

Madras Crocodile Bank Trust

Centre for Herpetology

Annual Report 2021-2022



INTRODUCTION

Looking beyond the pandemic

This year (2021-2022) has had its share of ups and downs for Croc Bank, yet, it has been better than the uncertainties of last year. As we come to the end of another season, we reflect on how we began it, right in the middle of the second wave that led to our second lockdown from April 20th to August 24th. The next few months flew by, with the hope that COVID-19 was behind us, with visitors waiting for a break after being cooped up in their homes for ages. It didn't last long as the third wave hit Chennai around the Pongal festival that is normally our best season. Partial lockdown was back in place but people were cautious this time and stayed indoors. COVID is the new norm that we will have to get used to, just like we overcame earlier epidemics like the bird flu and the swine flu. Our staff have been vaccinated and safety precautions continue at the zoo.

The epic activity that happened this year is the transfer of crocodiles from MCBT to GZRRC (Greens Zoological Rescue and Rehabilitation Centre) in Gujarat. Never before have so many adult captive crocodiles been shifted! The distance is 2154 km, involving three days of travel by road. This is definitely a milestone achievement for us and the Croc Bank team has proved their mettle once more. This move will help to ease up the space constraint and pave the way for the modernization of our zoo. We are now gearing ourselves to start up a major crowd funding campaign to raise funds to execute our Master Plan that has been on the cards since 2013.

Although virtual programs still continue to happen, we will gradually introduce physical events. Volunteers have started visiting our zoo in small numbers but our special educational programs like the night safari and snake walks are still on hold. An olive ridley turtle hatchery has been set up on our beach and eggs were collected during the nesting season. . The Big 4 Snakes display was officially opened on the 26th of January at Snake Haven. A film about snakebite in the north- east is almost complete and ready to be launched. The Vet lab has been upgraded with new equipment that would pave the way for more accurate diagnosis and research. To top it all, our dear friend Jaws is back, preserved for posterity, as our star display in the Reptiles Interpretation Centre.

We end this year, with gratitude, and optimism....gratitude for how our supporters and friends responded to our call for action and stood by us through this journey, and yes, optimism as we undertake rebuilding in the wake of the pandemic to emerge as a world class attraction with exciting exhibits and newer additions to our already exhaustive collection.

This takes us back to where this incredible journey began. MCBT was started in 1976 by a group of idealistic conservationists including RmWhitaker and Zai Whitaker, as a desperate effort to save India's dwindling crocodilian populations from extinction. At that time the gharial was particularly endangered, with only 300 or so left in the wild. The mugger and saltwater crocodile were in better shape but hunting and habitat depletion were serious threats for them as well. Today, after 46 years of reptile research and grassroots education and awareness building, the Croc Bank is recognized as a world leader in the field of frontline conservation of species and habitats. Its infrastructure and programs include the Croc Bank, a reptile zoo on the East Coast Road south of Chennai, and field stations and study sites reaching as far afield as the Chambal River. The zoo receives about 4.5 lakh visitors annually, making it one of the popular tourist attractions in the region.

Originally designed to be a living repository of crocodilians for genetic safekeeping, the Croc Bank is now no longer confined to crocodile conservation but includes all reptiles in its mandate and its title includes "Centre for Herpetology". In keeping with our original goal, over 1500 crocodiles were sent to various states for restocking in wild habitats. However, the release of captive bred mugger or marsh crocodiles into the wild, is no longer happening, because of shrinking wilderness and the lack of suitable habitats. The mandate has also extended to crocodilians from other countries. In fact of all the world's species, i.e. 26, 15 are housed at the Croc Bank currently. Of the species represented, 4 are listed as 'Critically Endangered' by the IUCN, and 3 as 'Threatened'.

In 2003, the Trustees of the Croc Bank decided to expand its mandate and reach, and become a Centre for Herpetology. Its work now includes the conservation of all reptiles, i.e. snakes, chelonians and lizards as well. The need for chelonian conservation has grown in recent years and MCBT now breeds several threatened species including 2 that are listed as Critically Endangered by IUCN. Field work, namely surveys and ecological studies, are a large part of its activities; in fact, our core operation is as much a field-based conservation outfit as it is a captive gene pool of endangered species.

Over the years, the Croc Bank has developed into a world-renowned conservation NGO with strong community and government support at the local and national level. Apart from its commitment to research and conservation of herpetofauna, it is a recognized resource for environment education and interpretation. Its strength has been to maintain a relatively small but effective operation that is dynamic in action and prolific in results. An example of this is the field station it started in the Andaman Islands, ANET (Andaman and Nicobar Environment Team), which is now being very ably run by Dakshin Foundation.

In 1976, it was obvious that there was a serious and urgent need for herpetological surveys and conservation action in the then little-known and neglected Andaman and Nicobar archipelago. ANET was conceived and started, and has since carried out extensive work on saltwater crocodiles, marine turtles, marine ecosystems, herpetofaunal biogeography and many other biological studies. In addition, ANET has also been productively involved in the broader ecological and social spheres, including projects on natural resource utilization, sustainable development and protected areas management. As one of the oldest and most known and trusted NGOs in the Islands, ANET played a pivotal humanitarian role after the 2004 tsunami devastated the region, including getting relief supplies to desperate victims. Today, although still active in the herpetological arena, ANET carries

out a broad range of environmental work including marine and terrestrial components. It remains one of the few environmental research bases in the archipelago and voices ecological concerns on many local committees which advise the government on development policies and assessments. Its education and awareness building work includes programs and presentations for local and mainland schools, colleges and other institutions and groups on the amazing ecology of these islands and the need to conserve it.

For the last few years, Dakshin Foundation has partnered with the Croc Bank in the administration and development of ANET and this has been most productive and will have long-lasting benefits for the conservation and research platforms in the Islands. In 2019, the roles were reversed, and Dakshin agreed to take over the field station's administration completely, with MCBT playing an advisory and supporting role. The evolution and history of ANET is a good example of how much can be done when organisations come together to work for the common cause; in this case, Dakshin Foundation and Madras Crocodile Bank Trust.

Another such field station is ARRS, the Agumbe Rainforest Research Station. Situated in Agumbe in the Western Ghats, it was set up by Rom Whitaker in 2005, its focus being the biology and conservation of the king cobra. Agumbe is one of the world's primary refuges of the "king". Other iconic herpetofauna in this biodiversity hotspot include Draco (flying lizard), pit vipers and several species of endangered amphibians. A black panther has been seen a couple of times, on one of the pathways that adjoin the ARRS campus. Research projects range from frogs to pit vipers, and of course the king cobra. The rescue-release project for king cobras is the "call centre" for farms and households in the district, which have now become increasingly tolerant to this occasional visitor, thanks to the public education work being done by ARRS staff. The snake is removed and relocated, and the family/community is given moral support and confidence because superstitions and erroneous fears are negated, and scientific information provided. This has been named the most successful snake rescue services in the country, because it deals with one of the most threatened (and potentially dangerous) species of snake in the world.

2000 kms to the north of MCBT on the mighty Chambal River, is Garhaita: the base of the Gharial Ecology Project, one of the most long-term and in-depth crocodile studies in the world. Using sophisticated data collection techniques including telemetry, the study is tracking the home ranges and observing the habits of this wonderful rare and critically endangered animal. Local inhabitants are being trained in these techniques, and the need for conserving the species. Interesting and surprising data and information has emerged about the natural history of the gharial, such as the extensive riverine range of adults and the protection of hatchlings by adult males.

MCBT's education programs include school camps and family activities, as well as hands-on zoo experiences for youngsters such as Zoo Keeper for a Day. There are also presentations in rural schools and this year again, the Croc Bank conducted programs on snakebite and its treatment

at schools, colleges, NGOs, government departments and tourist groups. Education is the key to long term sustainable conservation. We devote a large part of our time and resources towards educating people of all ages and backgrounds on the importance of conserving reptiles and natural ecosystems. Workshops and training programs are also tailor- made and carried out for other zoos, schools, colleges, conservation agencies and government departments on topics related to reptile conservation, husbandry and management. These include groups from other countries as well, since we hold important husbandry experience and expertise for species in those regions (eg the Siamese crocodile).

We could not do what we do, without the help we receive from innumerable well-wishers. This includes donations, field and program participation, partnerships, and other “in kind” support. The names of this community of Croc Bank friends is extensive and we are extremely grateful to all of them.

ADMINISTRATIVE DETAILS - MCBT

Trustees:

Ashish Gupta

Samit Sawhny

M.M. Venkatachalam

Kamini Sundaram

Venu Srinivasan

Meera Anna Oommen

Nikhil Whitaker

Ex Officio Trustees:

Rom (Romulus) Whitaker (Founder)

Zai (Zahida) Whitaker (Founder)

PERSONNEL- APRIL 2021 TO MARCH 2022

Office and Administration

Managing Trustee	Zai Whitaker
Director	Allwin Jesudasan (Until 20 th May 2021)
Director	Pramila Rajan (From 21 st May 2021)
Curator	Nikhil Whitaker
Assistant Curator	Ambika Yelahanka (Until October 2021)
Assistant Curator	Abhijith S. (From November 2021)
Zoo Manager	T Senthil
Education Officer	Steffi John
Veterinarian	Dr. Ruchika Lakshmanan
Conservation Officer	Ganesh Muthiah
Project Coordinator, Snakebite Mitigation	Gnaneshwar Ch
ARRS- Field Director	Ajay V Giri
ARRS- Base Manager	S S Jayakumar
Gharial Ecology Project- PI	Dr J.W. Lang
Gharial Ecology Project -Coordinator	Jailabdeen A

Accounts, Husbandry and Maintenance

M. Mohan	Accountant
M. Pavithra	Assistant Accountant
V. Gangadurai	Chief Reptile Keeper
S. Nagarathinam	Chief Reptile Keeper
C. Dhanasekaran (Retired on 04.02. 2022)	Zoo Educator
L. Gunasekaran	Maintenance Supervisor
V. Mohanasundaram	Curatorial Assistant
T. Mohan	Supervisor, Entrance and pen watchers
C. Purushothuman	Senior Office Assistant
N. Selvamani	Ticket checker
R. Gnanamurthy	Ticket checker
M. Indradevi (Retired on 09.06.2021)	Senior Housekeeper
E. Amutha	Enclosure Maintenance and Housekeeping
J. Shanthi	Chelonian Keeper
S. Parimala (Retired on 14.05.2021)	Enclosure Maintenance
M. Ramu	Driver
S. Janakiraman	Animal Keeper
N. Pushparani	Croc Shop Operator
G. Ashok Somai Magar	Chief Cook
S. Mohan	Cleaning and Maintenance Asst
G. Gowri Shankar	Animal Keeper
Tek Bahadur Somai Magar	Security Guard
Budibal Somai Magar	Security Guard
Krishna Bahadur Somai Magar	Security Guard
V. Yuvarani	Enclosure Maintenance
A. Kumari	Maintenance and Cook
K. Elumalai	Maintenance Assistant

CURATORIAL AND VETERINARY TEAM REPORT

Conservation breeding:

- The Northern river terrapin laid a clutch of eggs in April 2021. Two red crowned roof turtles and a three-striped river turtle laid eggs in December 2021. In 2022, both the female Northern river terrapins laid eggs in February, and March. Two star tortoises and one Travancore tortoise were also hatched in 2021.



Clutch of Northern river terrapin eggs laid in March 2022

- Two clutches of gharial eggs were collected from Pen 24 and Pen 13 in March 2022.
- One mugger in Pen 10 laid 49 eggs. The Morelet's crocodiles and African slender snouted crocodiles laid eggs in June 2021.
- The Whitaker sand boa female gave birth to one individual. Rock python eggs hatched on 10/08/2021 and the female is doing well.



Indian rock python hatchling ("Molly") in August 2021

Veterinary treatment and care:

- The corn snake (*Pantherophis guttatus*) was suffering from a subcutaneous mouth abscess. In spite of treatment with antibiotics, the abscess increased in size causing oral obstruction and loss of appetite. It was successfully removed surgically. The procedure was done with an injectable anaesthetic, and the site was sutured. Post-operative care was given with antibiotics and anti-inflammatory drugs along with ideal captive husbandry management. The reptile has recovered with no marks of the surgery and is feeding well. Surgery data has been compiled and it will be published in an article along with the Hong Kong Ocean Parks Zoo vet Dr Paolo Martelli.



Corn snake, pre and post-surgery

- Two adult green anacondas, both male and female died in August and September 2021 respectively. Intestines of both snakes had classical gross lesions of enteritis and Amoebiasis, an infection caused by *Entamoeba*, a protozoan parasite was suspected. As the disease was known to spread faster between snakes, a prophylactic treatment was given to all our snakes with metronidazole. The snakes are healthy and feeding well.
- MCBT purchased a jab-stick and pole syringe to treat larger animals without capturing and restraining them.

Research:

- Radiography – both the high frequency X-ray machines are being used for studying embryo development inside the egg of reptiles (non-invasively). In one case where an Indian rock python died due to infighting, the cause of death was identified and diagnosed by X-ray as internal fracture and pleurisy in lungs due to suffocation.
- IDEXX hematology and biochemistry analyser – This has paved the way for cutting edge research for the curatorial and veterinary department. Blood was collected from 22 Travancore tortoises and studied for hematology and biochemistry. Study aspects involve clinical nutrition, standardization of hematology and biochemistry values and incorporation of a healthy balanced diet for growth and development.



**Blood collection from an adult
Travancore tortoise**



**IDEXX Veterinary Haematology
& Biochemistry Analyser**

- Similarly, blood parameters were studied for yellow anacondas, a sawscaled viper, Siamese crocodiles, gharial, and turtles using the IDEXX machine.
- Feed analysis (nutrient composition) was done at ICAR-CIBA, Chennai to determine the clinical nutritive content of food given to our reptiles and correlating it with the health of the reptile. The data is being compiled for publication. Feed types analyzed were fish, chicken, rats, vegetables, and buffalo meat. Results indicate that impurities in the samples are minor, and they have good nutritive value in keeping with published standards.
- The Karlstorz rigid endoscopy and laparoscopy unit was installed and the dry demo was conducted. It can now be used in the sexing of reptiles, in minimal invasive internal diagnosis and micro-surgery.



Installation of Karlstorz rigid endoscopy and laparoscopy unit

- Water sampling with the Tara life kits has been prioritized and analyses is done at different intervals depending on species and water type.

Transfers within and out of MCBT:

- We have transferred a male and female Nile crocodile to Vandalur Zoo, in exchange for a male reticulated python from them.

- We have transferred 300 mugger crocodiles to GZRRC, without any mortality between November 2021 - February 2022.
- The Big 4 Snakes exhibit has all four species, and the snakes are getting acclimatized to their new environment.

Development:



MCBT signed a MoU with Tamil Nadu Veterinary and Animal Sciences University, to collaborate on histopathology, molecular biology and microbiological analysis



Permission was granted under the relevant sections of the Wildlife (Protection) Act, 1972, to display Jaw's skin. The skin is now on display at Reptales

CONSERVATION

ECR Conservation Program:

Phase 2 of the program was initiated in the first week on January, 2022. Outreach programs were conducted at Radisson BLU, ITC Welcom Hotel, Joe Beach Resort, Jade Resort and Sheraton Grand.

Sea Turtle Conservation (STC):

A rehabilitated olive ridley turtle was released into the ocean on 18.03.2022.

A turtle hatchery was set up and 7 olive ridley nests were translocated. 434 hatchlings were safely released in the ocean

In the early hours of 09.02.2022, at nine nautical miles away from the coast, fishermen from the Semmancheri village encountered ghost nets that weighed over a ton. By midday, TREE Foundation and Croc bank had mobilised a team and a couple of boats towed the ghost nets ashore.



Checking the olive ridley turtle nest

Noise Issues & Mitigation - Sheraton:

Data Collection- A team from IIT Madras, led by Prof. Dr. Chandramouli recorded the noise levels and vibration during the events at Sheraton Grand Chennai Resort and Spa. The recordings took place from February to March, 2022. The collected data will be processed by Prof. Chandramouli and his team.

EDUCATION

This year, zoo education gradually shifted back from virtual to physical programs as the zoo opened up to visitors in September. The programs are a combination of guided tours around the park, show and tell with animals, enclosure visits, presentations on specific topics such as snakebite and reptile conservation. .

Education programs conducted:

Programs	Date	No. of participants
Turtle or Tortoise	Apr 12 2021	15
Meet the curatorial team with Rom Whitaker	May 05 2021	10
Reptile 101 (Turtles & Tortoises)	Jun 13 2021	10
Reptile 101 (Crocodiles & Lizards)	Jun 20 2021	10
Reptile 101 (Snakes)	Jun 27 2021	10
Tiny Tots	Jun 30 2021	29
FORD - Turtles and zoo tour	Jun 11 2021	40
FORD - Crocodiles and zoo tour	Jun 18 2021	35
FORD- Snakes and zoo tour	Jun 25 2021	20
FORD - Lizards and zoo tour	Jul 02 2021	10
FORD - Tortoises and zoo tour	Jul 09 2021	20
Tiny Tots Take 2	Aug 22 2021	17
Origin of Species with Rom & Curatorial team	Sep 05 2021	7
Reptiles at the Croc Bank	Sep 15 2021	23
Education program	Oct 15 2021	10
Guided tour	Oct 14 2021	15
Avinash education trip	Oct 18 2021	44
Guided tour	Nov 07 2021	15
Vruksha school - virtual program	Feb 07 2022	40
Guided tour	Feb 10 2022	4
Guided tour	Feb 18 2022	5
Nature's Eye - virtual program	Feb 27 2022	9
Guided tour	Mar 10 2022	5
Guided tour	Mar 11 2022	6
KC High - zoo visit	Mar 17 2022	24



FORD program on snakes



Meet the Curatorial Team with Rom Whitaker

World Days

World days were celebrated virtually on social media. We conducted quiz programs, shared pictures and had good interactions with our followers.

- World Crocodile Day – June 17th (652 participated in quiz)
- World Snake Day – July 16th
- Snakebite Day – Sep 19th
- Saltwater Crocodile Week was celebrated along with CZA from December 13th to 19th 2020. This included three webinars, Social Media posts, Educational talks and Thor feeding.

Social media

The following content was prepared by the education department for Social Media: Educational videos, adoption posts, program posters, online quiz, a WhatsApp group for the program participants, and live park talks.

Park talks

Feeding talks and snake talks took place every Saturday & Sunday, with the following timings:

- Snake talk with python - 11 am
- Snake talk with baby green anaconda - 3:30 pm
- Crocodile demo feeding - 11:30 am, 12:30 pm, 04:00 pm and 5:00 pm
- Green iguana feeding - 12:00 pm

Adoption program

We received immense support from our well-wishers this year. Most of our enclosures were adopted. From April 2021 to March 2022, there were 57 individual adoptions and 8 enclosure adoptions.

Volunteer program

We resumed our volunteering program after 18 months by strictly adhering to COVID protocols. The volunteers had an opportunity to work closely with the zoo staff in areas of Research, Education and Zoo maintenance. They found the program to be enriching and valuable.

S.No:	Name	Batch	Project
1	Srujan Butte	10 th to 28 th Oct 2021	Travancore tortoise observation
2	Kushah	10 th Oct to 9 th Nov 2021	Dive duration of gharial
3	Ketan Bende	20 th Nov to 4 th Dec 2021	Pen 10 observation
4	Rutuja Digaskar	1 st to 15 th Jan 2022	Observation of garden lizard
5	Prithvi Pramode	1 st to 30 th Jan 2022	Observation of garden lizard



Volunteers at work

Projects, Conferences & Webinars

- Conservation Education in Zoos IZE & EAZA 11th to 14th October 2021, Virtual presentation.
- Virtually celebrated International Day of Zoo & Aquarium Educators on 12th of November with IZE members from around the globe.
- Webinar lecture with Creative Group representing Madras Crocodile Bank Trust on "Introduction to Reptiles" to over 80 participants.
- Our Education officer was appointed the South Asia representative for IZE from October 2021.
- Virtual programs with Kalangiam Trust and India Sudar through FORD. The program was conducted in Tamil for children from government schools.
- Signed an MoU with Wild Immersions, France for our VR project and collaborated with IIT Madras for VR movies on Croc Bank.
- Video and photo coverage of crocodile transfer from Crocodile Bank to Greens Zoological Rescue and Rehabilitation Center was done for documentation.

Doctoral Research Student



Brinky Desai, a Ph.D. student from the Biological and Life Sciences division of Ahmedabad University did part of her research work at Croc Bank from November 2021 to June 2022. She worked on understanding the reproductive and stress physiology of mugger crocodiles under captive conditions. She used a non-invasive hormone sampling technique through scat analysis. This study will be further used to understand, compare and contrast the behavior and endocrine profile of free-ranging mugger crocodiles in Gujarat. She collected the behavior data through direct observations and CCTV footage. She was assisted by the keepers of MCBT for scat collection. She also published a paper in collaboration with MCBT in the Behavior journal of BRILL on a unique breeding behavior in captive mugger crocodiles.

AGUMBE RAINFOREST RESEARCH STATION (ARRS)

The Agumbe Rainforest Research Station (ARRS) continued its awareness building programs at rescue sites. While the Agumbe region has long been known to have a good population of king cobras it is now becoming famous for its tolerance and understanding of king cobras living in and around human habitation. People now realize that king cobras feed on spectacled cobras and vipers, which contribute to the huge snakebite problem in rural India.

Human-Snake Conflict Mitigation Project (HSCMP)

This period was hugely successful for king cobra rescue and snakebite awareness. With permission from the Karnataka Forest Department, over **238** calls were attended and **139** king cobras, **70** spectacled cobras, **12** pythons, **1** rat snake, **1** krait, and **1** montane trinket snake were rescued and released.

Education outreach programs conducted



15/10/2021 ARRS staff interacted with the Principal Chief Conservator of Forests of Karnataka and 15 Forest Department officials when they visited ARRS

28/11/2021, ARRS conducted an awareness program for Village Forest Community, a community from Hebri village

23/12/2021, ARRS conducted a program for 90 MSc students and 3 faculty members from Alva's Ayurveda Medical College

31/12/2021, ARRS conducted a program for 100 Forest Department officials and 30 MSc students from Kuvempu University.

SLAKEBITE MITIGATION & SLAKE CONSERVATION

The Centre for Herpetology/Madras Crocodile Bank's (CFH/MCBT) Snakebite Mitigation and Snake Conservation project has had great success over the past three years. The generous support from the Infosys Foundation has enabled us in mitigating this multilayered issue, and some of our key milestones are as follow:

Outreach & Capacity Building

We have been partnering with various NGOs and herpetologists to conduct extensive education, **outreach and capacity building** programs across 4 of the snakebite-prone states of India - Andhra Pradesh, Madhya Pradesh, West Bengal and Tamil Nadu. The outbreak of COVID-19 in early 2020 halted most of our outreach work. During these unprecedented times, our team started working on educational models that can run virtually. Between 2021 and 2022, we conducted over **375 educational programs** [virtual and in-person] and **30 capacity building workshops** in the above mentioned states.

These programs were conducted for stakeholders like school students, farmers, health workers, Forest Department, etc. We distributed about **4500** informative posters in various parts of the working area.

<i>Educational programs conducted -</i>	379
<i>Capacity building programs conducted -</i>	32
<i>Educational posters distributed -</i>	4500



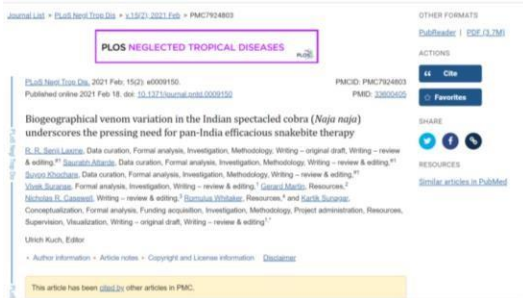
Educational materials distributed at a school



Training workshop for Forest Department

Venom Collection & Research

Through this component, we are studying whether snake venoms differ regionally in the same species of snakes. We are also testing the efficacy of antivenom against the venom of different snakes from across India. This data will be extremely useful in the measures being taken by us to improve the quality and modernize the production of the existing antivenom. The samples collected have been transferred to Dr. Kartik Sunagar's Evolutionary Venomics laboratory, Indian Institute of Science, Bangalore where analysis of samples is underway. One manuscript has been recently published and a few more scientific publications are in preparation.



Research paper published

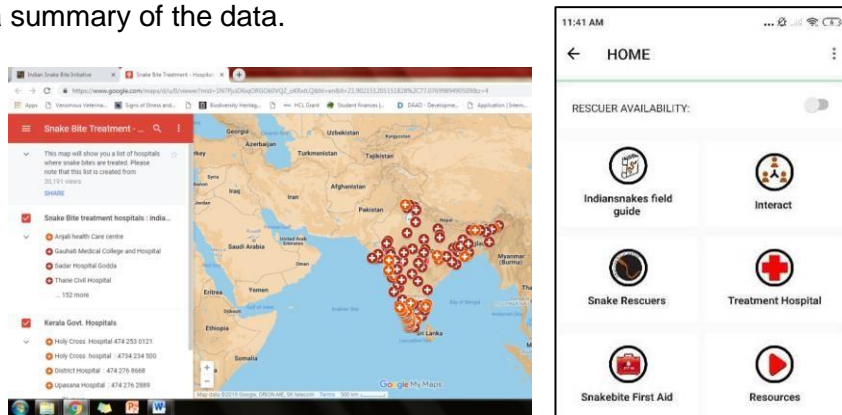


News article published

Technological Interventions

Through our tie-up with Jose Louies at the Tropical Institute of Ecological Sciences (TIES), Kottayam & Indiansnakes.org, we aimed to map the temporal and spatial occurrence of the common venomous snakes of India, as well as create a real-time updated database of clinics and hospitals across the country that routinely handle snakebite cases.

In addition to this, we helped TIES develop 'SERPENT', a mobile app for multiple purposes like contacting a snake rescuer, snake identification, locating a nearby hospital and watching MCBT's educational films. This app, the first of its kind in India, was released in December and so far has over 6000 users. . It indicates measurable results of snake rescues. An online guide to Indian snakes and contacts of snakebite experts are its key specialties of this app. Below is a summary of the data.



The interface of SERPENT's app

Interfacing with Government

We have partnered with the National Health Mission, Tamil Nadu State to collect epidemiological data and establish a **snakebite registry** for the state, a project that we hope will be replicated nation-wide. Also, we are training the doctors in identification of snakes and understanding their ecology.

In addition to this, we are working with the Government of India's Indian Council for Medical Research, Ministry of Health, and the Department of Biotechnology to help standardize snakebite treatment protocol, guarantee the adequate supply of antivenom and training rural clinicians. We are also lobbying to get snakebite added to the syllabus of MBBS physicians. We are assisting the government to set up a state-of-the-art Serpentarium that will house various venomous snakes from multiple regions of the country for the extraction of venom. This will contribute to the manufacturing of more effective antivenom.

Recently the Indian Council for Medical Research asked us to prepare a White Paper that illustrates the burden of snakebite and necessary measures to be taken against it, to be submitted to the Office of the Prime Minister.



Discussion with the expert committee

Films for Northeast India

The prevalence of snakebite in the Northeastern states of India is alarming. There are over 20 venomous snakes for which antivenom is not manufactured. In addition to this, there are very few hospitals that can treat snakebite. Therefore the treatment of snakebite in this region is very complex. To educate communities and put the spotlight on the plight of snakebite victims in the northeast, MCBT produced two films. One of these is to educate the communities on prevention and first-aid while showing the regional venomous snakes. The second aims to help government authorities and policy makers understand the burden of the problem.. These films will hopefully motivate people to work on snakebite mitigation. They will be dubbed in several northeastern languages like Assamese, Manipuri and Mizo, and pave the way for snakebite mitigation in this neglected region.

GHARIAL ECOLOGY PROJECT

The Gharial Ecology Project (GEP) is now in its 14th field season (2021), since its initiation in 2008, following the mass die-off of gharial (*Gavialis gangeticus*) in the winter of 2007-08. The GEP programs are facilitated by the State Forest Departments of Uttar Pradesh, Madhya Pradesh, and Rajasthan, as well as the Ministry of Environment, Forests, and Climate Change, Government of India.

Covid constraints: Over the crisis of Covid for 2020 and 2021, with Astral Foundation support, we were able to run our research and conservation activities without significant interruptions. The GEP field crew, consisting of Jailabdeen A., Pankaj K., Anand K., and "Guddhu" K., plus Ashutosh T. has been observing in-country lockdowns and precautions.



Comprehensive surveys: In 2021 January to March, in the upper Chambal, there were an estimated ~380 gharial and in the lower Chambal, ~1320 gharial were directly observed and tallied by the static survey. A total of 31 nesting locations were tallied in 2021.

Tagging and tracking: A total of 26 resident wild gharial were tagged with radio transmitters, including 7 with Iridium satellite transmitting tags that convey GPS location information. The majority of tagged gharial were females (19 of 26). Two younger, "big ghara" males as well as 5 sub-adult males were tagged.

Creche counts: In 2021, sharp declines in hatchling numbers were not obvious, and survivorship of hatchlings appears to be relatively high, in comparison with 2020.

Drones deployed: We have been employing DJI quadcopter drones to create 2D and 3D maps of riverine habitats, using geo-referenced JPEGs. Drone imagery facilitates species identification (mugger vs. gharial), quantification of numbers present, as well as accurate estimates of animal sizes.

Hatchling survival: Recently, the team outfitted 3-4 month old young with backpack radios in the post monsoon period, September-October. Survival of these young gharial has been about 60% after 3 months, and appears to be lower than the 90% levels of survivorship we have documented for 9-12 month old gharials. In contrast, the first 4-6 weeks for a hatchling appear to be particularly perilous, and our observations of crèche size indicate that at least half of the crèche disappears (presumably through predation) before the onset of monsoonal high water.

Gharial genetics: In collaboration with LaCONES, a novel 15 marker panel was developed which is more informative (0.43) than previous markers. With a new panel of markers, a genetic bottleneck event in the Chambal population is clearly evident. Furthermore, detailed parentage analyses are now possible and are currently underway, to understand the relationships among all participants in each creche.

Gharial communication: Jailabdeen A. has continued his PhD research studies of acoustic signaling among "big ghara" males. These signals consist of underwater "pops" in stereotypic patterns, primarily with "timing" variations, which are individually distinctive as well as context- dependent. Samples from wild gharial of various sizes, ages, and sexes have yielded complex mixtures of distinctive chemical compounds. Such secretions are presumably responsible for the noticeably strong, musky smell made by large male gharials during breeding.

Kuno connection: In December 2020, we tagged 11 head-starts, 6 for release in Kuno, and 5 for release at the Baroli sandbank on the main Chambal. At the end of March 2021, all 11 of these juveniles are actively being tracked, with most remaining near release sites. Also, in 2021, none of the recently tagged gharial from the mainstream Chambal ventured into the Kuno for nesting.

Films, videos, media: The GEP has an active Facebook page, with frequent posts about recent events and activities. Selected GEP films are now available in Hindi, and are being translated into other regional languages as well, such as Tamil. These are freely downloadable on the GEP YouTube channel. Animal Logic produced a 7 min video called "Boop the Snoot" including GEP behavioral footage; an edited version is on YouTube. A recent 3:30min short on Chambal gharial natural history appears on our FB and on the MCBT website, and is now available in English, Hindi, Nepali, Burmese, Sinhala, Bengali, Malayalam, Tamil, and Urdu, as well as Spanish, French, German, Czech, Norwegian, Dutch, and Chinese. This video summarizes the major findings from the GEP studies on the Chambal over the past decade and a half.

The GEP team worked collaboratively with the Gaia People, for the second season of *On the Brink*, an Indian TV series, coproduced by the Habitats Trust. The program is 26 minutes, and features Pankaj K. and Jailabdeen A. and was aired on Earth Day in April 2021, and distributed throughout the Pacific Region. The GEP has been very fortunate to work closely with a talented Indian film maker, Kalyan Varma and associates, and currently is teaming up with these cinematographers to make a series of documentaries, focusing on the resident gharial in the NCS.

Recent magazine articles that have featured stories about the GEP include a historical account of gharial conservation at the MCBT by one of its founders, Zai Whitaker (2020). In a three part series in the *Wall Street International* travel magazine, Gehan de Silva Wijeyeratne (2020) highlighted findings of the tracking studies using telemetry on gharial, as well as the Chambal River birds and related landscapes, and the challenges of conducting research in the National Chambal Sanctuary.

NEWS CLIPS 2021-2022

1. [https://www.thehindu.com/sci-tech/energy-and-environment/madras-croc-banks-new-director-pramila-rajn/article34716111.ece/June 3rd 2021](https://www.thehindu.com/sci-tech/energy-and-environment/madras-croc-banks-new-director-pramila-rajn/article34716111.ece/June%203rd%202021)
2. [https://www.thehindu.com/sci-tech/energy-and-environment/international-zoo-educators-association-and-pandemic-challenges/article35340977.ece/16th July 2021](https://www.thehindu.com/sci-tech/energy-and-environment/international-zoo-educators-association-and-pandemic-challenges/article35340977.ece/16th%20July%202021)
3. [https://chennai.citizenmatters.in/managing-wildlife-facilities-in-chennai-during-pandemic-31830/2nd August 2021](https://chennai.citizenmatters.in/managing-wildlife-facilities-in-chennai-during-pandemic-31830/2nd%20August%202021)
4. <https://science.thewire.in/culture/media/when-we-misunderstand-crocs-we-could-think-were-in-conflict-when-were-not/03.08.21>
5. [https://timesofindia.indiatimes.com/life-style/spotlight/visitors-back-at-crocodile-bank-snake-park-authorities-call-it-a-good-sign/articleshow/85660967.cms/August 27th, 2021](https://timesofindia.indiatimes.com/life-style/spotlight/visitors-back-at-crocodile-bank-snake-park-authorities-call-it-a-good-sign/articleshow/85660967.cms/August%2027th,%202021)
6. [https://www.thehindu.com/news/national/tamil-nadu/remembering-salim-ali-on-his-birth-anniversary/article37538148.ece/17th November.2021](https://www.thehindu.com/news/national/tamil-nadu/remembering-salim-ali-on-his-birth-anniversary/article37538148.ece/17th%20November.2021)
7. <https://www.newindianexpress.com/cities/chennai/2022/feb/08/1000-chennai-crocodiles-to-travel-to-reliance-zoo-in-gujarat-2416656.html>
8. [https://gujarati.news18.com/news/national-international/madras-crocodile-bank-to-send-1000-crocodiles-to-jamnagar-gujarat-jm-1178218.html/11th February/2022](https://gujarati.news18.com/news/national-international/madras-crocodile-bank-to-send-1000-crocodiles-to-jamnagar-gujarat-jm-1178218.html/11th%20February/2022)
9. [https://www.newindianexpress.com/cities/chennai/2022/feb/11/madras-crocodile-bank-to-get-facelift-after-sending-1k-surplus-crocs-to-gujarat-2418039.html/11th February 2022](https://www.newindianexpress.com/cities/chennai/2022/feb/11/madras-crocodile-bank-to-get-facelift-after-sending-1k-surplus-crocs-to-gujarat-2418039.html/11th%20February%202022)
10. 15/05/2021: Handling snakes responsibly (Deccan Herald).
<https://www.deccanherald.com/spectrum/handling-snakes-responsibly-986123.html>

SCIENTIFIC PAPERS 2021 – 2022

1. Nikhil Whitaker and Rom Whitaker, Record of Captive Gharial (*Gavialis gangeticus*) Preying on a Bird, Crocodile Specialist Group Newsletter Volume 40, No.2, April 2021 – June 2021.
2. Brinky Desai, Soham Mukherjee, Nikhil Whitaker and Ratna Ghosal, Anecdotal observations of 'double clutching' behaviour in captive Mugger crocodiles (*Crocodylus palustris*), Behaviour (2022) DOI:10.1163/1568539X-bja10153
3. Ananda Shikhara Bhat, Varun Aniruddha Sane, K S Seshadri and Anand Krishnan, Behavioural context shapes vocal sequences in two anuran species with different repertoire sizes, Animal Behaviour.
4. Pranay Bhatnagar, Dayalbagh Educational Institute, Deemed University, Agra, Uttar Pradesh 282005, India, HEBIUS BEDDOMEI (Beddome's Keelback), Herpetological Review 52 (1), 2021
5. Ruchika Lakshmanan, Ambika Yelahanka and Nikhil Whitaker, Management of Partial paresis in green Iguana (*Iguana Iguana*) – A Case Study, Indian Zoo Year Book Volume IX 2021
6. Nikhil Whitaker and Ambika Yelahanka, Onset Cephalic pigmentation in males in the Red Crowned Roof Turtle, Emydidae, Batagur Kachuga (GREY, 1887), Indian Zoo Year Book Volume – IX 2021
7. Ruchika Lakshmanan, Ambika Yelahanka and Nikhil Whitaker, Therapeutic Management of stomatitis and rostral abrasions in Reticulated Python (*Malayopython reticulatus*), Indian Zoo Year Book Volume – IX 2021
8. Yatin Kalki, Citizen science and online data: Opportunities and challenges for snake ecology and action against snakebite, Toxicon X 9-10 (2021) 100071
9. Rep-tales – in conversation with Zai Whitaker, Interview by Anooja A, Aswathi Asokan, Nanditha Ram Satagopan and Rohith Srinivasan, Nature Trail Volume 3. Issue 1
10. Yatin Kalki and Sachin Gowda, New Locality Records for the Indian Egg-eating Snake (*Elachistodon westermanni*) and the Stout Sand Snake (*Psammophis longifrons*) in Karnataka, India, Reptiles and Amphibians 28(1):65-67 April 2021
11. Allwin Jesudasan, Promoting co-existence between humans and venomous snakes through increasing the herpetological knowledge base, ScienceDirect 2021
12. Pranav C. Khandelwal and Tyson L. Hedrick, How biomechanics, path planning and sensing enable gliding flight in a natural environment, The Royal Society
13. Whitaker, N., & C. Sivaraman. 2022. Behavior in a captive family group of Siamese Crocodiles (*Crocodylus siamensis*) at the Madras Crocodile Bank Trust near Chennai, India. Reptiles & Amphibian 29(1), 71–75. <https://doi.org/10.17161/randa.v29i1.16247>.

14. Gour, R., N. Whitaker & A. Kartik (2022). Status and distribution of Mugger Crocodile *Crocodylus palustris* in the southern stretch of river Cauvery in Melagiris, India. *Journal of Threatened Taxa* 14(3): 20733–20739. <https://doi.org/10.11609/jot.7575.14.3.20733-20739>
15. Fowlea piscator (Checkered Keelback). Oophagy (NHN)- Checkered keelback feeding on the eggs of a Malabar Gliding Frog -Herpetological Review- Yatin Kalki
16. Dendrelaphis grandoculis (Large-eyed Bronzeback). Diet (NHN)- Large-eyed Bronzeback feeding on a Malabar Gliding Frog -Herpetological Review- Yatin Kalki & Ajay Giri
17. Dendrelaphis grandoculis (Large-eyed Bronzeback). Reproduction (NHN)- First report on clutch size for Large-eyed Bronzeback, obtained from a DOR female -Herpetological Review- Yatin Kalki, Piyush Dholariya, Robin Huizinga, & Ajay Giri
18. Monilesaurus rouxii (Roux's Forest Lizard). Diet (NHN)- Roux's Forest Lizard feeding on a Boxer Mantis -Herpetological Review- Yatin Kalki & Chi-Ting Hsu
19. Naja naja (Spectacled Cobra). Diet (NHN)- Spectacled cobra feeding on Indian Palm Squirrel pups and a Black Rat -Herpetological Review- Yatin Kalki
20. King cobra (*Ophiophagus Hannah*) feeding on Russell's viper. Diet. (NHN)Herpetological Review– Nagraj Belluru, Gurumurthy, Meghana Nagaraja and Ajay Giri.
21. Understanding the food habits of the green vine snake (*Ahaetulla nasuta*) in India: a crowdsourced approach - Herpetology Notes - Yatin Kalki
22. Biogeographical venom variation in the Indian spectacled cobra (*Naja naja*) underscores the pressing need for pan-India efficacious snakebite therapy. (R. R. Senji Laxme, Suyog Khochare, Hugo Francisco de Souza, Bharat Ahuja, Vivek Suranse, Romulus Whitaker, Gerard Martin, Nicholas Casewell, Kartik Sunagar. 2021, <https://doi.org/10.1371/journal.pntd.0009150>)
23. Biogeographic venom variation in Russell's viper (*Daboia russelii*) and the preclinical inefficacy of antivenom therapy in snakebite hotspots. (R. R. Senji Laxme, Suyog Khochare, Hugo Francisco de Souza, Bharat Ahuja, Vivek Suranse, Romulus Whitaker, Gerard Martin, Nicholas Casewell, Kartik Sunagar. 2021, <https://doi.org/10.1371/journal.pntd.0009247>)

INCOME AND EXPENDITURE STATEMENT 2021-2022

Income	
Ticket Sales	1,46,14,900
Research Grants	95,63,216
Donations & Rent	53,98,037
Environment Education	49,90,612
Adopt an Animal	13,02,950
Bank Interest	39,42,343
Croc Shop sales	9,02,765
Other income	3,08,470
ARRS	12,21,294
Total	4,22,44,587

Expenses	
Salary and Wages	1,57,92,013
Reptile Feed Costs	67,56,431
Maintenance and Upkeep	56,82,334
Research	1,18,17,768
Environmental Education Expenses	1,75,335
ARRS	22,13,502
Croc Shop Expenses	7,82,608
Administrative Expenses	10,86,331
Capital Assets	82,45,231
Total	5,25,51,553

VISITATION - 2021-2022

Sl.No	Month	Total no of visitors
1	April 2021	6,863
2	May 2021	Covid lockdown
3	June 2021	Covid lockdown
4	July 2021	Covid lockdown
5	August 2021	4,935
6	September 2021	20,471
7	October 2021	27,006
8	November 2021	12,910
9	December 2021	29,266
10	January 2022	17,675
11	February 2022	18,826
12	March 2022	22,721
	Total	1,60,673

DONOR LIST 2021-2022

Sl. No	Organisation	Project	Amount (Rs)
1	Infosys Foundation	ARRS staff salary and wages	10,00,000.00
2	USV Pvt Ltd	Providing food for reptiles	36,00,000.00
3	Coromandel International Ltd	Study on nutrient levels in reptiles	50,00,000.00
4	Ford Motors Pvt Ltd	Virtual zoo program	8,55,000.00
5	Kodaikanal International School	Donation for Covid Relief Fund	20,000.00
6	Rajeswari Kumar	Donation for Covid Relief Fund	25,000.00
7	TVS Motor Co Ltd	Donation for Covid Relief Fund	35,00,000.00
8	Krishnan Venugopal	Donation for Covid Relief Fund	25,000.00
9	A S E Angkammal	Donation for big 4 display	1,00,000.00
10	Astral Foundation	Gharial Ecological Project	10,00,000.00
11	King Cobra Conservancy	ARRS	3,59,020.00
12	Prague Zoo	Gharial Ecological Project	14,87,002.00
13	UK Online Giving Foundation	Snakebite Mitigation (Google) & Education program	4,83,218.00
14	Montgomery Zoo	ARRS	2,21,623.00
15	Elizabeth Dailey	General donation	1,71,178.00
16	Jennifer Miller	General donation	1,01,920.00
17	Jeffrey W Lang	Gharial Ecological Project	4,39,200.00

AFFILIATED INSTITUTIONS

(Committees/ Membership/ Collaboration/ Consultation/ Editorial/
Networking)International Union for the Conservation of Nature (IUCN)

1. Andaman & Nicobar Coastal Zone Management Authority
2. Andaman's Science Association, Port Blair
3. Andaman & Nicobar Islands 'Monitoring Committee for the Working Plan for the South Andaman Division'
4. Andaman & Nicobar Islands State Level Environmental Council, Port Blair
5. Andaman & Nicobar Islands State Wildlife Board, Port Blair
6. Ashoka Innovators for the Public, New Delhi
7. Auroville Index Seminum, Tamil Nadu
8. Central Zoo Authority of India, New Delhi
9. Centre for Cellular and Molecular Biology, Hyderabad
10. Centre for Environment Education, Ahmedabad
11. Chennai Snake ParkTrust
12. Chicago Herpetological Society, USA
13. Coral Reef Monitoring Network- South East Asia
14. Dakshin Foundation, Bangalore
15. Development Alternatives, New Delhi
16. Fauna and Flora International, UK
17. Irula Tribal Women's Welfare Society, Chennai
18. Irula Snake Catchers' Cooperative Society, Chennai
19. International Association of Zoo Educators, UK
20. Jersey Wildlife Preservation Trust, UK
21. Turtle Survival Alliance
22. IUCN/SSC Crocodile Specialist Group
23. IUCN/SSC Tortoise and FWT Specialist Group
24. IUCN/SSC Marine Turtle Specialist Group
25. IUCN/SSC Indian Subcontinent Reptile & Amphibian Group
26. IUCN/SSC Captive Breeding Specialist Group
27. IUCN/SSC Sustainable Use of Wild Species Group
28. Kalpavriksh, Pune

29. Madras Veterinary College, Chennai
30. Madurai Kamaraj University, Madurai
31. National Centre for Biological Sciences, Bangalore
32. Nilgiri Wildlife Association, Ootacamund
33. Pondicherry University, Pondicherry
34. Salim Ali Centre for Ornithology & Natural History, Coimbatore
35. Smithsonian Institution, USA
36. Marine Conservation Society, U K.
37. Society for the Andaman & Nicobar Ecology, Port Blair
38. Sri Lanka Dakshin Foundation, Bangalore, Karnataka
39. Survival International, UK
40. The Indian People's Tribunal on Environment & Human Rights, Mumbai
41. The Wildlife Trust of India, New Delhi
42. Trust for Environmental Education (TREE), Chennai
43. Zoo Outreach Organization, Coimbatore
44. UNEP/Conservation for Migratory Species of Wild Animals, Germany
45. World Congress of Herpetology
46. World Wide Fund for Nature (WWF) - India & International Wildlife Institute of India,
Dehradun
47. Bombay Natural History Society, Mumbai

PEOPLE INVOLVED WITH INDIAN SNAKEBITE INITIATIVE

1. Dr. David Williams (Global Snakebite Initiative)
2. Dr. Kartik Sunagar (IISc)
3. Gerard Martin (Liana Trust)
4. Dr. Jaideep Menon (AIMS, Kochi)
5. Dr. Joseph K Joseph (Little Flower Hospital, Angamaly)
6. Dr. Anand Zachariah (CMC, Vellore)
7. Dr. Harshjeet Singh Bal (CMC, Vellore)
8. Jose Louies (WTI/Indiansnakes.org)
9. Shaleen Attre (WTI/Indiansnakes.org)
10. Kedar Bhide (Natureworks)
11. Priyanka Kadam (she-india.org)
12. Soham Mukherjee (Naja.in)
13. Sumanth Madhav (HSI-India)
14. Jayasimha NG (HSI-India)
15. Ganesh Mehendale (OWLS)

TN – EDUCATION PARTNERS

1. ATREE-ACCC
2. Kenneth Anderson Nature Society (KANS)
3. CEE- Tamilnadu
4. Santhi Animal Welfare and Wildlife Conservation Trust (SAWWCT)
5. WWF-Western Ghats Landscape Program
6. CMC Vellore
7. Keystone Foundation
8. Wild Wings Trust