Agenda Item: SC. 2.3.

Crocodile Specialist Group Steering Committee Meeting

Skukuza, Kruger National Park, South Africa

22 May 2016

East & Southeast Asia Report

Cambodian Crocodile Conservation Program
(Mr. Sam Han, FA and FFI & Dr. Jackson Frechette, FFI)

- 25 crocodile wardens supported to patrol over 5000 ha of critical crocodile habitat. Monthly patrols conducted at the four key crocodile breeding and release sites to provide protection for crocodiles and their habitat and stable employment for local community members;
- 7 (2 adult females, 3 sub-adults, 2 juveniles) pure-bred Siamese crocodiles were released into a remote sanctuary site. Monthly post-release monitoring of crocodiles fitted (3) with radio-transmitters is ongoing and the crocodiles appear to be doing well;
- Annual monitoring of crocodile populations was conducted at the three key sites (O'Som, Tatai Leu, and Areng) and the populations appear stable;
- Paper on Siamese crocodile status and distribution in Cambodia was published in the peer-reviewed Cambodian Journal of Natural History (October 2015);
- Full support at all the community, district and provincial levels has been received for the proposed crocodile sanctuaries at every site and we have submitted our proposal to the Forestry Administration.
- A total of 22 Siamese crocodiles were cared for at Phnom Tamao Wildlife Rescue Center.
- 7 Siamese crocodile hatchlings were bred (July 2016) and are currently being cared for at Phnom Tamao Wildlife Rescue Center;
- We have identified two crocodile farms who are willing to donate crocodiles for breeding and release. We have identified two large adult purebred Siamese males that we will move into our breeding program in the next few months;
- Lonnie McCaskill provided training and technical support for the captive breeding program;
- Our captive breeding assistant attending the AZA Crocodilian Biology and Captive Management Training Course in April 2016.
- Sanctuary management plans have been drafted for O'Som, Tatai Leu, and Chhay Reap after community consultations;
- We continue to work with Drs. David Rodriguez and Mike Forstner at Texas State University and Dr. Frank Rheindt at National University of Singapore to develop and refine genetic screening techniques for hybrids.
- Our Reintroduction and Reinforcement Action Plan has been preliminarily approved by the Forestry Administration and is awaiting signature from the Director General. We have also made progress on the National Crocodile Strategic Plan in collaboration with WCS and the Fisheries Administration. Complicating these matters is a major reshuffling of government agencies responsible for protected area management and biodiversity conservation. There is a considerable lack of clarity as far as which government body

will be responsible for these sorts of plans which means that we will likely not make any progress until these issues are clarified within the government.

Cambodia: (Heng Sovannara) – Agenda item SC.4.2. refers also.

Vietnam: (Thai Truyen – Agenda item SC.4.2 refers also.

Lao PDR: (Chantone Phothitay – Agenda item SC.4.2 refers also.

Philippines:

(a) Mabuwaya Foundation (Marites Gatan-Balbas & Merlijn van Weerd)

The Mabuwaya Foundation is a Philippine non-profit organization established in 2003 to study and conserve the Philippine crocodile in the wild. The name Mabuwaya is a combination of the Filipino words Mabuhay (Long live) and Buwaya (the Crocodile). Mabuwaya currently has 10 Philippine staff members. Funding for Philippine crocodile conservation comes from grants and from a sustainable funding mechanism involving nearly all zoos in the World that have *Crocodylus mindorensis* in their collection. Mabuwaya has evolved over the years into a general environmental research and conservation organization and is now the largest conservation NGO of northern Luzon implementing programs on climate change mitigation and adaptation, agroforestry development, environmental management capacity building of local governments and biodiversity research and conservation programs. Mabuwaya operates under a Memorandum of Agreement with the Department of Environment and Natural Resources of which it is an official NGO partner. Furthermore, it has partnership agreements with several universities and local governments.

Philippine crocodile population in north Luzon

A remnant population of the Philippine crocodile *Crocodylus mindorensis* was discovered in 1999 in the municipality of San Mariano in Isabela Province in northeast Luzon by the Dutch funded Plan International - Northern Sierra Made Natural Park - Conservation Project (NSMNP-CP). The first comprehensive crocodile surveys in 2000 found a population of just 2 adults, 10 juveniles and 1 nest with 12 hatchlings. In 2001 new crocodile localities were found and the total crocodile count was 5 adults, 12 juveniles and 7 hatchlings. In addition to San Mariano in Cagayan Valley, crocodile localities were identified in the coastal area of Isabela in the municipalities of Maconacon, Divilacan and Palanan.

In 2001, conservation efforts started with communication campaigns and lobbying for local protection of critical habitat areas for the Philippine crocodile with the municipal government. In 2003, the NSMNP-CP ended and the Mabuwaya Foundation was established to continue Philippine crocodile research and conservation.

In 2005, a Philippine crocodile head start program started in San Mariano aimed at raising hatchling crocodiles under protected circumstances to increase survival rates. Nests were located and protected, hatchlings collected and raised for 2 years in the Municipal Philippine Crocodile Rearing Station and released back into the wild.

In 2009, 50 captive-bred Philippine crocodiles were released in Dication Lake in Divilacan in the coastal area of Isabela (geographically separated from the wild crocodile population in San Mariano).

In 2015, the minimum crocodile population (counts, no extrapolations) in San Mariano (Valley area) was 17 adults, 33 juveniles and 34 hatchlings from 4 nests and in Divilacan and Maconacon (coastal area): 3 adults, 12 juveniles and 1 hatchling from 1 nest. In addition, in the rearing station 2 adults and 19 juveniles were held.

In summary: the total minimum Philippine crocodile population (counts) in Isabela Province in 2015 in the wild was 20 adults, 45 juveniles and 35 hatchlings from 5 nests.

Threats

Philippine crocodiles in Isabela are threatened by 1) direct killings, mostly out of revenge for livestock predation, 2) collection for illegal trade and 3) habitat loss. In 2015, a juvenile crocodile was killed with a machete and another wounded and a previously head-started released crocodile (scute-clipped) was found in a local zoo. A future threat is infrastructure development: all rivers where Philippine crocodiles are found in San Mariano are targeted for hydropower and irrigation dams. In Divilacan important Philippine crocodile habitat was lost for the development of an airport.

Protection/Sanctuaries

Mabuwaya works with communities and municipal governments to protect critical habitats of the Philippine crocodile. Extensive communication campaigns are followed by consultations to design local protection measures for crocodiles, and mitigation measures for livestock predation. In 2016, there are 8 locally declared Philippine crocodile sanctuaries in San Mariano protecting all sites with permanent Philippine crocodile presence and all breeding areas. In Divilacan there is 1 Philippine crocodile sanctuary. In Maconacon there is 1 Philippine crocodile and 1 saltwater crocodile (*Crocodylus porosus*) sanctuary. Environmental law enforcement, patrolling and crocodile monitoring is done by the sanctuary guards (*Bantay Sanktuwaryo*), local inhabitants who have been trained and deputized to be local law enforcers. In San Mariano there are 14 sanctuary guards while in Divilavan there are 15 environmental guards who all are trained in crocodile monitoring and law enforcement. Communities that conserve their crocodiles receive cash rewards every year per counted crocodile (c. $US20/non-hatchling and $US10/hatchling). These cash rewards are used for development needs in the community such as the establishment of water pumps, repair of roads and building of classrooms.

Crocodile reintroduction Dicatian Lake

In 2009, 50 captive-bred crocodiles were released in Dicatian Lake in Divilacan inside the Northern Sierra Madre Natural Park. The lake had been declared a crocodile sanctuary by the municipal government and the crocodile release was sanctioned by the local government and local communities. The crocodiles originated from the government run Palawan Wildlife Rescue and Conservation Center (PWRCC), the former Crocodile Farming Institute (CFI). When released the crocodiles were sub-adults of about 1.2 m long. Later genetic studies revealed that there were 3 possible *C. porosus/C. mindorensis*

hybrids among the released crocodiles. Two of these crocodiles could be caught and were returned to PWRCC. The third crocodile was earlier caught during a growth monitoring survey, before the genetic study results were known, and was in a poor condition but released back into the wild. We assume it died. Radio-telemetry studies of 10 released crocodiles showed dispersal throughout the lake, and into creeks and marshland surrounding the lake. Released crocodiles also visited nearby rice fields and predated on livestock.

Growth monitoring (re-catch studies) showed very poor growth and many released crocodiles were badly malnourished a few months after release. Thirteen crocodiles were found dead, either by starvation or because they were killed by local residents in retaliation for livestock predation. Some of the released crocodiles had no fear of people and would readily visit houses and approach people, presumably to look for food. Three years after the release no crocodiles could be found in Dicatian Lake and the surrounding rivers and creeks, and no crocodiles were reported by local residents. We assume all released crocodiles have died and the reintroduction program must be considered a failure. Two main reasons are likely the cause of this failure: 1) the released crocodiles were not accustomed to catch prey in the wild; later information from the PWRCC indicated the crocodiles were fed with dead chicken, stray cats and dogs and other meat, sometimes publicly. The crocodiles were not shy of people and probably related the presence of people to food. 2) the lake itself was not preferred habitat. Later studies showed that Philippine crocodiles prefer rivers and creeks over lakes, except during periods when water currents in rivers are strong. All released crocodiles eventually left the lake and colonized nearby rivers and creeks.

The findings of the failed reintroduction project were shared with DENR and with other scientists and the Crocodylus Porosus Philippines Inc. during a workshop at the national museum in Manila in 2011. A reintroduction protocol was drafted that includes the soft-release of crocodiles in semi-natural areas without feeding, and without human interference, at least 6 months before reintroduction to the wild. No other crocodile reintroductions from captive sources have taken place in northern Luzon since 2011 but Philippine crocodiles are released every year from the head-start program using the reintroduction protocol.

Head start Program

The head start program in San Mariano includes nest searching by the sanctuary guards, nest protection of located nets and the collection of hatchlings once they are born. Collected hatchlings are brought to the Municipal Philippine Crocodile Rearing Station (MPCRS) in San Mariano town. The MPCRS is jointly managed by the Mabuwaya Foundation and the municipal government of San Mariano, under a permit by the DENR. The MPRCS is also a visitor's center about the Philippine crocodile and wetlands conservation, with about 1,000 visitors per year. Collected crocodiles are raised under protective conditions for 2 years, the last year in a semi-natural pond, before release back into the wild. Since 2005, 247 hatchlings have been collected of which 178 survived (72%) and 135 (76% of survived) were released back into the wild. Survival in the wild after release is difficult to monitor exactly but during a study in 2007/2008 of 32 released crocodiles, 17 could be recaptured one year after release indicating a survival rate of at least 53%. Recaptured crocodiles showed considerable growth indicating good adaptability to wild conditions. Some released crocodiles colonized new areas, which

were subsequently protected as crocodile sanctuaries. A male and a female from 2 distinct breeding areas have not been released back into the wild to form a potential breeding pair for captive breeding of Luzon-originating Philippine crocodiles. The head-start program itself is set to continue as a source of crocodiles to be released in San Mariano and in new areas in northern Luzon to expand the Philippine crocodile population in size and distribution.

Future Priorities

The first priority is to continue the protection of the existing wild populations of Philippine crocodiles in San Mariano (Cagayan Valley area) and in Maconacon and Divilacan (coastal area) of Isabela Province. Education and awareness programs will have to continue to maintain and increase public support for Philippine crocodile conservation in the wild. Livestock predation mitigation and compensation programs are a priority as well, in combination with habitat restoration and crocodile sanctuary management. Environmental law enforcement needs to be strengthened and threats to crocodiles and their habitat such as killing, illegal trade, habitat loss and large-scale infrastructure development in rivers need to continue to be addressed.

The second priority is to continue the head start program and to identify possible new release sites to continue to increase the wild crocodile population both in size and in range.

The third priority is to establish a captive breeding program with Luzon-originating Philippine crocodiles to be able to raise more crocodiles for release back into the wild. An agreement with Isabela State University in San Mariano has been reached to establish the breeding facility on their campus and funding has been secured. It is environed that the facility will be constructed in 2016 and that breeding could commence in 2017 with two animals currently in the head start program.

The fourth priority is to conduct Philippine crocodile population surveys in other areas of Luzon with (previously) reported crocodiles, such as on Dalupiri Island in in Abra Province in the Cordillera.

(b) Crocodylus Porosus Philippines Inc.

- The Philippine Red List Committee has categorized both Philippine populations of *Crocodylus porosus* and *Crocodylus mindorensis* as Critically Endangered (CR) in the recent drafting for the iteration of the List of Terrestrial Threatened Species in the Philippines. This in pursuant to the Wildlife Resources Conservation and Protection Act of 2001.
- The Conservation and Management Plan of Crocodiles in the Philippines 2016-2020 has been drafted and refined through series of stakeholder's workshops. A final consultation is pending upon circulation of final draft to the members of the National Committee for the Conservation of Crocodiles - Technical Working Group for comments and suggestions.
- On October 2014 Crocodylus Porosus Philippines Inc. (CPPI) spearheaded the first and only nationwide survey to determine the abundance of *Crocodylus porosus* in the Philippines.

In January 2016 CPPI recorded an exceptionally large population of *C. porosus* in Bugsuk Island, southern Palawan, Philippines. This single and important population had an estimated population of 214 individuals (all size classes present) in 5.17 km of interconnected waterway, a single location in an island.

- In partnerships with GT Metro Foundation and CrocFest, the CPPI's Crocodile CARE Campaign had successfully reached 6534 students from 52 primary and secondary schools in Agusan Marsh and Wildlife Sanctuary (AMWS) and Siargao Islands Protected Landscapes and Seascapes (SIPLAS).
- CPPI's collaboration with AZA-Crocodilian Advisory Group has been instrumental to the Municipality of Pilar in Surigao Del Norte for declaring the month of MAY as CROCODILE CONSERVATION MONTH in the municipality of Pilar, Surigao Del Norte, Siargao Island Protected Landscapes and Seascapes on 26 October 2015.

Malaysia:
Sabah Crocodile Programme (Activities - April 2015-2016)
Danau Girang Field Centre (Dr. Luke Evans; Dr. Benoit Goossens)
Sabah Wildlife Department (Silvester Saimin; William Baya)
Wildlife Rescue Unit (Dr. Senthival Nathan; Dr. Diana Ramirez; Jibius Dausip)

- Wildlife Rescue Unit has captured a total of 60 individuals throughout the last six years (since its formation). Some of these individuals were translocated, others were moved to farm or zoo facilities.
- During the course of the last 12 months two estuarine crocodiles were satellite tagged in the Kinabatangan River.
- Population genetics of 120 individuals from the Kinabatangan River was conducted suggesting the presence of 3 distinct non-geographically isolated sub-populations. Individuals were found to belong to the same evolutionary significant unit as found during other studies throughout the region (paper in prep).
- Satellite tagged individuals showed restricted movements in the presence of a non-physical barrier (a large bridge over the river). This phenomenon was shown to be the case for four individuals on both sides of the bridge (paper submitted). Additional testing is planned for the future.
- A preliminary survey of the Kinabatangan River showed a large increase (2.21 ind/km (corrected)) in crocodile numbers compared to prior surveys (Whitaker 1984; Stuebing 2002). These results were used to apply for funding federal funding to complete a state-wide survey beginning this year.
- A Masters student is conducting some form of crocodilian research at Universiti Malasia Sabah, however I have been unable to find out any details of the nature of the research.
- Future plans are in place to conduct Tomistoma surveys in western Sabah together with researchers from Universiti Malaysia Sarawak. These surveys are scheduled for March 2017.

Chinese Alligator (Steven Platt):

The Chinese alligator (*Alligator sinensis*) is the most critically endangered crocodilian in the world. The few remaining wild alligators (<150) occupy small patches of marginal habitat and any increase in the size of these populations is precluded by the limited availability of suitable habitat. In contrast to the situation in the wild, ca. 14,000 Chinese alligators are maintained at government breeding centers. An action plan prepared in 2001 recommended

that new wild populations be established by reintroducing captive-bred alligators into suitable, but unoccupied habitat. To this end, we evaluated 9 potential reintroduction sites in the Yangtze River Basin of Anhui Province: 1) Baidang Lake, 2) Caizi Lake, 3) Chenyao Lake, 4) Huang Da Lake, 5) Long Gan Lake, 6) Po Lake, 7) Pogang Lake, 8) Wuchang Lake, and 9) Xizi Wetland Park.

Of these sites, eastern Wuchang Lake appears to offer the best prospects for a successful reintroduction. Our conclusion is based on several factors. Foremost, Wuchang Lake is a Nature Reserve where the protection of wildlife is the paramount mission. Second, several large expanses of densely vegetated marsh are excellent alligator habitat and undoubtedly rich in prey. Third, water levels in Wuchang Lake are maintained at relatively stable levels by a canal linking the lake with the Yangtze River. Fourth, land use adjacent to Wuchang Lake is for the most part compatible with alligator conservation. Finally, given the amount of available marsh habitat (ca. 2,500 ha), Wuchang Lake has the potential to ultimately support 1,000 adult alligators. Should this goal be achieved, the Wuchang Lake population would be the largest wild population of Chinese alligators in the country.

In addition to Wuchang Lake, we recommend that serious attention be given to reintroducing alligators at Long Gan Lake. Although relatively small (ca. 200 ha), the shallow lake is densely vegetated and appears to be excellent alligator habitat. Several existing islands offer suitable nesting sites and additional islands could readily be constructed. Long Gan Lake is slated for development as a Wetland Park and reintroduced alligators would no doubt represent a significant tourist attraction. Despite its relatively small area, Long Gan Lake could potentially support a population of 50-80 adult Chinese alligators that could play an important role in the larger conservation metapopulation.

Finally, because previous small-scale efforts have demonstrated that reintroduction is an effective strategy for restoring viable populations of Chinese alligators in the wild, we recommend that reintroductions at Wuchang Lake be up-scaled to include larger groups of individuals. Larger reintroductions are more likely to succeed and will increase the trajectory of population recovery

China Sub-Regional Report (Chinese Alligator (Jan2014 - Dec 2015):
(Jiang Hongxing, National Wildlife Research and Development Center of State Forestry Administration of P.R. CHINA)

1. Reintroduction progress of Chinese alligators

1.1 In Anhui Province

- The Gaojingmiao Forest Farm (GFF) is the unique reintroduction site of Chinese alligators in Anhui Province of China. The GFF initiated habitat restoration since 2003 and started to release captive alligators since 2005. Normally, six captive alligators were released to the created wetlands in each year. Till now, 11 releasing events occurred. By 2015, a total of 78 alligators was released there and approximately 50 ha of habitats were created and restored. Since the first successful breeding in 2008, a total of 8 nests with 158 eggs were counted, and 80 hatchling alligators were produced.
- In 2014, a total of 8 ponds covering 5 ha was created and 10 captive alligators were released to the newly constructed ponds in Gaojingmiao Forest Farm. Meanwhile,

1500 kg small fishes were released and 10 kg seeds of aquatic plants were sowed to foster the food web and create suitable habitats for these releasing alligators.

- In 2015, 12 captive alligators were released to the restored ponds in the Gaojingmiao Forest Farm.

1.2 In Zhejiang Province

- In 2012, 120 captive Chinese alligators were released to the newly constructed and restored habitats in Yinjiabian Chinese Alligator Nature Reserve (YCANR of Zhejiang Province), with a total area of 23 ha.
- In 2014, the released alligators were firstly observed to build 7 nests and lay the eggs in the wild. This proved the released alligators have adopted the wild environment to complete the full physiological process related to foraging, burrowing, wintering, nesting and incubation.
- In 2015, the released alligators laid 261 eggs, and hatched 128 alligator hatchlings.
- Meanwhile, the YCANR continued to release the captive alligators into the wild. A total of 30 captive alligators including 7 males and 23 females were released in two times in 2015.

2. Status of wild alligators in Anhui Province

- From 2005 to the present, two complete surveys were conducted in 2011 and 2015, respectively. The survey in 2011 belongs to the ad hoc survey under the second national wildlife investigation, which was hosted by Anhui Normal University with cooperation of Anhui Chinese Alligator National Nature Reserve (ACANNR). The survey in 2015 was hosted by the ACANNR using the reserve fund.
- The results of 2015 survey indicated a total of wild population estimate ranges from 136 to 173 individuals, which was based the actual counting of 64 alligators including 32 adults. It is worthwhile to mention that 3 adults were observed in the two sites outside of the ACANNR.
- In addition, 52 alligators including 34 adults were observed in the reintroduction site: Gaojingmiao Forest Farm during the survey period of 2015. The population estimate would be 74-86 individuals.
- In 2015, 52 eggs of two nests were successfully laid in the wild. A total of 38 alligator babies were hatched in the natural condition.

3. Captive breeding situation

3.1 Anhui Province

- In 2014, 6880 eggs of 273 nests were laid and 3833 alligator babies were hatched in the Anhui Breeding and Research Center for Chinese alligator (ABRCCA in Xuancheng City of Anhui Province). In 2015, 5063 eggs of 171 nests were laid, which only include 3639 fertilized eggs. Of them, 2287 alligator babies were hatched in the ABRCCA. Till now, there are 12,680 captive alligators raised in the ABRCCA, including 8960 adults and 3710 hatchlings.
- In fall of 2014, the ABRCCA has completed the construction and maintenance for the captive breeding infrastructures, such as construction of 2498 m^2 hatching room, prevention of leakage in raising ponds, prevention of sunlight through setting shelf and covers, and dredging and reconstruction of captive ponds.

3.2 Zhejiang Province

- In 2014, a total of 300 alligator babies were hatched in Changxing Breeding and Research Center for Chinese alligator (CBRCCA in Zhejiang Province). In 2015, a

total of 864 eggs was laid and 388 babies were hatched in CBRCCA, including 261 eggs and 128 babies from the released alligators in 2012.

- By 2015, the total captive population exceeds 5000 alligators in CBRCCA.

4. Basic and applied researches

4.1 Three grants funded by the National Natural Science Foundation of China (NNSFC)

- The regulation mechanism of sex hormones level and its receptors gene expression in follicular development of Chinese alligators, which was hosted by Prof. Wu Xiaobing of Anhui Normal University. This is the general program of the NNSFC.
- Impact of nest-site selection on the sex ratio of babies of Chinese alligators, which was hosted by Associate Professor Zhang Fang of Anhui Normal University. This is the general program of the NNSFC.
- Molecular mechanism of impact of environmental change on the sexual ratio of Chinese alligators, which was hosted by Prof. Fang Shengguo of Zhejiang University. This is the key program of the NNSFC.
- The three projects were initiated from January 1 2013 to be ended by December 31 2016.

4.2 Two grants funded by the State Forestry Administration of China (SFA)

- Evaluation of candidate sites for reintroduction of Chinese alligators along Yangtze River in Anhui Province, which was organized by National Wildlife Research and Development Center, SFA, with cooperation with the ACANNR, Anhui Normal University and Anqing Municipal Forestry Bureau.
- Ecological adaptive mechanism of released Chinese alligators in constructed wetlands, which was hosted by Associate Professor Jiang Hongxing of National Wildlife Research and Development Center, SFA.

5. Other important events

- **Enhance community-co-management in the ACANNR:** The reserve authority raised 300 thousand RMB in 2015 to help maintenance of three ponds in the village surroundings in Jin County and Xuanchuang District of Xuancheng Municipality.
- **Rental land for creating wetland habitat for wild alligators:** In the late 2015, the reserve authority rented agriculture land of 20.1 mu (15 mu = 1 ha) in the current distribution pond, which is subject to Changle Management Station in Nanling County. The design and restoration is planning to be completed in 2016.
- **Reintroduction progress in Wangjiang County of Anqing Municipality, Anhui Province:** Wuchang Lake was confirmed as one of 10 pilot releasing sites during our evaluation report. The lake is located in Wangjiang County of Anqing Municipality, which belongs to the lower reaches of Yangtze River. Through communication and negotiation with local officials, Wangjiang County Government is eager to reintroduce the captive alligators in Wuchang Lake. They have expressed great passion and enthusiasm to support this work. This work is being operated as planned, and also get active support from Anhui Forestry Department and ACANNR.

Prepared by: Lonnie McCaskill
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