

CROCODILE SPECIALIST GROUP NEWSLETTER

VOLUME 35 No. 1 • JANUARY 2016 - MARCH 2016



CROCODILE SPECIALIST GROUP NEWSLETTER

VOLUME 35 Number 1
JANUARY 2016 - MARCH 2016

IUCN - Species Survival Commission

CHAIRMAN:

Professor Grahame Webb
PO Box 530, Karama, NT 0813, Australia

EDITORIAL AND EXECUTIVE OFFICE:

PO Box 530, Karama, NT 0813, Australia

Printed by: Uniprint NT

Charles Darwin University, NT 0909, Australia

COVER PHOTOGRAPH: From left, clockwise: 1. Wild Gharial being fitted with VHF transmitters. 2. Ashutosh Pripathi (Gharial Ecology Project) presenting summary of survey techniques to Forestry Department staff; 3. Catch team with Gharial. 4. Communal Gharial nesting site at Rithora Tighra, with three females and excavated nests. See pages 10-14 for update on status of Gharial population in India.

EDITORIAL POLICY: All news on crocodilian conservation, research, management, captive propagation, trade, laws and regulations is welcome. Photographs and other graphic materials are particularly welcome. Information is usually published, as submitted, over the author's name and mailing address. The editors also extract material from correspondence or other sources and these items are attributed to the source. If inaccuracies do appear, please call them to the attention of the editors so that corrections can be published in later issues. The opinions expressed herein are those of the individuals identified and are not the opinions of CSG, the SSC or the IUCN unless so indicated.

CSG Newsletter Subscription

The CSG Newsletter is produced and distributed by the Crocodile Specialist Group of the Species Survival Commission (SSC) of the IUCN (International Union for Conservation of Nature).

The CSG Newsletter provides information on the conservation, status, news and current events concerning crocodilians, and on the activities of the CSG. The Newsletter is distributed to CSG members and to other interested individuals and organizations. All Newsletter recipients are asked to contribute news and other materials.

The CSG Newsletter is available as:

- Hard copy (by subscription - see below); and/or,
- Free electronic, downloadable copy from "<http://www.iucncsg.org/pages/Publications.html>".

Annual subscriptions for hard copies of the CSG Newsletter may be made by cash (\$US55), credit card (\$AUD55) or bank transfer (\$AUD55). Cheques (\$USD) will be accepted, however due to increased bank charges associated with this method of payment, cheques are no longer recommended. A Subscription Form can be downloaded from "<http://www.iucncsg.org/pages/Publications.html>".

All CSG communications should be addressed to:
CSG Executive Office, P.O. Box 530, Karama, NT 0813, Australia.
Fax: +61.8.89470678. E-mail: csg@wmi.com.au.

PATRONS

We thank all patrons who have donated to the CSG and its conservation program over many years, and especially to donors in 2015-2016 (listed below).

Big Bull Crocs! (\$15,000 or more annually or in aggregate donations)

Japan, JLIA - Japan Leather & Leather Goods Industries Association, CITES Promotion Committee & Japan Reptile Leather Industries Association, Tokyo, Japan.

Heng Long Leather Co. Pte. Ltd., Singapore.

Hermes Cuirs Precieux, Paris, France.

Golden Ranch Farms, Florida, USA.

Kering, Paris, France.

Singapore Reptile Skin Trade Association, Singapore.

Species Management Specialists, Canberra, ACT, Australia.

United Leather Product Co. Ltd. and Nakorn Sawan Crocodile Farm, Thailand.

Friends (\$3000 - \$15,000)

Ashley and Associates, Florida, USA.

Barefoot Zoological Gardens, South Carolina, USA.

William Belo, Coral Agri-Venture Farm, Philippines.

Crocodile Conservation Institute, South Carolina, USA.

International Reptile Leather Association (IRV), Germany.

Enrico Chiesa, Italhide, Italy.

Mainland Holdings, Lae, Papua New Guinea.

Phillip Cunliffe-Steel, New Zealand/Australia.

Porosus Pty. Ltd., Northern Territory, Australia.

Primary Resources Investments, Australia.

St. Augustine Alligator Farm, Florida, USA.

San Diego Zoological Society, California, USA

Virginia Aquarium and Marine Science Center
Foundation, Virginia Beach, Virginia, USA.
Yee Tai Leather Enterprise Ltd., Hong Kong.

Supporters (\$1000 - \$3000)

Simone Comparini, Pantera S.R.L., S. Croce s/Arno, Italy.
Paolo Martelli, Hong Kong.
J. Perran Ross, Gainesville, Florida, USA.
George Saputra, CV Alona Jaya, Jakarta, Indonesia.
Colin Steveson (UK) and Rene Hedegaard (Denmark)
Toronto Zoo, Ontario, Canada.
Yosapong Temsiripong, “Sriracha Moda” and “Crocodile &
Ostrich Cooperative of Thailand”, Thailand.
Zambia Crocodile Farmers Association, Lusaka, Zambia.
Zoo Leipzig, Leipzig, Germany.

Contributors (\$250 - \$1000)

Cathy Shilton, Northern Territory, Australia.
Crocodile Park, Malaga, Spain.
James Hennessey, The National Reptile Zoo, Ireland.
J.K. Mercado & Sons Agriculture Enterprises Inc.,
Philippines.
The Ebey family, New Mexico, USA.
Marco Schultz, Germany.

Editorial

For some time now the CSG has been trying to assist Colombia to resolve a problem with ranched and wild harvested skins entering the legal trade in *Caiman crocodilus fuscus*, which in accordance with Colombian laws must be restricted to production through captive breeding. I have included an article in this Newsletter (pages 8-9) that summaries recent actions by the European Union and Colombia. Added to this now, is a recent Notification from CITES (No. 2016/017). This will all hopefully lead to improved management of *Caiman crocodilus fuscus* in Colombia.

Colombia has also submitted a proposal to CITES to transfer from Appendix I to Appendix II, exclusively for ranching [Resolution Conf. 11.16 (Rev. CoP15)], the population of *Crocodylus acutus* in the District Integrated Management of Mangroves Bay Cispatá, Tinajones, La Balsa and Area near, Córdoba Department. CSG members have provided comments to the Colombian Management Authority on early drafts of this proposal: the final text should be available by the end of April.

In January 2016 the CITES Standing Committee (SC66) recommended that all Parties suspend commercial trade in some specimens of rosewood from Madagascar, until a range

of requirements are met. It also agreed that if Madagascar does not make significant progress about illegal use and trade in rosewood by 25 July 2016, it will consider a recommendation to all Parties to suspend commercial trade in all specimens of CITES-listed species from Madagascar at SC67 (October 2016). Should a total ban be recommended, there are clearly implications for the Nile crocodile management program that is currently being developed and implemented after a 4-year ban.

A summary report on the 3rd Regional West and Central Africa meeting, held in Abidjan, Côte d’Ivoire, on 8-10 December 2015, is on pages 6-8 (Fig. 1 below). This was a remarkable meeting, very well attended by regional countries.

It is truly pleasing to see the population of Indian Gharial (*Gavialis gangeticus*) in the Chambal River, is in better shape than has been generally reported in the past. A recent report by Jeff Lang (see pages 10-14) gives an excellent summary of what is being achieved within India. The main study with which Jeff has been involved - supposedly in his retirement - is inspirational for us “oldies”.

The Best Management Practices Manual is now in the final drafting stages, integrating any additional comments from reviewers and from the CSG Steering Committee. It will soon be posted on the CSG website.

A Crocodile Symposium, organized by Dr. Mark Merchant and Professor Wu Xiaobing, will be held under the auspices of the 8th World Herpetological Congress (Hangzhou, China, 15-21 August 2016). The opportunity is being taken to update the CSG on progress with the Chinese Alligator Action Plan, and it is hoped that participating CSG members will be able to visit alligator facilities and habitats, and meet Chinese researchers, prior to the 8th WHC.

The 24th Working Meeting of the Crocodile Specialist Group will be hosted by SANParks at Skukuza Rest Camp, Kruger National Park, South Africa, on 23-26 May 2016. The theme of the working meeting is “Crocodiles, Communities and Livelihoods”. There will be a veterinary workshop on 21 May, and a meeting of the CSG Steering Committee on 22 May. Details, including the proposed Program, are now available on the meeting website (www.csg2016southafrica.org). The deadline for Abstracts is 30 April 2016. The CSG Executive urges all CSG members and others interested in crocodilian conservation, management, research and trade to consider participation in the meeting.

Professor Grahame Webb, CSG Chairman.



Figure 1. Some of the participants at the 3rd regional West and Central Africa meeting. From left, Samuel Martin, Vincent Lapeyre, Nathalie Kpera, Georges Hedegbetan, Grahame Webb, Ekke Waitkuwait, Joaddane Donaye Dekoua, Cyrille Mvele, Christine Lippai. Photographs: Christine Lippai.

The restocking program is a component of the complete strategy of the conservation of *C. rhombifer*. The program took into account established criteria of the IUCN-SSC Re-introduction Specialist Group (1998, 2012), as well as available information on reintroduction programs in Cuba and other countries such as the USA, India, Philippines, Nepal, Zimbabwe, Uganda, Nigeria, Thailand, Vietnam, Venezuela and Colombia.

Zapata Swamp, with an approximate area of 657,900 ha, is located on the Zapata Peninsula, south of Matanzas Province, western Cuba. Most of this territory has protected area status, under the categories of Protected Area of Managed Resources, Wildlife Refuge, and National Park. The Zapata Swamp Biosphere Reserve was established in 2000, and since 2001 has been designated a RAMSAR site. The Zapata Peninsula also holds the status of Special Region of Sustainable Development (Decree 197/96, Plan Turquino-Manati).

One of the four potential areas for the liberation of crocodiles identified is a protected area with category of fauna refuge (Canales Hanabana), located in the Oriental region of the Zapata Swamp with an area of 5646 ha. This natural freshwater habitat of *C. rhombifer* was altered in the 1960s for agriculture purposes. This reserved area is formed by systems of canals, flooded terraces, patches of vegetation in the borders of the canals, pastures of swamp flooded in the spaces between canals.

On 28 January, 100 crocodiles (12 males, 88 females; 3-5-years-old), selected at the Zapata Crocodile Farm, were released. The average total length of animals was 114.8 ± 14.9 cm (range 94-162 cm) and average weight 7.3 ± 3.5 kg (range 4.0-19.5 kg). A high proportion (71%) of the animals were between 110 and 120 cm TL.

A monitoring program for the reintroduced population and the habitat will be implemented to evaluate the success of the program and obtaining the necessary knowledge on the species that will allow improvements to be identified.

Roberto (Toby) Ramos, *Empresa Forestal Integral "Ciénaga de Zapata"*, Cuba (toby@zapata.atenas.inf.cu).

South Asia and Iran

India

It's time for an update on the Gharial conservation scene in India. Any additions would be most welcome, so we can have the most comprehensive update possible. Information can be sent to me at jeff.w.lang@gmail.com). We now have Facebook presence at "Gharial Ecology Project", featuring a short overview (5 min video clip).

This project, now in its 9th year, started in 2008 with Rom Whitaker and Dhruvajyoti Basu, and was initially sparked by the mass die-off of 110+ Gharial in the National Chambal Sanctuary (NCS). Fortunately, there hasn't been a recurrence

of the mass mortality during the winter of 2007-08, but there is growing pressure for water extraction, illegal sand mining and fishing, as well as the ever present threat of major dams and diversions.

For the Gharial Ecology Project focused on the lower Chambal, we anticipate another several years at least, and are actively looking for handover partners within India who can keep the work going. Funded through the Gharial Conservation Alliance and private contributions in the beginning, the main supporters now are primarily from the international zoo community (Zoo Paraha, Ocean Park, Wildlife Conservation Society, LA Zoo, Cleveland Metroparks, San Diego Zoo, San Antonio Zoo, AZA-CAG and others), as well as help from generous donors such as participants in CrocFest events in Florida, CroctoberFest in San Diego, Swamp Girl Adventures, and others.

Every year/season, we learn a bit more, and now we have a fairly complete picture of how many Gharial populate the lower 225 km of Chambal where we "guess-timate" about 75% of the remaining megapopulation in the NCS resides. The non-hatchling numbers are in the 1500-2000 range, with at least 300+ reproductive-sized females, and probably 150+ "big ghara" males (4.5-5.5 m TL). Some 200-300 nests are produced each year, with >80% hatching, resulting in ~8000 hatchlings yearly.

These numbers are an order of magnitude above the usual figures referenced; eg "200 left in wild" and "less than 10 big males" for the entire species worldwide! This is without a doubt the most significant and most important stronghold of the species anywhere in the world, and coincides with prime habitat for the Ganges freshwater dolphin, two species of endangered hard shelled turtles, two species of large softshells, Indian skimmers, Saurus cranes, as well as major migratory flyway, in a protected, unpolluted large river - probably the only one within India of this size and scope. The Chambal Gharial are likely the only wild, free-living population that continues to live and thrive in an intact, large riverine habitat, where conditions are still favourable.

Our field work has recently shown that reproductive/nesting females travel long distances; our current longest traveler, back and forth on a seasonal basis, is a female we marked 100 km downriver at about the km100 mark (we reference all river locations as river distance in km from the Chambal-Yamuna confluence). She traveled upstream last season after being marked in November 2014, to a nesting sandbank at a turning in the river, 120 km from where she was tagged. She nested there, guarded her nest, opened it, and stayed with a large creche of 400-500 hatchlings until mid-July, then went 220 km downstream to the confluence as soon as monsoon waters flooded nesting banks and the creche dispersed.

In early December 2015 we tracked her back to this same nesting site, the entire 210 km distance, where she was part of a 50+ assemblage of large Gharial congregating and basking together. At this same site last year there were 31 nests counted, 27 of which hatched, producing two large creches separated by about 300 m. Each creche of 300-500 hatchlings



Figures 1-8 (from top left, clockwise): 1. Captured Gharial being tagged on mid-river sandbar. 2. A 5.3 m TL male Gharial tagged with VHF transmitter. 3. Tagged female Gharial being released. 4. Female #24, a long-distance mover (see text). 5. Getting locations, downloading GPS data. 6. Hatchling Gharials basking. 7. Illegal sand mining on the Chambal River. 8. GPS logger radio attached to dorsal surface of tail.

attended by an individual, big ghara male. These two males were more or less side by side within 500 m of shoreline, each attending a separate creche and patrolling an invisible boundary between the two nesting areas.

Our effective range now is this 210-km lower section of Chambal, about 170 km within Uttar Pradesh (with Madhya Pradesh across river), and the upper 40-45 km in Rajasthan (with MP across the river). We counted 153 nests along this entire stretch immediately after hatching this year (2015), 124 of which had hatched. There are probably another 50-75 nests upriver within the next 100 km, then the habitat and disturbance limit Gharial numbers in the upper reaches of Chambal, above about 300-350 km from confluence. There are animals there, but scattered, and populations are fragmented.

The other exciting finding, new these past several years, is the extent of complex social interaction, particularly around the creches. There are clearly defined “guardians” with the large creches, but these consist of a single dominant female, typically one of the largest nesting females at each colonial nesting site, and a big (>4.5 m) male, usually with ghara developed to at least half size, or larger. These guardian males are not necessarily the largest, dominant breeding males, but may be adjacent males not yet ready for “prime time.” We have several solid scenarios in which a junior male is the guardian, and almost certainly *did not* participate in the breeding group nearby, where most of the nesting females courted and mated. These detailed observations strongly suggest “alloparental” behavior by the guardians, since they are the “surrogate” parents, rather than the actual parents of the majority or all of the hatchlings in creches they are guarding.

To date, we have tagged more than 50 Gharial with radios, and tracked some for 30+ months. We have 20+ Gharial radio tagged and continue to monitor them manually, as well as some with GPS loggers incorporated with the radios. These are remotely downloaded and provide fine-scale movement data (on daily basis for most animals) to augment and supplement the manual tracking. We have three researchers on the river on an almost daily basis, and they are well known and recognized by folks from all the river villages for at least the lower 170-km stretch, since they visit these sites regularly. These observers take photos and detailed notes, as well as track, and also discreetly monitor any other activities which appear to affect the Gharial and their presence at particular sites along the sandbanks, shorelines and deep pools.

Pankaj Kumar, Ramraj and Deepu Mishra continue to be the core field team doing the hard leg work of observing and tracking throughout the year. Soham Mukherjee has been an invaluable aide during the capturing and tagging efforts, with help from Munuswamy K, from MCBT. Ashutosh Tripathi has been coordinating and leading the training sessions with forest department staff, as well as primary and secondary school teachers. In addition, a local cadre of “gharial guards” is being assembled to help with monitoring riverside activities, and how these affect resident Gharial.

Besides water extraction and dam proposals, the most

persistent threats are illegal fishing and sand mining. We have good connections with local Forest Department staff on both UP and MP sides of the river, and are in regular touch with them about river activities, etc. In the past several years, there has been an exponential increase in “industrial scale” sand mining on the extensive sand banks and bars, primarily in MP and Rajasthan. At the communal nest site where our long-distance mover nested last season (2015), sand mining was happening 24/7 during the pre-monsoon months, with 35-40 tractors and wagons plying up and down. At this site, sand removal resumed immediately post-monsoon and continues for 10 months (September-June) until the next monsoon.

The Gharial Ecology Project is operated through the MCBT, a 45-year-old registered Indian NGO. We are developing strong ties with the Laboratory for Conservation of Endangered Species (LACONES), a sister organization of Centre for Cellular and Molecular Biology, based in Hyderabad, the premier international government body doing world class research. We are tying up with LACONES to do genetic studies, aimed at establishing a Gharial database that will allow regional identification and within population level genetic relationships, as well as parentage of creche groups, to back up our behavioral observations. LACONES has a strong position in DNA-based wildlife forensics, primarily with megafauna such as leopards and tigers. Dr. Karthik Vasudevan, an alumnus from the MCBT, heads up herpetological research and is collaborating on crocodilian studies. We have also initiated a stable isotope study to better understand the prey base and food webs in the Chambal ecosystem, particularly for Gharial of different sizes, sexes and ages.

In addition to our work on the Chambal, I know of several other active Gharial projects that are on-going. One of these is being run by Subir Chowfin at Corbett Tiger Reserve in conjunction with Dr. Alison Leslie, who is helping write up their findings. There is a breeding population there of 100+ non-hatchling Gharial of mixed sizes. Estimates of adults are in the 30-50+ range, with recent increases in adults counted. There is sustained evidence of limited breeding in marginal, reservoir habitat, now that Ramganga River has been turned into series of lakes, that rise and fall pre-monsoon, with water control structures controlling water levels. The big plus at this site is the strict protection since these Gharial are residing in the middle of a famous National Park. Subir is an alumnus of the Gharial Ecology Project during 2008-10, and has established a long term study of Gharial in Corbett in his home state of Uttarakhand.

Another significant project is at Hastinapur, a 120-km protected area, set aside on the Upper Ganges, about 3 hours northeast of Delhi. Here, WWF-India has released about 100 juvenile Gharial per year from the Kukrail facility since 2010, so the released total now exceeds 500. I have been working with their biologist, Sanjeev Yadav (from Etawah) and we (with our fishing/catching crew from the Chambal) caught some of these released animals in late March 2015. We caught and tagged 7 juveniles just released a month earlier with radios (2 year duration) and 2 larger recaptures that were initially released in 2010. Both were about 1.5 m and 5 kg

when released, and now the female is 75 kg, and 2.7 m, and the male 2.4 m and 40 kg. Both of these larger animals were tagged with GPS tags, as well as manual VHF tags, and at least the female has returned post monsoon right back to same spot, and the male has also returned to a downstream area.

We (Gharial Ecology Project/MCBT/GCA) donated the equipment, receiver and radios, etc., for this work, and are collaborating directly with WWF-India. The plan for 2016 is to tag more Gharial, and possibly start tagging some adult Batagur, large hard-shelled river turtles that are Critically Endangered as well. The habitats on the Ganges are totally different and degraded, but apparently at least some of the Gharial released there are thriving. I believe this is the most significant and successful Gharial release in India so far, and it goes a long way toward restoring this species in its native, original habitat - the female will need a larger male to breed with, and we are working on that component, hopefully by supplementing from captive breeding stock.

Other than these two projects, we also helped the Turtle Survival Alliance (TSA-India) carry out some tagging of juvenile Gharial released north of Lucknow, in the river system that runs out of the Katarniaghat barrage, Ghaghra and Girwa. Ten juveniles, again from the Kukrail facility, 3-5-years-old and 1.5-2 m in length, were released with radio tags, along with 52 others, some of these soft-release and some hard-release. Lonnie McCaskill was instrumental in getting some additional funding for this project, which is somewhat far afield from the usual turtle work TSA-India is doing. These Gharial were tagged and released at the end of February 2014, and have been intermittently tracked ever since. We (Gharial Ecology Project/GCA) donated the radio gear, radios and receivers, antennas, etc.

Only about half of these head-started Gharial survived post-release, through the first year at this site. But the one encouraging finding from the Ghaghra study is that the trackers were able to find evidence of a previously unknown “resident” population of Gharial in the river within 50-100 km below the dam at Katarniaghat, which suggests that the Katarniaghat population of 100-200 might be larger and more robust, and spread over more habitat, though presently unprotected outside the sanctuary. This Katarniaghat population is contiguous with the Nepal Bhardia population, the western one of two remaining wild populations within Nepal.

Other Gharial-related projects are of much smaller scale, and generally involve release of zoo-raised or captive-bred individuals into habitats not currently populated with Gharial. BC Choudhury and associates at the Wildlife Trust of India released some zoo Gharial in the upper reaches of Gandak, near the Nepal border on the UP-Bihar boundary, and some of these released animals have wandered around, up and downriver for 100s of kilometres. There is a plan to release more zoo Gharial in the Indus system in far western Punjab, near the Pakistan border, with help from WWF-India and others. The folks at Nandankanan, the first captive breeding facility set up by Dr. Robert Bustard and his team in Orissa, have been planning and/or actually released some Gharial into

the Mahanadi River, Satkosia Gorge, which is now degraded and may no longer be suitable for Gharial in the long-term. Reports of Gharial in some of the smaller river systems in MP, below the Chambal-Yamuna confluence continue, in the Ken and Son, possibly the Betwa. These are fragmentary populations, isolated in “protected” areas, surrounded by unprotected stretches, where irrigation is major, and water extraction results in dry sections during the pre-monsoon period.

Overall, assembling a very rough estimate of Gharial numbers/populations, the total Chambal non-hatchling population is ~80% (+/-10%), or 2000 +/-500 animals, of the worldwide total of ~2500 (+/-500). Thus, it is by far the most significant and critical remaining stronghold for the species anywhere in the world. In brief, the remaining populations and their approximate numbers in India are Katerniaghat-Ghaghra (150 +/-25) and Corbett (100 +/-25) and in Nepal are Chitwan (75 +/-25) and Bardia (75 +/-25). Gharial may still survive sporadically in Bangladesh, and in formerly occupied riverine habitats within India (Brahmaputra, Ganges, Gandak, Mahanadi, Ganges, Son, Ken, Yamuna, Betwa). All of these figures are very approximate, but on balance give a good indication of size relative to one another.

Recently, I was in touch with Iri Gill, Deputy Curator at London Zoo, about a Gharial conservation initiative that the London Zoological Society (LZS), with all its resources, is planning in Nepal. This Gharial initiative is just part of a comprehensive “range country” program that LZS has had in Nepal for decades, with major tie ups with tigers and other species. Iri just spent 10 days with us on the Chambal during the recent catching and tagging (17-26 November 2015), and is planning a workshop in November 2016 in Nepal to jump-start their program there. Initially, the emphasis will be on captive breeding, since this is the existing program there, with Bed Khadka and team, but there will likely be a parallel program up and running as soon as possible to shift the major conservation effort toward the wild populations, particularly at Bhardia and at Chitwan. The tentative plan is to draw on the Indian side to visit and advise on-site in Nepal, as part of the workshop.

Rom, Zai and I continue to dialogue about GCA, and the best way forward. We are in the process of drawing up an updated GCA mandate and operational procedure, and identifying an Indian-based coordinator. We are committed to continuing the initiative, in spite of the hiatus caused by staff changes at the MCTB, and an important period of re-imagining and re-examining its role and structure. With solid support for Gharial conservation from the international zoo community, in the USA and Europe as well as in Asia, the GCA will likely move toward becoming the main priority-setting advisory board with zoo representatives and a panel of overseas and south Asian experts.

In the meantime it is particularly important that the focus remain on the most significant remaining population worldwide, namely the Chambal Gharial (~80% of global population). The remaining four populations (Corbett and Katarniaghat in India; Chitwan and Bardia in Nepal) account

for the remaining 20% (roughly 5% each). The real challenge is how to protect and conserve this unique species in its natural habitats.

Jeff Lang (*Senior Advisor, Gharial Ecology Project, Madras Crocodile Bank Trust, jeff.w.lang@gmail.com*) with inputs from the Gharial Ecology Project team, Rom Whitaker (*Founding Trustee MCBT*) and Zahida Whitaker (*Director, MCBT*).

GHARIAL CONSERVATION IN NATIONAL CHAMBAL SANCTUARY, INDIA. The National Chambal Sanctuary (NCS) in northern India is a legally protected nature reserve that offers excellent conditions for eco-tourism in the region. The important wildlife species present in the riverine section of the NCS are the Gharial (*Gavialis gangeticus*), the Mugger (*Crocodylus palustris*), 7 species of freshwater turtles (*Asperidetes gangeticus*, *Lissemys punctata*, *Chitra indica*, *Batagur kachuga*, *B. dhongoka*, *Pangshura tentoria* and *Hardella thurgii*), the Gangetic dolphin (*Platanista gangetica*) and the otter (*Lutragale persipelleta*). A variety of fish also occur in the Chambal River, and around 120 species of birds were identified in the NCS. Other important terrestrial animals present in the ravines of the sanctuary are land monitor lizard, variety of lizards and snakes, sambhar, spotted deer, jackal, hyena, fox, wolf, langur, porcupine, hares, desert cat, blue bull, wild boar, etc.

Chambal River

The Chambal River, one of the best remaining habitats for the Gharial in its range, originates in the Vindhyan range near Mhow in Madhya Pradesh (MP). It flows in a northeastern direction, passing through Rajasthan up to Pali and thereafter it flows in eastern direction, forming the boundary of MP and Rajasthan and MP and Uttar Pradesh (UP). It joins the Yamuna River near Bareilly of Etawah District of UP. The Yamuna, in turn, flows in a southeast direction, till it meets the Ganga River at Allahabad. Kali Sindh, Parbati, Banas and Kunoo are the important tributaries of the Chambal River. A series of multipurpose dams at Gandhi Sagar (MP), Rana Pratap Sagar (Rajasthan), Jawahar Sagar (Rajasthan) and Kota barrage (Rajasthan) have been erected in the upper reaches of the Chambal River.

National Chambal Sanctuary

During 1978 the Chambal River was declared as a Crocodile Sanctuary under Crocodile Project with an aim to provide fully protected habitat for the conservation and propagation of the Gharial and other wild animals. The NCS extends over the Chambal River from Jawahar Sagar Dam to Kota barrage and after a gap of 18 km. free zone, from Keshoraipatan (Raj.) through Pali to Pachanada (UP) where Kunwari, Pahuj and Sindh rivers form a confluence with the Yamuna River. The total length of the river inside the sanctuary is about 600 km. The width of the river that is included inside the sanctuary is 1000 m from either bank in Rajasthan and Madhya Pradesh. Uttar Pradesh has a greater width, totaling to an area of 635 km². Geographically, the sanctuary lies between the latitude

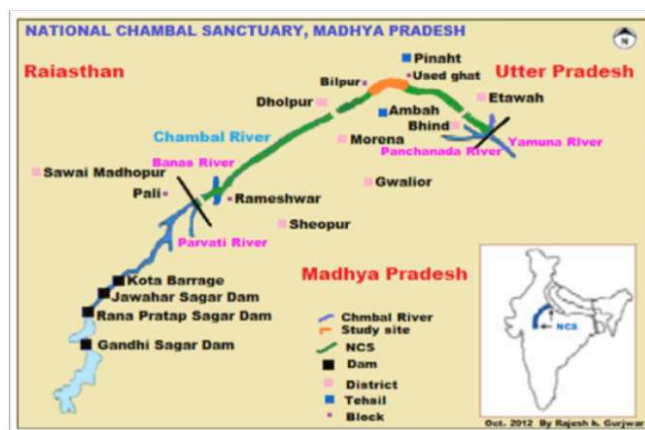


Figure 1. Map of Chambal River declared as National Chambal Sanctuary, India.



Figure 2. Chambal River.

25° 35' N and 26° 02' N and longitude 76° 28' E and 79° 01' E.

Wildlife habitats: The habitat of aquatic wildlife in the Chambal River is characterized by expanses of open sand which is sparsely covered with a variety of herbs. The river-side vegetation is sparse in most of the southern (MP) side of the river. Both banks are muddy, formed by erosion of ravines adjacent to the river and the river depth varies from 1 to 20 m. Most of these banks are used for extensive agriculture. At some places one bank is sandy and other bank is rocky. Rocks are also present in the mid-river islands. Because of monsoon high waters the sand banks alter considerably making the steep sand banks into flat sand banks. In some stretches both the banks are rocky with alluvial deposits. The river is deep and fast and at some places shallow riffle areas are present. The overall topography of the Chambal River indicated that most of the south Chambal River has rocky beds compared to north Chambal River, where extensive sand banks are present.

Climate: The sanctuary is located in the northern tropical region where during a year three distinct seasons are distinguished. The duration of hot season is normally from 15 March to 30 June. The rainy season is from July to September. The area receives most of the rainfall from the southeastern monsoon. The winter season is from mid-October to February with minimum temperatures reaches 40°C in January. Gales are very common during the summer season when wind velocity goes up to 12.4 km/h during June.

Steering Committee of the Crocodile Specialist Group

Chairman: Professor Grahame Webb, P.O. Box 530, Karama, NT 0813, Australia

For further information on the CSG and its programs on crocodile conservation, biology, management, farming, ranching, or trade, contact the Executive Office (csg@wmi.com.au) or Regional Chairmen

Deputy Chairmen: Dr. Dietrich Jelden (Dietrich.Jelden@BfN.de).
Alejandro Larriera (alelarriera@hotmail.com).

Executive Officer: Tom Dacey, P.O. Box 530, Karama, NT 0813, Australia, Tel/Cell: +639393356750, (csg@wmi.com.au).

Regional Chairman, Southern and East Africa: Christine Lippai (lippainomad@gmail.com). **Regional Vice Chairmen:** Dr. Alison Leslie (aleslie@sun.ac.za); Howard Kelly (crocfarm@venturenet.co.za).

Regional Chairman, West and Central Africa: Dr. Samuel Martin (s.martin@lafermeauxcrocodiles.com); Dr. Matthew Shirley (mshirley@ufl.edu). **Regional Vice Chairmen:** Prof. Guy Apollinaire Mensah (mensahga@gmail.com); Christine Lippai (lippainomad@gmail.com).

Regional Chairmen, East and Southeast Asia: Lonnie McCaskill (lonnie.mccaskillcroc@gmail.com); Dr. Jiang Hongxing (jianghongxingcaf@163.com). **Regional Vice Chairmen:** Dr. Choo Hoo Giam (giamc@singnet.com.sg); Dr. Nao Thuok (naothuok.fia@maff.gov.kh); Uthen Youngprapakorn (thutcrok@ksc.th.com); Yosapong Temsiripong (yosapong@srirachamoda.com).

Regional Chairman, Australia and Oceania: Charlie Manolis (cmanolis@wmi.com.au). **Regional Vice Chairmen:** Eric Langelet (elangelet@mainland.com.pg); Steve Peucker (speucker@barneveld.com.au).

Regional Chairman, South Asia and Iran: Anslem de Silva (kalds@sltnet.lk). **Regional Vice Chairmen:** Dr. Ruchira Somaweera (ruchira.somaweera@gmail.com); Maheshwar Dhakal (maheshwar.dhakal@gmail.com); Raju Vyas (razoovyas@gmail.com); Abdul Aleem Choudhury (aleemc1@gmail.com); Asghar Mobaraki (amobaraki@yahoo.com); Dr. S.M.A. Rashid (carinam.bangladesh@gmail.com).

Regional Chairmen, Latin America and the Caribbean: Alfonso Llobet (Management Programs) (alfyacare@yahoo.com); Dr. Carlos Piña (Human Resources Development) (cidcarlos@infoaire.com.ar); Alvaro Velasco (Incentives for Conservation) (velascocaiman@gmail.com); **Regional Vice Chairmen:** Hesiquio Benítez Díaz (hbenitez@conabio.gob.mx); Marisa Tellez (marisatellez13@gmail.com); Dr. Luis Bassetti (luisbassetti@terra.com.br); Sergio Medrano-Bitar (faunasilvestre@gmail.com); Manuel Tabet; Bernardo Ortiz (Regional Trade) (bernardo.ortiz@traffic.sur.iucn.org).

Regional Chairmen, Europe: Dr. Jon Hutton (jon_hutton@hotmail.co.uk); Dr. Samuel Martin (s.martin@lafermeauxcrocodiles.com). **Regional Vice Chairman:** Thomas Ziegler (ziegler@koelnerzoo.de).

Regional Chairmen, North America: Dr. Ruth Elsey (relsey@wlf.la.gov); Allan Woodward (allan.woodward@myfwc.com).

Regional Vice Chairmen: Noel Kinler (nkinler@wlf.louisiana.gov); Dr. Frank Mazzotti (fjma@ufl.edu); Dr. Thomas Rainwater (trainwater@gmail.com).

Vice Chairman for CITES: Hank Jenkins (hank.jenkins@consol.net.au); **Deputy Vice Chairman:** Dr. Yoshio Kaneko (gtrust@wa2.so-net.ne.jp).

Vice Chairman, Industry: Don Ashley (Jdalligator@aol.com). **Deputy Vice Chairmen:** Yoichi Takehara (official@horimicals.com); C.H. Koh (chkoh@henglong.com); Kevin Van Jaarsveldt (kvj@mweb.co.za); Enrico Chiesa (enricochiesa@italhide.it); Jorge Saieh (jsaieh99@yahoo.com); Thomas Kralle (Thomas@Kralle.com); Chris Plott (cjp@amtan.com); Jerome Caraguel (jerome.caraguel@hcp-rtl.com); Simone Comparini (renzocomparini@libero.it).

Vice Chairman, Trade Monitoring: John Caldwell (john.caldwellxx@mail.com). **Deputy Vice Chairmen:** James MacGregor (James.MacGregor@WorleyParsons.com); Steve Broad, TRAFFIC International (steven.broad@traffic.org).

Vice Chairmen, Veterinary Science: Dr. Paolo Martelli (paolo.martelli@oceanpark.com.hk); Dr. Cathy Shilton (Cathy.Shilton@nt.gov.au).

Vice Chairman, Zoos: Dr. Kent Vliet (kvliet@ufl.edu).

Vice Chairman, Public Education and Community Participation: Myrna Cauilan-Cureg (myrna_cauilan_cureg@yahoo.com.ph).

Vice Chairmen, General Research: Dr. Valentine Lance (valcrodoc@gmail.com); Dr. Mark Merchant (mmerchant@mneese.edu).

Vice Chairman, Legal Affairs: Curt Harbsmeier (charbsmeier@hdalaw.com).

CSG IUCN Red List Authority: Dr. Perran Ross (pross@ufl.edu).

Honorary Steering Committee Members: Ted Joanan (USA), Romulus Whitaker (India), Phil Wilkinson (USA), Prof. F. Wayne King (USA).

Task Force/Working Group Chairmen: Future Leadership Working Group, Dr. Matthew Shirley (mshirley@ufl.edu); Siamese Crocodile Task Force, Dr. Parntep Ratanakorn (parntep.rat@mahidol.ac.th); Chinese Alligator Working Group, Dr. Jiang Hongxing (jianghongxingcaf@163.com); Tomistoma Task Force, Bruce Shwedick (Bshwedick@aol.com).