert-like region in the central part of the country. The Star Tortoise shares much of this range with the bulk of Myanmar’s human population, and hence, subsistence harvesting and habitat loss have long been factors in the decline of this species. Prospects for survival worsened in the mid- to late 1990s when this stunningly beautiful animal became avidly sought by the high-end international pet market. Within a decade, wholesale collecting had denuded the dry zone of its tortoises. The collecting frenzy was of such intensity that even populations within protected areas were decimated. By the mid-2000s, the Burmese Star Tortoise was ecologically extinct in the wild. Fortunately, ecological extinction failed to translate into biological extinction. Recognizing the few remaining wild tortoises could not be protected, the Myanmar Forest Department, working together with the TSA and WCS, established captive breeding colonies at Lawkanandar, Minzontaung, and Shwe Settaw wildlife sanctuaries.

After a slow beginning during which various husbandry issues were resolved, these efforts rapidly gained momentum. Since 2008, the captive population has increased at an astonishing annual rate of 37%. In keeping with this trend, the 2016-2017 breeding season proved record-breaking with the captive population surpassing 14,000. Rather than simply warehousing these tortoises in captivity, the ultimate objective of these efforts has always been the reintroduction of headstarted offspring into suitably protected habitat. A National Star Tortoise Action Plan we developed as part of a 2012 workshop held in collaboration with our governmental partners set forth the ambitious goal of restoring wild populations of Star Tortoises at every protected area within the dry zone. Our strategy to achieve this objective is two-fold: reintroduce captive bred and headstarted tortoises and then effectively protect restored populations through “boots-on-the-ground” law enforcement, a must considering the high dollar value these tortoises continue to command in the illegal trade.

As a first step in realizing the action plan, we initiated a reintroduction program at Minzontaung Wildlife Sanctuary (MWS) during 2013-2014. After an intense community awareness and education campaign in the villages around MWS, we erected three acclimation pens well away from the sanctuary boundaries, and stocked each with 100 headstarted subadult tortoises from the assurance colonies. The tortoises were released after varying periods of confinement and their wanderings monitored with radio telemetry. With some modifications of our basic protocol, additional releases took place in 2015 and 2016, and now about 600 free-ranging tortoises reside in the sanctuary, with another 150 awaiting release in early February 2018. Numerous instances of successful nesting by reintroduced tortoises have been documented, boding well for the future viability of this population.

Building on lessons learned at MWS, we are now undertaking a second reintroduction at Shwe Settaw Wildlife Sanctuary, a much larger protected area that is home to one of the world’s largest surviving herds of Brow-antlered Deer and could ultimately support thousands of wild Star Tortoises. However, before reintroduction could be safely undertaken, we had to first wrest control of the release area from poachers, illegal timber cutters, and other criminals who until recently have enjoyed free reign in the sanctuary. As part of this effort, we recruited Community Conservation Volunteers (CCVs) from local villages to give a familiar face to our efforts. CCVs not only assist with field work, but most importantly function as our eyes and ears in the community, ever alert for information on poachers and their activities.

In accordance with highly effective protocols developed at MWS, in 2016 we erected three acclimation pens in the now secure release area, and stocked these with 150 headstarted tortoises selected from the three assurance colonies. In February 2017, after a year of residence, panels on the acclimation pens...
were removed and the tortoises wandered off into the surrounding forest where we are now monitoring their movements with radio telemetry. To date, most of the tortoises continue to reside within 1 km of the pens and survival rates appear high. To our surprise, in June 2017 we chanced upon several newly emerged hatchlings indicating the headstarted tortoises are not only surviving, but also reproducing! The three acclimation pens now hold an even larger group of 300 headstarted tortoises slated for release in November 2017. **CAPTIVE BREEDING OF BURMESE EYED TURTLES AND ASIAN BLACK GIANT TORTOISES**

The Burmese Eyed Turtle (*Morenia ocelata*) is a poorly known species endemic to the lowlands of Myanmar. The Eyed Turtle is one of the most common turtles seen in pagoda ponds where most reside in squalor until succumbing to a premature death. Even more alarmingly, large numbers of Eyed Turtles are harvested from the wild, destined for the wildlife markets of southern China. The husbandry requirements of this species were unknown until recently. Then, in early 2016, we chanced upon a pagoda in Myain Kalay in Mon State that expressed an interest in properly caring for the turtles released into their ponds. An inspection of the shallow ponds revealed mostly Eyed Turtles, which according to the caretaker laid large numbers of eggs every year, although few had ever hatched. Armed with Styrofoam boxes and sacks of Vermiculite, we returned to the pagoda, assisted the caretaker with cleaning the ponds, helped provide a better diet to the turtles, and demonstrated how to properly incubate turtle eggs. These efforts paid off well; in May and June, 130 hatchlings emerged from the eggs, to our knowledge the first ever successful propagation of the Eyed Turtle in captivity. The hatchlings proved surprisingly hardy, readily consuming aquatic plants and commercial turtle food, and growth has been rapid. The young turtles are now being headstarted for eventual release at a wetland near the pagoda.

The Asian Black Giant Tortoise (*Manouria emys phayrei*) is imperiled throughout Myanmar largely due to subsistence harvesting. Given the impending demise of this species, the TSA/WCS established two assurance colonies, one at the Turtle Rescue Center and the other in southern Rakhine State, to produce offspring for eventual release. These colonies have been plagued by problems, most recently when voracious ants (most likely a species introduced into Myanmar) penetrated incubating eggs and consumed the embryos. In 2017, success was finally achieved when 16 eggs hatched at the Turtle Rescue Center despite a power failure that shut down the incubators for an extended period. A few weeks later another six hatchlings emerged from eggs produced in southern Rakhine State. The hatchlings at both assurance colonies appear to be thriving and will one day be released into a protected area.

**ACKNOWLEDGEMENTS:** For their steadfast and generous support of the TSA/WCS Myanmar Turtle Conservation Program, we wish to recognize the following donors: Andrew Sabin and the Sabin Family Foundation, Andrew Walde, Critical Ecosystem Partnership Fund, Helmsley Charitable Trust, Holohil Systems, Ltd., Panaphil Foundation, Patricia Koval and WWF Canada, Turtle Conservation Fund, and Wildlife Conservation Society.

**CONTACT:** Turtle Survival Alliance and Wildlife Conservation Society, No. 12, Nanrattaw St., Kamayut Township, Yangon, Union of Myanmar.

Steven G. Platt [sgplatt@gmail.com] and Kalyar Platt [kalyarplatt@gmail.com]
The Creative Conservation Alliance (CCA) is proud to unveil a brand-new breeding center dedicated to the endangered turtle and tortoise species of Bangladesh. With more species of turtle per area than any other country, assurance colonies here are of paramount importance. Prior to this, no facility in Bangladesh was capable of housing and breeding multiple species. Establishing this center has been one of our main objectives for several years.

The TSA also proudly supports the Northern River Terrapin (Batagur baska) breeding program, and with our breeding center now focusing on endangered terrestrial turtle species, giant steps are being taken to protect all species of testudines in the country. Establishing this center has been one of our main objectives for several years.

The CCA’s breeding center safeguards eight Arakan Forest Turtles (Hosemys depressa), eight Asian Black Giant Tortoises (Manouria emys phayrei), a single Keeled Box Turtle (Cuora mouhotii), and four Elongated Tortoises (Indotestudo elongata). Arakan Forest Turtles were only recently discovered in Bangladesh by our very own Caesar Rahman, prior to which they were known to be endemic only to a small area of northwest Myanmar. This species is an Asian Species Action Partnership (ASAP) species and one of the most threatened species of turtle in the world. Our Asian Giant Tortoises, Keeled Box Turtle, and Elongated Tortoises are all critically endangered in Bangladesh and would face a grim fate if not for our organization’s holistic conservation measures. With the eventual goal of safeguarding all endangered native species of turtle in this facility, many additions to our center will be needed and additional funding will be required in the near future.

This ex situ breeding center is only one step in the CCA’s plan to save the magnificent Sangu Reserve Forest in southeastern Bangladesh. It is the only thing stopping the annihilation of this last vestige of turtle paradise – the only forest in the country supporting populations of most of these species. The majority of our turtles are rescued from patches of forest outside of the government declared protected area, which are about to be cleared for subsistence agriculture by one of several indigenous tribes. To reduce forest resource dependence in these indigenous communities we offer several alternative livelihood initiatives including our Schools for Conservation and Crafts for Conservation programs, indigo dye production, and a plant nursery.

When these efforts are not enough to save the habitat, the last resort is to collect what animals we can, with every intention of releasing them back into similar habitats once those habitats are secured. We employ traditional hunters-turned-conservationists to survey pre-impacted areas and save every turtle they can before the slash and burn begins. CCA staff are fighting to save what is left of these ancient forests and are confident that we will be able to see these turtles roam free again in a few years.

Construction of our breeding center began in February 2017 and was completed in August after enduring several unforeseen bureaucratic setbacks. A portion of the Future for Nature Award 2017 fund was used to build the facility and the Prokriti O Jibon Foundation (Nature and Life), our local NGO partner, generously provided funding for construction of the center.

In addition to providing refuge for these turtles, we will bring students of all ages, as well as youth groups such as the Boy Scouts of Bangladesh, to experience the extraordinary personalities of our turtles. One in particular is the friendly and ever-curious tortoise

The facility is constructed amongst native trees which provide enough shade to keep the turtles happy until the undergrowth fills in. PHOTO CREDIT: SCOTT TRAGESER/NATURESTILLS.COM
Casanova. We try not to have favorites, but it’s hard not to when this loving 16 kg Asian Giant Tortoise wants nothing more than to hang out with you, vocalize, and have his head scratched. In addition to liking humans, he’s a huge fan of female Asian Giant Tortoises, making him our star breeder and earning him his name.

In the near future, we plan to expand the center with a small classroom, dorm facility, and research center. These additions will allow us to train interested individuals with husbandry techniques and impart awareness of the dire state of our country’s wildernesses. These hands-on experiences are not found anywhere else in the country and should help to instill a deep appreciation for turtles and nature in the future leaders of Bangladesh. Pending available funding, we also hope to conduct in situ dietary research for these understudied species which will support healthy diets of our captive colonies in Bangladesh and all other range countries.

DONOR ACKNOWLEDGEMENT: We would like to thank the Future for Nature and Prokriti O Jibon Foundation for their generous financial support which has allowed us to construct and support this breeding facility. We are grateful to Bangladesh Forest Department for generously allocating us land for the center and provide us support.

CONTACT: Scott Trageser, Creative Conservation Alliance, Avenue 3, Road 13 A, House 925, Mirpur DOHS, Dhaka, Bangladesh [trageser.scott@gmail.com]
In the last year, Project Batagur baska in Bangladesh prepared for a new breeding season. The previous years proved to be complicated because the group faced a bacterial infection, and lately nests in Bhawal were attacked and eaten by ants. We decided to split the existing breeding group and brought four of the eight females from the Bhawal National Park to the recently established back-up station in the South at Karamjal. The large breeding pond in Karamjal was renovated with the financial support of the Zoological Society for the Conservation of Species and Populations (ZGAP), Deutsche Gesellschaft für Herpetologie und Terrarienkunde (DGHT), REWE Group, and the Austrian Zoo Organization (OZO). As part of the renovation we cleared bushes and grass to establish a large sand beach for egg deposition.

In both stations, females nested in March. To counteract the ant predation in Bhawal National Park, we immediately put the clutches in ant-secure boxes, which were checked regularly by the staff to prevent excessively moist conditions during incubation. Two months later, a total of 118 juveniles hatched between both stations— a success unseen so far in one breeding season in Bangladesh! All hatchlings were placed in tanks secured from predators and to date are growing well and fast.

We also were able to team up with a new local partner in Bangladesh, the Prokriti O Jibon Foundation, who joined the Vienna Zoo, the Forest Department, and the TSA as leading project team partners. The Foundations TV Channel broadcast the
hatchling success throughout the whole country and raised awareness to the plight facing this critically endangered terrapin.

The Karamjal station in the Sundarbans is regarded as the best starting point for a future reintroduction of the terrapin to the wild. In February 2017, two males equipped with satellite transmitters were released in the Sundarbans in order to observe migration routes and detect possible breeding habitats. In the trial release, one animal was lost quickly, presumed captured or dead, and the second was caught by fishermen within two weeks and was brought back to the station with the help of the Forest Department.

In the future, we will continue to grow the assurance colonies and raise the offspring, and we will also continue to try to find suitable habitats for the reintroduction of the Northern River Terrapin to someday sustainably return the animals to the Sundarbans.

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Peter Praschag, Turtle Island, Am Katzelbach 98, 8054 Graz, Austria [ppraschag@turtle-island.at]
In the Sundarbans of southeastern India and Bangladesh, one of the most endangered species on Earth has been pulled back from the brink of extinction thanks to the efforts of the TSA and its allies.

The Northern River Terrapin (Batagur baska), once abundant in the rivers and tidal sloughs of the Sundarbans, was nearly extinct in the wild by 2010. Once believed to occur from India to Sumatra, the Northern River Terrapin was divided into two distinct species in 2009 by Peter Praschag and colleagues: the Northern River Terrapin (Batagur baska) of India and Bangladesh, and the Southern River Terrapin (Batagur affinis) of Cambodia, southern Thailand, Peninsular Malaysia, and Sumatra. The true B. baska was not merely Critically Endangered; it was a species on the razor’s edge of extinction. Two years of surveys (2008-2009) found no evidence of a wild population or even a single wild individual. Subsequent searches indicated occasional individual animals but no breeding population in either country. A small captive colony of B. baska at the Sajnekhali Interpretation Center of the Sundarbans Tiger Reserve (STR) became the center for the species’ survival in India. Although 8.4 terrapins were permanently housed at the Center, they were not reproducing successfully. To remedy this situation, staff from TSA India, working with the West Bengal Forestry Department, set about making husbandry improvements and modifications to the facility that would encourage nesting. In 2012 these efforts paid off, when 25 hatchlings were produced here.

At the same time, the TSA with its allies and partner organizations led by Peter Praschag and Rupali Ghosh set about doing the same in Bangladesh. By rounding up some of the last surviving individuals living in village ponds, and by scouring animal markets, the nucleus for a captive breeding program began to come together at the Bhawal National Park.
Thanks to the remarkable efforts of Rupali Ghosh, the Bangladesh team recovered six males and two females by the end of 2010. That year, the Vienna Zoo, which just recorded the first captive breeding worldwide, stepped in as partner in Bangladesh. Over the next few years, additional individuals were tracked down and added to the Bhawal colony, including three wild caught hatchlings, the first proof that at least one wild nesting female still persists in Bangladesh. The Bhawal colony has experienced various setbacks, including flooding, a bacterial infection outbreak in the colony, and predation on the eggs by monitor lizards and ants. Yet the incredible dedication of Rupali and our partners at the Vienna Zoo, and with funding support from Save Our Species –SOS, we have turned a near tragedy into an incredible success story. By 2017, the combined hatching successes in India (323) and Bangladesh (263) resulted in a total of 586 hatchlings.

Because of some of the husbandry issues at Bhawal, the team decided to establish a second breeding colony in Bangladesh, at Karamjal in the south, closer to the natural range of the species, and a group was moved there in 2016. This strategy paid off and in 2017, the current Bangladeshi breeding colony of 21 males and eight females had its greatest year to date, producing 118 hatchlings at both facilities. In total the global captive population of *B. baska* now numbers over 630.

With the iconic terrapin of the Sundarbans now relatively safe from extinction, at least in captivity, efforts are shifting to reintroduction. As we continue to learn more about *B. baska*, our successes will continue to improve. We are confident that one day, through reintroductions of animals hatched at our breeding colonies, the Northern Terrapin will once again thrive and breed in the Sundarbans of India and Bangladesh.

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**Table. Population size in India and Bangladesh, presented as Male:Female (1.1), and number of hatchlings produced each year**

<table>
<thead>
<tr>
<th>Year</th>
<th>India</th>
<th>Hatchlings (India/Bangladesh)</th>
<th>Bangladesh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>8.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2010</td>
<td>8.4</td>
<td>6.2</td>
<td>12.4</td>
</tr>
<tr>
<td>2011</td>
<td>8.3</td>
<td>25/25</td>
<td>15.5</td>
</tr>
<tr>
<td>2012</td>
<td>56/61</td>
<td>16.6.3&lt;sup&gt;c&lt;/sup&gt;</td>
<td>16.8.3&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>2013</td>
<td>55/48</td>
<td>16.8.3&lt;sup&gt;c&lt;/sup&gt;</td>
<td>17.8.3&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>2015</td>
<td>9.3</td>
<td>103&lt;sup&gt;c&lt;/sup&gt;/0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>18.8.3&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>2016</td>
<td>9.3</td>
<td>84/118</td>
<td>27.8.4&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>2017</td>
<td>9.3</td>
<td>323/263</td>
<td>21&lt;sup&gt;b&lt;/sup&gt;/8.4&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>96 at STR, 7 at Madras Crocodile Bank Trust  
<sup>b</sup>100% egg mortality due to ant predation.  
<sup>c</sup>wild caught juveniles in Bangladesh  
<sup>d</sup>one male with transmitter lost in 2017 and 5 males died until 2015
In a recent article in the international journal Conservation Biology, we demonstrate a theoretical basis for why headstarting programs are a necessary conservation strategy for stopping the declines of freshwater turtles—especially those primarily threatened by both adult mortality or removal (due to roads, predation, or harvest) and invasive predators affecting multiple life history stages. Once common widespread species are becoming locally extinct because the longevity of turtles has hidden the impact of these threats. Australia is now at the stage since post-European settlement where the effects of foxes and urban population sprawl (and associated infrastructure) are being observed through large declines and extinction events. Declines of up to 91% have been observed along the Murray River in southeastern Australia. Wildlife diseases have become more prevalent over the last decade, a symptom of deteriorating water quality and climate change. The net effect of these threats are that freshwater turtle populations in southern Australia are at high risks of extinction without active management.

EUROPEAN RED FOXES
The European red fox was first introduced into Australia in 1845. Other successful releases followed in southern Australia in the 1870’s and within 20 years, the red fox had achieved pest status. The expansion of the red fox population across mainland Australia followed the spread of rabbits, with the fox’s distribution on mainland Australia limited by the northern tropics. Fox predation is having a serious impact on many native animals and is a major contributor to extinction of some species. In the Murray River in Australia, mortality rates of eggs have increased to over 93%. This is likely to be replicated throughout the distribution range of foxes, as changes in nest predation rates are largely independent of fox density, meaning that a single fox can have a similar impact on turtle nests as a high-density population of foxes. Long-term, high levels of nest predation have resulted in extreme aging populations, and there are few available management techniques to effectively eradicate foxes over a broad scale. Poison baiting is the only broad-scale management technique available in Australia, and our trials demonstrated...
that only intensive, large-scale baiting can effectively reduce nest predation rates. Other common techniques, such as targeted shooting and fencing, may also reduce the impact of foxes but are not cost-effective techniques for broad-scale management.

Management of a population or a species under threat often focuses directly on reducing impacts on the life history stage(s) affected. In doing so, focus inevitably is directed to the threat, rather than on the impacts on the affected population. Plant biologists and conservationists have long criticized classical biocontrol for lacking quantitative assessments of effectiveness, especially post-release, yet invasive vertebrate pest management primarily focuses on reducing densities of invasive predators or herbivores. The core components of conservation policy to manage their impacts is to reduce predator numbers in an area using lethal methods. The actual efficacy (e.g., reduced impact on target species or increases in biodiversity) of such programs are rarely assessed and success is determined by the number of carcasses, reduced activity of the target species or the number of baits taken.

Efficacy of these programs is vital given the limited resources available for most conservation programs and the high costs associated with lethal control. AU$21.3 million was spent on labor costs alone for red fox control in Australia between 1998 and 2003, but the benefits to native prey are largely unknown.

**INCREASING ADULT MORTALITY**

In addition to nest predation, foxes also kill adult turtles they encounter on land. Australian turtles are resilient to high levels of nest predation for sustained periods and periodic levels of reduced nest predation and pulse recruitment can maintain population viability, but high levels of adult mortality can drive populations to extinction.

Mortality of Australian turtles has increased through disease, too. In February 2015, a mystery disease almost drove the Bellinger River Snapping Turtle (*Myuchelys georgesi*), in northeastern New South Wales, Australia, to extinction in less than a month. The disease did not affect other turtle species, and the juvenile population of *M. georgesi* appears unaffected. The cause of the disease remains unknown but has been suggested to be a novel virus. Our analysis adds to the growing body of literature reporting that climate change is having a detrimental effect on organisms. The disease that brought the species to the brink of extinction may be a spectacular climax to an already declining or stressed population.

An unusual mortality event also occurred at the same time with the Johnstone River Snapping Turtles (*Elseya irwini*) in Far North Queensland, Australia. Similar to the Bellinger River Snapping Turtle, moribund animals were found lethargic with variable degrees of necrotizing dermatitis and at the time of the turtle deaths, water levels were extremely low.

Water quality and drought are significant factors that have hastened population declines of turtles in South Australia. In early 2008, Murray River Turtles (*Emydura macquarii*) infested with the Australian tubeworm (*Ficopomatus enigmaticus*) were reported at the mouth of the Murray River in South Australia, and reported cases spread upstream until 2011. This emergent condition in turtles is due to high water salinity in the region. The worms form calcareous tubes...
on hard surfaces of turtles and potentially killed thousands of turtles, although the exact number is not known. At current levels of recruitment, it takes only 1% of the adult population (~2% of adult females) to be harvested from a population each year to increase the risk of extinction (over 200 years) to over 60%.

Road mortality is another source of adult mortality that particularly targets nesting females as they emerge to nest. Our Citizen Science project, TurtleSAT, has shown extensive road mortality of Eastern Long-necked Turtles (*Chelodina longicollis*) in southeastern Australia. Eastern Long-necked Turtles are Australia’s most widely distributed turtles, yet their numbers have declined by 91% over the last 40 years in some areas.

**PROGRESSIVE MANAGEMENT**

With no recruitment in the region and limited dispersal opportunities due to the number of dams, the near-complete absence of turtles at many sites in south Australia is particularly disturbing because it was first predicted over 30 years ago, and low numbers have been subsequently reported.

Several states have recently listed Murray River turtles as Threatened or Data Deficient, but they are not listed at the federal level, thus few conservation initiatives are occurring. Species like Eastern Long-Neck Turtles are not considered species of concern or trigger protocols associated with Environmental Impact Statements (EIS) for urban development. It takes community groups, such as Turtle Rescues NSW, to conduct last minute rescues as developers drain and fill in swamps and wetlands as urban development expands throughout the Sydney basin.

Few freshwater turtles are actively managed in Australia. The most prominent example is the Western Swamp Tortoise (*Pseudemydura umbrina*), which is one of Australia’s most endangered reptiles. It has the smallest surviving population of any Australian reptile. The Western Swamp Tortoise is listed as Endangered under the Environment Protection and Biodiversity Conservation Act 1999.

There are less than 200 endangered Western Swamp Tortoises, restricted to only two wild populations, remaining near Perth in western Australia. Less than 50 individuals survived 30 years ago, but since 1988, a successful breeding program has allowed translocation of captive-bred juveniles to three sites.

Similarly, the Bellinger River Snapping Turtles is now Critically Endangered under the Environment Protection and Biodiversity Conservation Act 1999. During the disease outbreak with the Bellinger River Snapping Turtle, I was part of a large rescue team that collected 16 healthy adult turtles before the disease reached the upper stretches of the River. These turtles are now part of a breeding
program that will hopefully implement a successful headstarting program over the next few years.

Headstarting is generally seen as a management tool of last resort when species crash and become critically endangered. Captive breeding and headstarting has not been commonly used as a conservation strategy for freshwater turtles in Australia. High financial costs, as well as landscape level disconnectivity among populations, have probably restricted its use, and past population modelling suggests that conservation efforts are more effective when focused on reducing adult mortality. However, we clearly show that the criticism of headstarting as “halfway technology” is erroneous, especially in cases where external threats affect multiple life history stages of freshwater turtles. The “halfway technology” argument assumes that all perturbations or mitigating factors affecting turtle populations can be eradicated, but in Australia, factors that impact turtles in southern Australia are multi-factorial and will never dissipate until populations are extinct or technology to reduce threats from invasive predators becomes more effective.

Headstarting should be the primary conservation tool for managing freshwater turtles in decline.

Headstarting programs with small captive populations of Galapagos tortoises and Burmese star tortoises have proven successful at restoring population numbers. But the value of headstarting as a management tool goes beyond critically endangered species. In cases where “common” turtles are declining, developing suitable harvest populations _in situ_ is the key. Many common species of turtle occur in integrated wetlands and water treatment plants (e.g., constructed wetlands) throughout their range, and these facilities may provide a tool for low cost headstarting programs for widespread but declining populations. The reproductive potential of turtles in constructed wetlands represents a potential pre-existing resource for developing localized headstarting programs _in situ_. A simplistic model where relative densities of the Eastern Long-necked Turtle are based on surface area of water demonstrates that all eggs/hatchlings collected from 1 hectare of water can service ~25 hectares of water in a region to maintain population growth at pre-European levels and completely eliminate the risk of population extinction.

Our models also demonstrate that periodic increases in recruitment can sustain populations, potentially allowing populations in a region to be managed in a mosaic fashion. In other words, not all populations need to be actively managed each year.

That is the key. Their longevity ensures that they are resilient to annual variation in mortality, which provides management with the flexibility to manage populations over wide spatial and temporal scales.

**ACKNOWLEDGEMENTS:** Research has been supported by the Australian Research Council Linkage Grant Program (LP150100007), North-Central Catchment Management Authority, Yorta Yorta Aboriginal Corporation, Foundation for National Parks and Wildlife, Victorian Department of Land, Environment, Water and Planning, Winton Wetlands, Turtles Australia, Inc. and Save Lake Bonney Group Inc.

**CONTACT:** Ricky Spencer, School of Science, Hawkesbury Institute for the Environment, Locked Bag 1797, Penrith, 2751, NSW, Australia [r.spencer@westernsydney.edu.au]
Two Million-Dollar Turtle Funds: Turtle Conservation Fund (TCF) and Mohamed bin Zayed Species Conservation Fund (MBZ)

Anders G.J. Rhodin1,2, Hugh R. Quinn1, Russell A. Mittermeier1,2, Nicolas Heard2, Frederic Launay2, and Razan Al Mubarak2

In 2017, two of the most prominent turtle conservation funding organizations in our global community, the Turtle Conservation Fund (TCF) and the Mohamed bin Zayed Species Conservation Fund (MBZ), each achieved the significant milestone of reaching the $1 million mark for dedicated turtle and tortoise conservation funding. The TCF celebrated its milestone at the TSA/TFTSG Symposium in Charleston in August, and the MBZ reached its milestone in September at a combined meeting with the Turtle Conservancy in New York.

The TCF was founded in 2002 by the International Union for Conservation of Nature Tortoise and Freshwater Turtle Specialist Group, the Turtle Survival Alliance, and Conservation International, and through 2017 has provided funding for 234 projects focused on turtles and tortoises for a total disbursement of $1,024,000 at an average of $4,377 per project. Current supporting partners in the TCF now also include Turtle Conservancy, Global Wildlife Conservation, Humane Society International of Australia, George Meyer and Maria Semple, Matt Frankel, the Chelonian Research Foundation, and the Andrew Sabin Family Foundation. The TCF Board is composed of Anders Rhodin, Hugh Quinn, Gary Ades, Chris Banks, Kurt Buhlmann, Bernard Devaux, Matt Frankel, Paul Gibbons, Eric Goode, Cris Hagen, Brian Home, Rick Hudson, John Iverson, Gerald Kuchling, Richard Lewis, Luca Luiselli, George Meyer, Russ Mittermeier, Vivian Páez, Peter Pritchard, Martina Raffel, Maurice Rodrigues, Craig Stanford, Peter Paul van Dijk, and Andrew Walde.

The MBZ was founded in 2008 by His Highness Sheikh Mohamed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi, and through 2017 has provided a total of about $16 million in grants to 1,677 projects, with 102 projects focused on turtles and tortoises, for a total turtle disbursement of $1,019,000 at an average of $9,988 per project. The MBZ Advisory Board is headed by Razan Al Mubarak and Fred Launay.

Over the last year, the turtle-focused distributions of these two funds have made a major difference for many worthy projects working to save endangered turtles and tortoises. MBZ funded nine turtle and tortoise...
proposals: eight regular awards at an average of $9,670, and one Chairman’s Award for $23,900, for a total one-year disbursement of $101,260. TCF funded 17 turtle and tortoise proposals at an average of $4,124, for a total one-year disbursement of $70,100. The synergy between these two funds, with Mit-termeier and Rhodin on the advisory boards of both, has been very beneficial to international turtle conservation efforts, with a combined disbursement from MBZ and TCF of $171,360 this past year, up from $160,000 the year before.

Both TCF and MBZ greatly value the support of the turtle conservation community in our efforts and we are honored and pleased to be able to provide as much support as we do for so many of the critically important front-line and on-the-ground efforts on behalf of global turtle conservation. By continuing to expand and grow our capacity for providing support, we hope to make an increasingly important impact on all turtle conservation efforts. Please consider submitting your grant proposals to us for consideration.

ACKNOWLEDGEMENTS: "Turtle Conservation Fund; "Mohamed bin Zayed Species Conservation Fund

PROJECTS FUNDED BY TCF OVER THE PAST YEAR:
• Agyekumhene, A. Kinixys in Ghana;
• Bishop, N. Dermatemys mawii;
• Bock, B. Podocnemis lewyana;
• Currylow, A. Astrochelys radiata;
• Juvik, J. Homopus solus;
• Keeler, H. Glyptemys muhlenbergii;
• Kuchling, G. Astrochelys yniphora;
• Loehr, V. Homopus boulengeri;
• Luiselli, L. South Sudan;
• Mandimbihasina, A. Astrochelys yniphora;
• McCormack, T. Rafetus swinhoei;
• Palomo-Ramos, R. Gopherus flavomarginatus;
• Petrov, K. Myuchelys georgesi;
• Randrianjafizanaka, T. Astrochelys radiata;
• Shirley, M. Kinixys in Guinea;
• Thong, P.V. Cuora zhoui;
• Walker, R. Astrochelys radiata and Pyxis arachnoides.

PROJECTS FUNDED BY MBZ OVER THE PAST YEAR:
• Agyei, V. Kinixys homeana in Ghana;
• Alzate Estrada, D. Podocnemis lewyana;
• Drummond, G. Mesoclemmys hogei;
• Gunter, J. Batagur borneoensis in Sumatra;
• Juvik, J. Psammobates geometricus;
• Kuchling, G. Astrochelys yniphora;
• Light, C. Indotestudo forstenii and Leucocephalon yuwonoi;
• Luiselli, L. South Sudan;
• Perdamaian, A. Chitra chitra javanensis.

TISCHLER ART FOR CONSERVATION
Renowned artist Tom Tischler’s second sculpture in his Tischler Art for Conservation (TAFC) project is a Galapagos Tortoise dedicated to the Turtle Survival Alliance. The TAFC project was created to provide impact beyond what Tom’s life-sized sculptures, seen in more than 100 zoos, museums, and private collections around the world, have had on their viewers. Forty percent of the purchase price of each sculpture is donated to a conservation organization selected by Tischler to support programs in the field so that the subjects of his wildlife sculptures can live on for future generations.

The Galapagos Tortoise measures approximately 6 in (15 cm) long (tail to nose) by 4 in (10 cm) wide and weighs approximately 4 lb (1.8 kg). The sculpture is cast in bronze with a hand applied and rubbed patina that makes each individual a unique creation. Forty percent of the purchase price supports TSA conservation programs and includes shipping within the U.S. Shipment confirmation and tracking information will be provided by TAFC. Please visit www.turtlesurvival.org and visit the online store to purchase your limited edition bronze today.
Significant Breedings of Asian Turtles in Europe

Richard P.J.H. Struijk

European hobbyists continue to establish more solid breeding colonies and professionalize their chelonian husbandry. They are upgrading both housing and diet with the goal of more successful reproduction. Although the total numbers of turtles being bred might still be low, numbers of both hatchlings and breeders are increasing for several hard-to-breed species. For example, within the genus *Cuora*, all species currently kept in Europe (except for Yunnan Box Turtle (*C. yunnanensis*)) were bred successfully in 2017.

Most notable is the world’s first F2 generation hatching of Zhou’s Box Turtle (*C. zhoui*) at the Cuora Conservation Center. The center also hatched multiple Central Vietnamese Three-striped Box Turtles (*C. cyclornata annamitica*) and is sending a group of Three-striped Box Turtle (*C. trifasciata*) to Kadoorie Farms & Botanical Garden in Hong Kong. This has also been a good year for rare aquatic *Cuora* including Yellow-headed Box Turtle (*C. aurocapitata*), Pan’s Box Turtle (*C. panii*), McCord’s Box Turtle (*C. mccordi*) and Hainan Three-striped Box Turtle (*C. t. luteocephala*).

The most commonly bred *Cuora* is Yellow-margined Box Turtle (*C. flavomarginata*), especially in Italy, where some large colonies produce dozens of offspring annually. The subspecies from Japan’s Ryukyu Islands, *C. f. evelynae*, is also being bred at several locations. A few private locations that received confiscated specimens successfully bred shortly thereafter. At a single private German location, 23 specimens have been bred in a five-year period, with four in 2017.

Breeding within the Indochinese Box Turtle (*C. galbinifrons*) complex is ongoing, with a fourth European location having bred all three species: Indochinese Box Turtle (*C. galbinifrons*), Bourret’s Box Turtle (*C. bourretii*), and Southern Vietnam Box Turtle (*C. picturata*). Of these, *C. picturata* seems to be the hardest to breed, having the lowest fecundity. Even so, throughout the last decade, limited numbers have hatched annually at three private locations. Reproduction of these F1 animals can be expected soon.

In the United Kingdom, Bristol Zoo Gardens celebrated their first successful Keeled Box Turtle (*C. mouhotii*) breeding. After caring for the adults for 12 years and having produced several unsuccessful clutches in the past, three eggs hatched this year, making Bristol Zoo Gardens the first European Zoo successful with the species.

Besides *Cuora*, several other significant births took place in 2017. At ReHerp in the Netherlands, a Vietnamese Pond Turtle (*Mauremys annamensis*) hatched in September; their first success. In France, the nation’s first successful Big-headed Turtle (*Platysternon megacephalum*) breeding occurred when an entire clutch of five eggs hatched simultaneously. In Germany and Austria, several subspecies of this species have been bred for many years. Since 2016, the first fertile eggs of this species have been produced in the Netherlands. Ryukyu Black-breasted Leaf Turtles (*Geogemyda japonica*) are being bred in very low numbers but more keepers are succeeding with this species. The species was first reproduced in the Netherlands in 2016 and at two locations in 2017.
Turtle Survival Alliance Europe Refocuses

Eleanor Tirtasana Chubb

In 2016, I was asked to lead the European wing of TSA. In 2012, I was deeply honored to be invited onto the committee by Henk Zwartepoorte and Hans Dieter Philippen. Since that time both became close mentors and friends. The past year has not been easy after the unexpected loss of both Hans Dieter (Vice Chair) and Henk (Chairman) who represented such a large part of the European conservation community. The wealth of knowledge they were always so willing to share with such modesty was an inspiration.

Moving forward, TSA Europe is united in our resolve to continue our work. Core supported work with ReHerp, European Studbook Foundation, and fields we previously supported have continued, while the TSA team has come together to devise a new strategic plan. I am pleased to report that over the past year we have made positive progress and now have a plan for the future with the united mission of zero turtle extinctions.

A new committee is in place to help coordinate conservation work in and around Europe. Due to the diversity of languages, we aim to appoint a diverse representation of nationalities for both committee and advisory members. TSA Europe has appointed Jo Keogh as communications officer to assist with framework and reports. Jo is experienced in conference and zoo work and we are pleased to welcome her aboard.

A key focus is further strengthening the community, with increased reporting and networking opportunities, through attending and hosting key events. The hope is to create a smaller local conference based on the existing Symposium on the Conservation and Biology of Tortoises and Freshwater Turtles to help build relationships within Europe and strengthen a united front towards zero turtle extinctions.

CONTACT: Eleanor T Chubb, TSA Europe, P.O. BOX 249, Bracon Ash, Norfolk, NR14 8WY, United Kingdom [eleanor@turtlesurvival.eu]

TSA Europe Committee

- Eleanor Tirtasana Chubb (Chairman) (UK)
- Kim Simmons (Co Vice Chair) Zoo sector (UK)
- Didier Laurent (Co Vice Chair) ESF (BE) Treasurer
- Job Stumpel Veterinary advisor (NL)
- Gerardo Garcia Zoo advisor (ES)
- Jo Keogh – Communications Officer (UK)

Areas of Focus for TSA Europe

- Develop the TSA Europe community through focused reporting on significant work as it happens and community networking via attending and hosting events.
- Collaborate with the zoo community to establish and build viable conservation initiatives in captivity and in the field.
- Continue links and support with the European Studbook Foundation and ReHerp Project.
- Actively encourage European initiatives and work within the research, private, trade, and zoo communities as well as in the field.
- Continue to support field studies, captive breeding programs, and research in Europe and immediate surrounding areas.
- Strengthen communication and links with the Turtle Survival Alliance and contribute on a united front to national campaigns within Europe.
The 12th annual Behler Turtle Conservation Award celebrated and honored Peter Paul van Dijk for his quarter-century of dedication to turtle science and conservation.

Peter Paul likes to point out that he was born in what was a good year for turtle research and conservation: 1967. That was the year Peter Pritchard published *Living Turtles of the World*, John Goode published his book on the Chelid Turtles of Australia, and Whit Gibbons began his groundbreaking work on *Trachemys scripta* at the Savannah River Ecology Lab.

Growing up in the Netherlands, a cool, damp country with no native turtles, Peter Paul’s childhood interest in animals initially focused on fish, aquarium keeping, and the occasional tortoise. Of course, there was the inevitable hatchling Red-eared Slider early on, but turtles did not enter Peter Paul’s life until several years later when, as an 11-year-old, he was presented with a bucket of four adult Red-ears. That opened the floodgates to what would eventually grow into a collection of various turtle species filling a greenhouse. Peter Paul supported his aquarium and turtle hobby by working Saturdays in a pet shop with a large aquarium section, giving him up close familiarity with a range of species from all corners of the Earth (at a time when the pet wildlife trade was rarely perceived as detrimental) and fueling curiosity about the places and habitats from where these animals originated.

After completing secondary school in the Netherlands, Peter Paul moved to western Ireland to study Zoology at the National University of Ireland in Galway. He took up scuba diving, did a BSc thesis on taxonomy of the gobiid fish genus *Lebetus*, and was well on his way to becoming a fisheries biologist monitoring Atlantic commercial fish stocks. Turtles and herpetology looked to remain a spare time hobby, including such highlights as attending the First World Congress of Herpetology in Canterbury in 1989 and becoming inspired by the people he met who had been surveying Indian turtles, breeding the Ploughshare Tortoise, rescuing the Western Swamp Turtle, and discovering new side-necked turtles (when we both met him for the first time).

Peter Paul started his postgraduate studies in late 1990. He was faced with the prospect of spending the winter doing little more than reading papers in the lab because sea conditions would be too rough for sampling. Instead, with support from his research supervisor James J. Dunne, Peter Paul decided to indulge his childhood fascination with turtles and other small tropical animals and booked a three-month-long trip to Thailand. He hoped to travel onwards and do some initial turtle survey work in Myanmar, Viet Nam, or Laos. Peter Paul never received a visa to enter any of those countries on his trip, but through an introduction from Padraig O’Ceidigh, his Professor of Zoology in Galway, he connected with Kumthorn Thirakhupt at Chulalongkorn University in Bangkok. Kumthorn had recently decided to switch his research focus from birds to tortoises, and a long-term collaboration and friendship between the two took off immediately.

That trip to Thailand was the start of a new chapter for Peter Paul, who spent most of the 1990s in Thailand. Together, Kumthorn and Peter Paul surveyed the distribution and status of the tortoises and freshwater turtles of Thailand, researched natural history and conservation biology of turtles, and studied a variety of wetlands, fish, and herpetofaunal assemblages. Peter Paul completed his doctoral research and dissertation on the natural history of the Elongated Tortoise (*Indotestudo elongata*) in the Huai Kha Khaeng Wildlife Sanctuary. This provided Peter Paul with extensive experience and solitude in a mosaic of seasonally deciduous and evergreen tropical forest, and a deep appreciation of the interrelationships and complexities of its ecology.

Perhaps more valuable than all the turtle research taken together was a rainy afternoon spent cooped up in the guest bungalow of Mae Yom National Park. Peter Paul and a few colleagues were surveying the herpetofauna of the park as part of an environmental impact assessment (EIA) for the proposed Kaen Sua Ten dam across the Yom River. The initial EIA had reported that the dam and the 65-km² reservoir it would create would not significantly affect natural resource and biodiversity values. However, researchers from Mahidol
University had drawn attention to the expected flooding of Thailand’s last remaining native Teak (Tectona grandis) forest by the reservoir, as well as impacts on the park’s biodiversity values. Thus, the World Bank commissioned Chulalongkorn University to conduct a third, limited EIA to evaluate the two competing previous EIAs, and so Kumthorn, Peter Paul, and their colleagues found themselves at Mae Yom in the wet season of 1996.

Curious about the extent of the proposed reservoir, Peter Paul started tracing the 260 m altitude contour line and suddenly a much larger reservoir appeared on the map. In addition to the previously predicted 65 km² reservoir tapering at its northern end between some hills, there appeared to be a large expanse of shallowly flooded land, used for agriculture, creating a total reservoir area somewhere between 79 and 114 km². This realization was subsequently confirmed by GIS and cartography reassessments. With the prospect of drowning more agricultural land than would benefit from improved irrigation downstream, the World Bank withdrew its backing from the project. To date, the dam and reservoir remain a shelved plan and a conservation victory.

Peter Paul traveled to Myanmar in subsequent years, catching tantalizing glimpses of the possible survival of Batagur trivittata and documenting the persistence of Geocheleon platynota in 1993. He collected and identified the first confirmed specimen of Chitra from the Mon River in 1994; these Ayeyarwady Chitra were described as a new species in 2003, named Chitra vandijkii by McCord and Pritchard.

In the 1990s came the first indications of extensive collection and trade of wild turtles from the forests and wetlands of Southeast Asia. Peter Paul recognized the possible threat to Asian turtle survival – and realized that life as a non-salaried research associate at Chulalongkorn could not last forever. This prompted him to join TRAFFIC South East Asia in Petaling Jaya, Malaysia, just in time to co-represent the organization at the Asian Turtle Trade workshop in Phnom Penh, Cambodia, in December 1999. With Bryan Stuart and Anders, he focused on editing the workshop’s proceedings into a monograph published by Chelonian Research Foundation. The seminal monograph was widely cited in subsequent years as governments and NGOs tried to come to terms with the scale of the challenge and the measures needed to prevent total extirpation of Asia’s native turtle populations.

That was the tipping point. Peter Paul left natural history research behind and focused on becoming a trade data analyst and policy-focused conservationist with a strong focus on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Over the years, Peter Paul has supported preparation of several proposals to extend international trade regulation and supervision to several Asian and other freshwater turtle species. He’s analyzed the impact of Asian turtle trade for CITES, prepared guidelines for non-detriment findings for turtle populations subject to international trade, and reviewed the scale and scope of illegal turtle trade, among others.

While focused on wielding CITES as a conservation tool, Peter Paul left Malaysia for his native Netherlands. He was hired by Russ at Conservation International and encouraged to move to Washington, DC, to lead their Tortoise and Freshwater Turtle Conservation Program. This enabled extensive support for turtle conservation initiatives by CI’s regional programs around the world, as well as resuming work on assessing all tortoise and freshwater turtle species for the IUCN Red List of Threatened Species. Ongoing assessments quantified the bleak picture that at least half of all turtle species are threatened with extinction.

Peter Paul was also at the core of CI’s Wildlife Trade program, linking on-the-ground efforts by CI and other NGO country programs with policy developments at CITES and in government wildlife departments in Washington, DC, London, Brussels, and elsewhere. As CI’s mission evolved, Peter Paul recently found a new professional set of homes at Global Wildlife Conservation and the Turtle Conservancy. He focuses on in situ conservation work for severely threatened tortoises and freshwater turtles in Mexico, South Africa, Madagascar, and elsewhere, while remaining involved in CITES. He is currently the Nomenclature member of the Animals Committee.

Over the years, Peter Paul has been a core contributor to the Turtle Taxonomy Working Group Checklists, conservation strategies in various countries, and a wide range of publications. He was Deputy Chair of the IUCN Tortoise and Freshwater Turtle Specialist Group under Anders from 2000 to 2012, Co-Chair with Brian Horne from 2012 to early 2017, and is currently Deputy Chair under Craig Stanford. He also sits on the review board of the Turtle Conservation Fund, and has been a mentor, mediator, and partnership builder for many in the turtle research and conservation community.

In our estimation, Peter Paul is a walking encyclopedia of turtle biology, taxonomy, and conservation. He is both a critically important resource and highly respected leader for the global turtle conservation community, having focused a large portion of his efforts on improving regulatory aspects of the unsustainable global turtle trade. He is a clear and logical thinker, amazingly good at providing reality checks and critical insight on new ideas that emerge and evolve. More than that, he is a close and trusted friend and most valued colleague.

Although the great majority of his time is now spent in front of a computer, Peter Paul relishes any opportunity to see wild turtles in their natural habitat, whether a highly threatened tortoise in a desert area, critically endangered Ploughshare Tortoises in Madagascar, a snapping turtle in a clear water river, or a box turtle nesting in his own backyard in Virginia.
CRISTINA JONES
Hometown: Tucson, Arizona.
Occupation: Turtles Project Coordinator, Arizona Game and Fish Department.

What first sparked your interest in turtles/tortoises?

My family is exceptionally outdoorsy. In my youth, we spent nearly every weekend and extended weeks camping, hiking, and exploring. During a family hike when I was four years old, I encountered my first Sonoran Desert Tortoise (Gopherus morafkai) in the wild. I was in awe of this animal – and we sat quietly for nearly an hour, watching it meander, exploring plants and grasses, taking more bites from one than another. From that moment, I was completely hooked on turtles.

What do you think are the most pressing challenges for chelonian conservationists?

Limited resources – in the forms of staff and/or funding – are among the most pressing challenges faced by chelonian conservationists. Prioritizing and implementing conservation and management actions for the many species that occupy the vast landscapes in the Southwest with so few resources is an ongoing challenge. As an example, one of the largest threats to turtles in the Southwest is habitat loss through destruction or modification – and any type of habitat restoration takes a tremendous amount of time and funding.

Living in a state with only a small handful of native chelonian species, how do you keep turtle and tortoise conservation relevant in Arizona?

That’s easy – the love people have for turtles truly fosters an environment of inclusivity and collaboration. When I mention turtles to friends, colleagues, and members of the public – nearly every person expresses their love for turtles! Through this united passion, I am able to recruit volunteers, develop unique partnerships, and lead multiple working groups. Volunteers assist with such endeavors as turtle trapping at The Phoenix Zoo, recording observations for the Ornate Box Turtle Watch citizen science project, or conducting Sonoran Desert Tortoise surveys – and when they return, they always bring friends! I strive to provide hope, share successes, and look at all possible approaches where we can make a difference.

What is your dream location and species to work with in the field?

While I am fascinated by many chelonian taxa worldwide, my dream is to stay in Arizona and maintain a position in turtle conservation and management. I would love to utilize my knowledge, leadership, and enthusiasm to increase awareness regarding the status, natural history, and conservation needs of species found in Arizona and the Southwest. If I had to pick a single species to work with in the field, I would be torn between the highly charismatic Desert Box Turtle (Terrapene ornata luteola) and the Sonora Mud Turtle (Kinosternon sonoriense), whose populations have been adversely effected by invasive predators.

CHRISTINE LIGHT
Hometown: Woodside, New York
Occupation: Biologist

How did you first become involved with the TSA?

In 2010, while working as the Assistant Curator of Fish, Invertebrates, and Herps at the Downtown Aquarium in Denver, I spent a year successfully rehabilitating a male Painted Terrapin (Batagur borneensis) that had surgery to remove an impaction. After doing some research, I came across the work that Joko Gontoro was doing in Indonesia and I wanted to get involved. In 2011, I organized a week-long World Turtle Day fundraiser at the aquarium with all proceeds going to the TSA’s Painted Terrapin (Batagur borneensis) headstarting program in Sumatra, Indonesia.

When did you first realize you wanted a career in conservation and why?

After spending time rehabilitating turtles and researching the plight that chelonians are facing, I realized that I wanted to focus my career in turtle conservation. In 2012, I attended my first TSA conference and presented on the rehabilitation work with
B. borneoensis. I was lucky enough to meet many people who were involved in turtle conservation and the presentations were very inspiring. Five months later I was working at the Turtle Conservancy where I also took on the role of the SSP Coordinator and Regional Studbook Keeper for the Forsten’s Tortoise. As the SSP Coordinator, my main responsibilities were to oversee the management of the captive population and to enhance conservation of the species in the wild.

Can you tell us a little about your conservation work in Sulawesi, Indonesia and why it’s important?

The forests on Sulawesi have been cleared at an increasing rate, primarily for palm oil production. Despite being part of an important biogeographical area, Sulawesi has not been afforded much conservation attention. The lack of research or conservation efforts focused primarily on the only two endemic chelonians on the island, the endangered Forsten’s Tortoise (Indotestudo forstenii) and the critically endangered Sulawesi Forest Turtle (Leucocephalon yuwonoi) is driving them toward extinction. By determining status and distribution for both species, we can work toward ensuring their long-term survivability as we develop a better understanding of the conservation initiatives that need to be employed.

Can you describe what your dream situation working with turtles and tortoises would look like?

I’ve been living my dream situation working with turtles and tortoises! I spent three years as the Collection Manager at the Turtle Conservancy working with some of the most endangered chelonian species. Through these experiences and the connections that I developed while working at the TC, I was afforded the opportunity to develop the project I am currently working on with I. forstenii and L. yuwonoi in Sulawesi. Hopefully the dream continues and I can accomplish some important conservation work for these declining species.

In an attempt to prove how different we were as individuals, we kept opposite critters. More often than I would admit at the time, I would sneak into his room and admire his turtles or take care of them any chance I got. It didn’t take me long to realize that chelonians are much more responsive and interactive roommates than snakes are!

In what ways does your career allow you to continue pursuing your passion?

I would think that the main way my career allows me to pursue my passion is the fact that I am able to afford a very expensive hobby. Anybody who keeps turtles or tortoises knows that lighting, enclosures, food, and substrate is certainly not cheap. Especially when you don’t listen to your wife and keep getting more and more of them. Just being able to support some of the greater conservation efforts of the TSA through membership, and donations or gifts to the Turtle Survival Center, has really kept my passion strong. As a private keeper that works a blue-collar job, contributing any extra allowances towards turtle conservation reassures me that maybe I am not just an insignificant turtle keeper.

If you could be directly involved with any of our range country programs, which would it be and why?

That is a terribly tough question. I suppose after choosing an often-times monotonous career, I would love to be involved with any of the TSA’s programs. The chance to travel to exotic locations, immersing oneself into unique cultures, and working with passionate turtle people is something that I could only dream of. Given the commitments I have made to my own shelled friends, I couldn’t see myself anywhere other than the Turtle Survival Center. It would surely be the best of both worlds.
Making Connections

Jordan Gray

For many of us, that first encounter – that first touch of a turtle – happened years ago. This initial experience during our formative years would be foundational in creating “a life measured by turtles.” At the Turtle Survival Alliance, we understand the fundamental value of that first touch and aim to ignite a passion in others by sharing in that experience. Through outreach events, fundraisers, group presentations, and school field trips, our staff and associates provide direct interaction with turtles and tortoises; bridging the gap through knowledge sharing with those in our communities. From young children to adults, we strive to fulfill our duties as conservation warriors by recognizing the inquisitiveness and potential in everyone around us and create catalytic moments for those eager to learn. It takes a community to make chelonian conservation work!

A student marvels at two Indian Tent Turtles at the TSA and Uttar Pradesh Forest and Wildlife Department’s celebration for World Turtle Day® in Kukrail, India. PHOTO CREDIT: ARUNIMA SINGH

Cris Hagen and Jordan Gray educate school children at the Berkeley County Kids Who Care, Inc.’s “Backyard NatureScope” at the Old Santee Canal Park in Moncks Corner, South Carolina. PHOTO CREDIT: ILZE ASTAD

Students from Mason Preparatory School participate in a field trip at the Turtle Survival Center. Under the leadership of Cindy Renkas, 4th, 5th, and 6th Grade Science Teacher, students have attended school trips at the Turtle Survival Center since 2015. PHOTO CREDIT: ILZE ASTAD

To schedule a tour of the Turtle Survival Center, please contact Cris Hagen, Director of Animal Management, at chagen@turtlesurvival.org. To schedule an outreach event please contact Jordan Gray, Communications and Outreach Coordinator, at jgray@turtlesurvival.org.
BREWERY PARTNERSHIPS

Drink Beer, Save Turtles

What happens when you combine two things people love? A fun slogan and fantastic way to bring people together for conservation awareness.

In 2014, the TSA first collaborated with Martin House Brewing in Fort Worth, Texas, to create an event where attendees could interact with and chat about turtles and tortoises while sipping on a specially made Blackberry Altbier. Since that first “Drink Beer, Save Turtles” event, the TSA has collaborated with breweries in Austin, TX, Charleston, SC, and Pittsburgh, PA, as well as brew pubs throughout the country. These collaborations have purveyed limited edition beers, merchandise, outreach, and tasting events to raise funds and awareness for the plight of turtles. Participants in 2017:

Holy City Brewing Company, Charleston, SC
holycitybrewing.com
Space Turtle
7.9% India Pale Ale infused with green tea
TSA partner since 2015

Hops and Grain Brewing, Austin, TX
hopsandgrain.com
River Beer
5.2% Premium American Lager with premium German malt, hops, and lager yeast
TSA partner since 2017

The County Line Legendary Bar-B-Q, Austin, TX
countyline.com
TSA partner since 2016

Spoonwood Brewing Company, Pittsburgh, PA
spoonwoodbrewing.com
Turtle Recall
7.2% India Pale Ale with coconut, lime zest, lactose, and vanilla bean
TSA partner since 2016

Interested in hosting a “Drink Beer, Save Turtles” event at your favorite local bar, taproom, or brewery? Please contact Jordan Gray, Communications and Outreach Coordinator, at jgray@turtlesurvival.org
Become A TSA Member

The TSA works with more than 100 (approximately one-third) of the tortoise and freshwater turtle species around the globe.

The TSA **directly impacts** 20 of the World’s Top 25 Most Endangered Tortoises and Freshwater Turtles.

This effort is supported by a global network of conservationists, field biologists, animal care technicians, veterinarians, governmental and non-governmental organizations, private stakeholders, citizen scientists, and YOU, our loyal supporter.

As a TSA member, you will receive our annual publication, bi-weekly e-newsletter, discounted conference registration, opportunities with the TSA’s North American Freshwater Turtle Research Group, and other exclusive benefits throughout the year. TSA members also enjoy a 10% discount every day on most items in the TSA’s online store. Most importantly, your support directly moves us closer to our goal of “zero turtle extinctions!”

Joining has never been easier as we have five levels of membership (figures represent annual dues):

- **Individual** ($50)
- **Student** ($25)
- **Senior** ($25)
- **North American Freshwater Turtle Research Group** ($30)
- **Organizational** ($400)

*If you would like to make your membership “green” we also have membership levels that will not receive a hard copy of the TSA’s annual publication by mail, but instead an electronic version!

**Become a TSA member at www.turtlesurvival.org.**

Once you’re a member, log into your membership account and select “Member Benefits” from the dropdown menu to learn about additional offers and rewards throughout the year!

**Thank you for your support!**
Help Conserve Turtles and Tortoises for Future Generations

1. Our “Zero Turtle Extinctions Legacy Circle” is an honorary association that recognizes individuals whose planned gift has been received or been established to provide a future benefit to the Turtle Survival Alliance. Provide for the future needs of our mission by naming the Turtle Survival Alliance as a beneficiary in your estate plans. A gift to the “Zero Turtle Extinctions Legacy Circle” will insure that the Turtle Survival Alliance continues its mission of zero turtle extinctions for years to come. Thank you for taking the time to explore the benefits of gift planning, including life income gifts, gift annuities, mutual funds, real estate, life insurance, and other plans.

2. Support the Turtle Survival Alliance by donating to the TSA Stewardship Fund. Your gift will have a significant impact on the future by helping to provide an ongoing income.

For additional information on the “Zero Turtle Extinctions Legacy Circle” or planned giving options, please contact Rick Hudson, President, at rhudson@turtlesurvival.org

Ways to support The Turtle Survival Alliance

1. Make a Donation Your support moves us closer to a goal of zero turtle extinctions.
2. Join the TSA Become a member of the TSA or buy a gift membership for a friend.
3. Purchase Equipment Check out the TSA’s Wish List on amazon.com to purchase equipment and supplies that are needed by our staff at the Turtle Survival Center and in the field.
4. Shop at turtlesurvival.org Visit the TSA’s online store to purchase t-shirts, art, publications and other merchandise to support conservation projects around the world.
5. Volunteer Visit the TSA website for volunteer opportunities.
6. Support the TSA at No Extra Cost to You There are several programs available through which you can support the TSA’s mission by doing what you do every day!
   - Amazon.com – Access amazon.com via the TSA link (http://bit.ly/tsa_amazon) and a portion of your purchase will be donated to turtle conservation!
   - eBay – The TSA is part of the eBay Giving Works program. So, you can support our mission when you buy and sell on eBay.
   - Good Search – What if the TSA earned a donation every time you searched the Internet? Or how about if a percentage of every purchase you made online went to support our cause? It can, with Good Search! www.goodsearch.com/nonprofit/turtle-survival-alliance

There are many ways that YOU can contribute to turtle conservation and support the TSA’s mission of zero turtle extinctions. Visit turtlesurvival.org.
Here at Zoo Med we make it our mission to develop and manufacture products that are beneficial to the overall health and happiness of your reptiles. Zoo Med’s Turtlitherm™ turtle heaters are essential to maintain the water temperature of your tank at a safe 78°, ensuring your turtles are always comfortable and have a great appetite. Visit our website below for more information regarding our Turtlitherms™ and other fine Zoo Med products.
Your reptiles know what high quality food is when they taste it, so why not give them what they want? Zoo Med’s Gourmet and Natural Tortoise and Turtle foods contain fresh ingredients that were specifically selected for their supreme nutritional value, but also for their amazing taste. Visit our website below for more information regarding our foods and other fine Zoo Med products.

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Thank you for your support!

We wish to acknowledge the individuals and organizations who donated to support the Turtle Survival Alliance between 1 November 2016 and 31 October 2017.

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Arakan Forest Turtle (*Heosemys depressa*). The TSA and our conservation partners in Bangladesh and Myanmar work to protect native chelonian species, including the Arakan Forest Turtle, and their habitats in the region. Assurance colonies for this rare species are maintained at the Turtle Survival Center in South Carolina, the Creative Conservation Alliance’s new breeding facility in Bangladesh’s Bhawal National Park, and the TSA/WCS managed facility at the Rahkine Yoma Elephant Sanctuary in Gwa, Myanmar.

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