A remarkable and rarely seen sight, a male Burmese roofed turtle, Kachuga trivittata, in splendid breeding coloration. The TSA, in partnership with WCS and the British Chelonia Group, is supporting efforts for this critically endangered river turtle, both in captivity and in the field (page 16-17). Photographed by Brian Horne in October 2005 at the Yadana Bon Zoo in Mandalay, Myanmar.

The mission of TSA is to develop and maintain an inclusive, broad-based global network of collections of living tortoises and freshwater turtles with the primary goal of maintaining chelonian species over the long term to provide maximum future options for the recovery of wild populations.
On the occasion of this sixth TSA newsletter and upcoming fourth annual conference, we pause to reflect on the state of the organization today and the direction in which we are heading. If we had to select a “break out” year for the TSA, 2006 would be it. As with any year, there have been some significant highs and lows, but your organization remains financially viable, alive with the spirit of volunteerism, well-connected internationally and strongly positioned to continue to make a lasting impact on chelonian conservation.

We began 2006 with one of saddest events in our five year history, the passing of John L. Behler on January 31 (see page 3). In addition to being an ardent and vocal supporter of the TSA, John was the most impassioned voice of the turtle conservation community. To honor his legacy, the TSA and IUCN Tortoise and Freshwater Turtle Specialist Group will present the first annual John Behler Chelonian Conservation Award in August in recognition of outstanding achievement in the field. A special conference session at the joint meeting in Saint Louis will likewise pay tribute with a series of presentations on two of John’s enduring passions, Madagascar tortoises and the genus *Clemmys*. John’s memory will always be with us, and our success his legacy.

Last year’s $100,000 Batchelor Foundation grant has the TSA firmly entrenched in six Asian countries including Malaysia, Thailand, India, Myanmar (Burma), Vietnam and Cambodia. In Malaysia, Dr. Chan Eng Heng’s excellent work with *Batagur* and *Callagur* (see page 14) focuses on egg incubation and TSD studies, as well as headstart and release strategies. This work promises to bring some much-needed science to ongoing recovery programs. In Thailand, Dr. Gerald Kuchling and Shannon Ferrell, DVM, addressed husbandry and mortality issues with *Chitra chitra* at the Kanchanburi Fisheries Station and made some significant preliminary discoveries in the process (see page 13). In India, the TSA and Madras Crocodile Bank Trust co-sponsored a Conservation Planning workshop for India’s endangered freshwater turtles and tortoises then rapidly transitioned into the action phase with a flurry of nesting season activities. In Myanmar, the TSA provided critical support to the Burmese roofed turtle, *Kachuga trivittata*, both in the field and captivity. Construction has begun on a new facility at Mandalay’s Yadanoobon Zoo and a Wildlife Conservation Society field team collected 200 eggs from eight nests on the Upper Chindwin river, where the last known nesting sites for this highly endangered river turtle exist (see page 16). In Vietnam, the TSA again provided support for operations and improvements to the Turtle Conservation Center at Cuc Phuong. And in Cambodia, the TSA, in partnership with the European Association of Zoos and Aquariums Shellschock campaign, is providing support for a headstarting operation for *Batagur* (see page 15). In China, the TSA will help support a planning workshop for the world’s most endangered freshwater turtle, the Yantze River giant softshell, *Rafetus swinhoei*, headed for almost certain extinction without heroic intervention (see page 29). Four specimens are in captivity in China, in three locations and a captive breeding plan must be developed soon. Closer to home, our initiatives in southern Mexico (see article page 11) for *Dermatemys* are expanding with plans to develop a community-based conservation program that could have widespread implications for the future of this heavily exploited river turtle.

On the domestic front, the TSA membership program is now in its second year and the numbers continue to grow. To date we have 110 individual partners, 40 institutional partners and 50 members - 200 total. This is an essential component of our operating budget and allows us to respond to emergencies and urgent requests for financial assistance. Increasingly the TSA is seen as the “go to” group for conservation action, and we often find ourselves unable to respond to good conservation initiatives because of lack of funds. Please know how much we appreciate your continued support, and hope you understand how important that support is for endangered chelonians. While this newsletter highlights our most recent conservation successes, the situation for many turtle species remains critical. The TSA global network is expanding to meet the challenges and we need your help. There are many ways to support the TSA, so please get involved as we work together to assure a future for turtles.

Rick Hudson and Dwight Lawson
Co-Chairs, Turtle Survival Alliance
In Memoriam, John L. Behler

John L. Behler Chelonian Conservation Center

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The global herp conservation community has lost one of its most impassioned voices. We are deeply saddened to report that John Behler passed away quietly in his sleep on January 31. Since 1976, John was the Curator of Herpetology at WCS/Bronx Zoo where, during a distinguished 30-year career, he inspired a legion of herp conservationists. Particularly well known for his work with crocodilians and chelonians, John was instrumental in organizing cooperative captive management strategies for endangered reptile and amphibian species. He traveled widely and conducted fieldwork in a range of countries, but is perhaps best known for his efforts to understand and preserve the tortoises of Madagascar, a passion he pursued for over ten years. John also worked to develop WCS’s turtle conservation program in Myanmar (Burma). He was the long-time Co-Chair of the IUCN Tortoise and Freshwater Turtle Specialist Group (TFTSG) and one of the founding members of the Turtle Survival Alliance (TSA), an organization he staunchly believed in and vigorously supported. He was the driving force behind the formation of AZA’s Crocodilian Advisory Group, and ran the Chinese Alligator SSP (the first reptile SSP program) for more than twenty-five years. The genus Clemmys was especially close to John’s heart and he conducted long term field studies on bog, spotted and wood turtles in the northeast.

John was recognized as a leader in the world of reptile and amphibian conservation, a role he accepted and pursued with an uncompromising set of high ethical standards and ideals. Truly a hero for turtle conservation, John was a vocal champion for this cause, sounding the alarm years before news of the Asian turtle crisis hit. To better understand the man’s heart and passion, one needs only to read his prophetic essay Troubled Times for Turtles, in the Proceedings of the 1993 Purchase New York meetings, at http://nytts.org/proceedings/behler.htm.

Behler authored more than 40 popular scientific articles, five guidebooks highlighting reptilians and amphibians and recently co-authored a book “Frogs - A Chorus of Colors” with his wife, Debbie Behler. He is also survived by his mother, two children and five grandchildren.

To commemorate John’s life and to pay tribute to his legacy, the TSA and TFTSG will award the John Behler Chelonian Conservation Award at the 4th annual conference in St Louis, 11 – 13 August 2006. The first award will be presented to Ed Moll in recognition of his lifetime achievements in turtle conservation. This award will carry a financial stipend - $3,000 for 2006 - and is sponsored by six leading turtle conservation organizations: Chelonian Conservation Center, Chelonian Research Foundation, Chelonian Research Institute, Conservation International, Durrell Wildlife Conservation Trust and World Chelonian Trust.
In 2005, the John L. Behler Chelonian Conservation Center (JLBCCC) was organized for the captive husbandry and propagation of chelonians with an emphasis on research and education. When the Wildlife Conservation Society (WCS) decided to dismantle operations on St. Catherines Island in 2004, considerable concern was expressed on where and how to disperse the incredibly valuable collection. The collection includes founders of the radiated tortoise (*G. radiata*) Species Survival Plan and also include the first recorded hatchlings in the United States of the spider tortoise (*P. arachnoides oblonga*). Eric Goode and Maurice Rodrigues, directors and founders of the JLBCCC, offered to help by developing property in southern California for the purposes of maintaining the collection. The JLBCCC has placed a considerable amount of funding and effort into developing the facility and has established a very credible and talented board of trustees to oversee its development. The board of trustees varies in expertise, but has a common commitment for the conservation of endangered turtles and tortoises.

In early 2005, construction began on several buildings for the collection. The commissary, greenhouse and two winter tortoise holding buildings were built. The greenhouse is a restored 1920s original with the latest automation controls installed to regulate heat and humidity. It has floor access doors that lead out into large, shaded, rockwork-lined yards with pools for species that require a wetter environment. The commissary includes a full size commercial kitchen, nursery, winter tortoise holding facilities and keeper’s quarters. The two winter tortoise holding buildings have state-of-the-art heat and humidity controls. All of the buildings have been constructed to maintain the aesthetic of a 1920s Spanish style-home set amid a desert-like landscaped garden, with a profusion of indigenous cacti and succulents, native fruit trees and desert wildflowers, all suitable for tortoise forage. The facilities have been designed with the utmost care and attention and have incorporated the best available technology to maintain the species in the collection. These buildings include hydronic radiant floor heating, elevated tables to hold smaller species and hatchlings, large glass windows and skylights to allow optimal sunlight and floor access doors that lead out to rockwork-lined holding yards for larger species that are planted with a variety of succulents and forage for the tortoises.

Striving to achieve the highest standard of captive husbandry for the tortoises, the JLBCCC has thoroughly researched the natural habitats and environmental conditions of the individual species in the collection. The facilities have been designed to mimic the biotic and abiotic factors necessary to ensure the health of each species along with the development of food and forage plots to supplement nutritional needs.

In the summer of 2005, the WCS agreed to transfer the collection held at the Wildlife Survival Center on St. Catherines Island, Georgia, to the JLBCCC’s developing site in southern California through formal breeding loan agreements. The founder stock of
approxiatively 100 threatened or endangered specimens from the WCS was relocated from St. Catherines Island to the JLBCCC in October 2005. Currently, 11 species of chelonians comprise the collection, including *Geochelone platynota*, *Geochelone radiata*, *Homopus s. signatus*, *Homopus areolatus*, *Chersina angulata*, *Pyxis planicauda*, *Pyxis a. arachnoides*, *brygooi* and *oblonga*, *Manouria emys phayrei*, *Manouria impressa*, *Testudo kleinmanni* and *Geoclemys hamiltoni*.

In January 2006, the JLBCCC decided to dedicate the facility in the name of John L. Behler, Curator of the Department of Herpetology of the WCS. As a critical member of the board of trustees, John L. Behler’s vision and insight were key elements in the inception and creation of the JLBCCC. With the news of his passing, the facility has embraced his vision for conservation and officially changed its name to the John L. Behler Chelonian Conservation Center.

The JLBCCC’s two-fold mission of education and conservation will be achieved through captive reproduction efforts and building an assurance colony of genetically diverse representatives of endangered chelonians. We also wish to integrate our research and our work by establishing and publishing protocols for successful breeding and training in the care and propagation of these species. JLBCCC is committed to supporting *in situ* conservation and field research that directly applies to our collection. As currently envisioned, our *in situ* efforts will initially be directed toward developing programs in Madagascar, Myanmar and South Africa. The endeavors of the JLBCCC will furnish the opportunity to grow in a variety of disciplines.
On March 13, 2006, Bill Zeigler, representing the TSA, met with members of the Batchelor Foundation to report on the status of their 2005 grant of $100,000. The meeting was held at the Batchelor Foundation office in downtown Miami, Florida and consisted of Sandy Batchelor, Jon Batchelor and other Foundation members. A power point presentation was given covering the projects the grant supported. During the presentation and again at the end, the Foundation stated their approval of TSA’s methods and utilizations of control to ensure the most efficient use of the funds. Overall the Foundation was most impressed with the TSA and the broad scope of accomplishments achieved by the grant money and the TSA in general. In gratitude, TSA presented the Foundation with a print of a Galapagos tortoise, courtesy of Peter Pritchard.

The Batchelor Foundation’s 2005 grant has had an incredible impact on the TSA’s ability to respond to urgent turtle conservation needs in eight Asian countries and Mexico. Of the 18 species ranked Critically Endangered by the IUCN Red List, over half are being assisted by TSA through Batchelor Foundation funding. The conservation programs that we are initiating in foreign lands are not short term, and we need to be prepared to commit for the long haul. Aside from the programs already started, we need to expand to include Madagascar and Africa. It is with this commitment in mind that we hope to strengthen our relationship with the Batchelor Foundation. We will continue to demonstrate fiscal responsibility and substantial impact on improving the chances for survival for endangered turtles and tortoises. Together we believe we can deliver on our promise of zero turtle extinctions in the 21st century. The following 11 pages illustrate excellent examples of the work that is being done by TSA in Asia and Mexico, with Batchelor Foundation funding.
The TSA, in collaboration with the Madras Crocodile Bank Trust (MCBT), sponsored a workshop for the Conservation and Action Plan for Freshwater Turtles and Tortoises of India, held 17-20 October 2005, at the Kukrail Breeding Centre in Lucknow. The primary goals of this workshop were to identify chelonian species most at risk in India – through the IUCN Red Listing process, and to draft conservation action plans for those species considered the highest priorities. A secondary objective was to provide a range of training opportunities on various chelonian techniques and practices to Forest Department personnel, researchers and students. Organized by the MCBT, in collaboration with the Uttar Pradesh (UP) Forestry Department, this workshop brought together 95 individuals from diverse backgrounds including governmental agencies, zoos, universities, forest departments, conservation NGOs and wildlife breeding and rehab centers. In all, nearly 30 organizations and institutions, both Indian and international, were represented. Major funding for the workshop was provided by the TSA.

With 28 species and subspecies of tortoises and freshwater turtles, India has one of the most diverse and best-studied chelonian faunas in the world and ranks among the top five Asian countries in terms of its importance for turtle conservation. Unfortunately, nearly 40 percent (11 of 28 taxa) are listed as either Endangered or Critically Endangered on the IUCN Red List. With nearly a billion people living in India, the aquatic resources, as well as the turtles that inhabit them, face a growing number of threats that will likely increase. Multiple threats take their toll, but uncontrolled and non-sustainable commercial exploitation by man has been the single most damaging.

The workshop highlighted 10 species for intensive conservation action planning: Batagur baska, Kachuga kachuga, Pelochelys cantorii, Aspideretes nigricans, Aspideretes leithii, Chitra indica, Kachuga dhongoka, Hardellathurjii, Manouria emys and Pangshura sylhetensis. Nearly a full day was devoted to drafting a detailed “recovery plan” for the red-crowned roof turtle (K. kachuga), an IUCN critically endangered species unofficially chosen as the centerpiece of this action plan. The working group examined existing conservation measures, and then worked to recommend new initiatives and/or expand existing ones.

Though multiple threats and needs were identified, of primary importance is an increased focus on the Deori-Eco Centre at Morena in Madhya Pradesh (MP). Developed as a gharial headstarting operation, ample facilities are available here for turtle conservation. It is close to the National Chambal River Sanctuary, home to at least three target species, and is well positioned to become the focal point for K. kachuga recovery efforts. Plans call for major improvements and upgrades at this facility that will substantially expand capacities for egg collection, incubation and headstarting. Two other species are targeted for work here as well - the three-striped roof turtle, K. dhongoka, and the narrow headed softshell turtle, Chitra indica.

To initiate this important component the European Association of Zoos & Aquariums (EAZA) Shellshock campaign recently awarded $10,000 for Deori facility improvements (Rick Hudson)
Following the recommendations from the Action Plan workshop, Harry Andrews and his staff from the Madras Crocodile Bank Trust/Centre for Herpetology, in collaboration with the Uttar Pradesh (UP) and Madhya Pradesh (MP) State Forest Departments, moved rapidly into the implementation phase. *Kachuga kachuga* and *Kachuga dhongoka* were immediately targeted for in situ hatcheries and nest protection programs along the National Chambal Sanctuary in both states. With funding from TSA and EAZA/Shellshock, the MCBT team initiated a broad range of field activities including the establishment of ex situ nursery/incubation facilities, egg collection, rearing hatchlings for headstarting, continued population surveys and impact monitoring.

Nesting surveys commenced in February and ended in April 2006. GPS coordinates and locality names mapped all nesting islands and river banks. Data recorded included nest and egg counts (including those depredated), turtles found in net entanglements (both dead and alive), and their measurements. Human impacts are being recorded (mainly agriculture, illegal fishing, sand mining, fuel wood traffic and grazing of domestic livestock). Out of the 172 km of the UP portion of the Chambal River sanctuary 160 km have been surveyed, and additional 250 km have been surveyed in MP. Results indicate that the number of *K. kachuga* may be down to a few hundred nesting females along the 472 km stretch of the National Chambal Sanctuary, reaffirming that this species is critically endangered.

In February 2006, using old fishing nets and a thorn brush barrier (a defense against jackals, the primary threat to turtle nests in this area), 624 square meters were fenced to create an in situ hatchery. Located on an island in the Chambal River near Garhaita, Etawah, UP (southeast of the Taj Mahal), the hatchery received translocated nests of both *K. dhongoka* and *K. kachuga* beginning in early February. A total of 305 clutches - 19 (224 eggs) from *K. kachuga* and 286 (5,883 eggs) from *K. dhongoka* - were translocated between February and April 2006. *K. kachuga* clutches from additional localities along the Chambal River in UP were also transported to the Garhaita hatchery.
On 8 May 2006, *K. dhongoka* began to hatch and continued until early June. Staff working at night collected hatchlings, labeled them on the plastron (by nest) with a permanent marker. All hatchlings were measured and selectively photographed, with most being later released in the Chambal River, one km downriver from the hatchery area. Releases were made early in the morning (between 6 and 7 am) or late evenings (between 5 and 6 pm), mainly to reduce heat stress and the risk of depredation. Currently *K. kachuga* nests are continuing to hatch. Plans are to maintain these later hatchlings in the nursery pond for the headstarting program. Environmental parameters such as ambient and nest temperatures, rainfall, and river depth are being recorded at the *in situ* hatchery. Data on naturally hatching nests are also being recorded for comparison to the *in situ* hatchery data.

A second *in situ* hatchery was established but had to be abandoned due to problems with poachers and dacoits (bandits). Eggs incubating here were moved to the more secure Garhaita site. All told, 23 *K. kachuga* nests (265 eggs) and 372 *K. dhongoka* nests (7,015 eggs) were collected in UP, with 147 *K. kachuga* having hatched to date, 68 of which were released into the Chambal and 77 are being kept in the nursery pond at Garhaita. 112 eggs are still incubating and resulting hatchlings will be moved to the nursery for headstarting. Of the 7,015 *K. dhongoka* eggs, 5,191 have been hatched and released.

In the state of MP, construction of the nursery pond at the Deori Centre, 15 km from the Chambal River, was completed in June 2006 with funding from the EAZA/Shellshock campaign. A total of 160 *K. dhongoka* nests (3,437 eggs) and 74 *K. kachuga* nests (1,208 eggs) were monitored *in situ*. Of these 2,929 *K. dhongoka* and 1,052 *K. kachuga* were released into the Chambal River. Along the MP stretch of the National Chambal Sanctuary 198 *K. dhongoka* and 56 *K. kachuga* nests were recorded as depredated. Currently 190 *K. kachuga* and 250 *K. dhongoka* are being headstarted in the new Deori Centre facility. Whenever possible, river surveys for nesting and impact assessments are being continued. To aid in the headstarting program, additional Forest Department staff trained in egg collection, handling, incubation and hatchling husbandry. The team will soon expand this project to include egg collection and headstarting for the *narrow-headed giant soft shell* turtle, *Chitra indica*. Intensely hunted in India, this species was recommended for elevation to Critically Endangered status by the Action Plan workshop Red List group. Plans call for eggs to be moved to *in situ* hatcheries for incubation with hatchlings being released post-monsoon. Captive breeding programs will also be established at MCBT and the Kukrail Endangered Species Breeding Center.

The above Indian turtle projects represent significant progress towards conserving India’s imperiled turtle fauna. In only the first year of field implementation, the nest protection program produced thousands of *Kachuga* hatchlings that would have otherwise been lost to depredation, a testament to what can be achieved with modest funding. In addition to the Batchelor Foundation and EAZA/Shellshock campaign funds, the TSA is grateful to both the Detroit Zoological Institute and the Zoological Society of San Diego for financially supporting these projects. In particular, San Diego Zoo CRES has agreed to fund a five-year postdoctoral fellowship for Brian D. Horne, based on the Chambal River. It is hoped that his research will begin to shed some insight into the life history and survival strategies of this community of increasingly threatened river turtles. For various courtesies extended during the past year, we are grateful to Jeff Lang, Peter Paul van Dijk, Don Boyer, and Brian D. Horne. (Rick Hudson)
The TCC, located within the Cuc Phuong National Park, represents the flagship of Vietnam’s turtle conservation efforts. With facilities that include a 50,000 square-meter (fenced) forest hill and more than 2,000 square meters of enclosures, and newly established research and hatchling rearing buildings and separate quarantine and veterinary station, the TCC holds about 800 turtles of 16 species, and continues to receive new turtles from trade seizures.

However, as I frequently have to remind visitors of the center, the real value of the TCC’s efforts rest less with the turtles that the center holds but more importantly on how the center is used to promote turtle conservation and protection efforts in Vietnam. The TCC’s multi-faceted approach includes a range of regular and ongoing activities that utilize the center and its Chelonian occupants as a resource for training of wildlife protection officers, working with the media, raising awareness, and developing a constituency for turtles amongst the next generation of young conservationists.

The past year has been an exciting year for the TCC with a range of new training activities carried out at the center including a 10-day course on captive management and care for keepers and veterinarians from other major rescue centers in Vietnam, a second annual field skills development training course for students from five different universities, and training in turtle identification and ecology for frontline rangers from five provinces.

The center has also received turtles from a number of confiscations, and in May 2006, coordinated the return of 34 *Mauremys annamensis* from Hong Kong’s Kadoorie Farm and Botanic Garden.

With support from the British Chelonian Group, the TCC has also developed a number of new facilities for turtles including a large wetland enclosure that is currently occupied by *Hieremys annandalii*, but will soon be used for the growing number of sub-adult *Mauremys annamensis* born at the center. The Dutch Tortoise Society supported the expansion of the TCC’s hatchling-rearing facilities with a new small building for housing juvenile aquatic species. A new quarantine cage was also constructed with support from an AZA CEF grant administered through WCS.

During the coming summer, the TCC will double its captive management area with the expansion of the center to include an additional 2,000 square meters of space. The additional space is needed to allow for construction of additional secure cages for turtles confiscated from the illegal trade, as well as the growing number of juveniles resulting from the park’s conservation breeding program for five priority endangered species; *Cuora mouhotii*, *Sacalia quadriocellata*, *Cuora galbinifrons* [*C. bourreti*, and *C. picturata*], *Mauremys annamensis* and *Indotestudo elongata*.

However, the most important structural development this year will be the slow-but steady development of the TCC’s Chelonian Interpretation Center (CIC) for which architectural plans have been completed and builders are expected to break ground by mid-July. Supported in part by a grant from the TSA, as well as a number of zoos (Melbourne, Taronga, Auckland, Perth, Houston), the CIC features 14 interpretation stations, live exhibits and hands-on activities for visitors at the center. The new facility is scheduled to open in late 2006.

The Cuc Phuong Turtle Conservation Center has brought the crisis facing Vietnam (and Asia’s turtles) into the light, and has elevated the status and conservation importance of turtles, not just within the conservation and scientific community here, but also amongst government agencies responsible for their protection, and perhaps most importantly, amongst decision-makers and the general public. The battle is far from over, but from our perspective, there is light at the end of the tunnel.

The Turtle Conservation Center and its activities during the 2005-2006 project year were made possible thanks, in part, to a generous grant from the Batchelor Foundation through the TSA. (Douglas Hendrie)
With support from the Batchelor Foundation, TSA Partners continued to assist the turtle farm at Nacajuca in the state of Tabasco, Mexico, where the largest captive group (800 estimated) of *Dermatemys* is held. This initiative was launched by Greg George and his team at Petraworks, Inc. in 2004 and continues today.

In April 2006, Sam Rivera, DVM (Zoo Atlanta), assisted Gracia Syed in implanting PIT tags in many of the farm’s *Dermatemys*. The goal is to keep the wild-caught founder stock identifiable and distinguishable from the F1 progeny that are becoming adult size now. Sam also did an initial assessment of the health and needs of the seven turtle species kept at Nacajuca. Unfortunately, little is known about the veterinary husbandry of these species in captivity. Sam visited other farms in southern Mexico to get an idea of what the veterinary needs were. He also taught Mexican biology graduate students how to implant microchips on captive turtles.

Some of the health problems observed included decreased weight, shell trauma, fungal and bacterial shell lesions, anemia, and ectoparasites. There is currently an on-going project looking at several hematologic parameters in captive and wild *Dermatemys mawii* to assess their overall health. There are also ongoing projects aimed at improving the infrastructure and management of the facility, which in turn will help decrease the morbidity associated with these factors. A lot of work is still needed to evaluate the medical problems in captive aquatic turtles at the farm, and how these can affect the species’ management in captivity.

In order to improve some of the husbandry procedures at Nacajuca, in May 2006 Petraworks Inc. staff Gregory George and Adam Edelstein returned to Nacajuca to continue work that started the previous year. In addition to inspecting and maintaining the filter systems installed previously, additional problems with infrastructure were also addressed. A new cistern to gravity feed fresh water to the large *Dermatemys* pond was completed and a new well pump was installed. To provide a more appropriate enclosure for the *Rhinoclemmys*, their enclosure was refurbished with some plantings to provide shade and fruit for the turtles by the Nacajuca staff. Petraworks continued this project by adding more native plantings and resurfacing the pool in the enclosure. Three small exhibit tanks were also constructed with the help of staff and volunteers. The acquisition and installation of pumps, filters, and waterlines was accomplished with the generous help and financial support of Raul Rodriguez of Electrica Seis, Villahermosa, Tabasco.

Looking to expand the TSA’s involvement with *Dermatemys*, and to launch a sustainable and innovative new program for their conservation, Rick Hudson and Brian Horne joined Greg and team in Veracruz before they moved on to work at Nacajuca. Hosted by Range Country Programs: Mexico TSA Expands Focus on *Dermatemys* in Southern Mexico, Prepares to Launch a New Community-based Initiative

Photo courtesy of Brian D. Horne

An attractive male *Rhinoclemmys rubida* at the National Turtle Center in Oaxaca, Mexico
the staff at the Center for Coastal Studies at La Mancha (CICOLMA), which is managed by the Institute of Ecology (INECOL), the team evaluated the potential for a new Dermatemys facility. The La Mancha site has been classified as an Ramsar-designated site and is recognized as an internationally important wetland. Our primary host was Gustavo Aguirre of INECOL, a long-time turtle conservation biologist in Mexico. His group wants to develop a “model” Dermatemys facility and they have excellent infrastructure to support it. Research labs, dormitories, service facilities and meeting rooms are all there, perhaps just as exciting is a group of local eco-guides and an adjacent ecotourism area with cabanas for overnight visitor stays. The guides are particularly excited about the potential of developing turtle facilities and offered to help with maintenance and upkeep of the proposed ponds. Another important aspect is the constant presence of staff and students, both national and foreign, so security and manpower will not be an issue. We envision a low-maintenance, low-cost system that generates much of the plant food source in the filtration ponds and plan to design a good working model that can be used by others.

The team then traveled to Rio Cana in the La Popotera Lagoon (another Ramsar site) located in the vast and productive wetlands of the Papaloapan Basin in coastal Veracruz. There they met with a group of turtle trappers, some of whom want to explore alternative sources of income, and a few have already abandoned turtle hunting. These trappers are a valuable source of information on the local abundance of Dermatemys and harvesting pressures. We discussed some innovative “aquaculture style” floating turtle-rearing enclosures for Dermatemys and specs. Cost estimates are being worked up. If successful, this could develop into a model technique for rearing turtles naturally, at low cost and impact - food is free because the area is choked with water hyacinth and other edible aquatic vegetation. By developing a partnership with local communities and organizations, the TSA hopes to be able to launch a model program for turtle conservation in Mexico - one that will have community support and involvement. Developing cutting edge rearing and headstarting techniques that help take pressure off of wild populations.

The team also visited the National Turtle Center of Mexico in Masunte, Oaxaca, and was hosted by Director Martha Harfush. Originally built as an aquarium, the facility was converted primarily for exhibiting sea turtles. However, they have expanded to include a wide range of Mexican freshwater and terrestrial turtles, some of which are reproducing quite well. Particularly impressive were their Rhinoclemys programs, including R. aerolata, R. p. pulcherrima and R. rubida, a beautiful little gem that is rarely seen except in the rainy season. Unfortunately, 15 of their group of 20 R. rubida were stolen in January 2006. The center wants to re-establish the R. rubida breeding program and build a new and secure exhibit. The TSA is interested in assisting with this project and believes that the Center will make an excellent partner for us as we expand our involvement in Mexico. The added benefit of developing programs in Mexico is proximity for travel. Getting TSA Partners involved in our range country programs is one of our goals, and this idea is more feasible in Mexico than Asia. Finally, the TSA has been asked to help support and participate in the Mexican Turtle Action Plan; evaluation committees are forming now and the process will launch in November 2006 at the Mexican Herp Society meeting in Monterrey. (Rick Hudson, Gregory George and Sam Rivera)

Miguel Angel de la Torre Loranca holds a particularly large female Dermatemys at a fish farm in Oaxaca that produces captive-bred hatchlings

_The Central American river turtle, Dermatemys mawii, has undergone dramatic population declines in southern Mexico and was recently elevated to Critically Endangered status by the IUCN Red List._

_Miguel Angel de la Torre Loranca holds a particularly large female Dermatemys at a fish farm in Oaxaca that produces captive-bred hatchlings._

Photo courtesy of Brian D. Horne
A captive breeding and species recovery program for the critically endangered Siamese narrow-headed softshell turtle, *Chitra chitra chitra*, at Kanchanaburi Inland Fisheries Development Center (KIFDC), a Thailand government agency, produce more than 900 eggs and more than 700 hatchlings between 2000 and 2004. Seventy-nine headstarted juveniles were released in June 2005 to reinforce the dwindling wild population. Therefore, the program is the most successful *Chitra* breeding, head-starting and population recovery project in the world. However, some concerns do exist which include juvenile mortality, high variability of juvenile growth rates and cessation of egg production since 2005.

In January 2006, the TSA sponsored a multidisciplinary visit to the KIFDC *Chitra* breeding project for Dr. Shannon T. Ferrell (Fort Worth Zoo), Dr. Gerald Kuchling (University of Western Australia) and Dr. Nantarika Chansue (Chulalongkorn University) who offered technical and laboratory support. Jonathan Murray organized logistics and facilitated the team’s visit. The team collaborated closely with Dr. Wachira Kitimasak (KIFDC) who started the *Chitra* breeding program in 2000-2001 as part of his doctoral work and is now leading the *Chitra* breeding program. The purpose of the visit was to assist in an investigation into the causes of mortality in captive hatched/reared juveniles, to assess the reproductive fitness of the *Chitra* breeding stock, and to evaluate the sex ratio of captive-bred turtles. The goal of the mortality investigation was to generate recommendations for disease prevention and treatment regimens in the juvenile *Chitra*. Goals of the reproductive studies included recommendations to optimize the breeding output and to ensure the production of a balanced sex ratio.

At this time, there are approximately 130 juvenile *Chitra* alive in the facility. The mortality investigation started with a detailed history of the collection, past water quality testing, diet, husbandry practices and previous medical problems and diagnostics. Juvenile mortality has been intermittent over the years with deaths usually occurring after a protracted bout of shell disease characterized by pitting, vesicles, ulcers, and weight loss. The team did extensive water quality sampling and analysis of the reservoir and holding water. Physical examinations of both healthy and sick juvenile *Chitra* were performed. Samples of blood, shell, and feces were obtained for testing at Chulalongkorn University in Bangkok. In addition, necropsy investigations were also done. Final results are still pending, but indicate a possible underlying parasite infection as a major cause of mortality in some animals. Recommendations are being constructed to reduce parasite transmission and to provide practical therapies in symptomatic animals to reduce morbidity and mortality.

Ultrasound scanning of the only adult *Chitra* female demonstrated some early vitellogenesis (follicular growth) but did not suggest a normal ovarian cycle (given that January is the immediate pre-laying season). The two males in the other breeding pond also appeared to have regressive testes, although the annual testicular cycle is unknown in *Chitra* and the regressive testes could be a normal occurrence at that time of the year. These reproductive assessments suggest that environmental factors in the captive facility should be investigated to determine their impact on reproductive success. Examination of the gonads of some dead juveniles indicated a male sex bias in the captive-bred turtles. Recommendations for captive breeding management include changes to design and management of the breeding and rearing ponds, to the management of egg incubation and investigations into sex determination and reproductive cycles. (Shannon Ferrell and Gerald Kuchling)
This program that initially focused on the river terrapin (*Batagur baska*) of the Setiu River, in Terengganu, Malaysia (see TSA Newsletter, Vol.4 No.1), has now been expanded to include painted terrapins (*Callagur borneoensis*) of the same river as well as *Batagur* from the Dungun River. This short report will summarize project achievements made from 2004 to 2006 and project developments in 2005 and 2006.

**Achievements**

Setiu River egg purchase and incubation: 20 egg clutches (total of 365 eggs) were purchased in 2004, 18 clutches (282 eggs) in 2005 and 24 clutches (387 eggs) in 2006. A total of 370 hatchlings were produced in 2004 and 2005. Incubation of clutches purchased in 2006 was still in progress at the time the report was written.

*Release program:* In 2005, the first 150 yearlings from the 2004 cohort were released in a much publicized event dubbed Terrapin Independence Day (TID). TID was chosen to coincide with Malaysia’s National Independence Day on 31 August and is now set to become an annual event in Setiu.

*Head-starting program:* This project is still ongoing and aims to develop protocols for optimal growth of *Batagur* in captivity.

*Mark and recapture study:* A monthly sampling program conducted in 2004 and 2005 in the Setiu River using large-meshed gillnets yielded four female *Batagur* and 15 male and 19 female *Callagur*, as well as two head-started *Batagur*. Because of the low numbers of *Batagur* caught, it was not possible to estimate its population size. However, *Callagur* population size in the Setiu River was estimated at 203 individuals by the Schnabel mark-recapture method.

*TSD studies:* This was conducted collaboratively with Dr. Gerald Kuchling from the University of Western Australia who trained Malaysian researchers in the use of laparoscopic techniques in sex determination. Preliminary findings showed that incubation temperatures of 27° and 29° C produced 100 percent male hatchlings while temperatures exceeding 31° C produced 100 percent female hatchlings. Temperatures exceeding 33° C appear to be lethal.

**Project Developments**

In 2005, head-starting experiments on *Callagur* hatchlings from the Setiu River were initiated. These studies will pave the way for a long-term headstarting and release project for *Callagur* to supplement the current conservation efforts of the Fisheries Department focused on open-air beach hatchery incubation of eggs and release of hatchlings a few weeks after emergence.

In 2006, KUSTEM (University College of Science and Technology, Malaysia) initiated a project with the Terengganu Department of Wildlife and National Parks (PERHILITAN) to incubate *Batagur* eggs in their *in situ* nests in two nesting banks on the Dungun River. Incubation temperatures in several *in situ* nests were monitored using i-buttons and hatchlings produced will be subsequently sexed.

The work presented here has been made possible with seed grants from TCF, TSA and Cleveland Metroparks Zoo, as well as funds raised from the project’s terrapin adoption program. In 2006, the project received a US $10,000 grant from TSA, through the Batchelor foundation Grant. (Chan Eng Heng)
The 2000 rediscovery of a remnant population of the critically endangered mangrove terrapin, *Batagur baska*, in Cambodia has led to major efforts in assuring the survival of the species in Indochina. In the 2006 nesting year, 74 eggs were laid in three clutches of which 49 were incubated *in situ* on the beaches of the Kaong River. By the end of May, all 49 eggs hatched and the young turtles emerged.

As part of an effort to ensure that this small population of *Batagur* does not disappear altogether, the Fisheries Department, working with support from the Wildlife Conservation Society (WCS), has opted to develop emergency facilities that will secure a small number of each year’s hatchlings, while releasing some back into the wild and continuing to push efforts to protect remaining wild populations. If turtles can be raised to a size where the likelihood of mortality is lowered, up to two or three years, greater population regeneration can be expected. The plan is to release 10% of the hatchlings at around one month of age and retain 30-50% in holding facilities for up to three years. The remaining hatchlings will be retained indefinitely and become founders of a long-term assurance population, maintained in captivity in case wild populations do not survive.

The holding facility is currently under construction and the hatchlings are being well cared for. The first stage of the construction was to build a security cage where all the hatchlings will be raised. A small cleaning/food preparation and keeper staging area are also in the plans. The juvenile tanks measuring (3m x 4m) are in the process of being constructed and will provide the turtles with a basking and pool area. Plans also include the construction of a perimeter fence to provide added security.

Since 2000, the WCS-led Fisheries Department team has worked to protect Cambodia’s last known surviving population of *Batagur*. These efforts have included additional surveys and research on the ecology of the species, as well as active enforcement measures such as patrolling the rivers, confiscating animals, and guarding nesting beaches during the prime nesting season. The project has also worked closely with local communities to raise awareness, and has gained the support of many fishermen and other local stakeholders, who frequently turn in or release turtles that they have accidentally caught in the Sre Ambel Cambodian population. The Vietnamese and Cambodian governments then organized the animal’s return, an amazing and highly publicized accomplishment.

The Fisheries Department, with help from WCS, has succeeded in securing part of the overall costs of establishing these emergency facilities, thanks to a $7,000 grant the EAZA Shellshock Campaign. The TSA is awarding another $5,000 from Batchelor Foundation monies. However, further support is being sought to complete the construction, maintain and develop the facilities. Additional assistance with achieving this important and urgent project would be warmly welcomed. (Joe Walston)
With donor support from the Batchelor Foundation and the British Chelonia Group, the TSA is directing $22,000 towards the recovery of one of the world’s rarest and most endangered freshwater turtles, the Burmese roofed turtle, *Kachuga trivittata*. With no specimens reported to science since 1935, this Myanmar endemic was “rediscovered” in 2002 thanks to the alert efforts of noted chelonian conservation biologist Gerald Kuchling. A small captive group (3.3.2) now exists at the Yadanabon Zoo in Mandalay, gathered from a local temple pond and confiscated from fishermen on the only two rivers where the species is believed to persist, the Upper Chindwin and the Dokthawady. Since the rediscovery, conservation actions have centered around improving conditions for the group at the zoo in Mandalay, and river surveys to locate viable breeding populations. Working through the Wildlife Conservation Society’s (WCS) Myanmar Program based in Yangon, the TSA delivered funding and technical input towards the advancement of a conservation strategy, supporting both the captive and field programs in an effort to prevent the extinction of one of the world’s most magnificent river turtles (see cover photo of male in breeding color).

**Captive Program**
In October 2005, a TSA team visited Mandalay and met with a local architect to design a new captive management facility for *K. trivittata*. The new facility will allow for captive breeding and rearing, as well as for headstarting offspring collected on the Upper Chindwin River. The facility will make use of two existing retention ponds already in place at the Yadanabon Zoo. The larger of the two will be modified to serve as the breeding facility with a nesting beach (with retaining walls to contain the sand), a fenced feeding area and an anchored basking platform. The smaller pond will be utilized as a biological filter with modifications to the feeder canal and inlets to permit improved flow-through to the larger pond. Water hyacinth and other aquatic plants will filter the water before it enters the breeding and rearing ponds. Two large and four small ponds will be built for juvenile rearing, isolation and quarantine. A raised reservoir tank will provide pressurized water for filling and cleaning the rearing ponds. The entire complex will be surrounded with security fencing to protect juveniles from predation and to prevent escape. The total cost is roughly $18,000, covered by contributions from the TSA, the British Chelonia Group, WCS and Walter Sedgwick’s child’s school class (see accompanying article). Construction got underway in June and is expected to be completed by September 2006.

**Field Program**
When Kuchling discovered an active nesting population on the Upper Chindwin River, he noted the potential for a conservation management zone. A WCS turtle team led by Doug Hendrie began field work here in September 2005 and launched a major effort to conserve the species within its habitat. Threats to this remnant population include gold mining, drowning in fishing nets, overexploitation of turtle eggs, human disturbance of nesting beaches and illegal trade of live turtles. A 30 nautical mile stretch of the river was designated at the project area and a base camp established at Linpa village. Nesting beaches were identified and preparations for the 2006 egg-laying season (December to March) were made. A public education program aimed at
the villages within the project area began to teach the locals about the upcoming project and encouraged their involvement. With local village help, 12 warning signboards were mounted at nesting sand banks to keep people from disturbing the sites. This was done in concert with a series of talks to educate villagers and fishermen about the importance of these nesting beaches. Daily river patrols searched for tracks and signs of nesting activity and discovered a total of 200 eggs from eight clutches within the project area. To avoid egg poachers, clutches were moved to a safe and guarded area and reburied for incubation. Temperature data loggers were installed in five nests. By June 2006, 88 hatchlings had emerged, 20 of which will be brought to Mandalay Zoo for rearing and the rest will be tagged and released.

The turtle team also announced cash incentives to villagers providing information on turtle nests or bringing in live turtles caught in fishing nets. 300 non-resident fishermen work in the project zone, many using gillnets, so the pressures are intense. Several adult females were recovered this way, and marked and released; juveniles were also recovered, two of which were sent to Mandalay Zoo.

The TSA wishes to thank the WCS office in Yangon for their ongoing support and facilitation of our efforts with *Kachuga trivittata*. Without their assistance and collaboration, it is unlikely that we would be able to effectively work in Myanmar. We are again indebted to the British Chelonia Group for their generous support of our work to conserve Asian turtles. *(Rick Hudson)*

*Khin Myo Myo and Kyaw Moe (center facing) describe the turtle conservation program to local villagers living near the Chindwin nesting beaches.*
Each year, the third grade class at Phillips Brooks School in Menlo Park, California, studies endangered species. The class raises money and designates it for a worthy project. Mrs. Seddon and Meeta Gaitonde, the third grade teachers, ask parents with an interest in conservation to come in to talk with the class and help them pick a project to support.

In 2005, parents Walter Sedgwick and Stephanie Osborne came into class and discussed possible projects. Mr. Sedgwick, who is involved with the Wildlife Conservation Society, suggested the children focus on turtle conservation, and specifically the Burmese roofed turtle, Kachuga trivittata, the second most endangered turtle in the world. The Turtle Survival Alliance (TSA) was trying to raise money for a captive breeding facility for this species in Myanmar (Burma). The children got excited about supporting this effort and felt it would be a lasting contribution to the conservation of an endangered species.

The students raised $800 by designing wrist bands to sell. Each of the 20 children sold about 6 bands for $6.00 each. When the class discovered how much had been raised, the parents got so excited they told the class they would match the funds and then add a bit more to make the total an even $2,000. The children got certificates from the TSA and feel wonderful about their efforts, as does TSA! (Walter Sedgwick)

Taronga Zoo Supports Turtle Conservation Center at Cuc Phuong, Vietnam

The Taronga Foundation, based at Australia’s Taronga Zoo in Sydney, has developed an effective fund-raising tool for turtle conservation, specifically the reknown Turtle Conservation Center (TCC) at Cuc Phuong National Park in Vietnam. Graphic panels highlight the role of the TCC in addressing the Asian turtle crisis, and a turtle shaped donation box (pictured here) collects contributions. To date over $10,000 Australian (roughly $7,400 US) has been raised for the TCC.
The TSA recently awarded $8,745 in seed grants for turtle conservation. The 2006 recipients are:

1) Status and conservation of the Asian giant softshell turtle, *Pelochelys cantorii*, in the Philippines; Arvin Diesmos, $2,000.

2) Inventory, distribution, status and conservation action for the critically endangered Philippine forest turtle, *Heosemys leytensis*, Palawan Island, Philippines; Pierre Fidenci, $2,000.

3) Initiating a freshwater turtle conservation education program for elementary schools in Behnkulu, Indonesia; Dr. Aceng Ruyani, $1,800.

4) Conservation breeding program for the black soft-shell, *Aspideretes nigricans*, in Bangladesh; Ali Reza, $2,000.

5) Publication of Cambodian turtle calendar; David Emmett, $945.

These grants were made possible by a grant from the Batchelor Foundation. TSA seed grants are intended to support small, focused turtle conservation initiatives, preferably carried out by range state nationals. The program is designed to fund projects that can grow and strengthen through additional support.

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The TSA announced two awards in the 2006 Partner Grant program. The Partner Grant program seeks to provide financial support directly to partners whose activities strengthen our mission. This program provided two awards during the 2006 competition.

The first award supports work with *Cuora flavomarginata* in captivity. The proposal, submitted by the TMG coordinator Ray Farrell, will examine temperature dependent sex determination (TSD) in this species. The goal is to obtain data directly contributing to the captive management of this turtle by better understanding its reproduction and enabling the gender of offspring to be manipulated during incubation. Total project cost is $535 with $400 funded by the TSA Partner Grant program.

A second grant has been awarded to the Savannah River Ecology Laboratory in Aiken, SC, and affiliated with the University of Georgia. The proposal will provide the funds needed to create and improve housing facilities for 11 species at the facility. All of the taxa are imperiled in the wild: *Leucocephalon yuwonoi* (CR), *Mauremys annamensis* (CR), *Cuora trifasciata* (CR), *Chinemys nigricans* (EN), *Sacalia quadriocellata* (EN), *Sacalia bealei* (EN), *Platysternon megacephalum* (EN), *Notochelys platynota* (VU), *Lissemys punctata* (LR), *Heosemys grandis* (VU) and *Melanochelys tricarinata* (VU).

With continued success in captive reproduction among our partners, these facilities will provide space for captive offspring and enable work improving captive husbandry data for targeted species. Total project cost is $8,750 with $1,750 funded by the TSA Partner Grant program. (Mike Forstner)
Another Busy Year for TSA’s Animal Management Group

The TSA Animal Management Group has had another busy year, receiving and placing over 253 specimens of seven species since July 2005. Working with USFWS, Bill Ninesling’s dedicated team provided humane care and veterinary support for turtles seized during confiscations, or imported illegally into the U.S. The two most recent seizures included groups of leopard (149) and pancake tortoises (83), most of which arrived in surprisingly good shape and experienced minimal mortality. For help with this large group of tortoises, special thanks are extended to Dr. Orlando Diaz, Pat Ruby, Kenan Harkin, Paul van der Schouw, Andy Sury, Tam Jones and the team from Disney’s Animal Kingdom (Lonnie McCaskill and Andy Daneault) for their hands-on assistance or donations of medical and husbandry supplies. For providing ongoing veterinary services to the Animal Management group, the TSA wishes to thank Dr. Greg Fleming (Disney) for his tireless assistance.

The Animal Management Group also receives and places donations from partners and colleagues and, from July 2005 to July 2006, 75 new turtles and tortoises were accessioned into the TSA holdings database. The record keeping and paperwork involved in tracking all these turtles is a demanding task. There are 2,263 active turtle records in this database that must be accounted for annually. This enormous responsibility is efficiently handled by TSA Registrar Annabel Ross (Fort Worth Zoo), but her job becomes more onerous when updates are not returned as requested. Responding to requests for information is important and helps make Annabel’s job a little easier. So if you have TSA turtles, please be respectful of her position and return your updates and reports in a timely manner.

The TSA is grateful to Bill Ninesling for making his facilities in Fort Pierce, Florida available for staging and processing many of the turtles that come our way. Until the TSA can acquire its own facility, it will be dependent on the good will and support of its incredible volunteer network.

Photo courtesy of Pat Ruby
Dr. Orlando Diaz Figueroa runs a fecal check.

Photo courtesy of Pat Ruby
Adult pancake tortoises awaiting placement at Bill Ninesling’s facility in Ft. Pierce, Florida.

Thanks Bill, for all you do for turtles and the TSA!

Bill checks the PIT tag number on a pancake tortoise.
Campaign in Europe Exceeds Expectations and Raises $466,000 for Turtle Conservation

The biggest single global conservation campaign to protect turtles and tortoises has come to an end. Launched in September 2005, Shellshock highlighted the extinction crisis facing tortoises and turtles. During 2004 and 2005, the European Association of Zoos & Aquaria (EAZA) ran a collaborative conservation campaign for turtles and tortoises. The campaign had three main goals: 1) Raising awareness of the current conservation crisis facing the world’s tortoise and turtle species 2) Promoting European zoo and aquarium participation in TSA Assurance Colonies for priority species and 3) Raising money to help support turtle and tortoise conservation in the wild.

Over 150 zoos and aquariums across Europe participated in the campaign. The original fundraising target of 150,000 Euros ($190,000) was reached early on in the campaign, and the final amount raised by the Shellshock campaign was 375,000 Euros ($466,000). This money is now being used to support key conservation projects around the world.

Projects that have already received Shellshock funding include:

**Turtle breeding facilities in the Angkor Centre for the Conservation of Biodiversity (ACCB)**

Development of a turtle breeding facility in the Angkor Centre for the Conservation of Biodiversity (ACCB), Siem Reap Province, Cambodia. This project was successfully submitted by the Allwetter Zoo Muenster to Shellshock for inclusion in the campaign.

**Endemic Chinese box turtle (Cuora sp.) research**

Urgent research in China into the distribution and status of this little known species of box turtle from the genus Cuora.

**Leatherback Ocean Wanderer (LOW)**

A satellite telemetry study in Gabon to enhance protection of one of the world’s most important leatherback turtle (Dermochelys coriacea) nesting beaches. The Shellshock tagged turtles can be tracked online at http://www.seaturtle.org.

**Royal Chitwan National Park Turtle Conservation Project, Nepal**

A turtle conservation project at the Gharial Breeding Centre in the Royal Chitwan National Park, for the native turtle species of Nepal. This project was successfully submitted by the Zoological Society of London to Shellshock for inclusion in the campaign.

**Philippine Turtle Conservation Centre**

Shellshock funds will help support the construction of *ex situ* holding and breeding facilities by the Katala Foundation on Palawan for native Philippine turtle species. These will include enclosures for *Siebenrockiella (Heosemys) leytensis*.

**Developing Local Turtle Expertise in Southeast Asia**

This Conservation International led Shellshock project focuses on major universities and forestry colleges in Vietnam, Cambodia and Myanmar. It will work on developing interest and expertise amongst university students in chelonians through a combination of activities including university lectures by specialists, training, and mentoring of students involved in turtle projects and an internship program.

Other projects to be supported by Shellshock in 2006 include headstarting and captive breeding initiatives in Myanmar, India and Cambodia, a reintroduction project in Madagascar and a second sea turtle project in Mozambique.

By running the ShellShock campaign, EAZA has stepped up the global effort to ensure survival of turtles and tortoises and established itself and its member organizations as major stakeholders in the international chelonian conservation community. The amount of money raised by Shellshock participants means that a legacy of Shellshock supported projects will continue for many years to come. Shellshock will be working with the Turtle Conservation Fund to ensure that many more turtle and tortoise conservation projects around the world receive vital funding.

More details about the Shellshock campaign, its objectives and its achievements, can be found on the EAZA website http://www.eaza.net. (Kevin R Buley)
The mission statement of TSA includes the phrase, “preserving future options for the recovery of wild populations.” A likely expectation is that offspring produced from TSA’s Assurance Colonies and TMGs can be used to repopulate areas in the wild where native turtle species have been previously extirpated, but the threats that caused the declines have since been removed or remediated. In expectation of such an opportunity, research is being conducted to determine methods that make a reintroduction most likely to succeed. Questions that need answers include: 1) which age class is most likely to facilitate establishment of a viable population? 2) which release techniques maximize site fidelity? 3) which basic measurements (i.e., survivorship, reproduction) indicate success?

The bottom line, when placed in an unfamiliar habitat, the majority of animals left. The longer the tortoises were confined, the greater the likelihood that they remained on the site and established a home range. Subsequently, our studies are now focusing on the reproductive rates of this population, hatching success and long term survival and health of the adults. We have also begun to recapture tortoises that were initially translocated as hatchlings and juveniles. Preliminary data suggests that the juvenile age classes did remain in the release area and are perhaps more likely to readily adopt a new location than adults. We are finding hatchlings from the initial translocation, now 5-year-old juveniles, indicating some survivorship. Our studies are continuing. We hope that the results of our work on gopher tortoises may be applicable to other species and will help to advance one of TSA’s goals - that being the successful reestablishment of populations of certain turtle species from offspring produced by TSA partners. (Tracey D. Tuberville and Kurt A. Buhlmann)
The Knoxville Zoo has had recent success with the captive breeding of two uncommonly bred-in-captivity Asian chelonians, *Heosemys spinosa* and *Geoemyda spengleri*. The *H. spinosa* group was received from the 2001 Hong Kong seizure and took several years to acclimate. On 15 May 2004, two large eggs were found buried under leaf litter in their outdoor enclosure, and a third egg was found under similar conditions on 1 August. Because of sharp declines in female body mass, it is believed that all eggs were laid by a single female. After 114 long days a large 40.8 gram hatchling emerged. Shortly after hatching, the neonate’s shell unfolded and became extremely hard, and it was observed eating a portion of its own eggshell. The second egg hatched five days later, and the third egg hatched on 22 November 2004. In 2005, we hatched our fourth *H. spinosa* from the same female on 27 October.

Also in 2005, we successfully hatched our first *G. spengleri*. A single female had been in the collection since 1990, but we did not receive a male until late in 2004. Copulation was noted a few days after introduction, and a single egg was laid on 26 April 2005. Unfortunately, this egg was infertile, but two viable eggs were deposited on 31 May. A cool incubation protocol (23-24°C) was utilized, as suggested by multiple institutions, and we were delighted as our first *G. spengleri* hatched on 16 August. To date the Knoxville Zoo has hatched four *G. spengleri* from our single pair. (Brad Moxley)

There are new bloodlines for *Manouria e. phayrei*. Pat Ruby reports that 31 hatchlings have emerged from a clutch of 47 eggs in July 2006, and that she is still counting. Three additional clutches from three females are also incubating. These represent important new bloodlines for this TMG and will vastly increase the genetic diversity of the North American captive population. *Phayrei* is the rarer of the two *emys* subspecies, and is consistently reproduced by only a handful of breeders.

At the San Diego Zoo, there have been three successful hatchings of flat-tailed dwarf tortoises, *Pyxis planicauda*. The first egg was deposited in December of 2003, and went through two diapause intervals before development occurred, finally hatching after a 314 day incubation period. Two *P. planicauda* eggs, from different females, were deposited in September of 2004. A similar temperature schedule was utilized - mid 20s° C for a month, dropped to 16-22°C for one month, then gradually raised to 30°C that successfully produced the 2004 hatching. After two months, if no development is observed through candling, then the whole cycle is repeated. Once development had been detected in the 3rd egg, hatching occurred in 84 days for a total incubation of 332 days. (Tommy Owens)
The Buffalo Zoo welcomed its second and third *Cuora galbinifrons* hatchlings (right) on August 7 and September 1, 2005 as well as the Zoo’s first ever *Cuora trifasciata* (left) on October 14 and 16, 2005.

One of the TSA’s midwest partners had a banner year with tortoise reproduction, successfully hatching six taxa from November 2005 to June 2006. From top left, going clockwise are: *Geochelone radiata, Geochelone elegans* (Sri Lankan), *Pyxis a. arachnoides*, *Malacochersus tornieri*, *Testudo graeca terrestris* and *Testudo hermanni boettgeri*.

The Fort Worth Zoo hatched a clutch of *Callagur* in 2005 after a one year hiatus in breeding. A new nesting beach resulted in four clutches being laid but fertility was low; two clutches from 2006 are currently incubating. Other partners successfully reproducing *Callagur* in 2005 and 2006 are Eric Holt and San Antonio Zoo.

The *Chelodina mccordi* housed by TSA Partner Michael Forstner produced clutches of eggs on January 14 and 16, 2006. Incubation at 28.5°C resulted in a successful hatch beginning on March 21, 2006 and taking 20 days to complete. The hatchlings (6=50% fertility) were moved into very shallow water temporary housing for several weeks and fed freshly stunned captive raised newborn guppies. Two of the juveniles were very weak and died within a week of hatching. At three months they are now actively hunting guppies and considering pelleted food as an option in their diet. The adults are long term captives, with reproduction potentially induced by increased water temperatures during the winter months (to 28°C rather than 25°C during winter). These offspring represent new bloodlines for this TMG. (Photos courtesy Philadelphia Zoo)
The Taxonomic Management Group (TMG) program is an important aspect of the Turtle Survival Alliance (TSA). In fact, it is one of the primary founding concepts for the TSA regarding the development of Assurance Colonies to act as supportive and supplemental efforts in a holistic approach to the conservation of turtle and tortoise species.

As the functional unit of the TSA, the TMG is a means of bringing individuals, organizations, NGOs and academia together for a common cause. Until the TMG concept, these groups had struggled to find ways to utilize their individual expertise and capabilities to make a significant impact on chelonian conservation. Essentially, TMGs are the means by which individuals can participate in the TSA and contribute to the management and survival of select species in captivity. The TMG’s goal is to combine the efforts of all interested parties and stakeholders in the development and implementation of a management plan based on sound husbandry protocols and with the goal of maintaining genetic integrity and diversity over the long term. In essence, TMGs are preserving options for the recovery of wild populations if needed.

Included in this newsletter you will find a Taxon Management Plan (TMP) report for *Cuora (Cistoclemmys) flavomarginata* prepared by Ray Farrell. This report exemplifies how TMPs should be developed and TMGs should be operating. The TMG Facilitator and Steering Committee wishes to thank Ray for all his hard work and dedication to this species and the TSA.

Over the last three years there has been a shift in the focus of the TSA with increased emphasis being placed on supporting in situ or range country programs. Despite this, the TMG program is still an important component in a comprehensive approach to species conservation. TMGs have the potential to play multiple roles through research in reproductive biology, behavior, disease control, reintroduction techniques, gene banking and systematics. Just as important is the ability to heighten awareness of the plight of turtles and tortoises through education, marketing (fundraising) and public relation programs.

In order to maintain their role in supporting conservation, it is imperative that TMG programs are capable of change and meet new needs and requirements of the species. It is also important that the TSA periodically update the list of TMG species. For these reasons, the TSA has begun a review process that will provide valuable information by reassessing the current status of each species based on ongoing in situ programs, the supportive ability of each TMG for species conservation, the level of activity within existing TMGs and the ability of the TMG Coordinator to implement and coordinate their program. The first review will take place over the next few months with an evaluation of current TMG species and an assessment of potential new species programs.

Given that implementing TMPs are arduous and time-consuming tasks, species selection must be based on need. The primary criteria that should be met is whether or not the TMG can realistically contribute to the species survival and whether the TSA-managed captive population is a necessary component to the overall survival strategy of that particular species. For example, if a species has multiple successful range country programs (*Batagur* for example), is there a real need for a Priority I TMP? Conversely, species that have no known range country recovery efforts (Indonesian endemics like *Chelodina mccordii* and *Leucocephalon yuwonoi* or some Chinese endemic *Cuora*) should emerge as top priorities for TMGs. To avoid duplication of efforts between TSA North America and Europe, this process will be a global effort that will ensure the most effective use of captive resources.

TSA North America has also considered the need for expanding the capability of TMG programs through the development of TSA facilities located around the United States. In doing so, larger groups of specific species could be maintained in areas that meet their environmental needs and allow for better controlled research on husbandry, health and reproduction. One existing facility that offers such potential is the University of Georgia’s Savannah River Ecology Laboratory (SREL) in Aiken, SC, where a number of important TSA assurance colonies are currently maintained under the direction of Kurt Buhlmann and Cris Hagen. With an extensive array of turtle management facilities and other infrastructure, SREL could potentially offer an enormous opportunity to TMP development.

To further evaluate the capacity of SREL to contribute to TSA goals and a closer and more supportive working relationship, a TSA contingent (Dwight Lawson, Co-Chair, and Steering Comm-
It’s been six months since my last update, and I wanted to share some exciting developments that have occurred since December 2005. The number of TSA-owned *Cuora flavomarginata* has increased to fifty-eight turtles (fourteen adults (6.8) and thirty-four hatchlings/yearlings).

In 2005, we received four adults from both the Cape May and Buffalo Zoos. These turtles were placed outdoors and I am happy to say they adjusted to their new outdoor environment and all eight turtles hibernated successfully. Breeding activity has not been observed to date, but I am confident that it will happen given enough time. I have continued my efforts to increase TSA’s turtle numbers with primary emphasis on improving genetic diversity. Utilizing the ISIS inventory to determine the zoos that have *flavomarginata*, I have been successful in receiving an additional five turtles from the Zoo community and one donation of an adult male from Darrell Senneke. Zoos providing turtles are Oakland (0.1), Brookfield (1.1), Columbus (0.1) and Denver (0.1). Some of these turtles have moderate to severe deformities that may impact their ability to breed. However, if they reproduce successfully, the F1 hatchlings will expand the genetic diversity of the TSA’s captive population. I have now contacted nearly all of the zoos in the U.S. that list *C. flavomarginata* holdings.

In last December’s update, I reported that 18 female hatchlings were produced when eggs were incubated at 29˚C and 30˚C. However, a number of eggs failed to hatch when incubated at 30˚C. This year, I have expanded the study to include incubating eggs at 25˚C, 27˚C and 29˚C. Last year, Brian Horne, PhD Candidate at Ohio University, performed laparoscopy on the hatchlings to determine their sex. All animals survived this procedure and I hope that Brian will be available again this year to repeat the process. The results of this study will provide a management tool that will aid in meeting our objective of 300 F1 turtles (100-200) and preserving a high level of genetic diversity as well.
In February of this year, I attended the TSA steering committee meeting and met Mike Forstner, TSA partner and a geneticist at Texas State University. Mike volunteered to analyze blood samples from _flavomarginata_ for DNA comparisons. He demonstrated how to collect blood samples and supplied me with the necessary storage buffer to preserve the DNA. I collected forty-six blood samples from adults (14 TSA turtles and 32 from private collections) and forwarded them to Mike’s lab for analysis.

Doctor Tien-His Chen (National Museum of Marine Science and Technology in Keelung, Taiwan) has collected blood samples from over 20 wild populations in Taiwan and is willing to compare his DNA analysis with ours. I am excited about this opportunity because hopefully it will help identify which turtles are closely related to _C.f.flavomarginata_ and which are not. Those turtles that appear to be unrelated will be separated from the others until additional DNA is available from the other range countries. Hopefully, the information gained will guide us in properly managing the breeding of _C.f.sinenis, C.f.flavomarginata_ and _C.f.evelynae_.

Another possible source for turtles and DNA samples are Japanese zoos that unfortunately do not list their animal inventory on ISIS. However, Ken Kawata, former General Curator of the Staten Island Zoo, provided me with a copy of a paper that he published in *International Zoo News, Vol. 50, No. 5 (2003)* entitled *Reptiles in Japanese Collections, Part 1: Chelonians, 1998_. In this paper, Ken reports that there are 15 institutions in Japan that have 104 _Cuora flavomarginata_ in their collections. I plan to ask Ken’s help in providing a list of these institutions along with contact persons that I can communicate with to discuss the status of _C.f.evelynae_ in Japan.

In closing, I would like to thank all of you for your excellent work in rearing TSA _C.flavomarginata_, and hope to see you all at the TSA meeting in August. *(Ray Farrell)*

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**TSA receives Disney grant for Cambodia**

The TSA has been awarded a $19,000 grant from the Disney Wildlife Conservation Fund (DWCF) to conduct community-based environmental education for turtle conservation in Cambodia. The flooded forests and coastal regions of Cambodia are vitally important for turtle conservation, yet these habitats are largely unrepresented in the existing protected area network. The coastal region contains the only known Cambodian populations of the Mangrove Turtle, *Batagur baska*, listed as Critically Endangered on the IUCN Red List. The seasonally flooded forests and lowland marshes are also home to at least six other tortoise and turtle species. This project aims to secure the long term conservation of wild, breeding populations of threatened turtles by implementing environmental education activities in the 12 communes in and around primary turtle breeding areas. Utilizing the experienced resources of the renowned Education for Nature Vietnam (ENV) program, staff from the Cambodian Department of Fisheries, the BP-funded Cambodian Turtle Conservation Project and community rangers from the WCS-managed *Batagur* project will all be trained in environmental education techniques. This work will be undertaken by Doug Hendrie (Action Turtle Conservation Network), David Emmett (CI) and the Cambodian Turtle Conservation Project (CTCP) team. *(Rick Hudson)*
The Asian Scholarship Program for *In-situ* Chelonian Conservation (ASP) is seated primarily at the Wetlands Institute (WI) in Stone Harbor, New Jersey. Begun in 2000, the ASP has funded the participation of 14 international chelonian conservationists in the WI’s Terrapin Recovery Program—a community based conservation effort. This opportunity involves field work designed to learn about, and to protect, the northern diamondback terrapin, a salt marsh turtle that inhabits the eastern US seaboard. To date, students have come from Bangladesh, Cambodia, China, Indonesia, India, Lao, Madagascar, Myanmar and Vietnam.

Many other venues have contributed to the overall experience of ASP participants. During the past two years these include time at Dr. Peter Pritchard’s Chelonian Research Institute, field work with University of Southern Mississippi graduate student Tom Morhman, and Dr. Tom Wilson’s University of Tennessee at Chattanooga project focusing on riverine turtles in the Tennessee River.

The ASP participants are enabled to develop and work with community-based conservation initiatives in their home countries. They become a part of a network of turtle conservationists through relationships developed while in the ASP. They also develop scientific expertise for chelonian research, build conservation leadership skills and participate in conservation organization networking.

Pictured here is the 2006 ASP recipient Rajeev Chauhan, along the Tennessee River near Chattanooga. Rajeev’s home is Uttar Pradesh, a state in northern India that includes several rivers at the base of the Himalayan mountains. Many species of freshwater turtles occur in this region. Rajeev’s thesis concerns the impact of humans on turtles. He has also published conservation papers about several groups of animals besides turtles, including cranes and other birds, wolves, pangolins (scaly anteaters) and crocodiles. Rajeev is Secretary General for Society for Conservation of Nature in Etawah, the community he lives in. His participation in the ASP for 2006 has been partially funded by the Batchelor Foundation grant to the TSA.

The TSA’s support of the ASP is in conjunction with many other sponsors including the AZA’s Chelonian Advisory Group, the Metro Toronto Zoo and numerous interested individuals. All communications for the ASP can be sent to ASPin.situCC@gmail.com, the website for the ASP is in development, but can be seen at http://www.aspin-situcc.org.

(William Espenshade)

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**Cleveland Metroparks Zoo Makes Major Commitment to Turtle Conservation**

Over the past six years, the Cleveland Zoological Society has quietly made a major and collective impact on global turtle conservation efforts. Since 2000 they have awarded $142,518 to 35 projects (including workshops and professional development) in 11 countries. Of this, $50,000 went to fund the Asian Turtle Coordinator’s (Doug Hendrie) salary over the past five years. These funds also supported the initial Fort Worth workshop that led to the formation of TSA and funded its newsletter in early years. Many threatened species have benefited from these funds including *Batagur baska, Podocnemis lewyana, Testudo kleinmanni, Rafetus swinhoei, Manouria impressa, Sacalia quadricellata* and sea turtles in at least four countries. (Hugh Quinn)
Rafetus Workshop in China

The TSA will help fund a workshop in China to develop a conservation strategy for the Yangtze giant soft-shell (Rafetus swinhoei), recognized as the most critically endangered freshwater turtle in the world. Native to large river systems and associated wetlands and lakes in southern China and northern Vietnam, there are no confirmed localities where Rafetus can be found in the wild today. Scientists have focused efforts on identifying potential sites where Rafetus may still exist, following up on evidence of past presence and reported sightings of large soft-shell turtles. If sites are identified, immediate and urgent conservation measures will be put in place, aimed at securing these turtles and their habitat in the wild. Although there have been some encouraging reports from Vietnam, positive confirmation of the species in the wild has yet to be made. Earlier this year, the TSA provided funds to conduct surveys at two potential locales in Vietnam.

At present, there are five known living individuals of Rafetus swinhoei anywhere in the world. Four of these are in captivity in China (in three locations) and the fifth is in a man-made lake in the center of Hanoi, Vietnam. In addition to efforts to find and secure wild populations of this species in its habitat, urgent efforts are needed to establish a captive breeding program involving all four captive individuals maintained in Chinese institutions. Rafetus is the single-most important species priority for conservation action and a sense of urgency prevails. The stakes could not be higher, and without heroic and miraculous intervention (and a ton of luck) Rafetus swinhoei could be the first extinction on “our watch.”

WCS’s office in Beijing is organizing this workshop and getting the holders of the four captive specimens in China to participate will be essential. $7,500 will be needed to bring Chinese delegates to the workshop and we have funding commitments from Walter Sedgwick, Cleveland Metroparks Zoo and TSA. (Rick Hudson)
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The TSA gratefully acknowledges the following supporters for their generous contributions of $200 or more:

British Chelonia Group, Central Illinois Herp Society, Columbus Zoo, Cleveland Metroparks Zoo, Dallas Zoo, Disney Wildlife Conservation Fund, Fort Worth Zoo, Fort Worth Zoo AAZK Chapter, Houston Zoo, Tim McLaughlin, Minnesota Zoo, Minnesota Zoo AAZK Chapter, Pueblo Zoo, San Antonio Zoo, San Diego Zoo, David Shapiro, Walter Sedgwick, Woodland Park Zoo

2006 TSA Conference Support

Richard Ayres, Aquarium Innovations - Jay Allen, Brett and Nancy Stearns, Chelonian Research Foundation, Chelonian Research Institute, Conservation International, CTTC Turtle & Tortoise Care Society, Disney's Animal Kingdom, ECO, National Aquarium in Baltimore, Ponds and Plants - Dave Manser, Petraworks - Gregory George, Online Hobbyist - Jeff Barringer, Purina Mills / Mazuri, Reptiles Magazine, St. Louis Zoo, Zoo Med Laboratories

Special Thanks

Our special thanks to Lisa Lowell and Mike Forstner for making the arrangements for the February 2006 TSA U.S. Steering Committee meeting in Austin. Mike and Josie Duval graciously hosted the group for dinner and an evening with turtles at their San Marcos ranch. With short notice to prepare they laid out an amazing spread and everyone was amply fed; Phil and Lisa Lowell were designated drivers and safely chauffeured us that evening.

Very special thanks go to Jeff Ettling, Mark Wanner, Tom Barry and the staff at the St Louis Zoo for their exceptional generosity in hosting the TSA's 2006 annual conference and first joint meeting with the Tortoise and Freshwater Turtle Specialist Group. The St. Louis group has been great to work with and have enthusiastically tried to meet all our needs. We anticipate that this conference will be a watershed event, and that this meeting will grow each year to become the premiere gathering of turtle biologists and enthusiasts. We also gratefully acknowledge the contributions of Lonnie McCaskill, TSA Conference Chairman, and his team at Disney, and Chuck Schaffer, TSA Conference Program Chairman. Both tasks require considerable organizational skills and time commitment. Good job Lonnie and Chuck!

We owe a special debt of gratitude to a dedicated group of volunteers whose time and commitment mean so much to TSA’s continued success: Darrell Senneke (web site and communications), Bill Ninesling (animal management), Annabel Ross (records and permits), Heather Lowe (membership), Meg Bommarito (newsletter), Rose Tremblay (conference support), Lisa Lowell (partnership applications), Bill Ziegler (TMG Facilitator) and the many veterinarians who give tirelessly to care for TSA turtles. Special thanks are extended to the Fort Worth Zoo for their generous institutional support and for allowing staff members the time to pursue TSA activities.

The TSA was founded on partnerships and today those collaborations represent our core strength. The following is a list of some of the strategic partnerships that have contributed to the success of the TSA in the past year:

Asian Turtle Conservation Network
California Turtle & Tortoise Club
Chelonia Enterprises
Chelonian Research Foundation
Chelonian Research Institute
Cleveland Metroparks Zoo
Conservation International
Cuc Phuong Turtle Conservation & Ecology Program
Disney’s Animal Kingdom
Fort Worth Zoo
Intl. Reptile Conservation Foundation
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