A PUBLICATION OF THE TURTLE SURVIVAL ALLIANCE

Turtle Survival

2014

RICK HUDSON

FROM THE PRESIDENT'S DESK

The strength of the Alliance lies with our members

PHOTO CREDIT: MICHAEL OGLE

When looking back on the past year, two stories stand out that make me feel good about the TSA and the organization that we continually strive to become. Though our mission – *zero turtle extinctions* – is certainly global in scope, we remain at our core a very grassroots organization with a huge resource of chelonian expertise that we can summon when needed. As an example, when the young French biologist Gregory Duplant first came to work for our Madagascar program, he had a lot of questions that I would forward to colleagues for the best informed responses. When he needed equipment, it was donated; you want transmitters, you got 'em! After the first month, with information and resources seemingly arriving on demand, Gregory said "now I understand why they call it an Alliance."

My second story involves Milena Oliva Mendez, a Guatemalan biologist and one of the true "rising stars" in the turtle conservation community. Milena won the student speaker award at the 2012 TSA conference in Tucson for her impressive work with *Dermatemys*. In March, we sent Milena to Belize to join a TSA team that had gathered to help stock the new Hicatee Conservation and Research Center at the Belize Foundation for Research and Environmental Education (BFREE). Upon her return, I received a letter from her with the following: *I want to thank you from my heart for giving me the opportunity to attend this trip. I had the most wonderful time ever! For me it was a really HUGE thing to meet some of the greatest hickatee characters that I've only read about, but having a chance to work side by side with them was truly one of the greatest experiences of my life. I learned a lot from each of the team members, every night or morning when we came back from the field I just couldn't stop writing down things that I learned that day. I hope someday I can apply this field knowledge in my country and keep helping hickatees here as well.*

It is experiences like these that fill me with optimism about *OUR* Alliance, and reinforce my belief that the TSA has the knack for directing appropriate conservation resources to situations as they demand. Addressing the daunting challenges that confront turtles and tortoises in today's world is all about people, and getting the right people to the right place at the right time has been one of TSA's hallmarks. We strive to maintain the resources to deploy people around the globe when needed.

As always, this has been a busy year for us, and we continue to try and balance the needs of our established field programs with those of the new Turtle Survival Center in South Carolina. Despite delays resulting from record rainfall and an epic winter storm, we continue to make steady progress on renovating the Center. A new tortoise barn and yards, a quarantine building, a 30 x 100 ft greenhouse for Sulawesi endemics, and numerous infrastructural improvements and upgrades were all completed this year. A new state-of-the-art security system was installed, and a 25 kw generator capable of powering the entire Center, is coming online soon. Still to come, a complex array of forest turtle and tortoise habitats that will support the majority of our collection.

News from the field was highlighted by significant advances in our *Batagur* programs in India, Myanmar and Bangladesh, largely due to funding support from an SOS – Save Our Species - grant. TSA continues to be called on to handle shipments of turtles and tortoises confiscated from the illegal wildlife trade and rescue centers built for that purpose were quickly filled to capacity in both Myanmar and Madagascar. In India, we are improving our capacity for managing similar trade seizures by investing in the renovation of the Kukrail Gharial Rehabilitation Center in Lucknow, the home base for TSA India. In both Myanmar and India, pilot reintroduction programs for star tortoises and red-crowned roof turtles, respectively, are underway, and in Madagascar we are in the preliminary stages of returning confiscated radiated tortoises to the wild. In Belize, the first turtles arrived at the new Hicatee Conservation Research Center, most seized from illegal trappers. Finally, in Brazil, the TSA Colombia program (in concert with WCS) conducted a range-wide strategic planning workshop for the Giant Amazon River turtle that I predict will prove catalytic throughout the region.

Lastly, in an effort to make good on our commitment to *zero turtle extinctions,* we recently completed a detailed analysis of the most endangered chelonians and the actions that will be required to guarantee their survival. Recommended actions include new *in-situ*/in range programs and *ex-situ*/captive populations, and provide a blueprint to help guide our future growth and development. One thing is clear: TSA must embark on a rapid growth phase if we are to meet this daunting challenge. We urge you to join us as we fulfill that commitment, and please know how much we appreciate all you do for turtles and tortoises.

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ABOUT THE COVER: A female Red-crowned Roofed Turtle (*Batagur kachuga*) photographed in the National Chambal River Sanctuary in northern India. Here, just 500 adults are believed to represent the last stronghold population for this Critically Endangered turtle. Since 2006, thousands of *B. kachuga* nests have been protected in riverine hatcheries on the Chambal where, upon hatching, most are marked and released. Others are headstarted (this specimen is from TSA's Center in Garhaita) for future release or to join captive assurance colonies to help ensure the survival of this flagship species. A successful pilot release project launched in 2013 demonstrated that reintroducing headstarted animals can successfully bolster depleted wild populations of *Batagur*, and continued research is on-going. This program received a major boost thanks to a grant from SOS – Save Our Species, and the TSA is working throughout the region to help Batagur populations recover. PHOTO CREDIT: SHAILENDRA SINGH

BACK COVER PHOTO CREDIT: BRIAN D. HORNE

http://www.facebook.com/TurtleSurvival **http://twitter.com/turtlesurvival**

Changes to the TSA Board of Directors

The Turtle Survival Alliance welcomed Dr. Susie Ellis to the Board of Directors in 2013. Dr. Ellis is the Executive Director of the International Rhino Foundation, a non-profit organization that funds and operates rhino conservation and protection programs in Africa and Asia. Her role with the Foundation is to ensure the scientific integrity of the Foundation's programs, as well as awareness-raising and fundraising. Her long-time specialty is catalyzing and facilitating collaborative, multi-stakeholder processes to benefit conservation. She is a member of the IUCN Conservation Breeding Specialist Group, the African Rhino and Asian Rhino Specialist Groups and serves as the latter's Red List Authority. In her former role as a Vice President at Conservation International, she oversaw programs in terrestrial and marine biodiversity conservation in Indonesia and the Philippines. Dr. Ellis has worked on projects in more than 40 countries during the course of her career, with species ranging from penguins to pandas. She has authored more than 100 scientific, technical, and popular publications, and co-authored a book on giant panda biology and management with her husband, Dr. David Wiidt.

We are also pleased to announce the appointment of Pat Koval as our new Board Chairman. Pat brings an incredible amount of passion and dedication to this position, as well as a strong working knowledge of conservation politics and Board processes. With her in this new role, we are confident that there are no limits to what the TSA can achieve. In other Board news we are excited to announce that Dr. Hugh Quinn has agreed to serve as chair of the Animal Management Committee, and Colin Poole will take over as Field Conservation Committee chair. Hugh brings a strong background in animal management from his years in the zoo field, and Colin headed up WCS's Cambodia and Asia Program for years. Both programs are fundamental to TSA's core mission, and their years of experience in these areas and will ensure increased oversight, new perspectives and stronger processes as we move forward.

Patricia Koval visits the TSA India program

Susie Ellis

About the Turtle Survival Alliance

The Turtle Survival Alliance (TSA) was created in 2001 in response to the rampant and unsustainable harvest of Asian turtles to supply Chinese markets, a situation that came to be known as "The Asian Turtle Crisis." For its first seven years, the TSA worked under the umbrella of the World Conservation Union (IUCN). In 2005, it was registered as an independent 501(c)(3) non-profit, based in Fort Worth, Texas and a dedicated Board of Directors was selected in January 2009. From the day it was founded until today, the TSA has remained focused on a single goal: *zero turtle extinctions*.

The TSA is an action-oriented global partnership, focusing on species that are at high risk of extinction in turtle diversity hotspots around the world. Through our 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. The TSA has grown into a global force for turtle conservation and currently supports projects or programs in Belize, Colombia, Europe, Madagascar, Senegal, and throughout Asia, the. The opening of the Turtle Survival Center in South Carolina in 2013 has greatly enhanced our ability to protect the most vulnerable species through *ex-situ* captive breeding.

Meet the Staff

CAROL ARMELL

Carol was born with a love for animals and has always gravitated to the "underdogs." She was given her first pet turtle at age 7 and by age 9 she was training domestic farm animals, followed by exotics. Carol started working in the pet industry more than 35 years ago. After starting a family (she now has three children and six grandchildren) she returned to a career with wildlife and worked as a veterinary assistant, then clinic manager, for more than 12 years. Along the way, Carol has always enjoyed giving educational talks, especially to children, doing her best to open people's eyes to the beauty and value of all animals. For the past seven years she's been doing construction and electrical work while earning her certificates in medical assisting, phlebotomy, and CPR. Carol was an especially enthusiastic and hard-working volunteer at the Turtle Survival Center, because she loves design and construction work, especially if it is for animals. She is excited to have the opportunity to use her talents to benefit the turtles and tortoises at the Center full time as Operations Specialist.

TERRY NORTON

The TSA is pleased to announce that Dr. Terry M. Norton, DVM, Diplomate ACZM has joined the TSA team as consulting veterinarian for the Turtle Survival Center. Dr. Norton is the Director and Veterinarian for the Georgia Sea Turtle Center, which he founded on Jekyll Island. He earned his Doctor of Veterinary Medicine at Tufts University in 1986 and completed a residency in Zoo and Wildlife Medicine at the University of Florida in 1989. He became a Diplomate in the American College of Zoological Medicine in 1992. Dr. Norton developed and implemented the Georgia Wildlife Health Program, which has evaluated the health of many state and federally listed reptiles, birds and mammals. Currently, he provides veterinary care for the Georgia Sea Turtle Center, the Turtle Survival Center and St. Catherine's Island Foundation programs. He has published numerous book chapters and articles for refereed journals. Additionally, Dr. Norton serves as an Adjunct Professor at the University of Georgia, the University of Florida, the North Carolina State University College of Veterinary Medicine, and Clemson University.

NATHAN HAISLIP

Nathan comes to us from the Fort Worth Zoo where he has been a terrestrial ectotherm keeper for the past four years in the Museum of Living Art (MOLA). His passion for chelonians started as a child growing up on a family farm where he was immersed in wildlife and was especially fascinated by herpetofauna. Nathan has kept chelonians in his private collection for more than two decades. While at the Fort Worth Zoo, he focused on breeding critically endangered species including *Pyxis planicauda, Pyxis arachnoides,* and *Cuora pani*. Prior to his position in the MOLA, Nathan obtained a bachelor's and master's degree in Wildlife from the University of Tennessee at Knoxville. While there, he worked in a variety of animal labs and had the opportunity to study animal behavior with Dr. Gordon Burghardt. Nathan also completed several herpetofauna-focused internships, including a research internship at the Knoxville Zoo where he focused on chelonians. Over the course of his career he has gained a variety of skills including exhibit design, electrical, plumbing, carpentry, and masonry that will prove essential for his role as the Facilities Manager and Lead Keeper at the Turtle Survival Center.

Ichetucknee Springs Sampling Crew: Volunteers from NAFTRG, Santa Fe College, and University of Florida.

NAFTRG: The year of the Volunteer

Eric C. Munscher, Jessica S. Munscher, Brian P. Butterfield

U.S. turtle populations face many challenges, including habitat loss/degradation, poor water quality, and over-harvesting. The North American Freshwater Turtle Research Group (NAFTRG) was formed in 1999 to help address those issues via its volunteer research efforts. We began by providing long-term monitoring to important protected turtle habitats including freshwater springs in Florida and Texas, and lakes in Tennessee. In November 2012, NAFTRG merged with the TSA, increasing the TSA's involvement in North American turtle conservation, creating volunteer opportunities for TSA members, and bringing new resources to NAFTRG.

2014 was a very busy year for NAFTRG, as volunteer teams sampled Florida's Manatee, Wekiwa, Blue, and Ichetucknee Springs, Tennessee's Horse Creek, and Texas' Comal Springs.

It was also a big year for volunteerism: Our Florida Spring Sampling began at Manatee Springs State Park and was joined by well-known turtle research biologist Dr. John Iverson and his international group of students representing seven countries. In two days, we captured and processed 154 turtles representing six species—mostly adult Suwannee River Cooters (*Pseudemys floridana suwanenensis*).

Florida Spring sampling continued as NAFTRG volunteers moved to Wekiwa and Blue Springs State Parks where they were joined by a Freed-Hardeman University biology class led by NAFTRG co-founder Dr. Brian Butterfield, and by a biology research group from Jekyll Island's Georgia Sea Turtle Center. We sampled Wekiwa Springs for four days and captured 374 turtles representing eleven species, a new trip record. Most were *P. peninsularis, P. nelsoni*, *Sternotherus minor*, and *Apalone ferox*. Teams also sampled Blue Spring for two days, catching 70 turtles.

We concluded the Florida Sampling at Ichetucknee Springs—a new site for us. NAFTRG volunteers, a Santa Fe College team led by Dr. Jerry Johnston, and a Florida University wildlife ecology class led by Dr. Ben Atkinson caught more than 320 turtles in two days, bringing total captures for NAFTRG's 15th year to 920 turtles.

In February and April 2014, NAFTRG sampled Comal Springs in the Texas Hill Country, the largest freshwater spring west of the Mississippi. Volunteers on the February trip included Andrew Walde (TSA Board) and his family, plus

Recently released *Apalone ferox* at Wekiwa Springs State Park.

Fanning Springs' first *Macrochelys suwanennsis* capture. Roxane Losey and Julia Sweet on the capture.

biologists from SWCA Environmental Consultants and Sea World San Antonio. In 2.5 days we captured 434 turtles representing four species. The April trip included NAFTRG co-founder Dr. Brian Hauge, Jordan Gray (Houston Zoo), and Roxane Losey (Disney's Animal Kingdom). We captured over 450 turtles in 2.5 days.

In May, NAFTRG sampled Horse Creek, a tributary of the Tennessee River. The trip was led by Dr. Brian Butterfield and included Freed-Hardeman University students and volunteers. We captured 39 turtles representing five species, mostly *Trachemys scripta elegans,* but also *Apalone spinifera, Chelydra serpentina, Graptemys geographica*, and *Sternotherus odoratus*.

In six months of sampling, NAFTRG processed more than 1,800 turtles representing 15 species. Yet to come are sampling sessions at Comal Springs in September and November, another round of spring sampling at the Florida parks in August, a summer sample of Horse Creek, and fall sample of Ichetucknee Springs. NAFTRG is on track to process more than 3,000 turtles this year.

Another newsworthy item: in 2014 we added a new study site, Weeki Wachee Springs, the westernmost spring on the Florida peninsula. This large spring system—with five miles of spring run—boasts many freshwater turtle species, including an occasional Ornate Diamondback Terrapin, swimming in from the Gulf of Mexico. We hope to first sample here in October 2014.

NAFTRG RESEARCH OPPORTUNITIES

In recognition of the importance of volunteerism to turtle studies, a recently published paper chronicled the history of NAFTRG and our reliance on volunteers to achieve research goals (Munscher et al. 2013). Other research publications are currently in the works.

NAFTRG has compiled a wealth of turtle population data, and the possibilities for fruitful analysis are endless. For instance, diet studies of the *Sternotherus odoratus* at Comal Springs could be important to invasive snail control there. We welcome collaborations on NAFTRG projects, and proposals for publications addressing novel research ideas.

NAFTRG will continue conducting important conservation research utilizing student and citizen scientist volunteers from across the nation. We see public involvement as the key to conservation. We feel that community engagement in our research promotes scientific literacy and enhances public support for conservation policies and increased research funding.

To get involved, please contact us, check out our Facebook page, or visit http://www.turtle-survival.org/get-involved/volunteer.

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Acknowledgements: NAFTRG's volunteer research program has succeeded largely due to the dedication of the student and citizen scientist volunteers who attend and help fund our sampling sessions. We gratefully acknowledge the support of Andrew Walde, Daren Riedle, Roxane Losey, David Rogers, The Friends of the Wekiva River Foundation, Wekiva Wild and Scenic Committee, Disney's Animal Kingdom, and SWCA Environmental Consultants.

Literature cited: Munscher, E.C., B.P. Butterfield, J.S. Munscher, E.A. Barrett, and J.B. Hauge. 2013. The North American freshwater turtle research group (NAFTRG): an undergraduate research experience (URE) and citizen scientist project. Reptiles and Amphibians 20: 119-129.

Forested outdoor enclosures provide the perfect habitat for many terrestrial and semi-aquatic turtle species at the TSC. Here a Yellow-margined Box Turtle (*Cuora flavomarginata*) basks in some filtered sunlight. PHOTO CREDIT: CRIS HAGEN

Conserving Turtles in the South Carolina Low Country

Cris Hagen

In 2013, the TSA proudly announced breaking ground on the newly purchased Turtle Survival Center (TSC) property in coastal South Carolina. This conservation center provides the TSA the much-needed ability to manage its captive assurance colony programs from a single location and have a facility to call home. The species being managed at the TSC have been carefully chosen based on a variety of criteria such as conservation status, lack of effective *in-situ* protection and management, poor history of being successfully bred in captivity, and ability to thrive in the mild coastal climate of South Carolina. There are now close to 400 individual turtles and tortoises representing 31 species residing at the TSC.

One of the highest priorities for 2013 was to construct buildings and renovate existing structures in order to move the TSA's large collection of living turtles from the Savannah River Ecology Lab (SREL) to their new home at the TSC. It took about eight months of weekly trips to move close to 300 chelonians, including racks, enclosures, and other equipment, to the new location. With this major task finally completed, the staff can now focus on husbandry at a single location.

The turtles have settled in and are thriving, as evidenced by observed mating behavior in several species. Successful courtship and copulation was observed in Chinese Big-headed Turtles (*Platysternon megacephalum*) in late May and calcified eggs are present in one female as of this writing. Other eggs incubating at the TSC in 2014 at the time of this writing were laid by *Cuora amboinensis, Cuora aurocapitata, Cuora flavomarginata, Geoemyda japonica*, *Heosemys spinosa, Leucocephalon yuwonoi, Mauremys annamensis, Mauremys nigricans, Sacalia bealei*, and *Sacalia quadriocellata*.

Last year, we reported that the first half of

These captive hatched *Cuora galbinifrons* and *Cuora mouhotii obsti* are just a few of the breeding loan returns the TSA received back from its members this past year. PHOTO CREDIT: CRIS HAGEN

Left: The first tortoise barn at the TSC has a total of 20 indoor and outdoor enclosures for species such as Burmese Mountain Tortoises (*Manouria emys phayrei*) and Burmese Star Tortoises (*Geochelone platynota*). PHOTO CREDIT: CRIS HAGEN
Right: A multi-purpose building is initially being used as an incoming quarantine building and will transition into an over-wintering building for tropical species. PHOTO CREDIT: CRIS HAGEN

The updated vision of the TSC development plan will complete the first phase of construction through 2015.
DESIGN CREDIT: NEVIN LASH

2013 brought abnormally high amounts of precipitation to the area, creating abysmal construction conditions and slowing progress. The first quarter of 2014 brought an equally challenging weather related disaster in the form of a rare ice storm. Finally (we hope!) in early June 2014 nearly five inches of rain fell on the TSC in less than an hour, creating flash flood conditions for a short period of time. Fortunately, none of the facilities were significantly damaged and all of the turtles were kept safe during these events. Despite all of the weather related clean-ups and construction set–backs, a great deal of progress has been made with a small number of dedicated staff and hard- working volunteers.

ICE STORM

On 12 February 2014, weather conditions were just right to create an extremely rare ice storm around the Charleston area. The region around the TSC was hit particularly hard and the community was crippled for a few days. While the temperatures hovered around the freezing mark for 36 hours, a steady rain caused a thick coat of ice to form on tree limbs and branches. Since this rarely happens in the area, the trees are not adapted to hold this extra weight, and they bent and snapped. For a full 24 hours, one could hear the sounds of the forest breaking and crashing. The aftermath was described by local residents as similar to the period after Hurricane Hugo passed through the region in 1989. Volunteer weekends in March and April were dedicated to cleaning up debris left behind from this storm and forest damage will be evident for years to come.

CONSTRUCTION PROGRESS

The first year of construction focused primarily on infrastructure (new buildings, plumbing, and electrical), as well as indoor and outdoor turtle/tortoise enclosures. Although we have experienced some weather-related delays, the TSC is taking shape and is well on its way to becoming a world class conservation center. Zoo designer Nevin Lash (Ursa International) was on site in May 2014 to update and revise the original TSC master development plan. This updated vision will guide the remainder of the first phase of construction through 2015.

DRAINAGE

During the first half of 2013, the South Carolina low country received some of the highest levels of precipitation ever recorded. This amount of rainfall isn't normal for the area and

This forest complex provides an array of habitats for many of the species managed at the TSC that are adapted to a mild temperate climate. PHOTO CREDIT: CRIS HAGEN

An established reproducing pair of adult Impressed Tortoises (*Manouria impressa*) were recently placed on breeding loan at the TSC. They have acclimated nicely to their new outdoor forested enclosure. PHOTO CREDIT: CRIS HAGEN

when it does happen, it can be quite a mess. Developing a plan to speed the movement of water away from the buildings and facilities became a top priority in the development of the site. With the implementation of an extensive drainage plan, including 1000 feet of buried culverts and a series of French drain systems, the TSC will see an end to standing water after heavy rains. This major project is now underway and will be completed this summer.

TORTOISE BUILDING

The first of two planned tortoise buildings is completed. The building is 20' x 40' and there are eight indoor enclosures roughly 8' x 8' each, as well as two larger enclosures on each end of the building, both with garage doors opening to large outdoor yard areas. For warmer months of the year, there are ten 8' x 12' outdoor pens along both long sides of the building. Outdoor enclosures are being landscaped to provide shade and a misting system runs through all of the indoor enclosures to increase moisture and humidity during winter months.

MULTI-PURPOSE BUILDING

A 20' x 50' building was completed August 2013 to be used as an incoming quarantine area for much of the collection that was relocated from the SREL site. The turtles that are currently housed in this building are being moved to their permanent enclosures elsewhere at the center as they are completed. In the future, this building's primary purpose will be to provide indoor holding for tropical species during the winter.

GREENHOUSE

In February 2014, a 30' x 96' temperature controlled greenhouse was erected at the TSC, the first of two planned greenhouses. The interior of this greenhouse will be designed with a variety of enclosures and exhibits to maintain adult breeding groups of two Sulawesi endemics, the forest turtle (*Leucocephlon yuwonoi*) and Forsten's tortoise (*Indotestudo forstenii*), as well as some other tropical species with similar habitat requirements.

FOREST COMPLEXES

As outdoor habitats referred to as "forest complex units" are being completed, TSC staff have been able to start moving turtles and tortoises from their temporary indoor holdings to spacious natural outdoor environments. Multiple arrays of these forest complex enclosures are being planned and built in different locations on the property. These forest complexes will house many of the key species targeted for intensive management at the TSC.

OTHER IMPROVEMENTS

Other notable construction related updates include the purchases of a Kubota tractor with front end bucket loader and a rotary cutter to increase efficiency of property maintenance. A propane powered generator is being installed so the TSC will have several days of backup power in case of an emergency power outage. The food preparation room has a new commercial grade three-basin stainless steel kitchen sink, and the large room adjacent to the center's conference center will be renovated into a hatchling rearing facility.

SECURITY

Security is not taken lightly at the TSC. The threat of people, as well as mammalian and avian

This group of Home's Hinged-back Tortoises (*Kinixys homeana*) enjoy the humidity from a fogger that was donated by Zoo Med Laboratories, Inc. *Kinixys* species are a group of tortoises that are in rapid decline in Africa because of the bushmeat trade. The TSA manages assurance colonies of *K. erosa* and *K. homeana* in partnership with the recently created Kinixys Task Force. PHOTO CREDIT: SHEENA KOETH

A newly erected 30' x 96' temperature controlled greenhouse will be designed to maintain breeding groups of Sulawesi endemics, the forest turtle (*Leucocephalon yuwonoi*) and tortoise (*Indotestudo forstenii*). PHOTO CREDIT: CRIS HAGEN

A rare ice storm in coastal South Carolina in February 2014 destroyed many trees around the TSC. Damage to facilities was minor and all turtles were kept safe during this weather event. PHOTO CREDIT: CRIS HAGEN

predators, taking turtles is one of the harsh realities when caring for a large collection. The TSA has spared no expense when it comes to security measures. Perimeter fencing has been fortified with concertina (razor) wire and multiple strands of electrified wire, infrared security cameras covering everything inside and outside are recording 24/7, bright motion and photo cell activated security lighting is in place throughout the property, and motion detectors and smoke alarms are all tied into a monitored system. The constant presence of guard dogs and staff are also a deterrent to potential thieves and predators.

SIGNIFICANT ACQUISITIONS

This past year the TSA had a substantial increase in hatchling loan returns from its membership breeding loan program. A number of individual hatchlings of the following species were returned to the TSC per breeding loan agreements: *Cuora galbinifrons, Cuora mccordi, Cuora mouhotii obsti, Geochelone elegans, Heosemys annandalii, Heosemys depressa, Heosemys spinosa, Manouria emys, Manouria impressa, Mauremys annamensis, Pyxis arachnoides brygooi*, and *Sacalia quadriocellata*.

Through breeding loans and donations the TSA has also recently received adult pairs/groups of the following species: *Cuora amboinensis* (Philippine form), *Cuora flavomarginata, Cuora galbinifrons, Cuora mouhotii obsti, Cuora picturata, Geoclemys hamiltoni, Heosemys depressa, Kinixys erosa, Kinixys homeana, Manouria impressa*, and *Mauremys nigricans*. The TSA also received donations of hatchling and juvenile *Cuora pani, Erymnochelys madagascariensis, Heosemys depressa, Indotestudo forstenii, Leucocephalon yuwonoi, Manouria impressa*, and *Mauremys nigricans*.

The TSC has received a number of husbandry supply donations this past year including nearly 200 pounds of Reptomin from Bob Hay (retired Wisconsin DNR herpetologist). Our partner Zoo Med Laboratories, Inc. has generously increased their yearly product donation to the TSC, and the Puget Sound AAZK Fund donated $1,000 to be used to purchase power equipment to maintain trees and vegetation on the TSC grounds.

CONTRIBUTING TO AZA PROGRAMS

The issue of sustainability of zoo managed captive populations is a hot topic within the Association of Zoos and Aquariums (AZA) lately. Due to the high number of critically endangered turtle and tortoise taxa found in AZA zoos, the AZA Chelonian Advisory Group is always looking to find the space to manage them sustainably. With the addition of new space afforded by the TSC, a number of AZA programs will move closer to sustainability. Examples include *Indotestudo forstenii, Leucocephalon yuwonoi, Kinixys homeana, Manouria impressa, Cuora pani and C. mouhotii*. A second benefit will be the large F1 populations that can be managed at the TSC, thereby providing space for the next generation. Space constraints in zoos often preclude them from holding and rearing F1 progeny, and much remains to be learned about nutrition and juvenile husbandry for many of these species.

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Building a World Class Veterinary Center at the TSC

Sheena Koeth

Dr. Terry Norton (left) examines the plastron of a Zhou's Box Turtle at the TSC with Sheena Koeth (Veterinary Care Manager)

The veterinary clinic at the TSC is currently undergoing some substantial updates, most noteworthy being remodeling to increase functionality for hospitalization and quarantine, and the conversion of an exam room into a digital radiography suite. A few walls will be removed, providing additional working space in the laboratory and records area, and the former "receptionist area" will become part of a larger husbandry room. What was once a darkroom for developing conventional x-rays will be transformed into a utility sink cleaning and disinfecting station, and an area that held stainless steel mammal caging will become a necropsy suite and biological sample storage area. These changes will enable better flow through the clinic layout, increase storage, and promote biosecurity and ease of use.

With the help of Dr. Terry Norton, the TSC's veterinary clinic has received some much needed support this past year including substantial equipment donations from a number of benefactors. Equipment includes a cautery unit, surgical suction unit, laparoscope, surgical instruments, hot water blanket, scales, and many other items for use in diagnostics and treatment. However the most exciting is a digital radiography unit that will be installed as soon as electrical upgrades are competed. Facilitated by Dr. Norton, the unit is being graciously donated by Todd Pickler and Midlands X-ray service. A $19,000 market value, the high frequency x-ray and computed radiography unit will greatly improve diagnostic capabilities at the TSC. Reproductive condition, respiratory and digestive problems, and bone and shell health can all be monitored using digital radiography. Currently, patients needing x-rays are transported to the South Carolina Aquarium in Charleston, where we rely on the generosity of Dr. Shane Boylan. While the staff always enjoys this visit, the travel can add stress to turtles that may already be compromised by illness.

The TSC staff is pleased to report that medical concerns have been minimal, and the collection is healthy and well acclimated to life in the South Carolina low country. Quarantine and routine testing is done as needed to monitor collection health, including in-house fecal analysis and hematology. If more extensive testing is required for research or health, the TSC uses surrounding university laboratories. Much remains to be learned about contagious diseases affecting chelonians, so base-line screening was conducted at the University of Florida on over 50 turtles and tortoises including Ranavirus, Herpes, Intranuclear Coccidiosis, and Adenovirus.

Contact: Sheena Koeth, Veterinary Care Manager, Turtle Survival Center, skoeth@turtlesurvival.org

CAPITAL CAMPAIGN UPDATE

The Turtle Survival Center capital campaign is off to a great start, with donors from across the private, corporate and public sectors making gifts and pledges of nearly $1.1 million, almost 70% of the $1.6 million capital campaign goal to purchase, renovate and operate the Turtle Survival Center through 2016. The Center was purchased in 2013 and as construction projects unfold on a daily basis, it is exciting to see the site's transformation into a world-class conservation facility. We now have more than 400 animals on the site, many of them breeding, and we are excited to see what the future holds. The Turtle Survival Alliance would like to thank the many individuals and organizations that have supported the Center to date and invite anyone who would like to make a gift to contact Heather Lowe (817/759-7262 or hlowe@turtlesurvival.org) or visit www.turtlesurvival.org.

The first hatchling at the Turtle Survival Center, a Red-necked Pond Turtle (*Mauremys nigricans*). PHOTO CREDIT: CRIS HAGEN

SUPPORTERS DONATING $7,500 TO $19,999

Andrew Sabin Family Foundation, Anonymous, Brett and Nancy Stearns, Brian Bolton, Cleveland Metroparks Zoo, Dallas Zoo, Dennis Coules, John Iverson, Moody Gardens, Omaha's Henry Doorly Zoo, Riverbanks Zoo, Roy Young, San Antonio Zoo, Steve Gott Memorial Fund (multiple donors), Turtle Conservation Fund, Virginia Zoo, Walde Research and Environmental Consulting, Zoo Atlanta

SUPPORTERS DONATING $20,000 TO $49,999

Columbus Zoo, Bill Dennler, David Shapiro, Disney's Animal Kingdom, Sedgwick County Zoo, St Louis Zoo

SUPPORTERS DONATING $50,000 TO $100,000

Ab Abercrombie, Detroit Zoo, San Diego Zoo, Wildlife Conservation Society

SUPPORTERS DONATING MORE THAN $400,000

Patricia Koval

Mushroom Growing Monastery Helps Feed Endangered Turtles at the TSC

Sheena Koeth

Founded by the Monks of Gethsemane in 1949, Mepkin Abbey is home to a brotherhood of monks seeking to live a simple and devoted life. In the Cistercian tradition, the monks value working with their hands, sharing hospitality and living in unity with a common purpose. The brothers cultivate oyster and shitake mushrooms on grounds at the abbey, and share the meticulously kept Mepkin Abbey Gardens on the Cooper River north of Charleston with all who wish to enjoy their beauty and serenity.

Given the monks' traditions, it comes as no surprise that they responded with generosity to our request for mushrooms to feed the animals at the Turtle Survival Center. Many of the animals relish mushrooms, a natural food source in the wild. Thanks to Mepkin Abbey, complimentary mushrooms are available as needed for the turtles. Currently, the monks donate about 20 pounds of oyster and shitake mushrooms every month.

Mepkin Abbey Mushrooms can be found on the menus at some of Charleston's finest restaurants, and can be purchased in select grocery stores, and at the abbey gift shop. Having a short shelf life, the locally-produced fresh mushrooms are particularly valued by local gourmet restaurants because of the brief transport time. An attention to meticulous detail has earned Trappist monks a reputation for high quality produce, and the successful small business built by the monks at Mepkin Abbey is no exception. The TSA looks forward to building more new and unexpected friendships in the greater Charleston community, and offers thanks to the monks at Mepkin Abbey for their support.

Father Gerard Jonas assists with the cultivation of oyster and shitake mushrooms at the Abbey. PHOTO CREDIT: SHEENA KOETH

Thank you, Volunteers!

For more information on volunteering at the Turtle Survival Center, please visit http://www.turtlesurvival.org/get-involved/volunteer

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Developing New Methods to Induce Egg Laying in Turtles

Mark Feldman

This is our method for injecting into the empty space. Use a 25 gauge, 1-inch needle and a 1 cc syringe. For smaller animals, this is the safest position for the turtle and operator. PHOTO CREDIT: ELIZABETH FELDMAN.

Visiting John Legler's lab in 1977, I met graduate student Jim Berry. I told Jim that we liked to keep hatchling turtles for a year, release them, and then replace them with new hatchlings. When I complained about the difficulty of catching new hatchlings, he suggested I learn to "make them." Jim then showed me a process by which he injected oxytocin to induce egg laying. I didn't know it then, but that simple lesson changed my life.

From 1978 to 2005 I tried to induce roughly 250 turtles. We quickly learned that oxytocin didn't always work. Some species like Spotted Turtles responded well; laying all their eggs 82 percent of the time. Wood Turtles and Snappers almost never laid all their eggs.

By the early 1990s, we proved that induced eggs were as viable as natural nest eggs, but that using oxytocin alone was too simplistic a solution; it could never substitute for all the complex hormones, prostaglandins and neurotransmitters

A medium sized Spiny Softshell laying its eggs in one of our "obstetric suites." PHOTO CREDIT: MARK FELDMAN

(cholinergic, adrenergic and others) involved in egg laying

There were other oxytocin problems. One was false nesting; which occurs when a turtle re-emerges after a successful induction, digs a nest hole and lays no eggs. The other concern was delayed ovulation. In turtles that multi-clutch, a new set of eggs is released into the oviduct after nesting. These usually take two to three weeks to be shelled before release. Unfortunately, oxytocin used alone delays natural ovulation and sometimes eliminates it completely until the following year.

Our induction enhancement effort faced many questions. What drugs might be combined with oxytocin to improve efficacy? Sedatives or beta-blockers might eliminate egg laying anxiety. Prostaglandins, normally released by hormonal action, might need to be used with oxytocin. Neurological agents (cholinergic, adrenergic and others) might be needed to dilate the cervix, stimulate the oviduct or block natural inhibitory agents. Other hormones like relaxin or estrogens might be necessary.

All these possibilities required controlled testing in large numbers of animals to refine our induction technique. But where to find so many turtles? In 2008, the Evans family, owners of the Concordia Turtle Farm in Wildsville, Louisiana—the largest U.S. turtle farm—gave us access to a pond filled with 5,000 Red Eared Sliders (*Trachemys scripta elegans*), plus a shed and ATV for our research.

Our goal was to discover an induction technique that induced a 100 percent success rate—with every turtle laying all its eggs every time. We set strict criteria before accepting an animal into the study: it had to have at least two palpable eggs, at least one of the eggs had to be in the pelvis, and the egg shells had to be firm enough not to dent when palpated lightly.

We developed a daily routine at the farm, collecting 30-40 Red Eared Sliders from the laying area each morning. We then selected the first twenty animals meeting our criteria, washed and numbered them, and placed them in laying containers. Induction took place within three hours of collection and the turtles were left undisturbed, with containers covered, until the next morning, when eggs were removed and turtles released.

As a control, we injected the first 20 turtles with saline. As expected, nothing happened.

Recommendations for inducing egg laying

Recommendations for inducing egg laying as of July, 2014. All injections given subcutaneously unless indicated otherwise. All injections are given at the same time, except with softshell turtles.

Red-eared Slider (*Trachemys scripta elegans*): oxytocin 7.5 units/kg + PGF 1.5 mg/kg + bethanechol 0.09 mg/kg or phenylephrine 25.0 mcg/kg

Snapping Turtle (*Chelydra serpentina serpentina*): oxytocin 7.5 units/kg + PGF 1.5 mg/kg + bethanechol 0.09 mg/kg

Spiny Softshell (*Trionyx spiniferus spiniferus*): Dexdomitor 0.07 mg/kg. 20 minutes later give oxytocin 3.75 units/kg + PGF 0.75 mg/kg

Spotted Turtle (*Clemmys guttata*): oxytocin 15 units/kg + PGF 1.5 mg/kg

Eastern Box Turtle (*Terrapene carolina carolina*): oxytocin 15 units/kg + PGF 1.5 mg/kg

Painted Turtle (*Chrysemys picta picta*): oxytocin 7.5 units/kg + PGF 1.5 mg/kg

Current recommendations as of July 2014

The scene each morning. Red-eared Sliders are known to migrate in the spring. These turtles are a mix of animals looking to nest and those that are just on walk about. The turtles prefer to lay their eggs underneath the tents made of roofing tins. PHOTO CREDIT: MARK FELDMAN

The needle tip can easily end up in an egg follicle. This is *not* desirable. We suggest avoiding this method of injection. PHOTO CREDIT: MARK FELDMAN

The standard approach we used to palpate smaller turtles for eggs. When double checked with ultrasound the technique proved nearly 100 percent accurate for determining if there were no eggs, one egg, or more than one. PHOTO CREDIT: ELIZABETH FELDMAN

The Nomad, a portable, dental x-ray machine, was on loan from the Aribex Company. The turtle is in the container on the floor. There's a cheap laser pointer taped to the machine for aiming purposes. An exposure time of 1 to 3 seconds produced excellent films. PHOTO CREDIT: ELIZABETH FELDMAN

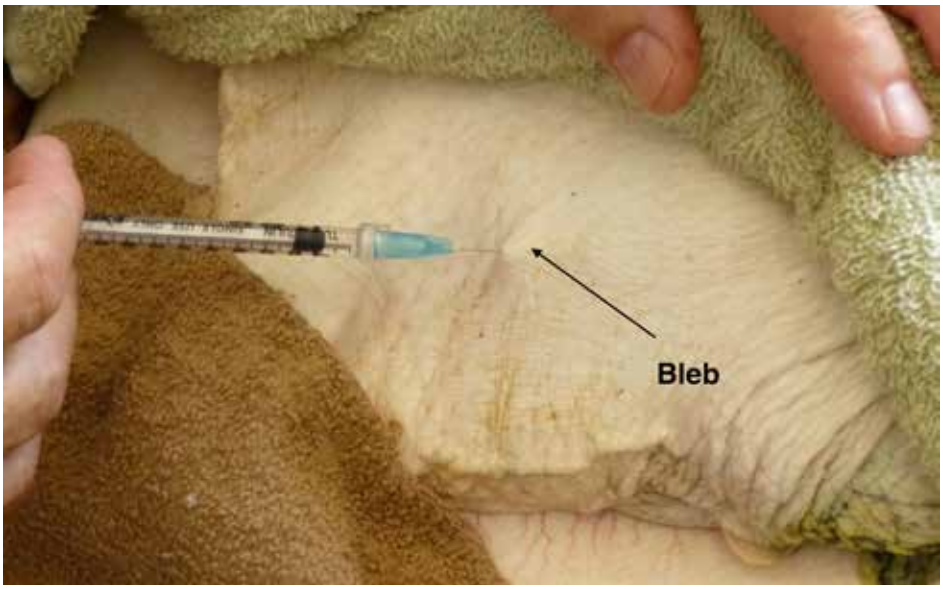
Then we induced a series of turtles with oxytocin alone under a variety of conditions. We used 10 units of oxytocin per kilogram as a standard dose—found efficacious by John Tucker in his 1990s work with wild Red Eared Sliders.

We found it best, easiest and safest to inject the drug subcutaneously into the area just superior and lateral to the base of the tail. We also determined that induction worked best when turtles were left dry on a grid to lay their eggs, in air temperatures between 21C (70F) and 32C (90F). Noise had no detrimental effect but visual disturbance did, so we kept containers covered.

With these norms established we began the drug experiments. First we tried arachadonic acid in a variety of doses; none worked. This was disappointing because we had hoped arachadonic acid would be the magic bullet for induction. It is the precursor to many prostaglandins and we had hoped the turtles would convert it to active forms. Next we tried specific prostaglandins involved in the natural nesting process. Prostaglandin E1 and E2 had no effect.

With our first season rapidly coming to an end, we tested prostaglandin F2 alpha (PGF), a common veterinary obstetrics drug. To our surprise, it worked! Doses from 0.25-2.0 mg/kg were effective, but no more than oxytocin alone. On our last two days at the turtle farm we

A simple EKG machine was used to determine the effective dose of drugs like propranolol that altered the heart rate. PHOTO CREDIT: MARK FELDMAN



In larger turtles like softshells and snappers it is safest to wrap the animal in a towel, turn it on its carapace and inject into the subcutaneous tissues between the back leg and tail. Always cover the cloaca or risk getting sprayed with musk! PHOTO CREDIT: ELIZABETH FELDMAN

tried combining oxytocin and PGF. The results were spectacular. Our success rate doubled from less than 40 percent with either drug to over 80 percent when used together.

We began the 2009 season by testing a variety of oxytocin and PGF combined doses. After inducing more than 500 turtles, we found that oxytocin 7.5 units/kg + PGF 1.5 mg/kg was the most effective. Using that dose, 85 percent of Red Eared Sliders laid all their eggs with one injection. We also learned that we needn't inject the drugs separately, but could pre-mix them at room temperature. This highly effective combination, dubbed "the mix," was stable for at least a month.

For the rest of 2009, we tried various drug combinations looking for something better. Trials with Prostaglandin E-2 (PGE-2) + PGF; oxytocin + PGE-2; oxytocin + PGE-2 + PGF; propranolol + PGF; and oxytocin + propranolol were all less productive than "the mix" alone. During 2009, we also determined that "the mix" eliminated the problem of delayed ovulation.

We believed that the anxiety of capture might be interfering with induction, so tried to reduce anxiety in three ways: using the beta adrenergic blocker propranolol to prevent inhibition of the oviductal smooth muscle; using Domitor, an alpha adrenergic stimulant that produces central relaxation in small mammals; and by injecting Telazol, a centrally acting sedative. We combined each of these with "the mix" but none performed better than "the mix" alone.

During 2008-09 we also injected over a hundred turtles of other species (Razor Back Musks, Snapping Turtles, Spiney Softshells, and various Painted and Map Turtles) with variable results. We concluded that different species required different drugs and/or doses for effective induction.

In 2010, we worked exclusively with Spiny Softshells, a species very different from Red Eared Sliders. Softshells are too large to palpate for eggs, so we x-rayed them to determine how many eggs they were carrying; a slow process that allowed us to induce only four turtles daily. We induced 160 softshells that season with varied combinations of oxytocin and PGF, both equally effective. Adding propranolol (a beta blocker) or methoxamine (an alpha 1 agonist) to "the mix" increased our success rate over that of "the mix" alone. We also learned that methoxamine was unstable once mixed, making it unsuitable for fieldwork.

For the next three years away from the farm, we used "the mix" to induce every clutch (3 to 5 per season) in eight Red Ear Sliders in our private collection. This work confirmed that using the mix prevents the delayed ovulation experienced with oxytocin alone, but does *not* prevent false nesting.

We returned to the turtle farm in 2013 to test cholinergic and adrenergic drugs that were stable in solution. Our hope was that, when added to "the mix," these drugs would relax the cervix and stimulate the oviductal smooth muscle to produce coordinated egg laying. Red Eared Slider trials showed that giving separate injections of either bethanechol (cholinergic) or phenylephrine (adrenergic) along with "the mix" increased the success rate to 93 percent. We saw even better results with Snapping Turtles. However, neither bethanechol nor phenylephrine worked with Spiny Softshells. They responded best to Dexdomitor, an adrenergic agent found ineffective with Red Eared Sliders. This shows, yet again, the variability of turtle physiology from species to species.

On returning to the Concordia Turtle Farm in 2014, we will experiment with new agents and reduce dosages of various drug combinations to see if we can get closer to the coveted 100 percent success rate. There is also a new, long acting form of oxytocin, called carbetocin, that though difficult to obtain may prove to be a game-changer. It's an ever-evolving story.

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First International Workshop for Conservation of the Giant South American River Turtle

German Forero, Camila Ferrara, and Brian D. Horne

Participants from six countries gather around a group of *P. expansa* females in Balbina, Brazil.

The giant South American River Turtle (*Podocnemis expansa)* has suffered a long record of exploitation. Hunting and indiscriminate egg collection resulted in drastic distribution-wide population declines beginning in the early 19th century. During the last 35 years, government and non-governmental institutions have launched a variety of *P. expansa* conservation initiatives in six countries—Bolivia, Brazil, Colombia, Ecuador, Venezuela and Peru - particularly focused on the protection and monitoring of the main nesting areas of the species. However, there was no consensus regarding the most effective actions for conserving *P. expansa,* and little on-going cooperation and coordination between the various countries and organizations. There was also no overall evaluation of the impact of past, current or proposed conservation actions on the recovery of the species across its range. Surprisingly, the many groups trying to conserve *P. expansa* in the Amazon had never gathered with the specific purpose of sharing experiences, pooling knowledge, and standardizing their methods.

Responding to the need, the Turtle Survival Alliance and Wildlife Conservation Society (WCS), with the support of the Mohammed Bin Zayed Species Conservation Fund and the Turtle Conservation Fund, held the First International Workshop for the Conservation of *Podocnemis expansa* in Balbina, Brazil, on 1-4 April, 2014. The primary objective of this workshop was to promote integration between the institutions and professionals that work with this species, and to

Female *Podocnemis expansa* nesting at a beach on the Trombetas River, Para, Brazil. PHOTO CREDIT: VIRGINIA BERNARDES

create the foundation for a regional monitoring program for *P. expansa* in the Amazon region of Bolivia, Brazil, Colombia, Ecuador, Peru and Venezuela.

Participants from all six countries gathered and shared their experiences, results, and contributed actively to lively discussions. Results were immediate, positive and pragmatic. A network of conservationists and researchers was established to communicate regularly on topics regarding *P. expansa* conservation. A database was compiled, containing basic information on conservation projects at more than 25 sites across the Amazon Basin; this data set includes the known number of nests for the species, as well as estimates for the number of reproductive females associated with nesting sites.

A set of recommendations for future conservation actions was developed and will be shared with all participants and the general public regarding three key areas: beach protection, population estimation and monitoring, and headstarting practices. These recommendations will enhance cooperation between organizations and help guide conservation practices at sites across the region, while also allowing for data comparison. The database is the first attempt to document species conservation projects across the entire basin and will serve as the starting point for a regional monitoring program.

Sites with an ongoing conservation program for *P. expansa* across its range. The size of each dot represents the estimated number of reproductive females based on the number of nests.
(DATA PROVIDED BY PARTICIPANTS OF THE WORKSHOP)

The success of this first international workshop, and the new spirit of cooperation generated by it, bode well for the future of the giant South American River Turtle.

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Snappers in the Dark:

An Iconic Turtle in an Iconic River

Travis Thomas

Biologist Kevin Enge (FWC) releases a recently captured *M. suwanniensis* back into the dark waters of the Suwannee River. PHOTO CREDIT: FLORIDA FISH AND WILDLIFE CONSERVATIONS COMMISSION.

I launch the boat at dawn as steamy mist rises and twirls off the dark water of the Suwannee River. My hoop net traps have been soaking overnight, and are heavily baited in hopes of capturing Alligator Snapping Turtles—the giant freshwater turtles that call this winding black water home.

The dark surface of the river only adds to the suspense as I pull up each trap, the tannin stained water slowly revealing the fruit of my trapping efforts. Sometimes it's an Alligator. Sometimes it's a Bull Shark. More often it's an Alligator Snapping Turtle, which is great news.

I grew up on the Suwannee River—one of the last remaining unaltered rivers on the Gulf Coast. I spent much of my youth in the water, catching turtles and watching the habits of wildlife. Older locals would often toss around terms like "alligator turtle" or "gator snapper", which were usually incorrectly applied to a variety of turtle species. Despite all that time spent on the Suwannee as a kid, I never saw an actual Alligator Snapping Turtle until I was in college.

The Alligator Snapping Turtle is described as secretive, but that's an immense understatement. In fact, most people who have lived their entire lives on the Suwannee River have never laid eyes on one of these magnificent creatures. This is no surprise—the Suwannee is truly a blackwater river, dark in color due to the influx of tannins leached from the decaying plant matter of surrounding swamps and wetlands. People refer to the river as "tea-stained"; however, "coffee-stained" would be more appropriate. Visibility is nonexistent, and these turtles very

A boat load of *M. suwanniensis* captured during a study on the Suwannee River. FWC biologist Eric Suarez rides on the bow of the boat to help secure turtles during transportation. PHOTO CREDIT: FLORIDA FISH AND WILDLIFE CONSERVATIONS COMMISSION

Above: Biologist Travis Thomas (FWC) carries a large male *M. suwanniensis* to be processed and released. PHOTO CREDIT: FLORIDA FISH AND WILDLIFE CONSERVATIONS COMMISSION.

Left: FWC biologist Travis Thomas poses with the largest *M. suwanniensis* captured during the study. This turtle had a straight line carapace length of 65 cm and weighed 57 kg (126 lbs). PHOTO CREDIT: FLORIDA FISH AND WILDLIFE CONSERVATIONS COMMISSION.

rarely leave the water. So it's no wonder, then, that most locals are shocked when they see me ride by with a boatload of bona fide gator snappers, on their way to be measured, tagged, and released back to the dark depths whence they came.

The taxonomy of the genus *Macrochelys* was recently revised and two new species described: the Apalachicola Alligator Snapping Turtle (*Macrochelys apalachicolae*), inhabiting river drainages from the Ochlocknee River west to the Choctawhatchee River; and the Suwannee Alligator Snapping Turtle (*Macrochelys suwanniensis*), endemic to the Suwannee River drainage. A colleague recently asked "how do you distinguish them from one another?" to which I replied "you need an X-ray machine and a genetic sequencer". There's really no easy way to tell them apart, except for the fact that *M. suwanneisis* has a unique caudal notch in the rear carapace. The best way to differentiate *Macrochelys* is to know where the animal came from, but even that is difficult considering the number of turtles that have been moved around and released.

In 2011, the Florida Fish and Wildlife Conservation Commission (FWC) responded to the new species designations by quickly putting together a plan to determine the population status of the two distinct lineages of *Macrochelys*. We started sampling the Suwannee River right away with good reason: a completed survey on Georgia's upstream portion of the Suwannee failed to capture a single *M. suwannensis*, raising concern that the population might be in decline.

Since 2011, we have captured 161 *M. suwanneinsis* at 12 different sites along Florida's portion of the Suwannee River. Amazingly, over 41 percent of adult males captured have weighed 45 kg (100 lbs) or more. The largest turtle captured on the Suwannee River was a male with straight line carapace length of 65 cm (2.13 ft) and a mass of 57 kg (126 lbs). It was quite a relief and a good sign to see such large turtles inhabiting the river. However, because *M. suwanneinsis* is endemic to only one river drainage, the Suwannee, this species is extremely vulnerable and could easily become threatened by anything that negatively impacts flow levels or water quality.

After three years of intensive study of *M. suwannensis*, which included a telemetry study, we are now turning our attention to the population status of *M. apalachicolae* in three major waterways: the Ochlocknee, Apalachicola, and Choctowatchee rivers. Our goal is to assess population numbers and build suitable management plans for these iconic reptiles.

Of course, that likely means more dawns spent floating on "coffee dark" waters pulling up hoop net traps and wondering whether this time if it will be an alligator, a bull shark, or hopefully, *Macrochelys apalachicolae*.

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Turtle Conservation Challenges in Papua New Guinea

Arthur Georges, Carla Eisemberg, Yolarnie Amepou, and Eric Manasi

The Pig-nosed Turtle is aptly named. Its nostrils terminate in a fleshy proboscis reminiscent of a pig's snout. The species is abundant in the extensive delta regions of the major rivers discharging into the Gulf of Papua, PNG, including the Kikori River. PHOTO CREDIT: ROBERTO DA SILVA, PIKU TEAM

The tropical nation of Papua New Guinea located just north of Australia is one of the world's most ecologically diverse nations. This astonishing diversity is all the more important regionally because progressive aridification of Australia has dramatically changed, and reduced, biodiversity of many vertebrate groups there.

New Guinea is, in a sense, a museum of biodiversity for the landmasses on the southern Australian tectonic plate—a region comprising Australia, New Zealand, New Guinea and neighbouring Pacific islands. It is in New Guinea that we find the highest diversity of freshwater turtles in Australasia—five species of long-necked or snake-necked turtle (*Chelodina*); two species of Australasian snapping turtle (*Elseya*); two species of softshell turtle (*Pelochelys*); one *Emydura* species represented by the New Guinea Painted Turtle; and of course, the Pig-nosed Turtle (*Carettochelys insculpta)*. The last three species are of Asian origin.

The biodiversity of New Guinea is matched by equally astonishing cultural diversity—Papua New Guinea (PNG) boasts an astounding 800 native languages, each bringing with it its own cultural heritage and perspectives on life. Surprisingly, little land is government owned, with land tenure resting instead in the hands of village communities and family groups. Most of PNG's 7.4 million people still rely on a subsistence economy, built around remarkable market gardens and hunting—at which the people are devastatingly efficient.

Conservation in PNG has many challenges. The nation is remote, with associated logistical difficulties. Community engagement is mandatory in any project because of the land tenure arrangements, but necessary in any case to achieve sustainable outcomes. Conservation is made even more complicated by the rich diversity of cultural perspectives and the acute need to put food on the table.

THREATS TO THE PIG-NOSED TURTLE

It is within this context that we have embarked on the conservation of the Pig-nosed Turtle in the Kikori River Basin of the southern lowlands of Papua New Guinea, a project receiving financial support from the region's petroleum

Landowner Frank John and his family release turtles that successfully hatched from the protected nesting beaches on his land. PHOTO CREDIT: CARLA EISEMBERG, PIKU TEAM

Papua New Guinea preserves much of the biodiversity in the Australasian region. Shown here is Parker's Snake-necked Turtle (*Chelodina parkeri*), centre, and clockwise from top left, the New Guinea Giant Softshell Turtle (*Pelochelys bibroni*), New Guinea Long-necked Turtle (*Chelodina novaeguineae*), New Guinea Painted Turtle (*Emydura subglobosa*), Pig-nosed Turtle (*Carettochelys insculpta*), New Guinea Snapping Turtle (*Elseya branderhorsti*), and Northern Snake-necked Turtle (*Chelodina oblonga*, formerly *rugosa*). PHOTO CREDIT: ARTHUR GEORGES, PIKU TEAM

producing industry.

Internationally, the Pig-nosed Turtle is of conservation concern, being the sole remaining species in its family. In Papua New Guinea, the Pig-nosed Turtle is a vital part of the community fishery, and it supplies a seasonally important source of protein to the local diet. The continued decline of the species to a point where it is at risk of extinction, either regionally or globally, is in no one's interest. It is also clearly to everyone's benefit to preserve *C. insculpta* and prevent a fishery collapse.

The eggs and meat of the Pig-nosed Turtle are highly prized by the local community as an important source of protein. Over 90 percent of *C. insculpta* eggs laid annually are harvested. Perhaps more critical for the turtle populations, adult females are heavily harvested too—an activity made easier by the animals' predictable seasonal nesting habits. On the coast, during the peak of nesting at the king tide, one man can turn a score of nesting females on their backs in little over an hour, all to be taken back to the village to feed families and for local trade. A number of factors are putting intense pressure on turtle populations, including a dramatic increase in human population (which has doubled since 1971), the concentration of that population along river banks since the cessation of tribal warfare, the use of efficient modern fishing nets and lines, and access to banana boats and outboard motors.

BUILDING *C. INSCULPTA* EDUCATION AND AWARENESS

Our initial objectives in the region have been to disseminate knowledge, to build awareness and local capacity, and to support community-led conservation initiatives.

We first set about proving that there had been a decline in *C. insculpta* numbers. We achieved this via market and village surveys of egg volume traded, matched against similar surveys in the 1980's by Mark Rose. Using this method, we estimated that Pig-nosed Turtle populations had declined by more than 50 percent in the last 30 years. Community engagement in these surveys helped to convince locals who doubted the decline. The science gave credibility to the claims of older people that egg harvests were much better in the past than they are today. We used the survey to directly challenge the often stated community view that the turtles have always been there, are there now, and will always be there for future generations.

With the survey complete, we focused next on strengthening community awareness about environmental issues and sustainability among children—the future stewards of PNG's biodiversity. We have produced two children's books, delightful stories with a conservation message written by Carla Eisemberg and beautifully illustrated by Fernando Perini. We have printed and distributed 10,000 copies of each book, one for every child in the Kikori catchment. We have also organized workshops for schoolteachers to show them how to optimally use the books to deliver the imperative environmental education message. The books have been exceptionally well received by the teachers, and for many children these are their first books—offering an opportunity to learn about conservation while also learning how to read.

We've also actively engaged students in the education process. High school students have produced a series of radio plays, each with a conservation message, and built around an

The eggs of the Pig-nosed Turtle are highly prized by local villagers, who include them in a variety of meals for consumption at home; they also sell them in the Kikori market to generate cash. PHOTO CREDIT: ARTHUR GEORGES, PIKU TEAM

indigenous animal of particular value to them. To reach a larger audience, the plays have been translated into three languages—English, Motu and Pidgin. The students took great pride in recording the plays, then hearing them broadcast on local (and later, national) radio.

We also provide scholarships for the brightest students who engage in our data collection effort, experiential learning that serves as a complement to formal classes. These exceptional students—the scientists and conservationists of the future—help us locate nests, measure eggs and hatchlings, mark adult turtles, record data, and to communicate with others about the work. All of these efforts with young people are leading to greater awareness, commitment, and capacity building in Kikori communities.

LOCALLY DRIVEN CONSERVATION EFFORTS

Another potentially effective component of our conservation work is our support for community-led conservation initiatives. No community likes outsiders coming in and deciding how things should be done, and expatriates working within PNG communities are no exception. Instead, we are working with a local landowner whose conservation views are aligned with those we think will bring long-term conservation benefits to the community; we support him and his family to achieve their community-focused conservation objectives.

The landowner, Frank John, has agreed to protect nesting beaches on his land in Wau Creek in the Kikori Basin—with a long term objective of obtaining government support for his project, and potentially some income as a land manager/

All 24 of these nesting females were collected on Turuvio Island in the Gulf of Papua by one hunter in one night. Predictable nesting habits and synchronised nesting increase vulnerability.
PHOTO CREDIT: CARLA EISEMBERG, PIKU TEAM

ranger. We are providing logistical support, transportation, and employment for Frank John and his family as he works to provide nesting beach protection, and as we build our ranger and research facilities at the Wau Creek site. Masters student Yolarnie Amepou is assessing the efficacy of beach protection there, comparing on-site and off-site causes of egg and adult mortality.

Our hope—and we can now see this unfolding—is that other communities will see what Frank John is achieving, and the benefits flowing to him for his conservation efforts, causing other families and villages to engage in a similar way. To this end, we would eventually like to see a Coastal Wildlife Management Area established, and the expansion of the Aird Hills Wildlife Management Area to include the needs and conservation of the Pig-nosed Turtle.

Challenges remain. There is exceptional goodwill in Kikori communities and awareness of the issues and options for action are building. However, protecting beaches from egg and adult turtle harvest comes at a cost in lost livelihood and a local food source. We are offsetting those costs through payments to landowners for conservation work done. The real challenge before us now is to devise and put in place sustainable economic systems to generate ongoing income from setting land aside for conservation. Of course, this is a challenge faced in developing countries everywhere.

For more information and regular project updates, sign on to our Facebook page: "Saving Piku – PNG's Pig-nosed Turtle"

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The Genesis of Turtle Island: A New Zoo, Research and Conservation Center for Chelonians

Peter Praschag

This larger version of *Mauremys nigricans* has megacephaly (massive heads) and females (shown) produce many small eggs. In human care, the "big-heads" prove to show significantly more intraspecific aggression than their smaller relatives and must be kept separately.

Graz is the second largest city in Austria and the only big city in the country lacking a zoo. That is now changing, thanks to an innovative private and municipal partnership meant to benefit turtles.

One year ago, the growing private turtle collection of the Praschag family was offered expanded space: a one-family home where the collection could be housed, free of rent and utilities, courtesy of the city of Graz. The result is Turtle Island, which combines a modern zoo exhibit and important assurance colonies where research and conservation can be conducted.

Over the last year, turtles in the Praschag collection—including more than 110 freshwater turtle and tortoise species—have been transferred into the new, but still temporary facility offered by Graz. The zoo, research and conservation center houses larger subtropical and tropical species such as soft-shell turtles (*Chitra sp., Lissemys sp., Nilssonia sp.*, and *Pelochelys sp.*), geoemydids (*Batagur sp., Hardella, Pangshura sp.*, and *Morenia sp.*), plus species of other turtle families such as *Erymnochelys madagascariensis, Peltocephalus dumerilianus,* and *Chelodina sp.*

The roomy facility has allowed for larger tanks and for strict separation of the sexes. Turtle Island is currently staffed by one full-time and two part-time reptile keepers—positions sponsored by The House of the Sea (a Vienna aquarium) and by the city of Graz.

This is just the beginning for this unique collaboration. Next steps include plans to build a large, state of the art, public access greenhouse that will be home to and showcase turtles of the subtropical regions.

The new Turtle Island facility has been up and running for a year now, and in that time most of the species housed there continued, or began, to reproduce. The first offspring to hatch at the new facility was an *Indotestudo elongata*. The strictly herbivorous species *Hardella thurjii* and *Morenia petersi* have nested for the first time. One old female, a *Pangshura tecta* imported in 1989, produced her first clutch of five fertile eggs after 25 years in captivity!

Turtle Island is focusing on neglected species which seem to be slowly disappearing and "under the radar" for captive management. We collected the last macrocephalic *Mauremys nigricans* in Europe, and now have the first fertile eggs in our incubators. Further morphological and genetic analyses and studies with stable isotopes will hopefully clarify their taxonomic status.

For more information and Turtle Island updates please visit: www.turtle-island.at

Contact: Peter Praschag, Turtle Island, Am Katzelbach 98, 8054 Graz, peter@turtle-island.at

Developing a *Kinixys* Conservation Blueprint

David Mifsud

Multiple partners in the *Kinixys* Conservation Program have had good reproductive success with their charges. PHOTO CREDIT: KURT EDWARDS

In August 2013, the chelonian community assembled in Lomé, Togo to evaluate the status of 43 species of turtles and tortoises in Sub-Saharan Africa. Prior to the meeting, information regarding the status and risks to these animals was largely incomplete, though there was mounting evidence of broad declines in several African species.

A key goal of the meeting was to evaluate the status of all of the region's tortoise and freshwater turtle species on the IUCN Red List and to identify priority conservation measures for their survival. To that end, all participants received draft species assessments in advance of the workshop for careful review. Then, during the event, attendees were asked to prepare comments and recommendations to complete the assessments. Numerous threats were evaluated, including domestic and international food and pet trade collection, loss and degradation of habitat, improper habitat management and land use decisions, subsidized predators, and climate change both observed and modeled. Workshop field excursions viewed habitat loss firsthand, and visited pet trade, bushmeat, and fetish markets.

This baby *K. erosa* is one of the first offspring successfully hatched in captive assurance colonies established to ensure long-term survival in this increasingly threatened group. PHOTO CREDIT: DAVID MIFSUD

Review of best available data led to draft designations for all species assessed. Changes to several IUCN rankings were proposed as a result of workshop evaluations, including the draft elevation of *Cyclanorbis elegans*, *Psammobates geometricus*, *Malacochersus tornieri* and *Kinixys homeana* to Critically Endangered; *K. erosa* to Endangered; and all other *Kinixys* to Vulnerable. A comprehensive list of revised designations will be available soon.

By all accounts, the Togo workshop was a resounding success, achieving outstanding results in a very short time frame.

ACKNOWLEDGEMENTS

Thanks go to our organizers: the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group; and to our sponsors: the Mohamed bin Zayed Endangered Species Fund, Frankel Family Foundation, Andrew Sabin Family Foundation, Turtle Conservation Fund, Turtle Conservancy, Conservation International, and Chelonian Research Foundation. Special thanks go to Peter Paul van Dijk for his superb meeting organizational skills.

IMPLEMENTING KINIXYS CONSERVATION GOALS

The genus *Kinixys* is experiencing an alarming rate of loss and decline across Africa. To address this threat, the 2013 workshop developed draft IUCN Red List designations, conservation action goals, and implementation plans for several *Kinixys* species. The *Kinixys* Conservation Blueprint (KCB), completed in May 2014, goes even further: it contains recommendations, goals and deliverables exclusively focusing on the genus.

The *Kinixys* Conservation Blueprint provides recommendations regarding the needs of *Kinixys* species in captivity, allowing for the successful breeding of multiple species. PHOTO CREDIT: DAVID MIFSUD

The 2013 IUCN Red List workshop in Togo elevated the conservation status for all *Kinixys* species including *K. homeana* seen here. This species was given the draft designation of Critically Endangered.
PHOTO CREDIT: DAVID MIFSUD

Workshop participants investigated local markets where several *Kinixys* species are regularly sold for bushmeat or fetish purposes. PHOTO CREDIT: DAVID MIFSUD

The KCB assesses current knowledge of *Kinixys* threats and conservation goals for this poorly studied genus. It also outlines recovery and management strategies and implementation actions. The KCB was developed by Herpetological Resource and Management (HRM), with support from the Mohamed bin Zayed Endangered Species Fund, Turtle Conservation Fund, Conservation International, and the TSA.

One mutual workshop and KCB goal is the creation of *in situ* and *ex situ* assurance colonies for *K. homeana* and *K. erosa*—a goal on its way to accomplishment. Within three months of returning from Togo, the *Kinixys* Conservation Program, in collaboration with the TSA, other institutions, and individuals, created a U.S. assurance colony of nearly 100 *K. homeana*. These animals—which include a group at the Turtle Survival Center—will serve as the founder population for a U.S. conservation breeding program. This founder group is doing well, with high survival rates, mating activity, and viable eggs production.

Efforts to increase *K. erosa* population numbers and survival in the U.S. are continuing. The first documented captive breeding of the species occurred in 2013 in three different groups. In spring 2014, two studbook keepers were assigned to manage both *K. homeana* and *K. erosa*, pooling their collective husbandry and reproductive knowledge. The *Kinixys* Conservation Program is also sharing information and building collaborative opportunities for *Kinixys* conservation with European partners.

Kinixys assurance colonies are also being created in West Africa. The first, at the African Chelonian Institute (ACI) in Dakar, Senegal was funded by TSA and HRM. Enclosures for *K. homeana*, *K. erosa*, and *K. nogueyi* have been built, and turtles recently confiscated at the Dakar airport—including *K. homeana* and *K. erosa*—will be housed at ACI. This site will serve as a model for future West Africa assurance colonies.

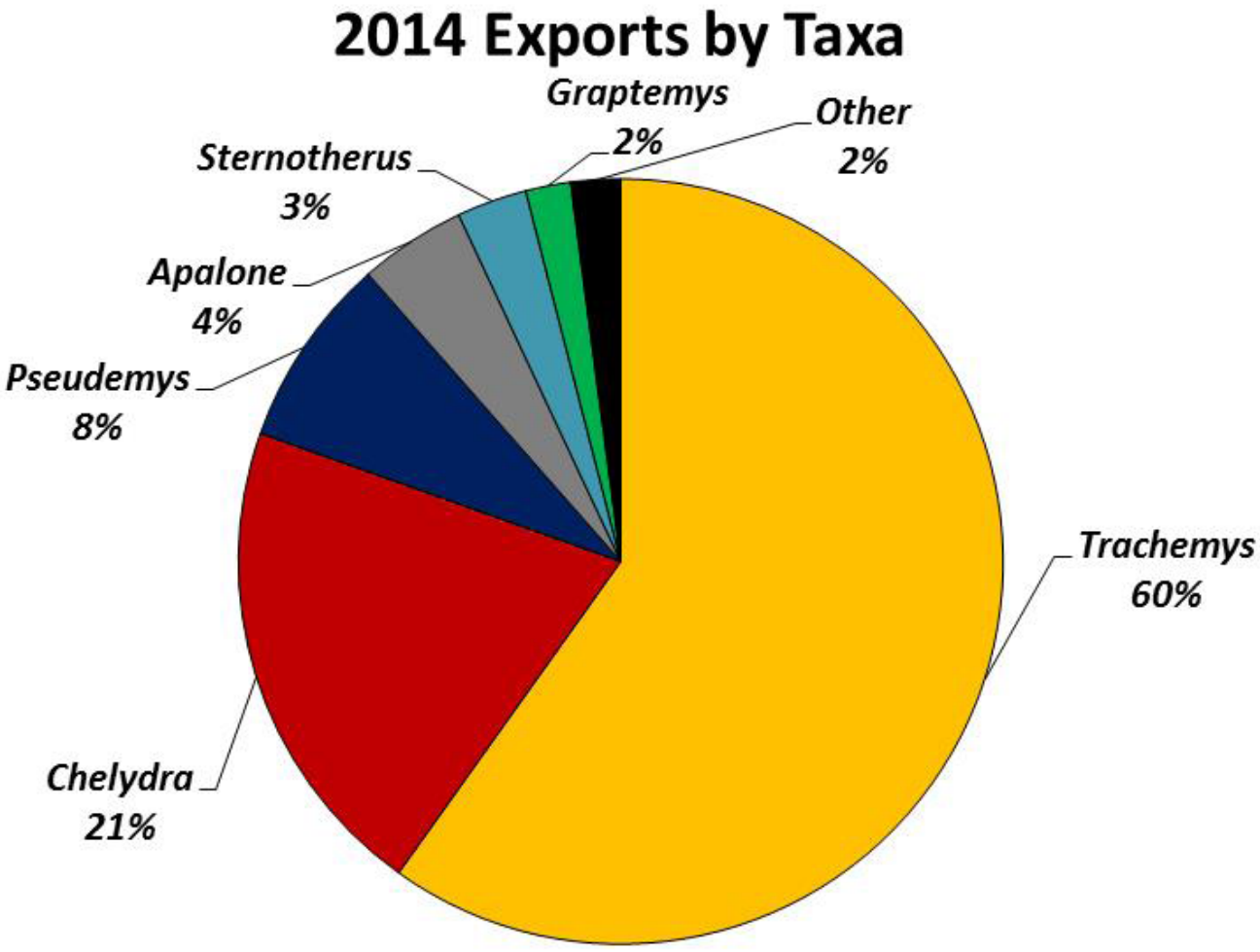
One workshop and KCB goal is a need for better savanna *Kinixys* baseline data. Work is underway to assess the number of savanna *Kinixys,* including *K. belliana*, *K. nogueyi*, *K. natalensis, K. lobatsiana*, *K.z zombensis,* and *K. z. domerguei* in U.S collections. Funding is being sought for research projects, including a southern African survey of *K. lobatsiana*, *K. natalensis*, *K. spekii*, and *K. zombensis*. The endemic Malagasy subspecies *K. zombensis domerguei* is also being studied. These projects will provide critical new data on natural history, distribution, threats, and status of these species in the quickly changing landscapes of southern Africa and Madagascar.

We are proud of the great strides made by the *Kinixys* program and invite anyone interested in helping protect and conserve these species to contact us.

Contact: David Mifsud, *Kinixys* Conservation Program Chair, davidamifsud@gmail.com

What Can Recent Export Trends Tell Us about U.S. Freshwater Turtle Exploitation?

Ivana Mali, Michael R.J. Forstner, and Peter Paul van Dijk



The high demand for turtles in Asian markets continues to result in the exploitation of a variety of wild freshwater turtle taxa in the United States. This ongoing pressure becomes particularly evident with a careful analysis of U.S. export data from recent decades.

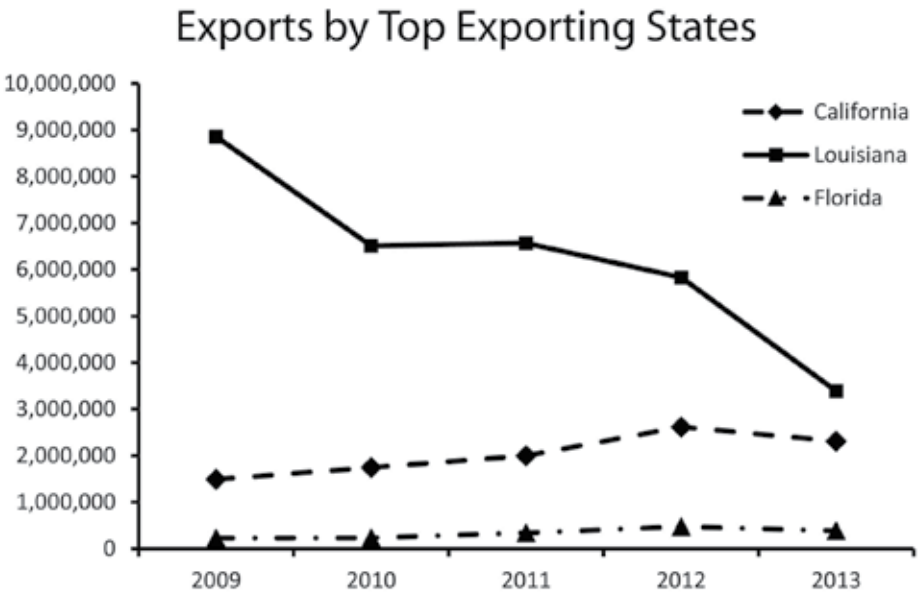
The Southeast U.S. is the most species rich and diverse region of the country and is where significant unsustainable harvest of turtles is of greatest concern. Efforts by a wide array of conservation groups have led to the implementation of more rigorous regulations on turtle harvest in several Southeast states (e.g., Alabama and Florida), but unlimited take is still allowed in others (e.g., Arkansas, Louisiana, Mississippi). Here, we evaluate the pressures of foreign markets on U.S. native freshwater species by examining the data available for export shipments as compiled by the United States Fish and Wildlife Service (USFWS).

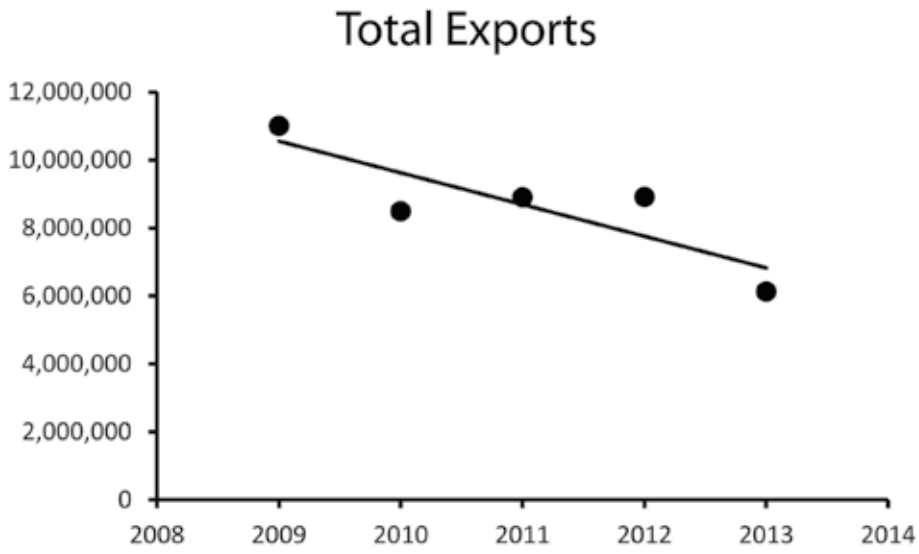
A simple assessment of this federal data shows that there has been a significant reduction in total exports following the tightening of freshwater turtle harvest regulations in some Southeast states. The USFWS export shipment

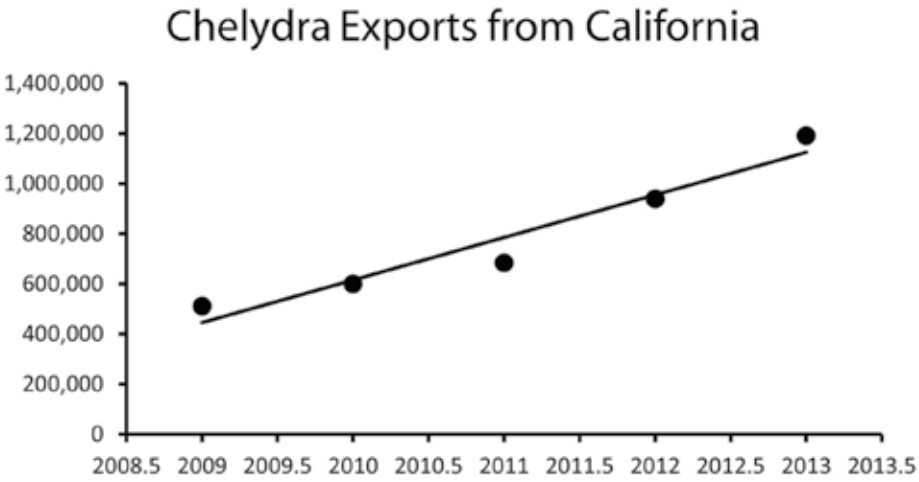
data reveals that overall commercial freshwater exports over the past five years declined by nearly two-fold, from approximately 11,012,235 individuals in 2009 to 6,133,290 individuals in 2013 (Fig. 1). In 2013, four genera accounted for 93% of all exports (Fig. 2): *Trachemys* (60%), *Chelydra* (21%), *Pseudemys* (8%), and *Apalone* (4%), while just three states: Louisiana, California, and Florida accounted for 99% of those exports. However, it is important to note that these total export statistics represent shipments of adults to foreign meat markets/turtle farms combined with hatchlings for the pet trade or other uses (such as turtle farm stocking).

Louisiana has long been a top freshwater turtle exporter, and the national decline in total exports is driven by the decline in exported turtles from this state (Fig. 3). Louisiana was the leading exporter of sliders (*Trachemys*), with over 3 million individuals exported in 2013, 87% of those shipped by only 14 turtle farms. The other 13% were exported by three corporations (Turtle Connection LLC, D&B Exotic Exports, and AC International Exports). Louisiana is known for its development of farming operations that produce hatchling turtles for the pet trade—operations that bring millions of dollars to the state economy. However, our recent interviews with the Louisiana Department of Agriculture reveal an important fact: the number of turtle farms has recently declined due to industry consolidation and competition, and as a result of decreased demand for U.S. hatchlings due to production by well-established Asian turtle farms. This observation is supported by the export data, as only 21% of exported sliders were shipped to Asia, with the majority going to Europe, Central and South America. We speculate that the drop in total exports is potentially a direct result of declining numbers of U.S. farmed captive bred individuals being exported, *not a decline in the export of wild caught turtles*.

California, a state with low freshwater turtle diversity and no known turtle farms, is a top exporter of freshwater turtles, with a steady annual volume of shipments. California has remained a top exporter of larger species valuable to the meat markets, such as snapping turtles, even though none of these species is native to the state. There was a noticeable increase of *Chelydra* exports in the past five years, with more than one million individuals shipped in 2013 (Fig. 4). The primary destinations of California exports were China (92%), Hong Kong (7%) and Taiwan (1%). Almost 90% of total exports were shipped by just four exporters. These are corporations estab-







lished in California, rather than turtle farms or individual exporters, which makes tracking the geographic origin of the exported turtles impossible using only USFWS data—a problem which should be rectified by legislation or regulations that require listing the point of origin of turtles exported from California ports. Once the origin of these animals is identified, a major effort to limit commercial harvest must be initiated, as no turtle population can survive a harvest of one million breeding sized animals/year.

We found that approximately 35,000 Alligator Snapping turtles (*Macrochelys temminckii*) were exported in 2013, with 79% coming out of California, and 21% out of Louisiana. Louisiana shipments were initiated by farmers within their state, while California shipments were exported from turtle farms located in Arkansas. While the farming of protected alligator snapping turtles is legal in the state of Arkansas, there is room for speculation about their true origin. The owner of one Arkansas facility, for example, was previously found guilty of illegal trafficking in freshwater turtles. In another incident in 2012, the owner of a Florida aquaculture facility was sentenced for illegally marking wild caught turtles as captive bred, then attempting to ship those turtles to California. Thus, even though one would expect that the development of commercial aquaculture and farming operations would decrease pressures on wild populations, there is good evidence to show that, without regulatory oversight, illegal export of wild individuals will continue.

In conclusion, it is misleading to interpret a decrease in total USFWS export numbers as an indicator of a net decrease in harvest pressures on wild populations. For a more realistic evaluation of exports, one must separate out shipments not only by taxa but also by origin. Unfortunately, while the USFWS records the source of turtles (wild, captive bred, or farmed) along with the name of the exporter, the legal definition of "captive bred" and "farmed" is vague at best, and the true point of origin of many of these turtles is unknown.

There are currently no regulations requiring a shipper to declare the origin of wild caught turtles, aside from the need to obtain state harvesting permits. However, these state permits are not linked to the export database, nor are state harvesting reports generally available.

Although some states recently implemented strict harvest regimes, large-scale wild turtle harvest continues unabated in many parts of the southeastern U.S. These animals are marketed through a complex interstate network that includes trappers, middlemen, aggregators, and dealers, which clearly emphasizes the necessity for protection of freshwater turtles across the entire U.S. Southeast region. Knowing the domestic site of origin of turtle exports, or the domestic origin point of the turtles themselves, is crucial to our understanding of the commercial trade of freshwater turtles in the United States. The lack of public information available for the full evaluation of origin and tracking of exports is at odds with the conceptual framework for wildlife management and for the sustainable use of natural resources.

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The Trade in Asia

IMAGE CREDIT: TORSTEN BLANCK

The insatiable Chinese demand for turtles reaches far beyond the United States. The Ploughshare Tortoise (*Astrochelys yniphora*) is a favorite of Chinese collectors. This critically endangered species has been reduced to fewer than 500 individuals in its home range in Madagascar, yet it is still for sale on Chinese black market websites. This photo montage contains images of all of the Ploughshare Tortoises offered for sale on a single such website in the first six months of 2014. It suggests that up to 10% of the remaining wild population has been smuggled out of Madagascar so far this year. For more information on the trade situation in Madagascar, please see the article on page 34.

Cody Martin, Brew Specialist, with a Burmese Mountain Tortoise at the Martin House brewery.

Brewing Up Something Special for Turtles

The Turtle Survival Alliance is thrilled to announce a new partnership with Martin House Brewing Company, based in Fort Worth, Texas. The Martin House name comes from both the names of its Founders and from a symbol synonymous with the company's values. The Purple Martin is a native Texan who nests in shared "houses." He is well-known for his aerial acrobatics, and Texans love watching him catch all of his food in flight. Just like the folks who make and enjoy Martin House beer, the adventurous Purple Martin enjoys fellowship and good times.

Located on the Trinity River, the folks at Martin House have a passion for the outdoors and wildlife. They are excited to be partnering with the Turtle Survival Alliance to create a limited edition craft beer that will benefit turtle conservation. Cody Martin, Martin House Founder and Brew Specialist, is currently fine-tuning the recipe for the brew, which will be an Altbier style that features blackberries. Additional details about the beer, including its name, will be announced on the TSA website this fall, prior to its release in October.

The Turtle Survival Alliance would like to thank Martin House for their generosity and hospitality thus far and are excited about the opportunity for future collaboration with our neighbors here in Fort Worth.

We Are the TSA

Heather Lowe

The foundation of the Turtle Survival Alliance (TSA) is our partnerships, including those with our individual members. With that in mind, we are pleased to announce that our membership has continued to grow in 2014. Funds generated by membership dues help to offset TSA operating costs and provide available funds for unexpected costs of conservation projects around the world. In short, your support is critical to our success.

We firmly believe that anyone can contribute to turtle conservation in some way, regardless of background or experience. These are three exceptional members who do just that. We hope that you enjoy getting to know them.

JAMES HARDING

Hometown: Okemos, Michigan

Occupation: Zoology Instructor (Herpetology) and Wildlife Specialist, Michigan State University

What first sparked your interest in turtles and tortoises?

I was five years old when I found a Painted Turtle on our driveway in our suburban Detroit neighborhood. My father let me observe it in my sandbox for a day or so, before releasing it. With that, my fascination with turtles was triggered. Soon after, I was given the *Golden Nature Guide to Reptiles and Amphibians*, and my future in reptile study was assured!

What is your most memorable encounter with a turtle in the wild?

Of all the "herps" described in my Golden Guide, the one I most wanted to see was the Wood Turtle, which my book pictured as a terrestrial woodland animal. On a family vacation when I was nine, my family and I were fishing along a river in northern Michigan and saw a turtle basking on a log. I was sure it must be a Map Turtle based on its habitat, but my brother managed to catch it in a net. I was overjoyed to discover it was a Wood Turtle— and learned that animals don't always behave the way they are pictured in the books!

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

Like many of us, I have been shocked at how quickly turtles and tortoises are disappearing from the wild, both at home and in other parts of the world. I totally support the TSA philosophy of bringing all interest groups — academic and government researchers, zoos, veterinarians, private hobbyists, etc. — together to share knowledge and implement a variety of conservation programs to help animals.

How would you describe your personal conservation philosophy?

I think that the challenges ahead for wildlife conservation will be immense; a major worldwide extinction event is very close to inevitable. Conservationists will need to employ both traditional and new, innovative methods to preserve species and biodiversity. I suspect that in just a few decades, wildlife conservation will be in full triage mode, and methods considered controversial now may well become the last hope for many species.

Have you ever tried to educate others about turtles and turtle conservation?

Without public support, conservation programs will almost certainly fail. So, education is critical. I started my career thinking I would do mostly research in conservation biology, specializing in herpetology. But I gradually came to put more and more of my time and effort into public education and outreach. I believe that my efforts, and those of many talented colleagues, have made a difference in changing perceptions about these animals, at least locally, but there is still much work to be done.

ROXANE LOSEY

Hometown: Tehachapi, California

Occupation: Large Mammal Keeper, Disney's Animal Kingdom

What first sparked your interest in turtles and tortoises?

I went on my first North American Freshwater Turtle Research Group (NAFTRG) survey in October 2011, not really knowing anything about turtles. The group was incredibly welcoming and thanks to my time spent with them, I have learned so much about turtles. While I have always considered myself a dyed-in-the-wool "mammal girl," I really appreciate the turtle species that we encounter during these trips.

What is your most memorable encounter with a turtle in the wild?

It was late in the day on my first NAFTRG trip; I had only captured four turtles and was feeling defeated (and cold!). I was leaving the water when I saw a large snapping turtle resting on a rock at the bottom. It was resting directly

in a sunbeam, as if it had been placed there just for me. Having no turtle experience, I popped my head out of the water to look for help. No one was nearby, so I just mustered up my courage and went for it. I think I was actually sweating in 73°F water! It turned out to be the largest female captured at Blue Springs (Florida) and the rest of the team were pretty impressed with my willingness to grab a snapping turtle.

How did you first learn about the TSA?

I first learned about the TSA through Lonnie McCaskill (TSA Board). He is my zoological manager at Disney's Animal Kingdom and a good friend. I am so happy that he put me in contact with the NAFTRG and made me aware of the incredible work that TSA is doing globally.

How would you describe your personal conservation philosophy?

Everyone can and MUST do something, even if it is a small thing, to protect the animals around us. Many of our greatest conservation efforts started with a simple idea.

Have you ever tried to educate others about turtles and turtle conservation?

I was pleased to present a booth at Disney's Animal Kingdom's World Turtle Day celebration in May. I distributed Florida turtle posters and gave kids the opportunity to "process" a stuffed turtle in the same way that the NAFTRG biologists do during their population studies. They were able to weigh it, measure it, and even read the PIT tag that we had implanted.

PETER S. MILLER

Hometown: Seattle, Washington

Occupation: Zookeeper, Woodland Park Zoo; Herpetology Collection Manager, Burke Museum, University of Washington

Do you keep turtles at your home?

"Myrtle" the Eastern (US) box turtle came to us from a dumpster where someone had thrown her away. "Bert" the semi-paraplegic red-legged tortoise was due to be euthanized when my wife and I adopted him. He is now thriving and walking!

What is your most memorable encounter with a turtle in the wild?

Finding an Eastern Wood Turtle that we were tracking via radio-telemetry; it had climbed and was perched on top of a seven-foot chain link fence. Another memorable experience was seeing my first Western Pond Turtle laying eggs in the wild.

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

I enjoy seeing how absolutely amazing people from all over the world are really doing something meaningful and genuine to save animals.

How did you first learn about the TSA?

I 'blame' Kate and Frank Slavens (TSA Board), two of the most accomplished field naturalists and insightful turtle behaviorists I have had the honor of meeting.

How would you describe your personal conservation philosophy?

Can you imagine how mindboggling it is to learn that turtle mothers call their offspring after they hatch to come and swim with them to a faraway place that they will call home? How can we not do everything we can to make that possible?

Gregory Duplant unpacks Radiated Tortoises that were selected to join a pilot reintroduction program in the community of Ampotaka. Brought over from the Village des Tortues on the west coast, these tortoises will live in pre-release enclosures in natural habitat, and then "soft released" after an acclimation period. PHOTO CREDIT: GREGORY DUPLANT

Tina Soanomena weighs one of the tortoises in the pre-release enclosures at Tranovaho. One of the primary goals of TSA's reintroduction program is to involve local communities in monitoring populations both pre- and post-release. PHOTO CREDIT: GREGORY DUPLANT

Mobilizing TSA's *Confiscation to Reintroduction Strategy* for Radiated Tortoises

Herilala Randriamahazo, Andrea Currylow, Rick Hudson and Christina Castellano

The TSA, in partnership with Utah's Hogle Zoo, has launched a *Confiscation to Reintroduction Strategy* meant to save Madagascar's iconic Radiated Tortoise (*Astrochelys radiata*). This multi-faceted initiative includes a media campaign to put attention on the plight of *A. radiata*; development of cooperative agreements with communities interested in conserving the animals; reduction of poaching and an increase in confiscations; establishment of triage centers to rehabilitate rescued animals; development of reintroduction strategies and sites; and creation of a regional tortoise center to maintain the initiative in southern Madagascar into the future.

We're happy to report that many elements in this plan are fast becoming a reality, which is good news for *A. radiata*. We provide the exciting details here.

MEDIA CAMPAIGN AND COMMUNITY OUTREACH A RESOUNDING SUCCESS

In 2011, the TSA and its partners launched a comprehensive awareness campaign to focus attention on the worsening crisis facing Madagascar's Radiated Tortoise. Poaching levels at that time were at an all-time high, with adults harvested as a source of meat by tribes in Madagascar's south, and thousands of juveniles collected for illegal shipment to international pet markets, primarily in Asia.

The media campaign, directed at local and international audiences, proved successful, and the resulting recruitment of local communities to help combat tortoise poaching is very encouraging. As awareness has grown in the rural South, several key communities have signed agreements, known as DINA, committing them to guarding against poachers. The best example is the village of Antsakoamasy. It is strategically located on the eastern edge of the Special Reserve at Cap St. Marie, a locale that arguably boasts the most important Radiated Tortoise population in Madagascar. The TSA joined forces with the village and built a primary school for the community as a reward for its guarding tortoises against poachers. The school opening was a celebrated event and touted by local politicians and officials as a model example of the benefits associated with tortoise protection. Today Antsakoamasy is a beacon in the region, demonstrating that a village's willingness to protect tortoises yields tangible community benefits.

This new spirit of community conservation and cooperation has resulted in an increasing number of Radiated Tortoise confiscations, both in the south and at the airport in the capital city of Antananarivo. Though tortoise poaching is still rampant, as evidenced by the large number of seizures TSA is asked to handle, there are signs that the tide may be turning slightly.

The increase in tortoise seizures was not

Some of the 968 Radiated Tortoises seized in the Comoros Islands in June 2014, representing one of the largest tortoise confiscations on record for Madagascar. PHOTO CREDIT: ANDREA CURRYLOW

Andrea Currylow (left) and Soary Randrianjafizanaka collect data on a Radiated Tortoise near the Tranovaho reintroduction site. PHOTO CREDIT: ANDREA CURRYLOW

unanticipated, and the TSA prepared for the flood of "tortoise refugees" by conducting two husbandry workshops in 2012 designed to build capacity among those who handle tortoises after confiscation.

TRIAGE CENTERS ESTABLISHED

A major outcome of the husbandry workshops was the realization of the urgent need for triage or rescue centers to process and care for tortoises after confiscation to reduce mortality rates among seized animals. Five strategically located tortoise rescue centers were planned, and to date, three have been built in Ampanihy, Ambovombe and Betioky. They were built under the able supervision of Gregory Duplant, a former TSA employee who managed the southern tortoise conservation program. The other two centers have been funded by Utah's Hogle Zoo and will be built soon in Behoha and Tsiombe.

Since becoming operational in August 2013, the centers have received a total of 50 Radiated Tortoises. Keepers have been trained to provide proper captive environments for the tortoises, and the facilities are now well planted to offer both shade and forage. Eventually the confiscated adult tortoises will be released in the wild in adherence with TSA reintroduction guidelines that are currently being established. Confiscated juvenile tortoises will not be released until they reach a suitable size to resist predator attacks.

We confidently expected that the opening of triage centers would result in more confiscations, and increased compliance with tortoise protection laws, especially now that forestry agents and customs agents have nearby facilities where they can easily place animals. We were not disappointed in those expectations!

TORTOISE SEIZURES RISING DRAMATICALLY

Over the first six months of 2014, the number of confiscated tortoises topped 1,667 individuals, stretching thin TSA's available resources of captive space and caretakers. This figure nearly equals the total volume of 1,784 tortoises handled by the TSA in Antananarivo over the past three years!

To recap, on 4 March, customs agents at Ivato International Airport arrested a young Russian lady attempting to smuggle 60 Radiated Tortoises (among other Malagasy reptiles) using South African Airlines to Johannesburg. A week later, the same authorities stopped a Malagasy man with 93 Radiated Tortoises, 19 Ploughshare Tortoises, and 15 Spider Tortoises in his luggage. He planned to take a Kenya Airways flight to Nairobi, with Bangkok as final destination. On 10 May, two suitcases full of 512 Radiated Tortoises and 9 Ploughshares were seized at the airport. The male Egyptian passenger escaped when the airport information desk announced his name. Finally, in the largest seizure on record, 968 tortoises were confiscated in Union des Comores in May and returned to Madagascar in June.

With over 1,500 tortoises in captivity and requiring care, the TSA facility in Antananarivo is now beyond its capacity to effectively manage all the animals with its limited space.

DEVELOPING A REINTRODUCTION STRATEGY

The record number of tortoise confiscations, and resultant overwhelming of our present capacity to handle them, drove home the vital need to put a reintroduction program into action. That's why TSA set a primary goal this year of establishing two reintroduction and monitoring sites for Radiated Tortoises.

The record number of confiscations raised the

Thiholore, Jean Kely, and Pierre have been trained to monitor tortoise populations and are closely involved with the tortoise reintroduction program adjacent to the sacred forest near their village of Ampotaka. PHOTO CREDIT: GREGORY DUPLANT

question of how best to handle the influx of juvenile tortoises. While we want to repatriate the animals to their native range, reintroduction areas must be selected with caution. A hasty repatriation to the wrong area could quickly lead to the tortoises' recollection by poachers, and might increase stress on tortoises already traumatized by the trade.

Two reintroduction sites were carefully selected near the villages of Ampotaka and Tranovaho, based on community interest and dedication to conservation. Local community involvement is key to the long-term success of reintroduction, and it is crucial that villagers play an active role. The selected villages have implemented a traditional local law (DINA) under which they pledge to monitor their forest resources and establish a communication network to report suspected poachers. Several community members have stepped forward and volunteered to learn how to monitor and care for pre-release tortoises.

The TSA has developed slightly differing "soft-release" strategies in the two villages and is supporting two PhD students—Andrea Currylow from the U.S. and Soary Randrianjafizanaka from Madagascar—to investigate the best approach. In a soft-release, tortoises are held in enclosures at the release site for an acclimation period before their actual repatriation.

We are investigating holding time duration (six months vs. one year) to determine if time spent in the pre-release enclosures affects their site fidelity—the animals' inclination to remain in the vicinity after release. We know from past experience that "hard-released" tortoises often move far away from the release site, which runs contrary to our goal of keeping the animals within a community-protected area that is safer from poachers. The soft-release holding period also allows researchers to monitor the tortoises' health and their transition from captivity to the wild.

With the recent surge of confiscations, and hundreds of animals already being held and cared for, we initiated the reintroduction project as early as possible in 2013. In mid-January—near the beginning of the active season for Radiated Tortoises—we transferred nearly 100 juvenile and adult radiated tortoises to the two release sites. Many community members assisted in the transfer, constructing and readying the temporary enclosures, moving the heavy animals into the forest, and monitoring them over subsequent months.

This project is breaking new ground, and we knew unexpected challenges might arise. At one site, an unknown predator ate some of the juvenile tortoises. Not knowing the perpetrator's identity (dog, fossa, rat?) it was hard to decide on a proper mitigation strategy. Undeterred, the community acted, planting dense vegetation inside the enclosures to naturally exclude the predator and better conceal the animals, while our team sought funding for camera traps and fencing. We expect to solve this problem soon, thanks to a Disney Rapid Response Fund grant.

Generous equipment donations from Holohil Systems Ltd., Andrew Walde, and IdeaWILD, are now allowing us to expand the pre-release studies at the two repatriation sites to include radio telemetry and thermoregulatory monitoring of the resident tortoises—this includes southern Spider Tortoises at Tranovaho.

The tracking program will compare control groups of repatriated tortoises, contributing to our baseline knowledge of the species in the wild, and telling us if released tortoises are exhibiting normal behavior similar to their wild counterparts. Relying on the rigors of scientific inquiry and the passions of turtle conservation supporters, we hope to develop an effective reintroduction strategy that will inform and guide future reintroductions of Madagascar's tortoises.

LOOKING AHEAD

TSA's comprehensive *Confiscation to Reintroduction Strategy,* implemented in partnership with Utah's Hogle Zoo, is seeing much success. However, the current practice of sending all tortoises confiscated in Antananarivo to Ifaty is unsustainable, resulting in over-crowding that places a burden on limited resources. What is needed now is a new long-term regional tortoise conservation center where animals can be held while plans are made to repatriate them to the wild.

This large regional tortoise center will be built in southern Madagascar, strategically located in the heart of the Radiated Tortoise's range, accessible to our core projects, and near rescue centers and where confiscations occur. With services modeled on the Village des Tortues in Ifaty, this new center is tentatively planned for Anosiala, near the commune of Marovato, not far from Antsakoamasy.

We envision a center capable of providing veterinary and supportive care for tortoises, plus a training center for workshops, as well as living quarters for staff and visiting scientists. The goal is to create a multipurpose tortoise conservation center that serves the needs of tortoises and biologists as well as neighboring communities. Community negotiations, final site selection and design get underway late in 2014 and our hope is to make the new Center a reality in 2015.

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A particularly colorful hatchling Radiated Tortoise found near Tranovaho. PHOTO CREDIT: GREGORY DUPLANT

Above: In the Comoros shipment, the tortoises were taped so as to immobilize their legs, to keep them from moving and making noise in transit.
PHOTO CREDIT: HERILALA RANDRIAMAHAZO

Left: An old adult Radiated Tortoise near Lavavolo, sporting shell notches and a radio-transmitter, courtesy of our partners at Holohil Systems.
PHOTO CREDIT: ANDREA CURRYLOW

Fishermen help catch adult individuals (two male *B. baska*) to equip them with transponders. PHOTO CREDIT: RUPALI GHOSH

Bringing the Northern River Terrapin Back from the Brink

Doris Preininger, Rupali Ghosh, Peter Praschag and Anton Weissenbacher

It was another fruitful year for Project *Batagur baska*, an international partnership to conserve the Northern, or Sundarbans, River Terrapin (*Batagur baska*) organized by the Bangladesh Forest Department, IUCN Bangladesh, the TSA and Vienna Zoo.

The project got underway in 2010 when five individuals from this critically endangered species were discovered and collected from small fish ponds in local Bangladesh communities where the animals had been kept as talismans. Over the next two years, more specimens were collected and a breeding group established. Today we house 20 adult *B. baska* in Bhawal National Park at a two-pond facility provided by the Bangladesh Forest Department. During the 2012 - 2013 breeding season 84 juveniles hatched there.

The 2013 - 2014 breeding season began well, with six females and four males occupying the smaller breeding pond, while 14 males shared the bigger pond with two gharials. By mid-April 2014, all six females had nested. Clutches were transferred to the hatchery and covered by metal mesh to protect them from predation. The six females produced 123 eggs. A total of 48 hatchlings emerged, a 39 percent hatching success rate.

Causes for this year's low rate of success are open to speculation. While we had one infertile clutch in past seasons, this year at least one hatchling popped out of each of the six nests, a rather remarkable result considering the advanced age of at least two of the females. Only two nests showed good hatching rates. Most embryos in the other four clutches died in different stages of development. Data shows that lethal temperatures were not an issue, though lack of oxygen or bacterial infection of the eggs may have been factors.

Female #6 in the Bhawal National Park facility, rescued in September 2013, with keeper Nurul. PHOTO CREDIT: RUPALI GHOSH

Pond reconstruction. Partitioning of the big pond into seven parts, five parts for individuals pairing and two larger side parts for adult and juvenile *Batagur baska*. PHOTO CREDIT: A. G. J MORSHED

PEDIGREE BREEDING AT BHAWAL

To avoid a future genetic bottleneck, we continue the vital work of nurturing genetic diversity in our population of *B. baska*. We have begun defining breeding lines to establish a studbook based on genetic data of all specimens. To that end, all adults and juveniles were equipped with transponders for individual recognition at the start of this breeding season, and Peter Praschag and Shannon DiRuzzo took tissue and blood samples for genetic analysis. The team of Prof. Uwe Fritz has begun microsatellite analyses for parental studies and the establishment of a studbook. To assure continued genetic diversity, we are partitioning the breeding ponds and adjacent beaches to isolate pairs of unrelated, or least related individuals—work generously funded by SOS (Save Our Species). Political unrest in Bangladesh made travel impossible for part of the year and delayed pond partitioning, but a contractor was finally hired. Workers have now installed wooden pole fence dividers in Bhawal's large pond, and enclosed another portion with a brick wall to separate *B. baska* from Burmese brown Tortoises (*Manouria emys phayrei*) kept at Bhawal.

THE SEARCH FOR WILD POPULATIONS

We continue seeking Northern River Terrapin in the wild. Rupali Gosh, during visits to Bangladesh's South searching for nesting sites and to develop relationships with fishermen, rescued an individual (female #6 of the current breeding group) in September 2013. During a market visit she also discovered a 54 cm *B. baska* carapace from an animal slaughtered three years ago. This trip yielded yet another discovery: the third wild-caught hatchling of 2013. She was also told of a *B. baska* hatchling that escaped from a fisherman's house prior to her arrival. These developments provide conclusive evidence of a wild reproducing population.

In surveys of nearly all the South's rivers, no further individuals or nesting places have been discovered. However, conversations with villagers reveal that most fishermen and crab catchers are aware of wild hatchlings, and that village children often play games with the juveniles, which mostly end in death for the turtles. Rupali Gosh has negotiated agreements to be informed in the next monsoon when juveniles arrive. She also learned that deep sea fishermen returning from the ocean travel upstream by mid March (during the full moon) and stay there until September, leaving downstream beaches empty, thereby providing possible interference-free nesting areas for *B. baska*.

ESTABLISHING A SECOND BREEDING FACILITY

Immediate plans call for splitting the Bhawal breeding group to start a second captive facility in the South—an initiative funded by the Deutsche Gesellschaft für Herpetologie und Terrarienkunde, the Zoological Society for the Conservation of Species and Populations, and the European Union of Aquarium Curators. The new breeding facility will be located within the natural habitat of the Northern River Terrapin at the Karamjal Forest Station run by the Bangladesh Forest Department in the Sundarbans. Breeding pond and nesting beach construction will start this year and we have ambitious plans to transfer half our Bhawal stock to Karamjal in time for the 2015 breeding season.

All of this good work offers reason for optimism toward the future of the rare *B. baska*

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A juvenile Black Softshell Turtle (*Nilssonia nigricans*) at the Nagshankar Temple. PHOTO CREDIT: SHAILENDRA SINGH

A Year of Steady Progress for Turtles and TSA India

Shailendra Singh, Shashwat Sirsi and Lonnie McCaskill

Twelve out of 28 species of tortoises and freshwater turtles—nearly half of those found in India—are either Endangered or Critically Endangered according to the IUCN Red List. However, TSA India, in association with the Madras Crocodile Bank Trust and other partners, is making considerable progress in implementing a long-term conservation strategy for imperilled chelonians across five regional zones known as Turtle Priority Areas. Success stories from TSA India's last field season are presented here:

RED-CROWNED ROOFED TURTLE (*BATAGUR KACHUGA*) CONSERVATION INITIATIVE

Less than 250 female Red-crowned Roofed Turtles are thought to survive in the Chambal River. TSA India has responded to the crisis with vigor. This year, nearly 800 nests (16,000 eggs) were protected at three riverside hatcheries in our on-going nest protection project in the National Chambal Sanctuary (NCS). Hatching is complete at the hatcheries, with an average emergence rate of 90 percent. Hatchlings were tagged with Decimal Coded Wire (DCW) or plastic cable ties prior to release. A hundred hatchlings were moved from riverside hatcheries to the Deori Eco Centre and Garhaita Turtle Centre to increase headstarting stock. Additionally, 191 *B. kachuga* and 63 *B. dhongoka* juveniles that were headstarted at the Garhaita Turtle Center were "soft released" in the Chambal River.

A sonic telemetry project was initiated at NCS this year to test headstarting effectiveness. Ten sub-adult *B. kachuga* were tagged with ultrasonic transmitters and soft released at a suitable site on the middle Chambal River. Initial monitoring showed that nearly the entire headstart group remained within five kilometers of the release site. However, recent observations showed individual variation in dispersal with some (n=3) choosing to remain near the release site and others (n=2) moving more than 100 kilometers downstream. A survival rate of 60 percent among the tracked animals seems to indicate that headstarting could be a useful *Batagur* conservation tool.

Illegal fishing patrols removed 25 monofilament nets in the area. During one such patrol, we rescued more than 15 adult *Batagur* turtles snagged in clandestine fishing gear on the middle and lower Chambal. This underscores the importance of these patrols in decreasing mortality. Observations on the number of nets detected, in conjunction with telemetry data, will also help us develop a better patrol plan for frontline forestry staff.

We constructed a modest incubation and rearing facility for endangered *Batagur* on the Upper Ganga at the Narora Atomic Power Station. In a pilot project, 25 *B. dhongoka* eggs were incubated at this facility resulting in the emergence of 24 hatchlings, setting the stage for an expanded recovery effort in this historic habitat.

NORTHERN RIVER TERRAPIN (*BATAGUR BASKA*) CONSERVATION INITIATIVE

TSA India has been collaborating with the West Bengal Forest Department in the Sundarban Tiger Reserve to save *B. baska* from extinction. Before the region was declared a world heritage site for tigers, intensive exploitation of *B. baska* adults and eggs, as well as commercial fishing bycatch, had nearly wiped out the population. Their numbers are now so few that acquiring remnant wild individuals for captive propagation and reintroduction seems to be the only recourse. Our efforts are focused on a captive population in Sajnekhali at the Tiger Reserve Headquarters.

This year, we helped build a separate enclosure for adult females ahead of the nesting season. This facility consists of a large pool and nesting beaches that are fenced to exclude predators. We also replicated previous successes, seeing the emergence of 55 hatchlings in late May. The 154 individuals at Sajnekhali represent the largest *B. baska* colony in the world.

Rapid growth rates necessitated the enlargement of an existing TSA facility, enabling it to house the 89 juveniles produced between 2012 and 2013. This, coupled with the expected continued expansion of this captive group, led us to the next logical step—reintroduction. An evaluative pilot release is planned for late 2014,

TSA India staff release female Northern River Terrapins (*Batagur baska*) into their new enclosure at the Sajnekhali Tiger Reserve, home of one of two major assurance colonies for this species in Asia. PHOTO CREDIT: SOUMITRA DASGUPTA

during which ten *B. baska* will be soft released and monitored via acoustic telemetry.

A survey was conducted of a portion of the Tiger Reserve that includes historic *Batagur* habitat where nesting was documented nearly 20 years ago. The survey was carried out during nesting season so we could check for remnant females. Three suitable nesting beaches were identified on the basis of sea turtle nest evidence. Habitat assessments included observations on depth, salinity and tidal creeks. A suitable release site has been identified that consists of a feeding corridor of low salinity and considerable depth. The proximity of the site to a forest outpost will provide for easy post-release monitoring and patrolling.

INDIAN NARROW-HEADED SOFTSHELL TURTLE (*CHITRA INDICA*) INITIATIVE

Chitra indica is one of India's most recognizable turtles and is at the core of our conservation efforts. We initiated a captive program for the species at the Kukrail Gharial and Turtle Centre in 2012, and 18 individuals are being raised there, each weighing over 200 grams. We sustained our nest protection program for the species along the Chambal-Yamuna River confluence, incubating nests in a riverside hatchery and at our Garhaita Centre along the lower Chambal. This effort protected more than 1,000 eggs. Most of the emerged hatchlings were released near natal sites. However, about 40 hatchlings were retained in a temporary enclosure near the hatchery site on the Yamuna River and head-started in a semi-natural environment through the winter. The experiment was a moderate success with a 60 percent survival rate. Twenty of the surviving individuals were transported to the Kukrail Gharial and Turtle Rehabilitation Centre to bolster headstarting efforts there.

This year we plan to expand our *Chitra* conservation work to the Ghaghra-Sarju River system in Tarai, the Turtle Sanctuary in Varanasi, and Son Gharial Sanctuary in Madhya Pradesh.

CROWNED RIVER TURTLE (*HARDELLA THURJII*) CONSERVATION INITIATIVE

The rivers and wetlands of the Tarai Arc Landscape (TAL) form a rich and diverse ecosystem supporting 14-15 turtle species in the Himalayan Foothills. A focal species in the region is the Crowned River Turtle (*Hardella thurjii*). Large scale fishing in this unprotected landscape is assumed to have caused considerable declines. Clandestine trapping for meat along with incidental drowning is a steady drain on the adult population.

This season we began a mark-recapture exercise to ascertain the size of the *Hardella* population on the Sarju River, and resumed an examination of turtle by-catch to document the demographic most affected by ongoing fishing.

Meet the TSA India Staff:

Saurav Gawan joined TSA-India in 2013 as Project Officer of the North Central Turtle Priority Area. Saurav's GIS expertise will aid us in species conservation and management in the region. He also intends to help expand our participatory initiatives. He has a passion for the ecology of scantly known taxa such as turtles. He aspires to reconcile the need for conservation of threatened species and the needs of local communities, believing that unless there is participation by local people there can be no lasting conservation.

PHOTO CREDIT: ASHUTOSH TRIPATHI

Disha Sharma joined TSA India as staff veterinarian this year and is based at the Kukrail Gharial and Turtle Centre. Disha graduated from Bombay Veterinary College, Mumbai, in 2007 with a Bachelor of Veterinary Sciences and Animal Husbandry. She first worked as a small animal practitioner in Mumbai, then shifted to wildlife medicine and conservation. In 2012, she graduated with a Master of Sciences in Wild Animal Health from the Royal Veterinary College, University of London. Disha further honed her conservation skills as an intern with the Durrell Wildlife Conservation Trust in Jersey, U.K.

PHOTO CREDIT: CHAITRA BALIGA

A handful of recently hatched Northern River Terrapins (*Batagur baska*) at the Sajnekhali Tiger Reserve. PHOTO CREDIT: SHAILENDRA SINGH

Children listen intently to a presentation during the Kukrail Guided Nature Tour. PHOTO CREDIT: ARUNIMA SINGH

We sampled three sites and encountered 45 animals before the onset of the monsoon. Shell fragments and drowned specimens accounted for another 33 animals. This study sets the stage by obtaining baseline data for future research and for comparing turtle communities between sites.

Simultaneously, we began testing turtle-friendly fishing gear provided by the Emerging Wildlife Conservation Leaders (EWCL) program. These nets have inexpensive modifications that allow for the capture of fish but exclude or provide escape routes to turtles. Four basic designs—an exclusion device, two escape devices, and an air pocket design—were tested at two sites on the Ghaghra and Sarju rivers. If preliminary test results are promising, local fishermen will be encouraged to use the alternate nets through an incentive program.

This year saw a breakthrough in our efforts to coordinate handling of confiscated turtles with state wildlife authorities. We recently acquired 155 Spotted Pond Turtles (*Geoclemys hamiltonii*) that were destined for the exotic pet market. These confiscated *G. hamiltonii* will be released at an appropriate site just before the onset of the monsoon. In a worrying trend for the species, another 900 individuals were confiscated in West Bengal; TSA is currently ensuring proper handling and triage of this group. To strengthen our presence in the region, and to reduce commuting times, we established a West Bengal field research station.

BLACK SOFTSHELL TURTLE (*NILSSONIA NIGRICANS*) CONSERVATION INITIATIVE

This critically endangered species is endemic to North-eastern India and Bangladesh and was long thought to exist in only one temple pond in Bangladesh. Fortunately, the species has been confirmed at a few spots in the Brahmaputra River drainage in the state of Assam and in some of the region's temple ponds.

The species continues to be hunted extensively for its meat and cartilage, and numbers in the wild remain dangerously low. Temple ponds that house *N. nigricans* are eutrophic and overcrowded, and the turtles are fed human food as religious offerings. The animals often show signs of poor nutrition, skin disease, infighting, and cannibalism. A lack of suitable nesting space results in females depositing eggs in areas where they have little chance of hatching and are often predated.

Since 2013, TSA India has worked diligently to improve conditions at selected temple ponds in Assam. The project goal is to eventually rear and release juveniles from these captive colonies to supplement depleted wild populations. As part of that initative, the TSA India team camped at the Nagshankar temple in April to observe nesting events and translocate nests. The Nagshankar temple pond houses an estimated 40-45 adult females. We transferred ten nests (158 eggs) to our hatchery and protected four nests (55 eggs) onsite.

We are currently expanding our headstarting capacity at Nagshankar temple to accommodate this year's hatchlings. This will enable us to hold 100 juveniles for the next six months, in addition to 15 juveniles from last year. Neonates and juveniles cannot be released back into the temple pond due to predation by larger turtles and exotic fish. For this reason, we acquired an earthen pond in the nearest village to provide space for the fast-growing juveniles, hopefully improving survival prospects within the cohort. Further,

we renovated a defunct temple kitchen, turning it into an educational kiosk.

We also inventoried turtles at the Assam Zoo and Botanic Garden in Guwahati, where we found, examined, marked, and photographed three adult *N. nigricans*. During this inventory other aggressive softshell turtles, such as *N. gangetica*, were removed from the pond to reduce competition. We are now collaborating with authorities to expand captive breeding possibilities for this species. A field station was established near Kaziranga National Park, famous for its rhino population.

KUKRAIL GHARIAL AND TURTLE CENTRE

The Kukrail Gharial Rehabilitation Centre (KGRC) was established in 1978 under the patronage of the Uttar Pradesh Forest Department primarily to recover declining populations of the Gharial (*Gavialis gangeticus*). We've partnered for nearly two years with KGRC to establish and maintain an "Indian Chelonian Ark." A significant step forward was taken in November with the creation of the Laboratory for Aquatic Biology (LAB), a facility housed in an unused, now renovated KGRC building. The LAB functions as a base for our veterinary and *ex situ* research team and is the first facility of its kind in North India. We are also renovating an unused enclosure, turning it into an isolation pool for confiscated turtles. Other unused KGRC facilities will be renovated as funds permit.

Shashwat Sirsi uses radio telemetry to track Red-crowned Roofed Turtles (*Batagur kachuga*) along the Chambal River. PHOTO CREDIT: SAURAV GAWAN

COMMUNITY OUTREACH

This year was an unprecedented year for community outreach in India. The team launched the Kukrail Guided Nature Tour (KGNT), offering urban dwellers a fun experience and educating them on freshwater diversity and turtle conservation. Twelve tours with 250 participants have been conducted so far, and the tours are fast gaining popularity.

We also launched zoo volunteer programs at the Lucknow and Kanpur Zoos. Volunteer groups are initiated every six months and trained to educate visitors and assist keepers with animal management. This innovative effort has been hailed as a way to enhance zoo transparency by increasing public participation and fostering environmental stewardship among today's youth. We also conducted a Turtle Safari in association with Turtle Limited on World Turtle Day.

TSA India has also continued its successful school education program, targeting 100 schools in the Chambal and Tarai region. We conducted two Teacher Training Programs, various talks

Winners in a contest conducted by Turtle Limited, in conjunction with World Turtle Day, participate in the release of *Batagur* hatchlings. PHOTO CREDIT: SAURAV GAWAN

TSA Staff test turtle-friendly fishing gear provided by the Emerging Wildlife Conservation Leaders (EWCL) program in the Tarai Region. PHOTO CREDIT: BHASKER DIXIT

and demonstrations, wildlife painting and quiz competitions, community awareness meetings, stakeholder workshops, and poachers and fishermen conversion workshops. We also held seven workshops for frontline forestry staff. Overall, we conducted 77 outreach events, positively impacting more than 10,000 people. Education materials and graphics were produced to support these programs.

Our networking efforts expanded this year too. We initiated two crocodile projects in Tarai and Sunderbans in collaboration with the State Forest Departments of Uttar Pradesh and West Bengal respectively. We signed Memorandums of Understanding with the National Atomic Power Corporation of India Limited, the Centre for Environment Education, and the Wildlife Trust of India to support conservation projects. During National Wildlife Week in October, the government of Uttar Pradesh formally recognized TSA India as a preeminent conservation organization in the region.

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Long-awaited Male River Terrapin Finally Makes Debut

Nikhil Whitaker

In the late 1980s, the Madras Crocodile Bank Trust (MCBT) received two female Northern River Terrapins (*Batagur baska*) from markets in West Bengal. Staff sought a male B. baska for decades, but were thwarted by lack of information on captive animals, and a sharp decline in wild populations. Finally in 2013, a male became available through the Vienna Zoo—a dream come true! The male arrived in India on the morning of 17 April 2014. It was quarantined for one month, and then introduced to our two long-term captive females. All three animals are thriving, eating greens, banyan fruit, filleted fish, and flowers that fall into the water of their enclosure. Staff hopes to see courtship starting in October. TSA India thanks the Vienna Zoo and Peter Praschag for facilitating this transfer.

One of the female terrapins tests the waters in the new enclosure she shares with the male from the Vienna Zoo.

Andrew Walde (right, TSA Board) teaching Kalyar Platt (TSA Myanmar) how to tattoo onto the shell of a Burmese Star Tortoise. All tortoises scheduled for release are tattooed with a local symbol "Sadapawa" which reminds locals that harming these tortoises can bring harm to them from powerful Nat spirits that protect the forest. PHOTO CREDIT: ANGELA WALDE

TSA/WCS Team Strives to Save Myanmar's Critically Endangered Turtles

Steven G. Platt, Kalyar Platt, Me Me Soe, Win Ko Ko, Khin Myo Myo, Tint Lwin, and Kyaw Moe

The past year saw significant progress on all fronts as the Turtle Survival Alliance/Wildlife Conservation Society (TSA/WCS) Team scored more victories in the on-going fight to save critically endangered turtles in Myanmar.

STAR TORTOISES REINTRODUCED

Our most notable success was the reintroduction of captive-bred Burmese Star Tortoises (*Geochelone platynota*) into a central Myanmar wildlife sanctuary. Endemic to the dry zone, a desert-like area of the country, these tortoises are likely extinct in the wild largely due to over-harvesting for the international pet trade. Fortunately, Star Tortoises reproduce readily in captivity and assurance colonies founded with just a handful of individuals now produce hundreds of offspring annually.

The ultimate goal of *in situ* breeding programs is to reestablish viable wild populations. With that in mind, we identified several protected areas in 2011 as potential release sites for captive-bred Star Tortoises. We selected one wildlife sanctuary in the heart of the dry zone which routinely sees temperatures above 40°C (104°F) and no rain nearly half the year. Despite these harsh conditions, Star Tortoises inhabited this sanctuary as recently as 2003, when commercial poachers decimated them. Although a poaching threat remains, nearby villagers believe the tortoises are protected by divine supernatural beings known as *Nats*, and that harming a tortoise could bring sickness, injury, and even death to the perpetrator. Given the strength of these beliefs and the protection they afford, we concluded that reintroduction into this protected area had a high likelihood of success.

We formulated a reintroduction plan that was approved by the Forest Department. In preparation, we ran a yearlong public awareness and environmental education campaign with school children and adults in neighboring rural communities. We also enlisted the support of Buddhist monks to reinforce the villagers' animist beliefs concerning tortoises.

The first phase of reintroduction began in September 2013 with construction of three 1.0 ha pre-release holding pens deep within the sanctuary. We planned to keep the animals penned for several months, getting them accustomed to the area to make them less apt to wander when freed. This is especially important because the sanctuary is encircled by farmland where wandering tortoises risk capture by wildlife traffickers. The pens enclosed typical Star Tortoise habitat—grassland interspersed with woody scrub. Staff quarters and an observation tower were built nearby to house a park ranger tasked with monitoring the tortoises and providing round-the-clock security.

We selected 150 sub-adult Star Tortoises from an assurance colony, permanently marked each with an identification number and tattooed Buddhist iconography on the carapace to discourage superstitious poachers. In October 2013, WCS and Turtle Conservancy veterinarians examined each tortoise to insure it was free from infectious disease. Radio transmitters were attached, and the animals placed in a quarantine facility awaiting transfer to the pens. A "donation ceremony" at a local Buddhist monastery showed the community that our efforts had the blessing of Buddhist monks. Then, the tortoises were taken to the holding pens, with 50 tortoises (25 males and 25 females) placed in each pen.

Though monitored, the tortoises are left on their own. The pens are scoured monthly and we locate every individual (no easy task in the thorny vegetation) for weighing and measurement. No supplemental food is needed; the tortoises subsist well on the coarse natural vegetation in the pens, a diet resulting in a slow but steady monthly increase in body size. Tortoise holding time is being varied (6, 12, and 18 months) to determine

Maung Yeah (left) and Zaw Zaw (right) unpack *Batagur trivittata* eggs laid a few hours earlier at a Chindwin River beach. The eggs are weighed and measured before being reburied in a fenced enclosure where they are monitored until hatching. PHOTO CREDIT: STEVEN G. PLATT

Hein Htet Lwin and Rakhine Yoma Elephant Sanctuary staff weigh and measure adult *Manouria emys* in an assurance colony established at sanctuary headquarters in Gwa. PHOTO CREDIT: WIN KO KO

the optimal penning period to familiarize animals with the area and reduce their likelihood of roaming—information important to future Star Tortoise reintroductions.

In May 2014, after six months in the pens, we removed bamboo perimeter fence panels to "self-release" the first group of tortoises. Some left the pens then returned, while others moved to the nearby scrub. Preliminary results are encouraging in that none of the tortoises have yet wandered beyond the sanctuary. Indeed, May 2014 is a conservation landmark—the first ever return to the wild of captive-bred tortoises in Myanmar.

BURMESE ROOFED TURTLE UPDATE

Our Burmese Roofed Turtle (*Batagur trivittata*) efforts met with a mix of triumph and heartbreak in the past year. One of the world's most critically endangered turtles, wild *B. trivittata* now are confined to a remote stretch of the upper Chindwin River where fewer than 10 adult females survive. The species would likely already be extinct had not an integrated *in* and *ex situ* conservation program been initiated in 2006 when the first assurance colony was set up at the Mandalay Zoo with adult turtles confiscated from fishermen and recovered from monastery ponds. More recently, conservation efforts were extended to the upper Chindwin River, where locally hired "beach wardens" annually monitor known nesting sites, notifying the TSA/WCS Team when females lay eggs. Eggs are reburied at a secure area near our Limpha Village Basecamp. Hatchlings are reared at a village headstarting facility—destined for return to the river or an assurance colony.

Monks at the donation ceremony.
PHOTO CREDIT: STEVEN G. PLATT

2014 was shaping up to be a banner year for Roofed Turtle conservation when the team traveled in February to Limpha Village to assist local staff with egg collection. By mid-March, eight clutches totaling 150 eggs were incubating in the sand, safely protected by a sturdy fence. The team was triumphant—never had so many eggs been found during a single nesting season.

Victory gave way to disappointment when by mid-June few eggs had hatched. The cause of the nest failures still elude us, but a likely reason was aberrantly high regional temperatures topping 46°C (115°F) during April and May—temperatures lethal to embryos. The lesson learned: complacency is never warranted when working with critically endangered species. This disaster also underscores the critical importance of captive populations as a hedge against extinction.

Despite the setback, we plan to reintroduce the first headstarted sub-adult Burmese Roofed

Turtles to the wild in late 2014. In preparation, we have conducted education and awareness campaigns in numerous fishing hamlets and agricultural villages along the Chindwin River and Nam Thalet Chaung, a tributary. We plan to confine headstarted Roofed Turtles in temporary pens for several months before "self-release" and monitoring by TSA/WCS field teams working with Forest Department rangers.

In 2013, funding was secured to expand the Roofed Turtle headstarting facility in Limpha Village and to establish another assurance colony in Htamanthi, a town on the Chindwin River where the Htamanthi Wildlife Sanctuary is based. Additional 250-gallon (946 liter) fiberglass tanks were installed at Limpha to house young turtles. The water delivery system has been improved, and two grow-out ponds for larger sub-adult turtles are being built. At Htamanthi, a large (0.40 ha) pond will be excavated to house a breeding group of Roofed Turtles. This fenced assurance colony with its resident technician will be stocked with sub-adult turtles now housed at the Mandalay Zoo.

An adult Burmese Star Tortoise staged in natural habitat near the reintroduction site. Tortoises will be placed in large natural enclosures for varying periods of time to evaluate the effect of penning on their behavior and movements after release. PHOTO CREDIT: ELEANOR BRIGGS

Win Ko Ko and a team of Forest Department rangers weigh and measure a recently captured *Heosemys depressa* before affixing a radio transmitter and returning the turtle to its natural bamboo forest habitat in the Rakhine Yoma Elephant Sanctuary. PHOTO CREDIT: WIN KO KO

ONGOING SURVEYS

Field surveys for turtles and tortoises in protected areas continued apace this year, with expeditions mounted to Alaungdaw Kathapa National Park, Mahamyaing Wildlife Sanctuary, and Lampi Island Marine Park during the 2013-14 dry season.

Alaungdaw Kathapa is Myanmar's premier protected area. Our fieldwork there yielded an important distribution record for the Asian Box Turtle (*Cuora amboinensis*); we discovered shells of locally collected turtles in several villages near Mahamyaing Wildlife Sanctuary. This finding was unexpected, as the nearest known populations occur in northern and eastern Myanmar, many miles away.

Our objectives at Lampi Island Marine Park were to determine if the island's freshwater river supported any Estuarine Terrapins (*Batagur baska* or *B. affinis*) or if its evergreen forests harbored the Asian Brown Tortoise (*Manouria emys phayrei*). Neither species appears to occur on Lampi Island, and in fact, Estuarine Terrapins are now likely extinct in Myanmar. However, this island park with its forests and springs, patrolled by armed Forest Department rangers, could be an ideal release site for captive-bred or confiscated Brown Tortoises.

BASIC RESEARCH

Basic scientific research is an imperative part of the TSA/WCS mission in Myanmar because it informs our most effective conservation actions. One such research project was launched in 2014 by Hein Htet, a PhD student at Yangon University, who began a life history study of the Arakan Forest Turtle (*Heosemys depressa*), one of the world's most poorly understood turtles. His work at the Rakhine Yoma Elephant Sanctuary progressed slowly at first, because finding these turtles proved challenging in this 161,000 ha protected area in the rugged Arakan Yoma Hills of western Myanmar. Enlisting the aid of village dogs, five turtles were eventually located, outfitted with radio transmitters, and tracked through the January-May dry season. To our surprise, the turtles moved very little (less than 30 m), staying buried beneath leaf litter. Perhaps this explains why *H. depressa* is known to locals as the "lazy turtle". Twenty more transmitters were obtained in April, and Hein Htet is now combing the remote bamboo forests for more study subjects.

CONFISCATIONS

The Forest Department made three major turtle confiscations from wildlife traffickers in

Win Ko Ko and assistant fence off a recently constructed Manouria emys nest at the Turtle Rescue Center. The rough wooden fence is designed to prevent other tortoises from inadvertently unearthing the eggs. PHOTO CREDIT: WIN KO KO


Kalyar Platt (standing) discusses Burmese Star Tortoise conservation with Myanmar Forest Department park warden and staff. PHOTO CREDIT: ME ME SOE

the last year—a total of 369 animals otherwise destined to suffer a grisly fate at the hands of Chinese gourmands. Chelonians saved included 296 Yellow Tortoises (*Indotestudo elongata*), 47 Asian Giant Softshell Turtles (*Amyda cartilaginea*), three Arakan Forest Turtles, 19 Asian Leaf Turtles (*Cyclemys* spp.), and four Impressed Tortoises (*Manouria impressa*).

Confiscated turtles—many having suffered weeks or months of abuse—were quickly transferred to the Turtle Rescue Center (TRC) near Maymyo, which sits astride a major trade route linking Myanmar with China. Despite the caring efforts of Dr. Tint Lwin and the TSA/WCS Team, 18 Yellow Tortoises and all four Impressed Tortoises died.

The TRC lacks sufficient facilities to maintain large softshell turtles for long, so all were shortly released into the Dokhtawady River near Mandalay. Once rehabilitated, the three Arakan Forest Turtles joined the assurance colony at Gwa, a valuable addition to the *in situ* breeding program. In May 2014, in a first-ever operation for Myanmar, the 274 surviving Yellow Tortoises were permanently marked, transported to Alaungdaw Kathapa National Park by truck, loaded on elephants, and released deep in the forest where they will be secure from poachers.

IN SITU PROGRAMS

In situ propagation programs are the linchpin of turtle conservation in Myanmar and complement our *ex situ* efforts by insuring that a nucleus of turtles survives in captivity as a hedge against extinction in the wild. Our efforts continue to bear fruit, most notably with the Burmese Star Tortoise. This year at least 2,000 tortoise eggs are expected to hatch, increasing the number of animals in captivity to over 4,000—a doubling of the captive population in just one year!

Funds have also been secured for a significant expansion of the small Star Tortoise assurance colony at Shwe Settaw Wildlife Sanctuary. The SSWS hosted a large number of wild tortoises until they were decimated by poachers in the late 1990s. A large enclosure is planned for an adult group that will one day produce offspring for release. A brooder facility for neonate Star Tortoises will be built at Lawkanandar, where young tortoises can be housed and monitored for a year before being placed in outdoor pens.

Successful breeding of Arakan Forest Turtles was achieved again in 2014, when a newly emerged hatchling turned up in the GWA assurance colony. The breeding of this species, likely occurring at night, continues to escape notice. Regardless, breeding these enigmatic turtles is a noteworthy achievement few zoos can boast.

Finally, after many years, our Asian Brown Tortoises (*Manouria emys*) are producing offspring. We ascribe this success to the move of assurance colonies from Lawkanandar and the Mandalay Zoo, to better environs at Gwa and the TRC. We were, however, unable to transfer the tortoises into their new homes in time for the 2012-13 breeding season. Now in their new quarters, laying commenced in 2014. More than 200 eggs are being incubated, with hatching expected as this article goes to press! These large tortoises are unrelentingly persecuted by subsistence hunters and commercial poachers, and are gone from much of Myanmar. With sufficient offspring, we hope to reintroduce captive-bred tortoises one day to a secure location within their ancestral range.

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Month old Southern River Terrapins feeding on aquatic morning glory. PHOTO CREDIT: BRIAN D. HORNE

Banner Year for the Southern River Terrapin in Cambodia

Brian D. Horne and Heng Sovannara

The 2014 nesting season produced 39 hatchlings of the Southern River Terrapins (*Batagur affinis edwardmolli*), the highest number produced since 2005! This is an important, if incremental step forward. With each new hatchling, the probability of *B. affinis* going extinct in Cambodia decreases. The species is already gone from the wild in Vietnam and most likely Thailand, with the only known wild populations in Malaysia, over 500 miles away across the Gulf of Thailand.

This year saw another significant achievement. Our collaborators at the National University of Singapore, supported by Wildlife Reserves Singapore, analyzed the population genetics of the 150 *B. affinis* we are headstarting in Cambodia. The importance of knowing the amount of heterozygosity (total genetic diversity) remaining in this small population cannot be overstated. If we are to design the best possible captive breeding program, then we must be certain not to mate closely related animals (i.e., siblings) in our headstarting colonies. Academics argue that inbreeding does not negatively affect reptiles in the same way as mammals, but we believe it is shortsighted not to limit possible long-term negative effects. Hence, we made it a priority that our breeding program be based on sound scientific principles of evolutionary theory; we have nothing to lose, and everything to gain from this approach.

In Hul, the Team Leader of WCS's Southern River Terrapin Project, is seen here jubilant after locating the first *B. affinis* nest of 2014. PHOTO BY KEZIAH HOBSON

The adult breeding pair of Southern River Terrapins at the Angkor Center for Conservation of Biodiversity (ACCB) are doing well and we are hoping for successful reproduction next year. PHOTO BY GABRIELLE NUSSBAUM

We are also moving ahead with plans for two separate assurance colonies—one at a new center in Cambodia and the other at the Singapore Zoo. Each colony will house twelve males and thirteen females. We estimate that first reproduction may not occur for ten to fifteen years, but we see these colonies as investments in the future; the true purpose of assurance colonies.

Last year we built a pond at the Angkor Center for Conservation of Biodiversity to house the only captive pair of adult *B. affinis* in Cambodia. The pair is thriving and we have observed evidence of attempted mating by the male. However, the female did not nest this year. This is not surprising considering that she had lived in sub-optimal conditions in Vietnam for over a decade before coming home to Cambodia last year. Our hopes are for a successful captive breeding season next year.

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New ponds of the Fishery Department in Langsha where we can accommodate any wild *Rafetus* we may trap.
PHOTO CREDIT: GERALD KUCHLING

Challenges for *Rafetus* in China Continue to Mount

Gerald Kuchling, Lu Shunqing, and Rao Dingqi

The future of the critically endangered Yangtze Giant Softshell Turtle (*Rafetus swinhoei)* is precarious, with our China program making diligent on-going steps toward conservation.

The last known female in captivity at the Changsha Zoo has been paired with the only known captive male at Suzhou Zoo since 2008. Though the female has laid multiple clutches of eggs every year since, none have hatched. We soon hope to find out why: Kaitlin Croyle of the San Diego Zoo has developed a method of in-ovo sperm detection in bird eggs—a technique also effective for turtle eggs. She will join us shortly in Suzhou to determine if there is any sperm present in recently laid eggs, findings that may advance the breeding program. Sadly, with just one female and one old male known in China, our options remain limited.

We continue the search for wild *R. swinhoei*. Starting in September 2013, we deployed traps in China's Red River at locations where fishermen and villagers observed Giant Softshell Turtles. This field program is run by students of the Kunming Institute of Zoology, partnering with the Fishery Department and local fishermen. Unfortunately, the river's once turtle-friendly habitat has been transformed by a series of huge hydroelectric dams and reservoirs. The impoundments, with their frequently fluctuating water levels, offer largely unsuitable habitat for the turtles, so any surviving individuals must roam widely.

Repeated *R. swinhoei* sightings have been made where side creeks flow into a reservoir downriver of the city of Langsha. These continuing observations may well involve a single individual. Our trapping attempts in the area have failed so far, and are made challenging by rapidly changing water levels that force us to frequently relocate and adjust our traps.

We are not the only people trying to catch Giant Softshell Turtles. Locals and recreational fishermen are keen to catch and eat them. We've found it nearly impossible to educate tourist fishermen from distant cities who visit only occasionally. Thus there is a real danger that the last wild *R. swinhoei* in China could end up at a banquet rather than in a breeding program.

Still we remain vigilant. In anticipation of catching a Giant Softshell Turtle, we procured a holding facility near Langsha where captured individuals can be kept. In early 2014, the Fishery Department built new, fenced and guarded fish breeding ponds there, offering to house any wild *R. swinhoei* we captured at least temporarily. We are set and ready. Now all that is needed is patience and luck.

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Trap deployment in the impoundment lake. The shoreline is denuded due to frequent water level changes.
PHOTO CREDIT: GERALD KUCHLING

River Terrapin hatchlings are headstarted for approximately five to six months before being released into the Kemaman River, Terengganu. PHOTO CREDIT: PELF-NYOK CHEN.

High Hatch Rates in Malaysian River Terrapin Program are Cause for Optimism

Pelf-Nyok Chen, Eng-Heng Chan

In 2010, the authors carried out a statewide survey to document the presence of River Terrapin (*Batagur affinis)* in the state of Terengganu in Peninsular Malaysia. While *B. affinis* was already known to inhabit the Terengganu, Dungun, Setiu and Besut rivers, interviews with local fishermen revealed that the Kemaman and Kerteh Rivers also have nesting populations.

Acting on this discovery, we initiated a River Terrapin Conservation Project in three villages along the Kemaman River—a project conducted by the Turtle Conservation Society of Malaysia (TCS), with approval and support from the Malaysian Department of Wildlife and National Parks (Perhilitan) and the collaboration of local villagers. Subsequently, the three most important nesting banks along the Kemaman River were gazetted as nesting reserves by the Malaysian District and Land Office.

Conservation work started in the villages of Pasir Gajah, Tok Kapor, and Dadong in mid-season 2011. A total of 649 River Terrapin eggs were secured for incubation that year, with 233 hatchlings produced (a 36 percent hatching success rate). In Pasir Gajah, 420 eggs from 24 nests were incubated and 198 hatchlings produced (47 percent). In Tok Kapor, 219 eggs from 16 nests incubated with 27 hatchlings. Tok Kapor's low, 12 percent, hatching success rate was attributed to relocation of nests away from the riverbank due to heavy flooding and an infestation of the new hatchery

Chen (first row, third from right) releasing River Terrapin hatchlings with the local state politicians and villagers in Pasir Gajah. PHOTO CREDIT: KOW-LIAN LAI.

Eng-Heng Chan and local Pasir Gajah villagers with the critically endangered River Terrapin. PHOTO CREDIT: PELF-NYOK CHEN.

site by ants. Unhatched eggs were peppered with ant holes, and dead full-term hatchlings within showed signs of ant attack. In the village of Dadong, 10 eggs from one nest were incubated with 8 hatchlings produced (80 percent).

In 2012, a total of 1,468 River Terrapin eggs were incubated at the three villages, and 975 hatchlings were produced (66 percent hatching success rate). In Pasir Gajah, 1,080 eggs from 97 nests were incubated with 661 hatchlings (61 percent). In Tok Kapor, 323 eggs from 27 nests were incubated with 290 hatchlings. This 90 percent success rate, a dramatic improvement over 2011, is credited to the use of ant pesticide. In Dadong, 65 eggs from five nests were incubated and 24 hatchlings produced (37 percent).

Nesting in 2013 was significantly reduced due to the prolonged monsoon on the east coast of Peninsular Malaysia. Nevertheless, a total of 486 River Terrapin eggs were secured for incubation. In Pasir Gajah—where flooding submerged the nesting bank for most of the nesting season—369 eggs from 29 nests were incubated with 274 hatchlings (74 percent). In Tok Kapor, 117 eggs from 10 nests were incubated with 106 hatchlings (91 percent). No eggs were incubated in Dadong.

In 2014, a total of 454 River Terrapin eggs were incubated. In Pasir Gajah, 344 eggs from 27 nests were incubated, and at the time of writing hatching was underway. In Tok Kapor, 122 eggs from 9 nests incubated with 90 hatchlings (74 percent). In Dadong, 10 eggs from one nest were secured and incubated at a local school to involve students in the project. There were eight hatchlings (80 percent).

Since the project was initiated in 2011, a grand total of 3,057 eggs have been collected for incubation, with more than 1,800 hatchlings produced, a 59 percent hatching success rate.

ANNUAL TERRAPIN RELEASE BUILDS AWARENESS

To increase awareness of the need to protect the critically endangered River Terrapin, TCS and the three Village Committees have co-organized annual terrapin release events to which the public is invited. In the past four years, these occasions have been well attended by university, college and secondary school students, kindergarteners, TCS members, supporters, local villagers, state politicians and the media.

Between 2011 and 2013, more than 1,500 headstarted River Terrapins have been released into the Kemaman River.

FUTURE DIRECTIONS

Since the River Terrapin Conservation Project began in 2011, local villagers have been trained in all aspects of our conservation work—collecting terrapin eggs from nesting banks, transporting eggs back to villages, incubating them, and headstarting *B. affinis* prior to release.

Now the time has come for TCS to empower the local Village Committees to lead the project in their respective villages. The local people have demonstrated their enthusiasm and dedication and we are confident that they will be able to execute the project with minimal supervision.

TCS has plans to expand the River Terrapin Conservation Project to the Kerteh River in 2015. Seed grants are presently being sought for project initiation at this new site.

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Tom Pop carefully removes a Hicatee from a net on the Sibun River. PHOTO CREDIT: THOMAS RAINWATER

Endangered Turtles Find a Home at the New Hicatee Conservation and Research Center in Belize

Jacob Marlin and Heather Barrett

The Central American River Turtle (*Dermatemys mawii*) is a large, aquatic freshwater turtle found in the coastal lowlands of southern Mexico, northern Guatemala and Belize. Locally known in Belize as the Hicatee, *D. mawii* has been intensely harvested for its meat and eliminated from much of its former range in southern Mexico. Its status in Guatemala remains unclear. The lone surviving representative of the family Dermatemydidae, *D. mawii*, has a unique evolutionary lineage. Classified as Critically Endangered by the IUCN Red List, it is ranked 15th in the report *Turtles in Trouble: The World's 25 Most Endangered Tortoises and Freshwater Turtles – 2011*, by the Turtle Conservation Coalition.

In 2010, the TSA organized a countrywide survey of Belize led by Thomas Rainwater to better understand the status of wild Hicatee populations in that nation, long considered the stronghold of the species. His study (2012) identified continued population declines and the need for protection and conservation measures, both in the wild and captivity.

Marlyn Cruz (BFREE) feeds figs and grasses to the Hicatee at least three times per week. A native grass, Paspalum, which comprises the majority of the Hicatee's diet in Belize, has been planted around the pond and on the floating island to provide a source of free-range forage. PHOTO CREDIT: JACOB MARLIN

Unfortunately, very little is known about Hicatee reproductive biology due to its secretive nature. Historically considered difficult to manage in captive settings, sustained breeding success has been elusive. To shed light on this challenge, the TSA collaborated with the Belize Foundation for Research & Environmental Education (BFREE) to construct a captive breeding facility at the BFREE field station in southern Belize.

This facility, the Hicatee Conservation and Research Center (HCRC), was designed to mimic wild conditions while also using sustainable low cost/low maintenance methods to achieve optimal husbandry and captive breeding success. The plan is to use captive hatched HCRC turtles to restock depleted wild populations and create new captive populations, thereby reducing hunting pressures in the wild. Our overarching goal is to develop sustainable Hicatee farming methods that can be easily duplicated throughout Belize and the entirety of *D. mawii's* range.

In March 2014, with the HCRC ponds established and ready for turtles, the TSA and BFREE assembled a field team to stock the breeding facility. The collecting effort, endorsed by the Belize Fisheries Department, took place in central Belize, an area that still supports many Hicatee despite heavy hunting. Our team, led by Thomas Rainwater and Jacob Marlin, focused on the Sibun and Belize River valleys. The four-day collecting effort mobilized up to 12 people per day, using three pickup trucks, a john boat, and six canoes. Two groups employed trammel nets and canoes, while a third utilized diving. Teams spent long hours on the water, targeting adult turtles for the breeding program, a task made difficult by reduced visibility due to recent heavy rains. Fourteen Hicatee (two males and twelve females) were successfully captured. The turtles were taken to a holding facility, weighed, sexed, measured, marked, photographed, and then transported south to the HCRC at BFREE.

Serendipitously, on 26 March, the first day of fieldwork, the team learned that the Belize Fisheries Department had just confiscated eight live turtles from illegal hunters. The team quickly contacted Fisheries and requested that the animals be transferred to BFREE for the breeding program. Permission was granted, boosting the number of individuals collected and confiscated to 22 (three adult males, 13 adult females and six sub-adult females).

Experimental nesting areas were installed on both sides of the breeding pond to catch either morning or afternoon sun. Each area has three choices of nesting material: sand, mulch and muck. PHOTO CREDIT: JACOB MARLIN

Each Hicatee receives a large bright number on the carapace before going into the ponds to enable monitoring and recording of behavioral observations.

In March 2014, the TSA and BFREE organized a field team to help stock the new HCRC. Some of the Team Hicatee participants are shown here. Front row: Thomas Rainwater, kneeling, Tom Pop and Milena Oliva Mendez. Back row: Curtis Flowers, Rich Zerilli, Eric Anderson, Alexis Thomas and Jacob Marlin.

The HCRC turtles have adapted well to their new home. BFREE staff members Marlyn Cruz and Elmer Tzalam feed and observe the turtles regularly. The primary natural diet of the Hicatee is a weed-like grass, *Paspalum paniculatum* (Moll, 1989), which BFREE began propagating on the perimeter of the breeding ponds before the turtles arrived. Feedings of *Paspalum* and local fruits takes place three times weekly. Small fig trees planted around the breeding ponds to create shade add another food source. To determine nesting site preference, artificial nesting areas are being installed at multiple locations, using a variety of media substrates.

Egg-laying will hopefully begin this year. Research grants have been submitted to fund detailed observations of nesting with infrared camera traps, and trials are planned to determine the best strategies for inducing egg-laying and hatching. The nesting and hatching cycles of *D. mawii* are closely linked with seasonal environmental cues, and the HCRC was designed to permit these variables to be replicated in a natural manner. Everything is now in place to begin determining and documenting the best strategies for encouraging Hicatee reproduction in captivity.

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Male Agassiz's Desert Tortoises (*Gopherus agassizii*) in combat in the Western Mojave Desert. PHOTO CREDIT: JOEL STRONG

TSA Teams up with the Marines for Desert Tortoise Research

Andrew D. Walde

0430 h, 10 May 2014 - *I stick my nose out of my sleeping bag from inside the relative comfort of my truck camper shell. It's cold, the wind is blowing hard, and I've already been startled awake several times by sudden gusts. It's going to be one of those days you can't think straight due to the howling wind—a normal spring day in the Mojave Desert.*

I don't remember half of what my herpetology professor taught me, but I clearly remember him saying, "Don't study birds! You have to get up at 4:30am! Study herps, you only go out on good days, stay up late, and get to sleep in." I guess he never visited the Mojave, where it can be over 100°F by 9:30am. It's best to get started early.

I meet up with the survey crew: Gretchen, Charlie, Angie, and Vicki (the Marines Corps Logistics Base, Director, Environmental Division). After bouncing down some poor excuse for a road for over an hour, along an extremely narrow ridgeline almost a thousand feet above the desert floor, we arrive at our survey point. I hop out, put on sunscreen, grab my water bottles, and hear Charlie yelling, "C'mon Walde, it's only going to get hotter!"

We line up across the ridgeline, ten meters apart, looking down the steep slopes, and begin to walk. After only 5 minutes of walking, Gretchen calls, "Carcass." It's an ominous beginning.

Situated in the southwest corner of North America, the Mojave Desert is the hottest, driest place on the continent, with annual rainfall averaging just 4 inches, and summer temperatures exceeding 110°F (43.3°C). Winter lows are below freezing. Though it doesn't sound like a place for turtles, or somewhere the TSA would be involved, it's home to Agassiz's Desert Tortoise (*Gopherus agassizii*).

Until recently, *G. agassizii* had a huge range extending from Utah, south to Sinaloa, Mexico. But that all changed in 2011 when the Mojave population—those turtles found west and north of the Colorado River—were identified as a distinct species from populations farther south and east. We now have two Desert Tortoises in North America: Agassiz's and Morafka's Desert Tortoise (*Gopherus morafkai*). At the time of separation, what is now Agassiz's Desert Tortoise was listed as Threatened under the Endangered Species Act, and as Vulnerable by the IUCN. However, the split into two species reduced the range of *G. agassizii* to thirty percent of its pre-split range. While the U.S. Fish and Wild-

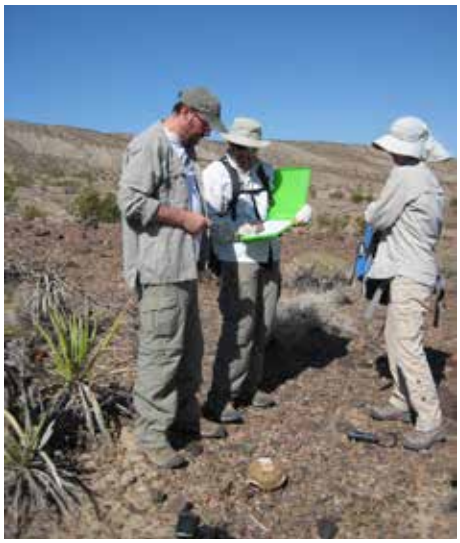
Andrew Walde explaining how to assess the age of a carcass to Vicki Davis, Director, Environmental Division at the Marine Corps Logistics Base Barstow. PHOTO CREDIT: ANGELA WALDE

Agassiz's Desert Tortoises (*Gopherus agassizii*) eating Desert Chicory (*Rafinesquia niomexicana*) from the Western Mojave Desert. PHOTO CREDIT: MEAGAN HARLESS

life Service doesn't consider this a significant change—with the population already protected by a recovery plan—this decrease in distribution and population warrants review by the IUCN, and a likely upgrade to Critically Endangered.

Reasons for listing Agassiz's Desert Tortoise include: losses to disease, severe climatic conditions, loss and degradation of habitat, increased mortality associated with urban growth, and the inability of regulatory and management agencies to protect the species and its habitat. Many of these conditions have escalated as U.S. desert regions experience rapid population growth, some of the fastest in North America. Recent studies have also documented greater pressure from subsidized predators—due to post-drought prey switching, causing population declines of up to 40 percent annually.

Which brings us back to the beginning of this story: the TSA has partnered with the Department of the Navy at the Marine Corps Logistics Base Barstow in California, to conduct preliminary investigations and assess the effects of season on tortoise population survey results. We're trying to determine if more animals can be located in the spring (their major activity time), or in the fall (the primary mating season). Results could prove beneficial to recovery efforts, as well as to clearance surveys for energy development.



Recording data during surveys. (L to R) Andrew Walde, Charlie Jones, and Gretchen See.
PHOTO CREDIT: ANGELA WALDE

Due to extreme drought conditions of 2012, survey results were questionable, but did show that more tortoises (>75 percent) were found in the fall survey period. TSA was invited back for repeat surveys in 2014, but to date we've only finished the spring survey. Of great concern, our initial results reveal that a once abundant population (>150 adults per square mile) has declined precipitously. Preliminary results suggest a population decline of >50 percent, with some areas no longer supporting a population. On the plot surveyed at the beginning of this article, we found 27 carcasses and no live tortoises.

Wetter conditions in fall 2014 will hopefully help us locate more animals and provide conclusive results with respect to season of survey and extent of population decline in this part of the Mojave Desert.

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Boladji Dunsin with Nigerian villagers and a female Kinixys homeana. PHOTO CREDIT: TOMAS DIAGNE.

TSA Africa Pioneers Chelonian Conservation in Senegal and Benin

Tomas Diagne, Ndiaga Boh and Josea Dossou Bodjrenou

Africa—though it supports a diverse chelonian assemblage, with 43 recognized species—has not received near the global attention as Asia. With only a handful of research programs, and lacking survey data, its species remain poorly known. However, new evidence shows that these animals are facing intensifying pressure. While the local bushmeat trade has long impacted turtle and tortoise species, now the long tentacles of Asian marketss are penetrating here. A recently discovered Chinese merchant-driven turtle butchery on Lake Malawi was collecting only the cartilage of local softshell turtles (Cycloderma frenatum).Given the past perceived lack of threat, Africa's chelonians have been largely left out of prioritization and planning, and hence, conservation funding. However, last year's IUCN Red List Workshop in Togo, West Africa (see articles pp. 26-27) focused needed attention on African species.

The conservation program for Adanson's mud terrapin (*Pelusios adansonii),* at Tocc-Tocc Reserve in Lac de Guiers in northwest Senegal, continued its advance in 2014. Our team procured buoys to mark the protected area's boundaries, plus a monitoring boat. We removed hundreds of illegal abandoned fishing nets from the Reserve lagoon that had drowned turtles. An observation tower was built where local eco-guards observe nesting and reduce poaching.

Eco-guard vigilance has been rewarded: female turtles spotted in the nesting zone offer evidence that Reserve reproduction is increasing. Surveillance of a protected wetlands area to detect hatchlings was also increased. Our conservation program received global recognition when the Tocc-Tocc Reserve was declared the fifth Senegalese RAMSAR site by the International Convention of Wetlands in January 2014, making the Reserve eligible for additional funding.

In Benin, West Africa, our survey team searched for the Nubian Flapshell Turtle (*Cyclanorbis elegans*), and remaining wild populations of the Hingeback Tortoise (*Kinixys homeana*), both recommended for Critically Endangered status by the 2013 IUCN Red List workshop in Togo. We also offered three days of species identification and survey training to 12 members of Nature Tropicale, a local NGO in Cotonou, Benin, and will receive help from them in coming days.Turtle surveys were conducted in the Mono and Oueme rivers systems, seeking specimens of *C. elegans*. But a month of intense fieldwork failed to record a single sighting. We were, however, pleased to find a population of over 300 *K. homeana* in the southeast part of Benin near Nigeria. We are working with locals to secure resources to protect this important population.

TSA Africa Welcomes David Mifsud as Program Vice-Chair

New TSA Africa Program Vice-Chair David Mifsud is a Wildlife Biologist, Ecologist, and Wetland Scientist whose ecological firm is based in Michigan, USA. He serves as an expert on Great Lakes turtles and African tortoises for the IUCN Tortoise and Freshwater Turtle Specialist Group, and is Chair of the *Kinixys* Conservation Program. He coauthored the *Kinixys* Conservation Blueprint for African Hingback Tortoises. David is passionate about conserving Africa's turtles and tortoises. He participated in the IUCN Red List workshop in Togo in 2013 where he assisted on species assessments with emphasis on *Kinixys*. David has worked with chelonians for over 25 years, keeping and breeding imperiled species. We welcome his knowledge, passion, and enthusiasm.

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Acknowledgments: In Senegal, our programs received funding from the GEF/Smalls Grants Africa-Program and the TSA. In Benin, TSA Africa received grants from the Turtle Conservation Fund and the Andrew Sabin Family Foundation.

Release events at Caño Viejo involve local schools, and are attended by residents of local communities, environmental authorities and NGO's. PHOTO CREDIT: GERMAN FORERO

Working to Conserve Colombia's Most Imperiled Turtle Species

German Forero-Medina, Natalia Gallego, and Rubén Palacios

The Turtle Survival Alliance (TSA) and Wildlife Conservation Society (WCS) joint turtle conservation program in Colombia achieved much this year in its drive to conserve the Magdalena River Turtle (*Podocnemis lewyana*) and Dahl's Toad Headed Turtle (*Mesoclemmys dahli*). These are Colombia's most imperiled turtle species, with *P. lewyana* relying entirely on the TSA/WCS team (along with other organizations) for its persistence in the Sinú River, and with *M. dahli* depending on conservation groups and local communities for the restoration and protection of vital habitat.

CONSERVING THE MAGDALENA RIVER TURTLE IN THE SINÚ RIVER

River Turtles are seriously threatened by nest flooding due to hydroelectric dams on the Sinú River. Conservation organizations met this threat head on by launching a community conservation program in 2006. Led by the towns of Caño Viejo and Cotocá Arriba, the initiative has four lines of action: 1) *in situ* management—the building of artificial beaches as nesting sites and the protection of females during nesting season, 2) *ex situ* management—rescuing nests from flood-prone beaches and incubating eggs under controlled conditions, 3) monitoring reproductive parameters, and 4) environmental education.

In 2014, the hydroelectric company failed to fund the community conservation program, but WCS and TSA stepped up to keep the initiative strong. We created five artificial beaches in elevated areas protected from floods. This was achieved by clearing riverbank vegetation, reducing riverbank slope to allow turtles better access, and by putting down a 30 cm layer of sand, creating a beach with a nest-friendly substrate mixture of sand and soil. Local people in the community of Caño Viejo constructed

three artificial sand beaches at La Isla, Caño Viejo, and La Ganga. Two more were built in the community of Cotocá Arriba at Guamal and Edmundo. Forty nests were recorded on the artificial beaches of Caño Viejo and eight in Cotocá Arriba (Table 1). Eggs from Caño Viejo nests were moved to an incubator to protect against high mortality due to ants.

Another big threat to *P. lewyana* nests is trampling by cattle that go to the river to drink. To mitigate this impact we closed access to the Ganga and La Isla beaches using barbed wire. This simple management action, agreed upon by landowners, allowed nine nests to incubate on natural beaches. These nests produced 189 eggs, with 181 hatchlings born (a hatching success of 98.36 percent).

Ex situ management also continued this year, thanks to the boat donated by TSA last year. The boat patrolled beaches located between Lorica and San Nicolas de Bari throughout nesting season. All nests located on non-protected beaches or in flood-prone areas were transferred to incubators in Caño Viejo. Unthreatened nests were left undisturbed but monitored regularly. By the end of nesting season, we collected 96 nests, resulting in 1831 eggs, from five natural and three artificial beaches. Of these, 9.5 percent of eggs were infertile, with 1,581 hatchlings emerging for a hatching success rate of 95.4 percent (Table 2). Add to this the nine nests left to incubate *in situ*, and a total of 1,762 hatchlings were released this year in Caño Viejo.

At Cotocá Arriba we monitored three natural beaches—Benito Osorio, Cotocá Arriba, and Guamal. All of these periodically flood, so we relocated all nests found. We located 26 nests with 444 eggs of which 12.6 percent were infertile. Hatching success at Cotocá Arriba was 87.37 percent (Table 3).

On 30 April and 2 May local communities hosted public events at which more than 2000 *P. lewyana* hatchlings were released. These events were attended by local and neighboring communities, schoolteachers and students, and environmental authorities including CVS, Conservation International, URRA S.A. E.S.P, and others.

Despite 2014 budget constraints, local communities with TSA/WCS team support were able to continue species management activities. Results were outstanding: nesting site availability was improved and females better protected, resulting in the incubation and release of more than 2,000 hatchlings that would have likely perished due to Sinú River flooding.

An incubation facilty for *Podocnemis lewyana* eggs located in the home of Alberto Viga, the community conservation project leader. PHOTO CREDIT: NATALIA GALLEGO

Team members and volunteer students plant 600 native trees beside the deforested stream San Fernandera. PHOTO CREDIT: RUBEN PALACIOS

Table 1. Nests and eggs on artificial beaches in 2014.

Community	Artificial Beach	No. nests	No. eggs	No. nests incubated in situ
Caño Viejo	La Isla	17	318	0
	Caño Viejo	15	303	0
	La Ganga	8	140	0
Cotocá Arriba	Guamal	6	96	6
	Edmundo	2	39	2
TOTAL		**48**	**896**	

A Dahl's Toad-headed Turtle from Chimichagua, Cesar - the site of a habitat restoration project. PHOTO CREDIT: GERMAN FORERO

Table 2. Number of nests, eggs and hatchings incubated ex situ in Caño Viejo in 2014.

Beach	No. nests	No. eggs	No. infertile eggs	No. hatchlings	Hatching success
Natural La Ganga	10	197	16	170	93.9%
Natural La Isla	2	45	7	38	100%
Natural Caño Viejo	0	0	0	0	0
Natural El Chorro	10	197	16	170	93.9%
Natural La Peña	33	625	62	552	96.3%
Artificial La Isla	17	318	28	282	97.3%
Artificial Caño Viejo	15	303	20	272	96.1%
Artificial La Ganga	8	140	23	101	86.3%
total	**96**	**1831**	**174**	**1581**	**95.4%**

RESTORING HABITAT FOR DAHL'S TOAD HEADED TURTLE

2014 saw the start of a new habitat restoration program for *M. dahli*, an endangered species endemic to Colombia's tropical dry forest—one of the nation's most degraded and least protected ecosystems. Our objective is to increase species abundance by protecting and restoring riparian vegetation in the stream San Fernandera, utilizing both ecological restoration and sustainable livestock production criteria.

The restoration site is located on private property administered by Orlando Palomino in the locality of Chimichagua, department of Cesar, Colombia. Historically, this land has been heavily degraded by livestock coming to drink at the stream, which damages riparian vegetation, prevents natural regeneration, and reduces the quality of *M. dahli* habitat.

In February 2014, we analyzed local forest cover on multiple field trips to determine key plant species for restoration. Candidate plants included threatened species with high conservation value and those that are useful to the community. The two key restoration plant species chosen were the Ñoli Palm (*Elaeis oleifera*) and the Caracolí (*Anacardium excelsum*).

To date, the team has: 1) repaired and reactivated a local plant nursery, 2) built a fence surrounding a portion of the stream to be restored, and 3) built a watering system so that cows needn't go to the stream.

Armando and Alberto Viga (and relatives) carry hatchlings to be released in a boat donated by TSA in 2013. Patrols with the new motorized boat have resulted in the monitoring and protection of more beaches, and the rescue of more nests, as opposed to when volunteers used a canoe. PHOTO CREDIT: NATALIA GALLEGO

Table 3. Number of nests and eggs incubated ex situ in Cotocá Arriba in 2014.

Beach	No. nests	No. eggs	No. infertile eggs	No. hatchlings	Hatching success
Natural Guamal	5	74	2	68	94.4%
Artificial Guamal	6	96	18	74	94.9%
Natural Benito	13	235	29	183	88.8%
Artificial Edmundo	2	39	7	14	17.9%
total	**26**	**444**	**56**	**339**	**87.37**

The newly built livestock watering system, built to prevent habitat degradation by livestock drinking from a stream inhabited by the Dahl's Toad-headed Turtle. PHOTO CREDIT: RUBEN PALACIOS

The project refurbished and is supporting a plant nursery located at a public school. The team prepared a portion of the school grounds (60 m^2) to grow 3000 seedlings in the near future. This included a much improved nursery irrigation system. The project engaged 150 students between ages 14 and 18 from the local "Institución Educativa Cerveleón Padilla", with all volunteers coordinated by their teacher Juan Robles. The creation of the plant nursery was incorporated into the students' agricultural curriculum. Our team ran multiple workshops to help the volunteers become more aware of the need to protect Dahl's Toad-Headed Turtle and its habitat. Students were trained in how to obtain seeds and seedlings from the nearby forest, native plant nursery techniques, and tree planting and living fence implementation. We will soon engage local guides to help us locate restoration plants in the forest, and to ensure the plants are well adapted to the local ecotype. Nursery plants will be grown to a minimum height of 70 cm to ensure they are robust enough for transplanting to the riparian environment and so they require little ongoing care.

We have constructed a 400m long wire fence that is 10m from the stream's edge to keep cattle out, prevent feces contamination of the stream, avoid erosion, and allow vegetative regeneration—urgently needed measures for conserving Dahl's Toad-Headed Turtle. The restoration area inside the fence encloses about 1.43ha. Our aim is to eventually replace the wire fence with a living fence; we have already planted *Pachira quinata* and *Bursera simaruba*, two excellent species for this purpose.

A key tenant of sustainable cattle production is: "cattle don't go to the water; the water goes to the cattle". So, to compensate for the stream closure, we built two watering systems—6m x 1m x 0.5 m watering troughs replenished from a deep pool on the property. About 150 cows are now drinking from our system, instead of going to the stream and destroying critical habitat.

We also bought and planted 600 tree saplings from a commercial nursery. These fast-growing, sun-tolerant species (*Crateva tapia, Pseudosamanea guachapele, Tabebuia rosea, Astrocaryum malybo, Hura crepitans,* and *Sterculia apetala*) will quickly grow into nursery trees, beneath which we will plant restoration species with more demanding growth requirements. Most of these trees are also timber species that will provide an ongoing sustainable harvest and economic benefit for landowners in future.

This project, funded by a conservation grant from the People's Trust for Endangered Species (PTES), has allowed us to move forward from our research on *M. dahli* population status and habitat requirements, to pragmatic actions leading to habitat restoration for the species. The project has already achieved considerable success, involving the community and landowner, and initiating a process that will hopefully result in the recovery of *M. dahli* at this particular location.

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Turtle Biology and Conservation Notes

This section provides brief updates on turtle biology and conservation from scattered field records and observations that are unlikely to be formally published through other outlets. Submissions can include new locality records for species, exceptional size records, noteworthy observations of feeding, reproduction, predation or other natural history aspects, as well as items to summarize recent developments regarding conservation of tortoises and freshwater turtles worldwide, including (but not limited to) changes in laws and regulations covering turtles, establishment of protected areas of significance to turtles, changes in the Red List status of turtles, and proposed changes to turtle taxonomy. Text sections should be short, and where possible link to sources of more detailed information. Submissions of items for possible inclusion can be made at any time by emailing **hlowe@turtlesurvival.org**.

Recently proposed changes of scientific names of turtles

Research into turtle systematics continues to accelerate, with results that have led to an extensive series of proposals, recommendations and suggestions to change the scientific names of turtles. Perhaps not all these proposed name changes will stand up to scrutiny and become adopted by the community, but the following summary may help to keep track of changing names. At the time of writing, the IUCN/SSC Tortoise & Freshwater Turtle Specialist Group's Turtle Taxonomy Working Group has not yet published its latest annual Checklist of Turtles, though it should be available by the time of publication of this issue of Turtle Survival. This checklist should contain full details, including full references to the original publications, of all but the most recent changes listed below, and can be downloaded from http://www.iucn-tftsg.org/checklist/

Naming of the Alligator Snapping Turtle continues to change, as Travis Thomas and colleagues (2014) argued that Hoser's 2013 names were invalid, and proposed the alternative names *Macrochelys apalachicolae* and *M. suwanniensis*.

Iverson, Le & Ingram (2013) analyzed the phylogeny of the Kinosternidae, and proposed recognizing the distinctness of *acutum*, *angustipons*, *creaseri*, *dunni*, *herrerai* and *leucostomum* by transferring them from the genus *Kinosternon* into a new genus *Cryptochelys*. In addition, they also recommended that two traditional subspecies each be recognized as a full species: *K. scorpioides abaxillare* as *K. abaxillare*, and *K. subrubrum steindachneri* as *K. steindachneri*.

Spinks, Thomson & Shaffer (2014) investigated the systematics of the *Emys* (*Actinemys*) *marmorata* complex, and concluded that its southern populations warrant recognition as a full species, *Emys pallida*.

In his monograph on the Map Turtles, Lindeman (2013) argued for the recognition of the Sabine Map Turtle as a separate species, *Graptemys sabinensis*, instead of its traditional treatment as a subspecies of *G. pseudogeographica*.

Ansorge, Fritz, Terbish & Shar (2012) looked into the status of the enigmatic Mongolian Tortoise, *Agrionemys kazachstanica terbishi* (or *Testudo horsfieldii terbishi*), and concluded that this was likely based on a traded specimen; they therefore recommended that it should not be recognized as a valid subspecies.

Arthur Georges and co-workers (2013) investigated the genetic structure of *Elseya novaeguineae* across its range, and concluded that its northern populations warrant recognition as a separate species, *Elseya schultzei*.

In a study to resolve the phylogeny of the genera *Elseya* and *Myuchelys*, Minh Le and colleagues (2013) determined that the species *purvisi* falls outside the group composed of *Emydura*, *Elseya* and *Myuchelys*; to accommodate this phylogenetic placement they established the new genus *Flaviemys* for this species.

Using samples from *Pelomedusa* populations from across Africa and Arabia, Alice Petzold and co-workers (2014) elaborated on an earlier mitochondrial phylogeny for the genus and its single species, and in combination with morphology and other data sets, concluded that at least ten lineages should be recognized as valid species: *Pelomedusa barbata*, *P. galeata*, *P. gehafie*, *P. kobe*, *P. neumanni*, *P. olivacea*, *P. schweinfurthi*, *P. somalica*, *P. subrufa*, and *P. variabilis*.

Stuckas, Gemel & Fritz (2013) analyzed *Pelusios seychellensis*, and concluded that its description was erroneously based on the widely distributed West African species *P. castaneus*, and they thus synonymized *seychellensis*.

Progress with Red List assessments of tortoise and freshwater turtle species

In October 2013, at a three-day workshop in Lomé, Togo, 34 participants and contributors from Africa and beyond discussed the current conservation status and conservation needs for the turtles of Sub-Saharan Africa. While no final Red List assessments have been concluded for any of the species, provisional results indicate that Africa's turtle species face increased threats and more challenging conservation prospects. Likely to qualify as **Critically Endangered** are *Kinixys homeana* (currently VU), *Malacochersus tornieri* (VU), *Psammobates geometricus* (EN), and *Cyclanorbis elegans* (LR:NT). Potentially **Endangered** species are *Centrochelys sulcata* (VU at present), *Homopus solus* (VU), *Kinixys erosa* (DD), and *Pelusios broadleyi* (VU). Likely qualifying for **Vulnerable** are *Homopus boulengeri*, *H. signatus*, *Kinixys belliana*, *K. lobatsiana*, *K. natalensis*, *K. nogueyi*, *K. spekii*, *K. zombensis*, *Cyclanorbis senegalensis*, *Cycloderma aubryi*, and *Trionyx triunguis*, with *Pelusios niger* likely **Near Threatened**. Other species were considered to warrant Least Concern, except for *Cycloderma frenatu*m, *Pelusios marani*, *P. nanus*, *P. rhodesianus* and *P. upembae*, for which insufficient data was available to adequately evaluate the species at the workshop. Current Red List status can be found at the Red List website, http://www.iucnredlist.org/, while current and draft Red List status is summarized in the annual Turtles of the World checklist, downloadable at http://www.iucn-tftsg.org/checklist/

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Partners are the Key to Our Success

From our inception, the TSA was intended to be an alliance of partners that shared in a common goal – *zero turtle extinctions*. Since our formation in 2001, partnerships have proven to be the secret to our success. The organizations listed here provide a range of services to our collective mission, including: guidance, networking, strategic planning, funding, turtle care and rescue facilities, animal management, marketing and public relations, field research, logistical and technical support, salaried positions, and a host of other resources. Significantly, some of these have been with us since the early days and were there when the TSA was born. All are integral to our success. On behalf of the Board of Directors of the TSA, we salute this remarkable group of dedicated partners.

A TCF-supported project on the critically endangered Northern River Terrapin (*Batagur trivittata*) in Myanmar. Me Me Soe (left) and Khin Myo Myo (right) measure hatchlings at a TSA headstarting facility at Limpha Village. PHOTO CREDIT: STEVE PLATT

Turtle Conservation Efforts Supported in 46 Nations

Hugh Quinn and Anders Rhodin, Turtle Conservation Fund Co-Chairs

The Turtle Conservation Fund (TCF), founded in 2002, is focused on helping save the world's most critically endangered tortoises and freshwater turtles by providing funding to conservationists around the globe.

A total of 510 grant proposals have been received by TCF since 2003, of which 173 (34%) have been funded. Requests received totaled $2,691,935, with $778,036 (29%) granted, for an average award of $4497. Grants were awarded to projects conducted in 46 nations, with support ranging from $1000 to $10,000. Of the Turtle Conservation Coalition's "Turtles in Trouble: The World's Top 25+ Most Endangered Tortoises and Freshwater Turtles – 2011," projects representing all 25 species have been funded. Of TCF's 62 *Priority Species* (February 2014 list), projects representing 48 (77%) have been supported. Of the 29 taxa listed by IUCN as Critically Endangered, TCF has supported projects for 27 (93%). TCF has also provided support for facilities and projects that impact many additional species. Since last year's report in this publication, the TCF has provided funding for 27 turtle conservation projects, including several by the Turtle Survival Alliance, for a total annual disbursement of $90,919.

In addition to TCF's regular grant program, a seed grant program was initiated in 2013, providing awards up to $1000 to evaluate the status and threats to poorly-known species (often listed by IUCN as Data Deficient or Not Evaluated), potentially facilitating follow-up conservation initiatives. This program is being coordinated by Vivian Páez and is beginning to generate some important early projects.

Working closely with its partner organizations (Conservation International, IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, Turtle Survival Alliance, EAZA Shellshock Campaign, Chelonian Research Foundation, Fort Worth Zoo, Asian Turtle Program, Wildlife Conservation Society, Behler Chelonian Center / Turtle Conservancy, Chelonian Research Institute, and Humane Society International – Australia), TCF will continue its efforts to help save the world's most critically endangered tortoises and freshwater turtles.

For more information about the TCF, and grant application procedures, visit www.TurtleConservationFund.org.

Members of the Mohamed bin Zayed Species Conservation Fund Advisory Board (and their taxonomic coverage), in the deep desert of southern Abu Dhabi following a funding review meeting, December 2012. Back row, left to right: Micky Pritpal Soorae (reptiles), Mike Parr (birds), Claude Gascon (amphibians), Fred Launay (MBZ Director-General), Russ Mittermeier (mammals, reptiles, turtles), Anders Rhodin (turtles), Nicolas Heard (MBZ staff); front row, left to right: Kirk Duthler (MBZ staff), Bill Konstant (mammals), Sanjay Molur (mammals, invertebrates), Jean-Christophe Vié (mammals). Not present: Mike Maunder (plants, fungi), Topis Contreras MacBeath (fish), Jim Sanderson (cats), and Razan Khalifa Al Mubarak (MBZ Managing Director).

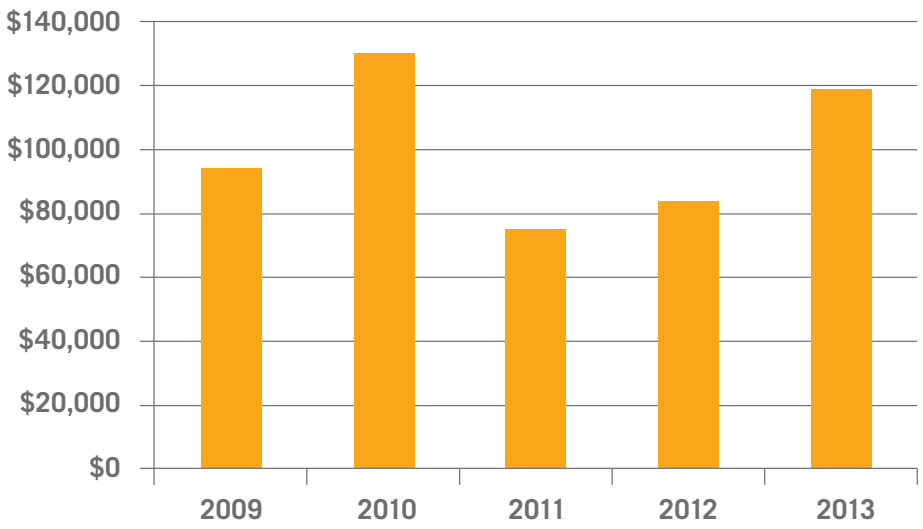
The Mohamed bin Zayed Species Conservation Fund, 2009–2014: Review of Five Years of Conservation Funding for Turtles and Tortoises

Anders G.J. Rhodin[1,3,4], Russell A. Mittermeier[2,3,4], Nicolas Heard[4], and Fred Launay[4]

Turtle and tortoise conservation efforts by the Turtle Survival Alliance and the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group and many other turtle conservation organizations have over the last five years benefitted greatly from grants from the Mohamed bin Zayed Species Conservation Fund (MBZ). Here we review the turtle and tortoise funding provided by MBZ from 2009 through the first cycle in 2014. Our objective is to provide members of the international turtle conservation community with this information in order to encourage more proposals to MBZ to aid the conservation of all threatened turtle and tortoise species.

The MBZ Fund was created in October 2008 by His Highness Sheikh Mohamed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi, United Arab Emirates, to benefit the conservation of all threatened species on earth, and was initiated with an endowment of 25 million Euros (ca. $30 million). MBZ began disbursing grants in June 2009, and through April 2014 the Fund has provided over $10.8 million in grants to 1,081

Tortoises and Freshwater Turtles



projects, at an average of about $10,000 per project. Despite this large disbursement to species conservation projects, through wise investment decisions, the total value of the MBZ endowment has increased to about $32 million.

The MBZ has to date focused its funding efforts primarily on species that are assessed as Critically Endangered or Endangered on the IUCN Red List, but has also funded work on species that are Vulnerable or Data Deficient, as well as on some Red Listing workshops. A broad range of taxonomic coverage has been sought, and funding amounts are proportionally allocated between the following eight major taxon groups: mammals, birds, reptiles, amphibians, fish, invertebrates, plants, and fungi. The amount allocated to each taxonomic group is reflective of the total amount requested by all proposals received for each group. The MBZ has made a special effort to focus a significant portion of its funding on species that in general receive less support from other large funding agencies. As such, the MBZ has been generating significant support for conservation efforts for some relatively underfunded taxonomic groups, such as tortoises and freshwater turtles, snakes and lizards, freshwater fish, small cats, and small mammals.

Grant proposals are reviewed by the MBZ Advisory Board, which is comprised of leading species experts in the conservation world. The Board is responsible for recommending allocation of approximately $500,000 to worthy conservation projects in each of three funding cycles per year, for an annual MBZ disbursement of about $1.5 million. Proposals are accepted online at www.speciesconservation.org, with application deadlines at the end of February, June, and October. Advisory Board review meetings are typically held in April, September, and December, usually in Abu Dhabi or at IUCN headquarters, Gland, Switzerland, with disbursements to successful applicants shortly thereafter.

In the 5-year period from June 2009 to April 2014, the MBZ has disbursed $649,230 to 66 turtle and tortoise conservation projects (6% of the total $10.8 million), with an average of $9,837 per grant. Annual amounts disbursed have varied from about $75,000 to $130,000 (see graph).

Tortoises and freshwater turtles have accounted for 83% of the total chelonian funding, for a total of $538,850 distributed to 56 projects, with marine turtles receiving 17% of the total for ten projects.

The MBZ has provided funding for 35 different threatened or data deficient tortoise and freshwater turtle species, many of them receiving multiple grants: *Astrochelys radiata, Astrochelys yniphora, Batagur affinis, Batagur baska, Batagur borneoensis, Batagur dhongoka, Batagur kachuga, Centrochelys sulcata, Chelodina mccordi timorensis, Chelonoidis duncanensis, Chitra chitra javanensis, Cuora aurocapitata, Cuora bourreti, Cuora zhoui, Dermatemys mawii, Elusor macrurus, Geochelone platynota, Indotestudo elongata, Kinixys erosa, Kinixys homeana, Kinixys lobatsiana, Malacochersus tornieri, Mesoclemmys hogei, Nilssonia gangetica, Nilssonia leithii, Nilssonia nigricans, Pangshura sylhetensis, Phrynops geoffroanus, Podocnemis expansa, Podocnemis lewyana, Psammobates geometricus, Pyxis arachnoides, Rafetus euphraticus, Rafetus swinhoei,* and *Testudo kleinmanni,* as well as for the 2013 IUCN Red Listing Workshop for Sub-Saharan Turtles and Tortoises. Funding for tortoise and freshwater turtle species has so far gone to projects in 26 different countries: Australia, Belize, Botswana, Brazil, Burkina Faso, Cambodia, China, Colombia, Ecuador, Egypt, Ghana, Guatemala, India, Indonesia, Iran, Ivory Coast, Kenya, Madagascar, Malaysia, Myanmar, Nepal, South Africa, Tanzania, Timor-Leste, Togo, and Vietnam.

During the most recent funding cycle (April 2014), MBZ funded the following four projects on tortoises and freshwater turtles, including two by the Turtle Survival Alliance:

- Coppolillo, Peter. The Geometric Tortoise Rescue Project: urgent action to protect 1/3 of an endangered species range. $9000.
- Luiselli, Luca. Towards an assessment of status and conservation strategy of the threatened *Kinixys homeana* and *Kinixys erosa* in Côte d'Ivoire. $10,000.
- Singh, Shailendra. Conservation of Assam Roof Turtle, *Pangshura sylhetensis* along Brahampatura River, Assam, India. $9000. (TSA)
- Sirsi, Shashwat. Conserving the endemic Leith's Softshell Turtle (*Nilssonia leithii*) on the Kali River in Karnataka. $9000. (TSA)

The Mohamed bin Zayed Species Conservation Fund has already made a significant impact on species conservation efforts and will continue to do so, including supporting critically important work focused on threatened tortoises and freshwater turtles. It has also coordinated and shared some of its funding efforts for specific projects with the Turtle Conservation Fund (see separate article in this issue), allowing greater support for threatened turtle species. By continuing to expand its own efforts and collaborating with other funding organizations, the MBZ hopes to make an increasingly effective and major difference for not only the long-term survival of highly endangered turtles and tortoises, but of all threatened life on earth.

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[2]Conservation International, Arlington, VA, USA [rmittermeier@conservation.org];

[3]IUCN/SSC Tortoise and Freshwater Turtle Specialist Group and Turtle Survival Alliance;

[4]Mohamed bin Zayed Species Conservation Fund, Abu Dhabi, United Arab Emirates [nicolas.heard@mbzspeciesconservation.org; fred.launay@mbzspeciesconservation.org]

IMPRESSED TORTOISE BREEDING PROGRAM

Notes on the Incubation and Rearing of Impressed Tortoises, 2007–2013

Viktor Mislin

I have kept two groups of 1.2 *Manouria impressa* at my Switzerland facility since 2005, with the first offspring produced in 2007. Varied incubation methods in specially designed incubators were used to produce 82 hatchlings between 2007 and 2013. The majority of these juveniles were placed with *Manouria impressa* Project participants in Europe for rearing (see Gaby Herzog's article in this issue of *Turtle Survival*). All keepers gathered weight data, which was uploaded to the www.emi.paddi.eu web page to allow for comparison of development.

In 2007, female #1 laid 13 eggs, and ten animals hatched. Incubation periods ranged from 71 to 74 days. Female #2 laid 18 eggs, and fiveanimals hatched. The remaining eggs were infertile or the embryos died. Incubation time was 77 to 80 days.

In 2008, no eggs hatched. Females #1 and #4 had egg laying problems of unknown cause. Between June 2008 and January 2009 single eggs were laid unburied. Repeated induction with oxytocin injections had no effect. Female #2 laid 18 eggs, however all were damaged during laying.

In 2009, we saw more success. Females made a nesting mount and laid eggs normally. Female #1 laid eleven eggs, of which nine died a week before hatching; two hatched normally. Incubation time was 70 days. Female #2 laid 15 eggs, of which eight died just before hatching and seven hatched. Incubation time was 67 to 76 days. Female #4 again laid unburied single eggs which were not incubated.

Between 2010 and 2012, egg laying and hatching results were similar to past years (see Table 1).

In 2013, female #1 laid 16 eggs; eleven were infertile, two died, and three hatched. The 34 eggs laid by females #2 and #4 were not incubated due to lack of keepers. The eggs hatched by the "old female" were her first success since arriving at my facility in poor condition in 2000. Despite her good recovery since then, and despite being kept together with a male since 2005, she didn't lay her first eggs until 2011, and didn't hatch eggs until 2013.

The rearing of juveniles generated many questions in the early years. In 2007, Janet C. Eldrigde provided valuable husbandry advice. *M. impressa* juveniles and adults can be kept rather well, and reproduction is possible with this species, although only with much effort and advanced techniques. As this species becomes larger in adulthood, it becomes more difficult to find keepers prepared to cooperate in the project. Therefore, we have made the decision not to incubate all eggs.

TABLE 1. HATCHING RESULTS, 2007 - 2013.

Female no. 1

Year	Total eggs	Hatched	Not fertile	Died	Incubation period
2007	13	10	3		71-74 days
2008	11		11		
2009	11	2		9	70 days
2010	12			12	
2011	9	1	8		73 days
2012	8	4	2	2	76-79 days
2013	16	3	11	2	70-71 days

Female no. 2

Year	Total eggs	Hatched	Not fertile	Died	Incubation period
2007	18	5			77-80 Days
2008	18		18		
2009	15	7		8	67-76 Days
2010	17	13			72-74 Days
2011	19	17		2	72-80 Days
2012	18	4	2	12	71 Days
2013	17	Birth control			

Female no. 4

Year	Total eggs	Hatched	Not fertile	Died	Incubation period
2008	18		18		
2009	16		16		
2011	16	5	6	5	72-76 Days
2012	18	8	5	5	72-76 Days
2013	17	Birth control			

Old Female

Year	Total eggs	Hatched	Not fertile	Died	Incubation period
2011	12		12		
2012	14		14		
2013	6	3	1	2	65-68 Days

Contact: Viktor Mislin, Zoological Institute for Evolutionary Biology, Vesalstreet 1, CH-4051 Basel, Switzerland, Tel. + 41 (0)61 2673466, Email: viktor.mislin@bluewin.ch

An example of an outdoor terrarium enclosure for juvenile Impressed Tortoises. PHOTO CREDIT: PETRA MEDERER

Notes on the Captive Husbandry of F1 Impressed Tortoises in Europe

Gaby Herzog

Manouria impressa, though smaller than *Manouria emys*, reaches a large size making it impossible for many keepers to maintain. It is therefore difficult to recruit interested breeders, which was the reason for the inception of the *Manouria impressa* project.

In 2007, Viktor Mislin's facility in Switzerland produced fifteen *M. impressa* hatchlings, and three were transferred to Gaby Herzog. It was at that moment we conceived our plan for the *Manouria impressa* Project, which got underway in 2008. Continuous observations since then have allowed us to experiment with and assess offspring rearing techniques and to develop optimal husbandry guidelines for captive breeding. A second benefit of the project is the use of captive born animals to establish unrelated breeding groups.

Between 2007 and 2014 the project produced 82 hatchlings. All juveniles were placed for rearing at 13 private locations in Switzerland, the Czech Republic, and Germany. This broad distribution creates different husbandry regimes regarding climate conditions, nutrition and behavior. Guidelines for these husbandry regimes were carefully assessed.

Of the 82 hatchlings produced, only seven died (some when hatched, others refused to be fed). Seventy-five juveniles thrived thanks to the care of participants, making the establishment and development of a breeding founder stock for this endangered species in Europe possible. However, by 2014 the Mislin facility was incubating more *impressa* eggs than there were proper homes for the hatchlings—a problem not yet resolved.

TABLE 1: EUROPEAN DISTRIBUTION OF THE 82 M. IMPRESSA BORN AT VIKTOR MISLIN'S SWITZERLAND FACILITY.

Year	Keeper		Country	Offspring	
	New	Total		New	Total
2007	2	2	Switzerland, Germany	15	15
2008	1	3	Czech Republic	0	15
2009	0	3	-	9	24
2010	2	5	Germany	13	37
2011	3	8	Switzerland, Germany	23	60
2012	3	11	Germany	16	76
2013	2	13	Germany	6	82

INDOOR KEEPING OBSERVATIONS

In most cases, project participants received juvenile or sub adult specimens. All participants are provided with planted vivariums that include retreat hiding places. Vivariums size is adjusted depending on the number of animals kept. Some keepers observed combat between smaller tortoises and mates, emphasizing the need to avoid overcrowding. Plants in the vivariums had to be well chosen. *M. impressa* does not feed on all vegetation, so trial and error was needed to determine the best plants, of course avoiding toxic species.

OUTDOOR KEEPING OBSERVATIONS

Outdoor keeping is relatively problem-free. The aninamls can be kept outdoors from mid May to September in Europe. They prefer shady retreat spots, disliking hot and bright retreat areas. They need temerature choices in a variety of areas. The animals are most active in the evening, often soaking in water at night. Because European night temperatures can be colder than those in *M. impressa's* natural Asian habitat, heated retreat locations are required where temperatures do not drop below 18 degrees C (64.4 degrees F).

BEHAVIOR

The behavior of *M.impressa* varies widely. Small tortoises were observed in combat, with some individuals hiding afterwards and refusing food. On these occasions more than one heating lamp had to be installed for the animals. Territorial behavior has been observed at 600 to 700 grams of body weight. In general the species is curious and observant of surroundings. When approached too closely the animals hiss, and occasionally bite. We do not know if this behavior is related to an individual's sex, because all juveniles are still too young to be accurately sexed.

Contact: For further information see: http://emi.padde.eu/

Update from the International Centre for the Conservation of Turtles (IZS) at the Muenster Zoo

Elmar Meier manages one of the most successful breeding collections of endangered turtles in the world at IZY. PHOTO CREDIT: HANS-DIETER PHILIPPEN

Dr. Martina Raffel and Elmar Meier

The ten year husbandry and breeding effort of the International Centre for the Conservation of Turtles (IZS) at the Muenster Zoo has achieved extraordinary results: a total of 463 surviving hatchlings in 19 species and subspecies, which is making a substantial contribution to the establishment of new assurance colonies across Europe. These animals are now managed in zoos, other institutions, and with experienced private individuals using the studbooks of the European Studbook Foundation. In 2013 alone, IZS bred 54 surviving hatchlings in 11 species/subspecies, 50 belonging to the genus Cuora—our most productive year for this genus to date.

IZS has played a particularly significant role in the survival of Zhou's Box Turtle (*Cuora zhoui*), with about two-third of the current known world population of *C. zhoui* originating from Muenster. In 2013, a female offspring produced three hatchlings for the first time—making this clutch the first ever reported halfway F2-generation. First offspring (five hatchlings) were also registered from *Cuora cyclornata* on breeding loan from Kadoorie Farm and Botanic Garden, Hong Kong since April 2012. It's also very likely that we will see the first successful reproduction this year by a female McCord's Box Turtle (*Cuora mccordi*) loaned by Zoo Atlanta, Georgia, USA, in 2011. 2014 also saw the hatching of the Sulawesi Forest Turtle (*Leucocephalon yuwonoi*). A new breeding group was established in Austria with offspring produced at Muenster.

Plans call for continuation of our highly successful breeding program and the ongoing establishment of new European assurance colonies. IZS will also seek out more founder animals for inclusion in studbooks, eventually to be exchanged with offspring bred in Muenster.

Contact: Dr. Martina Raffel, Curator for *in situ* Conservation, Allwetterzoo Muenster, Sentruper Strasse 315, 48161 Muenster, Germany, raffel@allwetterzoo.de

TABLE 1: OFFSPRING HATCHED AT IZS IN 2013

No. of surviving hatchlings	English name	Scientific name
2	Roti Island snake-necked Turtle	*Chelodina mccordi*
2	Red-necked Pond Turtle	*Chinemys nigricans*
6	Yellow-headed Box Turtle	*Cuora aurocapitata*
1	Bourret's Box Turtle	*Cuora bourreti*
5	Golden Coin Box Turtle	*Cuora cf. cyclornata*
3	Meier's Golden Coin Box Turtle	*Cuora cyclornata meieri*
5	Ryukyu Yellow-margined Box Turtle	*Cuora flavomarginata evelynae*
2	Indochinese Box Turtle	*Cuora galbinifrons*
19	McCord's Box Turtle	*Cuora mccordi*
2	Southern Vietnamese Box Turtle	*Cuora picturata*
7	Zhou's Box Turtle	*Cuora zhoui*

Sweirki Bedouin at work in the Zaranik Protected Area. PHOTO CREDIT: BASEM RABIA MOTWALY

A Spark of Hope for the Egyptian Tortoise

Henk Zwartepoorte

For years, the habitat and status of the Critically Endangered Egyptian Tortioise (*Testudo kleinmanni*), which once ranged from Libya to Israel, was uncertain. While small populations exist in Libya, prominent Egyptian naturalist Dr. Sherif Baha El Din declared the species extinct in the wild in Egypt. Nevertheless, El Din has worked diligently in cooperation with Omar Attum of Indiana University, USA, and others, to launch an Egyptian recovery program.

In 2007-08, Egyptian Tortoise Recovery Program became a priority of the Dutch and Belgium Turtle and Tortoise Society (NBSV). Since then, the project has benefited from funding offered by NBSV members and by the European Studbook Foundation (ESF). Significant funds have been raised in a novel manner: *T. kleinmanni* offspring incubated by breeders within the studbook have been transferred on a breeding loan basis to other program participants and new keepers within the studbook. These new keepers are asked to voluntarily contribute a small fixed sum per animal to help fund the recovery project, an idea conceived by co-studbook keeper Rob Verhoeks. Though money has been earmarked for the recovery project, and ESF has donated a new laptop computer, other basic field gear is needed, ranging from backpacks to calipers, GPS, scales and cameras.

IN SITU EFFORTS

A key component of the *T. kleinmanni* project involves the training of rangers in the Sweirki Bedouin tribe. The rangers patrol large blocks of former *T. kleinmanni* habitat, which has been fenced off within the Zaranik Protected Area in the north Sinai Desert. The fences keep cattle out and allow re-vegetation. Confiscated tortoises equipped with radio transmitters have been released in these re-vegetation zones. The Sweirki rangers follow individual tortoises from sunrise to sunset, collecting data on activity, nutrition, mating behavior, and egg laying. In a surprising 2013 discovery, the rangers found 25 juvenile tortoises *outside* the protected area, indicating that the species is still present and reproducing in the wild. The salaries of five Sweirki Bedouin rangers are currently paid by Indiana University. The NBSV and ESF boards recently voted to fund three ranger salaries over the next two years. Though ESF has donated a laptop computer, the project is in need of basic field gear, ranging from backpacks, to GPS, cameras, scales and calipers.

A five year management plan is being drafted for the in situ recovery project, which will one day be linked to the ex situ captive breeding program with the establishment of an assurance colony. ESF and NBSV will play a major role in these developments, and cooperation with the European Association of Zoos and Aquaria will be sought.

EX SITU EFFORTS

Since the start of the ESF studbook in 2001, a total of 455 animals have been registered. Reproduction by an increasing number of breeders is proceeding well, though there have been some casualties among captive born and wild founder animals. Egyptian political instability has forced us to put off plans for construction of a breeding center in the Zaranik Protected Area. Field research and education of local people remain our top priority. To that end, *Kleinmani* T-shirts distributed in 2012 among local people and in schools were popular, as were laptop computer presentations given in villages to raise awareness.

2014 TRAINING IN EUROPE

In 2012, Recovery Project Coordinator Basem Rabia Motwaly, on behalf of Nature Conservation Egypt, was invited by NBSV and ESF to visit the Rotterdam Zoo for training in tortoise husbandry. Egyptian political instability delayed his travel until February 2014. During the four-day visit, the Egyptian team trained daily with zoo reptile keepers, and also worked with zoo nutritionist Joeke Nijboer, developing a nutrition plan for the future Zaranik Breeding Center. The team also visited the International Turtle Breeding Centre (IZS) at Germany's Muenster Zoo and attended an international reptile husbandry workshop at the Sealife Centre at Scheveningen in Holland.

Ravaged by habitat loss and by the pet trade, *T. kleinmanni* is making its first tentative steps toward recovery.

Contact: Henk Zwartepoorte, ESF president, Testudo kleinmanni ESF studbook keeper and NBSV turtle conservation officer, henk.zwartepoorte@rotterdamzoo.nl

Tryon Bog Turtle Grants Awarded

Bern Tryon, who is best known for his pioneering work with the Southern Bog Turtle (*Glyptemys muhlenbergii*), passed away on May 6, 2011. However, Bern's 25-year commitment to the Southern Bog Turtle is being sustained as he bequeathed his significant herpetological library to the TSA to create an endowment to fund Bog Turtle research and conservation. Bern will forever be remembered for his dedication and passion for herpetology and uncompromising commitment to turtle conservation.

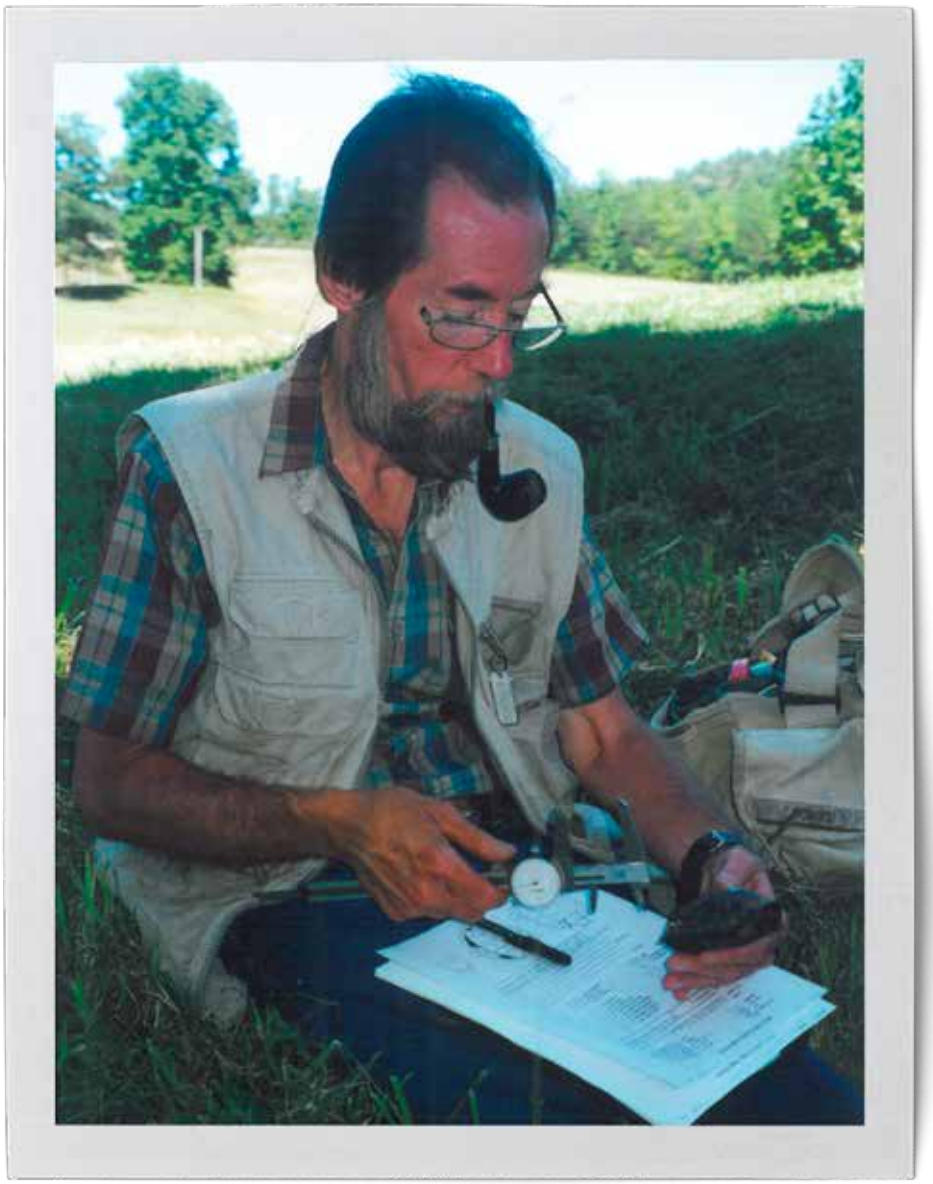
This year, the first grants from the Bern W. Tryon Bog Turtle Conservation Fund are being awarded to two very deserving projects. It is an exciting time for everyone in the turtle community who knew Bern, as it represents a continuation of his work and legacy.

The first funded proposal was from the Nature Conservancy (Tennessee Chapter, Shady Valley Program) for the project entitled, "Construction of livestock fencing to implement grazing management in Bog Turtle (*Glyptemys muhlenbergii*) habitat at Orchard Bog Preserve, Shady Valley, Tennessee." The project will put infrastructure in place at two Bog Turtle preserves in Tennessee that will allow managed grazing by livestock to improve the condition of the habitat for Bog Turtles by removing invasive plants.

The second funded proposal was submitted by Theresa Stratmann (Clemson University) for her project entitled, "Finding and Characterizing Habitat for Rare and/or Cryptic Species: A Case Study of Bog Turtles (*Glyptemys muhlenbergii*)." Currently there is no efficient method to locate habitat for cryptic species like the Bog Turtle, so the project seeks to use advances in species distribution and occupancy modeling to better locate and characterize the habitat used by this federally threatened species. The project's goal is to aid efforts to locate new Bog Turtle populations and determine landscape and local habitat features associated with Bog Turtle presence in a habitat.

Thus far, the library has generated an endowment of more than $150,000 for Bog Turtle conservation. However, there are still a number of wonderful books and reprints available for sale, many of which are out of print. All proceeds from library sales directly benefit the fund. To view the full catalog online, please visit http://pondturtle.com/btlMain.html.

If you are interested in submitting a proposal for funding in 2015, information on applying will be distributed via the TSA, IUCN Tortoise and Freshwater Turtle Specialist Group, Project Bog Turtle and the Herp Digest. The TSA would like to thank the Knoxville Zoo for their efforts in managing the grant process.



Bern in the field, recording data on a Southern Bog Turtle. PHOTO CREDIT: RICK HUDSON

Dick examines a Red-headed Amazon River turtle (*Podocnemis erythrocephala*) aboard his research vessel, Enigma. PHOTO CREDIT: ANDREW WALDE

Richard (Dick) C. Vogt Receives 9th Annual Behler Conservation Award

Brian D. Horne and Andrew Walde

Not many scientists can say that they have altered the course of an entire field of study; Dick Vogt can, not once, but now twice! His pioneering work with Jim Bull in the late 1970's on temperature-dependent sex determination (published in the journal Science) forever changed how we view the evolution and conservation of chelonians. Astoundingly, he has followed up this incredible career-defining achievement with yet another—his most recent work on chelonian vocalization has again turned the turtle world upside down and is setting a new path for how we practice turtle conservation.

Dick and his students have not only shown that a number of turtle species are "talking", but that there is communication between adult females and hatchlings in the Giant Amazonian River Turtle (*Podocnemis expansa*). This is the first documented evidence of post-hatching parental care in chelonians. Our conservation community must now consider how these findings may affect how we headstarted this and other species. We must ask ourselves if we are disrupting important transference of learned behaviors from mother to offspring by keeping hatchlings in captivity for weeks to years before their release. We may unwittingly be doing more harm than good, much like how many early turtle conservationists incubated turtle eggs at cool temperatures, thereby producing only

males, before Dick's seminal work demonstrated the error of their ways. This sentiment is echoed by Peter Paul van Dijk: "*Dick's fundamental role in the discovery of vocal communication between hatchlings and adult* Podocnemis *river turtles, will lead to another fundamental change in how* Podocnemis *population recovery efforts will be conducted, and will likely be relevant to other species efforts as well.*"

These two monumental scientific achievements should not overshadow the fact that Dick has published more than 100 scientific papers and book chapters, as well as 12 books in English, Spanish, and Portuguese. Rick Hudson states: "*From a practical application standpoint, Dick's work impacts us every day and his influence on turtle conservation biology is profound.*" Gerald Kuchling further supports this: "*Dick understands how to do cutting edge research and demonstrate its relevance for turtle conservation.*"

Dick earned his BS in 1971, MS in 1974, and Ph.D. in Zoology in 1978 from the University of Wisconsin-Madison, before holding a postdoctoral position at the Carnegie Museum of Natural History from 1978 to 1980. From 1981 to 2000, he was Investigador Titular and Curator of the Herpetology Collection at Estacion de Biologia Tropical Los Tuxtlas, Universidad National Autonoma de Mexico (UNAM), before moving to his present position at the Instituto Nacional de Pesquisas da Amazônia, in Manaus, Brazil, where he is Research Professor in the Department of Biodiversity and Curator of Herpetology.

Dick's passion for turtle conservation started at a young age and he was one of the first to bring attention to the plight of Wisconsin's turtles. His diligence helped place the Ornate Box Turtle, the Wood Turtle, and the Blanding's Turtle on the Wisconsin Endangered Species list. Dick is widely considered an authority on North American map turtles, genus *Graptemys*. For his doctoral work, he studied the ecology and systematics of the *Graptemys pseudogeographica* complex throughout their range, with his main study area in the Mississippi River of Wisconsin. Additionally, he and his long-term mentor, the late Jack McCoy, conducted some of the early definitive work on *Graptemys* in the southern U.S. Gulf Coast region.

Dick's twenty years of research on the turtles of Mexico is unsurpassed in breadth and scope. He has published widely on such topics as community ecology, feeding biology, and reproductive biology of Kinosternidae, Emydidae, Geoemydidae, and Dermatemydidae. His research on the Central American River Turtle (*Dermatemys mawii*) in Mexico led to the IUCN ranking them as Critically Endangered.

Dick with a Giant Amazon River Turtle (*Podocnemis expansa*), the subject of some cutting-edge scientific investigations into landscape-scale movements, parental care, and recently involving chelonian vocalizations. PHOTO CREDIT: ELIS PERRONE

After nearly twenty years of living in Mexico—which culminated in his most recent book "Turtles of Mexico: Land and Freshwater Forms", co-authored with the late John Legler, Dick yet again decided to challenge himself and begin anew.

He picked up his family and moved to Manaus, Brazil—yet another turtle biologist's paradise. He quickly developed a lab and a core group of students that over the years has always been devoted to both Dick and turtles. Dick does not just have students; he has co-researchers, who share in all aspects of the research and presentation of the results. Many of his publications had what most turtle biologists would think of as unattainable sample sizes; he routinely has published on studies that included groups of 3,000 to 4,000 turtles.

Vivian Páez states: "*Richard Vogt has devoted his life to the study of all aspects of turtle biology, principally in the United States, Mexico, and Brazil. In addition to his impressive publication record, he also has offered field courses to help train the next generation of turtle biologists, and has helped many Latin American turtle biologists to begin their careers.*" We don't know where our understanding of Mexican and South American turtles would be without Dick's dedication to these regions.

Yet, Dick is showing no evidence of slowing down. He has decided to branch out yet again by taking the helm of finishing John Legler's long-awaited book, "Turtles of Australia". If anyone can tackle this task, it is Dick Vogt. He continues to push the envelope of how we do turtle conservation and hence is extraordinarily deserving of our community's most prestigious award.

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Planning for the Future

For supporters who wish to have a long-lasting impact on the conservation of turtles, we have planned giving opportunities available. If you are interested in making a gift that will support our conservation programs well into the future, please consider a donation to our Operating Endowment Fund.

Please contact Heather Lowe at 817/759-7262 or HLowe@turtlesurvival.org for more information on either program.

How Can You Help?

There are many ways that YOU can contribute to turtle conservation and support the Turtle Survival Alliance's mission of *zero turtle extinctions*. Visit the TSA website to learn more!

- **Make a Donation** Donations can be dedicated to a specific project or program, just let us know what you'd like to support!
- **Purchase Equipment** Check out the Turtle Survival Alliance Wish List on Amazon.com to purchase equipment that is needed by our staff at the Turtle Survival Center and in the field.
- **Join the TSA** Become a member of the TSA or buy a gift membership for a friend.
- **Support the TSA at No Extra Cost to You** There are several programs available in which you can support the TSA's mission by doing what you do every day!
  - » **Amazon.com** – Access amazon.com via the TSA link 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!
- **Shop for the Cause** Visit the TSA's online store to purchase t-shirts, art, publications or other merchandise to support conservation projects around the world. Retired designs are available on a wide variety of merchandise in the TSA's Café Press store.
- **Volunteer** Pitch in and get your hands dirty! Volunteer opportunities are posted on the TSA website when available.

http://www.turtlesurvival.org/get-involved

Thank you for your support!

The TSA gratefully acknowledges the following donors and organizations for their generous support over the past year (July 2013-July 2014)

Supporters donating $500 to $2,499

AAZK - Cleveland Chapter, AAZK - Detroit, AAZK - National Capital Chapter, AAZK - Puget Sound Chapter, Akron Zoo, Albuquerque BioPark, Audubon Zoo, Baltimore Zoo, Baton Rouge Zoo, Beardsley Zoo, Bill Holmstrom, Bonnie Raphael, Brett and Nancy Stearns, Brevard Zoo, Central Illinois Herp Society, Cris Hagen, Dan Bernard, Dan Pearson, Diane Yoshimi, Dickerson Park Zoo, Dwight Lawson, Faith Connolly, Fresno Chaffee Zoo, Friends of Wekiva River, Inc., James and Barbara Stewart, James Breheny, Jenkinson's Aquarium, Joe Maierhauser, Kathryn Hudson, Knoxville Zoo, Landry's Downtown Aquarium Houston, Lois Dickson, Los Angeles Zoo, Mazuri, Nancy Karraker, Oklahoma City Zoological Park, Peter Woodman, Robert Krause, Robin de Bled, Santa Fe College, Toyota 100 Cars for Good, Virginia Aquarium, Wekiva Wilderness Trust, Wildlife World Zoo, Woodland Park Zoo

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Auckland Zoo, British Chelonia Group, Brookfield Zoo, Bruce Weber, Cleveland Metroparks Zoo, Dallas Zoo, Debbie Cooley, Desert Tortoise Council, Ed Neil, Frank and Kate Slavens, Hersh Markusfeld, International Fund for Animal Welfare, John Ball Zoo, John Iverson, Kristin Berry, La Vanille Crocodile Park Ltd., Omaha's Henry Doorly Zoo, Phoenix Zoo, Pittsburgh Zoo, Riverbanks Zoo, San Antonio Zoo, Sedgwick County Zoological Society, Taipei Forestry Bureau, Tim Gregory, Virginia Zoo, World Wildlife Fund, Zoo Atlanta

Supporters donating $7,500 to $19,999

Andrew Sabin Family Foundation, Anonymous, David Shapiro, Dennis Coules, Detroit Zoo, Natural Encounters Conservation Fund, Nature's Own, People's Trust for Endangered Species, St Louis Zoo, Turtle Conservation Fund, Utah's Hogle Zoo

Supporters donating $20,000 to $49,999

Bill Dennler, Columbus Zoo, Disney Wildlife Conservation Fund, Mohamed Bin Zayed Species Conservation Fund, San Diego Zoo Global, Save Our Species (SOS) Fund, Walter Sedgwick, Wildlife Conservation Society

Supporters donating $50,000 to $99,999

Brian Bolton, Fort Worth Zoo

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Ben and Jerry's, Brett and Nancy Stearns, Chelonian Research Foundation, Frank and Kate Slavens, IUCN Tortoise and Freshwater Turtle Specialist Group, John Carr, John Iverson, Michael Redmer, SWCA Environmental Consultants, Zoo Med Laboratories, Inc.

2014 Behler Turtle Conservation Award Sponsors

Brett and Nancy Stearns, Chelonian Research Foundation, Chelonian Research Institute, Conservation International, Deb Behler, George Meyer, IUCN Tortoise and Freshwater Turtle Specialist Group, Matt Frankel, Turtle Conservancy, Turtle Conservation Fund, Wildlife Conservation Society

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

Lonnie McCaskill has continued to go above and beyond as the TSA India Advisor, putting in many valuable hours to support this critical conservation program.

Robert Villa, **Phillip Sigler**, **Michael Hance**, **Rose Tremblay**, **Wendy Crofut**, **Nancy Reinert** and **Brian Bower** all returned as our faithful volunteers for the 2014 symposium. **Peter Miller** and **Kimberly Schmidt** joined them for the first time, providing photography and A/V support. Special thanks also to the amazing crew at **Disney's Animal Kingdom** for providing extra volunteer support while we are in Orlando.

Shannon Livingston assisted with grant writing for the India program, helping to secure funds for several key projects.

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

Ben Anders and **Mark Wallace** shared their artistic skills and provided us with t-shirt designs this year.

Andrew Walde, **Daren Riedle**, **Lonnie McCaskill**, **Scott Davis** and **Beth Walton** have once again put in countless hours of work behind-the-scenes to make the annual symposium a reality, catalyzing turtle conservation globally by bringing together the leaders in the field.

Cody Martin and the entire crew at **Martin House Brewing Company** have been so fun to work with while we developed a limited edition brew to benefit turtle conservation. We look forward to the beer's debut this fall.

Caught in a safety net?

Not all threatened turtles have a high profile: some of the most imperiled species are also among the most obscure. Hoge's Toadheaded Turtle (*Mesoclemmys hogei*) is a Critically Endangered species from the vanishing coastal forests of Southeastern Brazil that was described to science almost 50 years ago. Now it will get more attention from scientists thanks to a grant from the Petrobras energy corporation to Glaucia Moreira Drummond of Fundacao Biodiversitas and her colleague Dr. Marcos Eduardo Coutinho of Instituto Chico Mendes de Conservacao da Biodiversidade, who will research *M. hogei* and threats to its survival in the Carangola River. In addition to investigating the natural history of *M. hogei* and potential remedies for its decline, Drummond and Coutinho will establish an assurance colony, which has been helpful in the recovery of other endangered turtles.

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