

MADRAS CROCODILE BANK TRUST/ CENTRE FOR HERPETOLOGY



ANNUAL REPORT 2019-2020



In memory of JAWS...



INTRODUCTION to MCBT's Annual Report, 2019-2020

This year will be remembered as the Year of the Corona. Even though the covid19 pandemic and the lockdown began in Chennai and the Croc Bank in mid March, the immediate changes and future implications have significantly marked this (financial) year. The Croc Bank has had its highs and lows, but none as startling. We closed visitation on March 16th, knowing that it may be many weeks... months...before we were able to open again. It would be a challenge to “keep the wolf from the door”- or rather, croc. Everyone got into action; trustees, staff, and well-wishers, reaching out to donors for help during this very difficult period. The immediate and supportive response was wonderful. We knew then, that we would be able to keep our animals well fed. The operative word is “well” because there are several details- and often the more expensive options- that cannot be neglected in order to provide a healthy diet. For instance, tortoises tend to become handicapped with metabolic bone disease unless the diet is appropriately varied.

Apart from the loss of income, the other challenge related to animal feed has been the logistical one of transport, sometimes through multiple districts and even states as per the availability of particular items required. This became easier once the Central Zoo Authority intervened, and zoos were added to the list of “essential services”, exempted from the restrictions imposed for the containment of the pandemic.

Under the guidelines issued by the Central Zoo Authority, a skeletal staff was asked to come to work for the daily duration of a few hours for husbandry and maintenance tasks, all from the village of Vadanemmeli across the road. Expected protocol related to Covid19 safety has been put up on signs and the Zoo Manager designated to monitor and ensure social distancing while work is going on. Masks are worn, and frequent hand washing enabled through several wash basins.

The office team has been focussing on fundraising to tide us through this difficult time when there are no visitors and ticket income. Online posts and appeals, engagement with the print and tv media, and reaching out to previous donors have been productive, and indicated yet again that the Croc Bank has a wide network of friends and supporters here and abroad. A very grateful thanks to everyone who helped, financially or otherwise.

This kind of support- from friends, family, and conservation-minded well-wishers, has existed from the beginning, when MCBT was started in 1976 by a group of idealistic conservationists including Rom Whitaker 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 44 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 crocodylians for genetic safekeeping, the Croc Bank is now (since 2003) no longer confined to crocodile conservation but includes all reptiles in its mandate and its title includes “Centre for Herpetology”. The release of captive bred mugger or marsh crocodiles into the wild, which was an original goal, has not happened since the 1980s because of shrinking wilderness areas and the lack of suitable habitats. There are therefore about 2000 crocodiles in residence. The mandate has also extended to crocodylians from other countries, in fact all the world’s species, ie 23. Of these, 15 are housed at the Croc Bank currently, one of the few places in the world where such a sizeable chunk of the total species can be seen. Of the species represented, 2 are listed as *Critically Endangered* by the IUCN, and 3 as *Threatened*.

MCBT’s 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 the zoo now breeds several threatened species including two that are listed as *Critically Endangered* by IUCN. Field work, namely surveys and ecological studies, are a large part of its activities; in fact, the 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 sea turtles and 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 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. 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 MCBT.

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 initial focus being the biology and conservation of the king cobra. The first king cobra telemetry project was started here and is now a decade old. Agumbe is one of the world's last safe 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 within its home range, 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 service in the country, because it deals with a threatened (and potentially dangerous) species of snake.

2000 kms to the north of MCBT on the mighty Chambal River, is Garhaita: the base of the Gharial Ecology Project, where Dr. Jeffrey Lang is consultant to 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 and rare 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 (e.g. 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 too extensive to include in this report in its entirety, but we are extremely grateful to all of them.

ADMINISTRATIVE DETAILS-MCBT

Trustees:

Ashish Gupta
Prof Satyajit Mayor, Director, NCBS
M.M. Venkatachalam

Samit Sawhny
Kamini Sundaram
Venu Srinivasan

Trustees Emeritus:

Rom (Romulus) Whitaker (Founder)
Zai (Zahida) Whitaker (Founder)

Personnel- April 2019 to March 2020

Office and Administration

Joint Directors	Zai Whitaker Allwin Jesudasan
Curator	Nikhil Whitaker
Assistant Curator/Snakebite Coordinator	Ajay Kartik
Zoo Manager	K Narasimmarajan (Until June 2019) T Senthil (from July 2019)
Education Officer	Anjana Srimathi (Until May 2019) Steffi John (From April 2019)
Zoo Educator	C.V. Arul (Until December 2019)
Veterinarian	Dr Arun Pari (Until September 2019) Ruchika Lakshman (From October 2019)
Communications Officer	Venetia Sharanya (Until August 2019)
Conservation Officer	Ganesh Muthiah
Asst Coordinator, Snakebite Mitigation	Gnaneshwar Ch
ARRS- Field Director	Ajay Giri

ARRS-Research Director
ARRS- Research Associate
ARRS- Base Manager
Gharial Ecology Project- PI
Gharial Ecology Project -Coordinator

Seshadri KS
Yatin Malik
S S Jayakumar
Dr J.W. Lang
Jailabdeen A

Accounts, Husbandry and Maintenance

M. Mohan	Accountant
M. Pavithra	Assistant Accountant
V. Gangadurai	Chief Reptile Keeper
S. Nagarathinam	Chief Reptile Keeper
D. Sampath	Snake Keeper (retired 7 th July 2019)
R. Thangaraj	Supervisor, Entrance and pen watchers
C. Dhanasekaran	Zoo Educator
L. Gunasekaran	Maintenance Supervisor
V. Mohanasundaram	Curatorial Assistant
T. Mohan	Office Assistant
C. Purushothuman	Senior Office Assistant
N. Selvamani	Ticket checker
R. Gnanamurthy	Ticket checker
M. Indradevi	Senior House Keeper
E. Amutha	Enclosure Maintenance and House Keeping
J. Shanthi	Chelonian Keeper
S. Parimala	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
BudibalSomai Magar	Security Guard
Krishna Bahadur Somai Magar	Security Guard
V. Yuvarani	Maintenance and Cook
A. Kumari	Maintenance and Cook
K. Elumalai	Maintenance Assistant

AT THE CROC BANK ZOO

CURATORIAL and VET CARE

New Vet

- Dr Ruchika Lakshmanan joined MCBT in October 2019 and has been working on the veterinary management of our animals along with the curatorial team. She is a great addition and has made great strides in understanding reptile medicine and works well with the team to ensure all our animals receive the necessary vet care and attention.

Animal Care, Procurement and Breeding

- We obtained 4 (2.2) monocled cobras (*Naja kaouthia*) and 4 (3.1) banded kraits (*Bungarus fasciatus*) in exchange for 5 yellow anaconda (*Eunectes notaeus*) juveniles in June 2019, the animals have all acclimated well to captivity here and have grown well .
- We donated 6 yellow anacondas (*Eunectes notaeus*) and 3 Nile crocodiles (*Crocodylus niloticus*) to Nandankanan Zoo, Odisha, in September 2019.
- Veiled Chameleons produced two clutches of eggs after they were procured in June 2019
- Two green anaconda babies have been reared successfully from the clutch produced in October 2019, they are now healthy and feeding on their own.
- We have had two successful reproductive seasons in terms of chelonian breeding over this period, having produced two clutches of the Critically Endangered red crowned roof turtles (*Batagur kachuga*) and one clutch of the northern river terrapin (*Batagur baska*) in 2019/20.
- We lost our star attraction Jaws 3 in January 2020 to pulmonary pneumonia, he was 50 years old and donated by the Central Leather Research Institute. Jaws has been replaced with Thor, another large salty (*Crocodylus porosus*) about 15 feet long, who is altogether less easy-going.



Figure 1 Northern river terrapins from the 2018/19 clutch

The Legacy of Jaws

(Contributed by Vaidheeswaran G., Intern)

Jaws arrived at The Madras Crocodile Bank Trust in 1976, as a juvenile. Little did we know that in the years to come, he would grow into the largest captive saltwater crocodile in India, bringing in crowds of children and adults alike, all eagerly lining up to catch a glimpse of him



during his weekly feeding show. With an era spanning nearly 5 decades, Jaws captured the hearts of every visitor, zookeeper, staff and volunteer who walked through Croc Bank.

It is for this very reason that his passing on January 13th 2020 marked a sad day for everyone who had visited him or taken care of him during his stay here. As a show of love and respect for our dearly departed friend, we at the Madras Crocodile Bank Trust embarked on a mission to preserve his legacy in the form of a leather mount.

When we realized that his final days may be approaching soon, we requested the Tamil Nadu Forest Department (TNFD) and the Central Leather Research Institute (CLRI) for their permission and expertise respectively, to help us in our endeavour to skin the 4.69m (15 feet 5 inches) long saltwater

crocodile and convert his hide into leather so that it might be used as an educational tool at the Croc Bank. This process involved many phases, each consisting of rather complicated processes.

From making constant visits to the offices of the Forest Department and CLRI to the hands-on work in the tanning pit, this massive undertaking took 74 days of hard work and most of all patience.

We extend our heartfelt gratitude to the Tamil Nadu Forest Department and to the Central Leather Research Institute for all their assistance and we believe that with this “tool”, Jaws can continue to excite, enthral and educate all our visitors at the Croc Bank for decades to come and we hope that it also serves an apt memorial for all those who would wish to look back and cherish their loving memories of Jaws, our gentle giant.

Vet Care

(Some of the vet interventions this year, to give an idea of the kinds of routine and other treatment that reptiles require)

Crocodiles:

- Jaws III (*Crocodylus porosus*) first refused feed on 28/04/2019. His health deteriorated progressively due to his inability to ingest food. Various types of feed were offered. To stimulate appetite, a sucrose solution was administered orally. We thus suspected an obstruction in the oral cavity. He was manually restrained on 10/12/19 to conduct an endoscopy and the results revealed petechial haemorrhages and ulceration in the oral cavity. Oral swabs collected during the endoscopy were positive for gram +ve bacteria. He was injected with Enrofloxacin injection @10mg/kg b.wt to treat the same. He passed away on 13/01/2020. A thorough necropsy was performed. Left and right lung lobes, liver, right kidney, right and left auricle, ventricle, small and large intestine and stomach lining were collected and preserved in 10% formalin for histopathology analysis. Histopathology findings revealed that the reptile had bilateral granulomatous pneumonia along with concurrent hepatitis. The findings were confirmed by three veterinarians, Dr. Sridhar (Pathologist), Dr. Nagarajan (Pathologist) and Dr. Cathy Shilton (Crocodile Specialist Group).



Figure 2: Necropsy of Jaws III

Snakes:

- The albino spectacled cobra (*Najana*) was successfully treated for skin lesions (which has been a recurring problem for the last few years, especially in the summer). The wounds were flushed with a dilute solution of Betadine and Mupirocin. The lesions were absent during the winter months. We are repeating the treatment again this summer (2020) by cleaning the debris and flushing the wound with a solution of betadine and then topical application of Mupirocin ointment.
- Routine collection of the feces of the snakes was done for parasitological examination. The parasitological diagnosis used was direct smear examination and then fecal examination by sedimentation technique. It was checked for the presence of the eggs and parasites, and according to the load deworming was prescribed to the reptiles. All snakes were administered Fenbendazole (deworming) on 01/09/19.
- The new arrivals (4 monocled cobras (*Naja kaouthia*) & 4 banded kraits (*Bungarus fasciatus*)) were administered with Fenbendazole and Flagyl for the purpose of deworming. The dose was calculated based on the body weight of the animal.
- Green Anacondas (born in 2019) were treated with topical application of Mupirocin ointment and Candid Powder for white-spotted lesions noticed on the face and mid-abdominal region. Suspected to be a fungal infection, the lesions were cured within a week.
- Ticks were observed on the albino spectacled cobra and she was successfully treated with Frontline (Fipronil) spray (tick repellent) and kept in isolation for a week. No ticks were observed after a week.
- The albino rat snake (*Ptyas mucosa*) developed an abscess near the throat region on the ventral side. The abscess was punctured with a needle to drain out the liquid, so as to understand the nature of liquid and for accurate diagnosis of the abscess. The fluid was collected and sent for antibiotic sensitivity and bacterial culture test which showed the presence of gram –ve bacteria *Klebsiella* sp. The reptile was treated topically with Betadine and Mupirocin ointment for 5 days. The abscess healed progressively in a short span of time.

Lizards:

- Fecal samples were collected for all lizards and analyzed. The animals were dewormed using Fenbendazole.
- Fecal samples collected from two bearded dragons (*Pogona* sp.) tested positive for *Isospora amphiboleri* (coccidial oocytes) during routine parasitological examination using sedimentation technique. It was treated with Sulphadimidine bolus PO q24 @0.6ml/kg b.wt for seven days.

- The sexes of the two Blue-tongued Skinks (*Tiliqua sp.*) were confirmed when one individual was observed laying a spermatoc plug on 26/12/19. The collected sample showed spermatoc motility under a direct microscope. Further, the fecal hormonal analysis confirmed the individual to be male (motile sperm present). An ultrasound was performed on the female to check for viable young. In February 2020, the female laid yellowish semi-solid soft masses which were found to be unfertilized ova.

Turtles & tortoises:

- Calcium supplements were prescribed to the Travancore (*Indotestudo travancorica*) hatchling (born April 2019) due to persistent soft-shell condition. Fungal growth was also observed on the shell and was treated with topical application of Candid powder.
- All Travancore Tortoises (*Indotestudo travancorica*) and Star Tortoises (*Geochelone elegans*) were restrained, weighed and dewormed using fenbendazole on 01/09/19 & 02/09/19.
- On display Star Tortoise (*Geochelone elegans*) female was treated for eye infection in April 2019 and July 2019. The eye was flushed with Ciplox-D and massaged until the inflammation had reduced.

CONSERVATION

Sea Turtles

Sea turtle conservation has been one of the ongoing programs of MCBT since its inception and we are engaged in the activities of providing care, expertise, education, management, and rehabilitation and community-based conservation of sea turtles. This year, MCBT is working in collaboration with the TREE Foundation (TREE), a charitable trust involved in conservation of sea turtles and marine mammals. MCBT carries out the sea turtle conservation program along the defined territories located in the stretch between the villages of Kovalam and Vadanamelli covering approximately a coast line of 9 km.

MCBT has offered the use of its veterinary infrastructure facilities to TREE for the rehabilitation of the rescued sea turtles which require care. A hatchery was installed at the beach front of MCBT to safeguard the turtle eggs. The MCBT representatives were working on identity cards issued by Forest Department for a period of 6 months of the turtle breeding season this year and routines include turtle walks, physical handling of the turtles, egg and hatchlings.

Noise Mitigation at MCBT

In recent times, the neighbourhood of MCBT is exposed to impermissible levels of noise beyond 80 decibel on daily basis. The resorts and hotels near MCBT, play heavy bass music and sound vibrations from hi-fidelity speakers. A study on the effects of anthropogenic noise

on crocodilians was initiated. The effects of noise on crocodilian species are severely understudied, but are important when considering protected area management and ex-situ breeding facilities for conservation of endangered species.

The impact of anthropogenic noise is an important issue, which needs to be actively studied and addressed. Due to the lack of data on crocodilian species, and the difficulty of isolating stressors in the wild, studying captive animals may be a feasible approach. This information could be used as a baseline for policy makers who can work to include zoos and conservation centres in “silent zones” or areas of restricted noise pollution. In natural environments, this information could influence approved levels of development and help to minimize the effects of habitat encroachment.

At MCBT, we are working towards evaluating and mitigating the effects of increasing anthropogenic noise since the untimely death of one of our critically endangered Cuban crocodiles (*C. rhombifer*) in 2019. We are working in collaboration with the Indian Institute of Technology, Madras, to collect data during periods of elevated anthropogenic noise and using CCTVs to monitor animal behaviour during these exposures. This information will help us better understand the dangers of noise related stress in crocodilians and can also serve as a reference for all zoos and conservation centres that are facing similar challenges.

Reptile Conservation Centres

MCBT is reaching out to state governments with an offer to help set up Reptile Conservation Centres, to further conservation and public awareness about biodiversity issues. One of our proposals was accepted by the state of Andhra Pradesh. The aim of the proposal was to promote the conservation of reptiles, restock the genetic repository of reptiles for safekeeping, introduce captive breeding and rewilding programs for the critically endangered and threatened species of reptiles, and educate people about the vital role reptiles play in the environment and the need to conserve them.

MCBT is working along with The Reptile Conservancy Alliance to set up a regional reptile conservation centre in the Cauvery Delta region of Tamil Nadu to promote the conservation of reptiles and their habitats through scientific research, education and also through the management of human- crocodile conflicts in the region.

ZOO MAINTENANCE AND DEVELOPMENT

Weekly meetings were held with pen watchers, to review how best to interact with visitors, enforce MCBT’s rules and expectations, and to extend information to be offered to interested visitors. The waste management, littering and garbage can models were reviewed and improved. Additional security cameras were installed as per the Central Zoo Authority’s requirements, and also to provide further comfort to visitors. Damaged safety (inner) walls were repaired, and additional mesh barriers put up. In February, work was begun to divide Pen 1 into 4 sections, in line with the plan of moving the Cuban crocodiles and slender snouted

crocodiles there. The work was completed before the lockdown began. Plans were also confirmed for creation of 8 sculptures to put up on the front wall, depicting animals in our collection: Komodo dragon, iguana, star tortoise, aldabra tortoise, anaconda, python, gharial, saltwater crocodile. Work on these panels has started and they will improve the look of the frontage area substantially.

EDUCATION

Education programs

The Education Department designs and implements awareness programs on-site and off-site. They are open to all ages, our aim is to trigger the curiosity and empathy of the participants. Three programs take place during the first weekend of every month on a rotational basis. These are :

- Reptile Encounter – 1 hr
- Know Your Reptile - 2 hrs
- The Zoo and Me - 3 hrs

The programs are a combination of a guided tour around the park, a show & tell with animals, enclosure visits, and venom extraction from the "Big Four" venomous snakes of India (at the Irula venom centre).

During public holidays seasonal programs are conducted.

- Zoo Snooze – 2-day camp
- What's that Reptile? – 2-day camp
- Snake Walk – early morning walk through habitats near the Croc Bank



Art activity



Reptile encounter

Below is a summary of the education programs this year:

April 2019 to February 2020	
No. of education programs	43
No. of program participants	1059

World Days were celebrated at the Croc Bank, where new activities were implemented. The days celebrated are below:

- World Wildlife Day – March 3rd
- World Turtle Day - May 23rd
- World Environment Day - June 5th
- World Croc Day - June 17th
- World Snake Day - July 16th
- Independence Day - August 15th
- Wildlife Week – October 2nd to 8th
- World Wetlands Day - February 2nd



Activities were also conducted on the theme of Air pollution themed activities off-campus and on-campus for **World Environment Day 2019**.



- Carbon footprint calculator
- Waste management game
- Air pollution documentaries
- Social media challenges
- PPT presentation on air pollution at Vadanemmel Government school

Park talks

Feeding talks and snake talks were organized and carried out regularly every weekend and on holidays. The timings were:

- Snake Talk - 11 am & 3:30 pm
- Crocodile demo feeding - 11:30 am, 12:30 pm, 04:00 pm and 5:00 pm

- Jaws feeding show - 4:30 pm (till November 2019)
- Green Iguana feeding - 12:00 pm
- Aldabra tortoise feeding - 02:00 pm

During feeding demos, educators and volunteers interacted with the visitors, thereby ensuring interest and engagement. This also allows visitors to engage with the staff to know more about our park.

Night safari

Night Safaris were conducted throughout the year from Tuesday to Sunday. This year (April 2019 to March 2020) 2045 individuals (adults and children) participated in the night tour, which is a unique experience. The feedback from our participants was extremely positive, and a few participants who took the night tour returned with a different group of friends.

Adoption program

Our adoption program brings awareness about reptile conservation, and helps maintain the zoo collection. The following animals were adopted this year (April 2019 to March 2020):

S.No:	Adoptee name	Animal Adopted	Number of individuals	Amount (INR)
1	Sindhu	Northern river terrapin	1	4,000
2	Yamini Baskar	Asian water monitor	1	15,000
3	Athiveerapalpandian M	Cuvier's dwarf caiman	1	4,000
4	Niranjan Manoharan	Siamese crocodile	1	12,000
5	Reha Salvi	Gangetic softshell turtle	1	7,000
6	Akshar Arbol (School)	Indian black pond turtle (babies)	2	6,000
7	Surajit Mahapatra	Gharial	1	12,000
8	TehnazBahadurji	Aldabra	1	20,000
9	Sriram Bingi	Indian star tortoise	1	2,500
10	HemalathaMopati	West African dwarf crocodile	1	7,500

S.No:	Adoptee name	Animal Adopted	Number of individuals	Amount (INR)
11	NikithaNethaji	Aldabra	1	20,000
12	Vamsi Akuraju	Northern river terrapin & Start tortoise	3	10,500
13	R. Aravind Lakshman	Spectacle caiman	1	5,000
14	LakshanaViravalli	Dwarf caiman baby	1	4,000
15	Rajeev Ramesh	Dwarf caiman baby & Gangetic softshell	2	11,000
16	Pratap KS	Gharial	1	12,000
17	Samanvithavallabh	Red-crowned roof turtle	2	8,000
18	Anand Kumar Agarwal	Indian roofed turtle	1	3000
19	Sonia & Nikita	Indian black pond turtle (babies)	2	6000
20	Dhaanshiri	Spectacle caiman	1	5000
21	ChettinadSarvalokaa Education	Star tortoise	3	7500
22	Mehotra family	Star tortoise	1	2500
23	Dr Raj Kumar Jayapal	Jaws/Thor & 5 Northern river terrapins	6	60000
24	Deepika S	Dwarf caiman baby	1	2000
25	Mr Neerav Yadav	Star tortoise	1	2500
26	Aadhya Parthiban	Red-crowned roof turtle	1	4000
27	Geetesh Patil	Dwarf caiman baby	1	4000
28	Sheetal Mary	Star tortoise	1	2500
29	Yamini Bhaskar	Pen 13 Gharial female	1	25000
30	GN Arunachaleswaran&	Indian black pond turtle	2	6000

S.No:	Adoptee name	Animal Adopted	Number of individuals	Amount (INR)
	GN Shiva Skanda	(babies)		
31	Om Mandava and Mahesh Mandava	Indian roofed turtle	2	12000
32	Aditya Ravikumar	Green anaconda	1	15000
33	Divya Vijay Pratheek	Red-crowned roof turtle	2	8000
34	Reha Salvi (Anirudh Acharya)	Gangetic softshell & Indian black pond turtle (baby)	2	10000

Volunteer program

The program is open to those who have the commitment and enthusiasm to contribute proactively and adapt to the daily rigours of a zoo. Volunteers will have an opportunity to work in different components of the zoo such as research, education and zoo maintenance. The program has received wide attention and appreciation, and past volunteers have spoken and written of it as enriching, inspiring and immensely valuable. Moreover, many of them have gone on to impressive wildlife careers.

S.No:	Name	Batch
1	Sachin Bharadwaj Lock	March
2	Abhishek Ghosh	March
3	Kabeer Nadkarni	April
4	Raghuram RP	April
5	Nikhil Ganapathy	April
6	Vaidheeswarran G	April

S.No:	Name	Batch
11	Sanjana Rebecca	July
12	Ananya Mehra Vineet	July
13	Aditi Sharma	August
14	LaurynnD'souza	September
15	Sakshi Patnakar	September
16	SiddarthNaivurni	October

7	Rajwa Mecca	May
8	Priyanka Adhikari	May
9	Srinija Venkat	May
10	Lavanya Manohar palanimalai	July

17	Ismail	October
18	Anurag Jaglan	December
19	Ananya Natarajan	December
20	manoharchugani	March

AIF Clinton Fellowship

MCBT was a host organization for the 2019-2020 William J. Clinton Fellowship for Service in India. As a mentor, Steffi John attended the Host Organization conference in early September to establish a positive working relationship and project plan for the rest of the year.

Ms Naomi Tsai is the Fellow, and officially began her Fellowship in early September and was supposed to be here until mid-June. However, given the pandemic related lockdown, she left for home in March and has been working on materials through an online platform. Her contribution included:

- Education materials
- Content work for camps
- Designing banners and brochures
- Social media
- Articles and photographs for the print media

Below is a brief report from Naomi:

In September 2019, I joined the Madras Crocodile Bank Trust and Centre for Herpetology as an American India Foundation Clinton Fellow. The William J. Clinton Fellowship for Service in India is an immersive, 10-month volunteer service program matching young professionals with development organizations across India. Fellows undertake projects in the fields of education, livelihoods, and public health. Each Fellow is paired with a project supervisor at the host organization for support throughout the project. Steffi John, Education Officer, is my project supervisor at MCBT. My fellowship project includes scientific and informational writing, videography, networking with other organizations, developing educational content, and managing social media sites. Due to COVID-19, I was forced to leave MCBT three months early.

Two newspaper articles were written with translation to Tamil done by Ganesh Muthiah, Conservation Officer. The first article was on noise pollution and sound effects (which was published in a number of sources) and the second article was on firecrackers (publishing in process). An informational letter regarding noise and reptiles was written to the local villages and translated to Tamil by Ganesh Muthiah. A literature review on crocodilian noise stress was collaboratively written with Vaidheeswaran Ganapathy, Research Intern, which will hopefully be published soon.

Five short videos were filmed and edited: an Aldabra tortoise feeding video, a Komodo dragon training video, a video on rectilinear snake movement in the Indian rock python, an educational program spotlight video, and a compilation of testimonials on the snake rescuer training program. The transfer of Thor to Jaws' former enclosure (January 2020) was also recorded and made into a medium length video.

In October 2019, I represented MCBT at the Student Conference for Conservation Science (SCCS) in Bangalore along with Peter Christopher, Assistant Coordinator- Snakebite Mitigation, and Laurynn D'Souza, Volunteer. In January 2020, I organized a visit to Crocodile Bank for 40 students and teachers from TYCIA Foundation's APV school in Uttarakhand (which included current and former AIF Fellows). In February 2020, I organized and attended a snakebite education workshop at the Kattaikkuttu Sangam, Kanchipuram for students, teachers, staff, and local residents (in collaboration with the Snakebite Mitigation team and a current AIF Fellow). I organized five visits from AIF Clinton Fellows of various organizations to MCBT. I published 5 blog posts for AIF on their AIF Fellowship blog, with one being cross-published on WION News.

I assisted with countless large programs, ongoing education initiatives, and visiting groups at MCBT. I co-created a hands-on pH/water quality educational activity with Steffi John. I created educational promotional materials including posters (3), banners (7), brochures (1), and program posts (8). I also created educational worksheets (3) and helped to decorate the whiteboard displays on-site.

Increased Instagram followers from 4,876 to 5,624, increased Facebook likes from 12,122 to 12,893, increased Facebook followers from 12,333 to 13,249, and increased Twitter followers from 813 to 889. I maintained a constant presence on Facebook, Instagram, and Twitter through original posts, stories, messages, replies, sharing, likes, and retweets. I organized and created an inventory of all species' "best photos" on the MCBT hard drive. I organized and ran a special Valentine's Day campaign which was very successful. I wrote an updated, comprehensive social media plan for all current MCBT platforms. I introduced the utilization of Hootsuite to create a more consistent posting schedule and to streamline the posting/approval process.

Rajwa Mecca- Volunteer (May-June 2019)

Another wonderful volunteer this year was Rajwa Mecca, and below is a blog she contributed about her time at the Croc Bank.

Crocodiles in My Neighbor's Backyard.

The pungent smell of dead fish hit me like a steamroller as I approached the feed shed on the first day of my volunteer-ship. I stood quietly in the back, watching the commotion of fishermen and akkas dump bag after bag of fish into a rectangular concrete pit. I soon found myself holding an empty bucket, staring wide-eyed at an enormous 850-kilogram mound of fish. An Akka gestured for me to grab a stick and sit by the edge. Earlier, I had been told that I was going to “sort through fish”; at that moment I still hadn't fully understood what that meant. I sat down and looked toward the lonesome shovel in the corner, wondering why that wasn't the obvious equipment of choice. It didn't take long before an experienced volunteer said, “Watch out for the spines on their back” and dived his bare hand in!



The aim was to first hand pick two buckets-full of ‘kutti ones’ for the smaller animals and then shovel up the rest for the big guys. Not as easy as it sounds. The akkas then lifted the enormous buckets of fish, effortlessly placing them on their heads, cushioned only by a small rag and emptied them off the edge of the enclosures for the eagerly waiting crocodiles. All of which was accompanied by the constant exchange of playful banter. As I assisted the strong women with their work, I couldn't help but smile to myself at the thought that my first true introduction to the realm of reptiles had a surprisingly large amount to do with “meen” (fish in Tamil.)

To say I wasn't overwhelmed at the start would be a lie. However, things changed quickly. It became apparent that the contagious atmosphere at the Croc Bank was more than positive thus encouraging me to take on the work with passion and excitement. “If you don't love your job, you can't do it well”, Painsi Anna told us once as we cleaned the tubs of mugger enclosures. This couldn't be a truer embodiment of the essence felt upon at MCBT. As we progressed through our volunteer-ship, we got to experience the care that was put into handling animals from a curator's point of view. This included egg collection, as well as assisting in snake and lizard feeding. We were left with a myriad of invaluable experiences and skills with a certain level of professionalism that is probably very hard to acquire anywhere else in the region.



Despite how appealing sorting through heaps of fish and scrubbing enclosure walls may sound, my favorite activity was our assigned projects. I was assigned to carry out a behavior study on 22 Travancore Tortoises.

Spending nearly 3 hours a day with the tortoises, I grew rather fond of my reptilian companions. For, the longer I spent with them, the more I noticed that they each had somewhat of a personality of their own. Of course, my favorite character was the largest male, whom I had cheekily nicked-named Casanova. I would watch him as he took on his role as the dominant male with the utmost seriousness, rushing across the pen (as

fast as his stubby legs would allow) to save his damsels from the smaller males with a powerful head ram. However, if it had been a long day of rushing around, head ramming or partaking in female endeavors of his own; a simple bite to the leg accompanied by a mean glare would suffice.

Occasionally one of them would acknowledge my existence. If I was deemed interesting, they would perch themselves at the feeding station across from me and watch me watching them. Every once in a while, they would inch closer to peer over the low wall of the enclosure and give me a quizzical look. When nothing interesting was returned (as it never was), they would saunter back to the feeding station to partake in more exciting activities such as chomping spinach or socializing with more responsive members of the group.



I had lived a 10-minute drive from the MBCT nearly my entire life and not once had I entertained the idea of the how much work it took to keep these ancient creatures looking as comfortable as they do. Astonished and slightly ashamed, I realized how much I had underestimated the importance of the husbandry and the staff that carried it out. The staff that worked here have a way with the animals that showed me how much they truly

cared for them. They were assertive yet respectful; the way you would treat a child. Working at Croc Bank has been an incredible stepping-stone into the field of conservation and zoology. Here I sit, writing this with mosquito-ridden legs and slightly sore arms yet undoubtedly satisfied with my unforgettable experience.

Docent Program

List of current docents:

Rajkumar Adhikesavan
Suraksha Chandrasekhar
Arvind Mahadevan
Samyukta Sanjay
Stan Renoldo
Vinookanth
Praveen HN
Kaushik Shelat

Saravana A
Thirukumaran
Dikshitha Mani
Monica Suresh
Vishal Ahuja
Manasi Vignesh
Raj Kumar

Professional Development

Staff are encouraged to attend workshops, seminars, courses that will upgrade their skills and perspectives, as well as share our work with the world zoo and conservation community.

Education Officer Steffi John attended and participated in the 7th Asian Zoo Educators Conference: AZEC 2019, in Chiang Mai, Thailand.

Allwin Jesudasan presented MCBT's work on Snakebite at the 9th World Congress of Herpetology that took place from 5 – 10 January 2020 in Dunedin, New Zealand. He also visited Venom Supplies in Australia to understand the administrative aspects of running a venom production center. Allwin also took part in a two day workshop on Finance for Non-Finance Training Program conducted by Grant Thornton in Bangalore, and the 2nd Meeting with stakeholders on Antisera for Human Use at IPC, Ghaziabad. He has been appointed a Member in the IUCN Species Survival Commission's Crocodile Specialist Group.

Ajay Kartik and MCBT vet Dr Ruchika Lakshmanan visited Nandankanan Zoological Park, Bhubaneswar in January to assist them in some veterinary and husbandry issues with the yellow anacondas received from MCBT.

Snake Conservation and Snakebite Mitigation



The Madras Crocodile Bank/Centre for Herpetology's Snakebite Mitigation and Snake Conservation project has had significant success over the past three years. The generous support from USV Pvt Ltd, Infosys Foundation, Oracle, Google, Battle of Buffet and Srinivasan Services Trust has enabled us in working on this multi-layered issue, and some of our key milestones are summarized below:

Outreach & Capacity Building

We have been partnering with various NGOs and herpetologists to conduct extensive education, outreach and capacity building programs across 7 of the snakebite-prone states of India - Andhra Pradesh, Bihar, Jharkhand, Madhya Pradesh, Maharashtra, Odisha and Tamil Nadu.

These programs have been conducted for stakeholders like school students, farmers, health workers, Forest Department staff. We have reached more than 12,50,000 people so far through our workshops, which are supplemented with simple and concise educational materials, including posters, handouts and short films. These materials have been translated into multiple regional languages. In addition to these, we conduct snakebite awareness talks on weekends at MCBT. These talks take place at 11:00 am and 03:30 pm on Saturdays & Sundays.

As a part of the Battle of Buffet grant, we have conducted a series of educational programs at government schools of Kanchipuram district. Under this project, we have also conducted teacher and doctor workshops for exchange of ideas.

We have also collaborated with 'Aviratha', an NGO based out of Karnataka, in designing back covers for notebooks that were distributed to students of rural communities. This back cover has preventive measures and first-aid on snakebite. 2,00,000 notebooks were donated to 30,000 students.

In October, we partnered with the Srinivasan Services Trust to implement a 6 month pilot project. This project aimed to reduce snakebite deaths in Thirukarrangudi, Tirunelveli district. Community education initiatives like education programs at schools and community gatherings, capacity building for frontline staff and street plays were conducted and educational materials installed.

In addition to this, we initiated a socio-economic study to ascertain acceptability levels of key protective equipment: rechargeable torchlights, gumboots and mosquito nets, among rural communities in Thirukarrangudi. So far, the study had shown good results and in a few cases, the participants claimed that the equipment has prevented snakebite.

<i>Educational programs conducted –</i>	310
<i>Capacity building programs conducted –</i>	55
<i>Protective equipment distributed –</i>	150 kits
<i>Educational posters installed –</i>	500+
<i>Snakebite street plays conducted -</i>	10
<i>Notebooks distributed –</i>	2,00,000 (30,000 children)

Venom Collection & Research

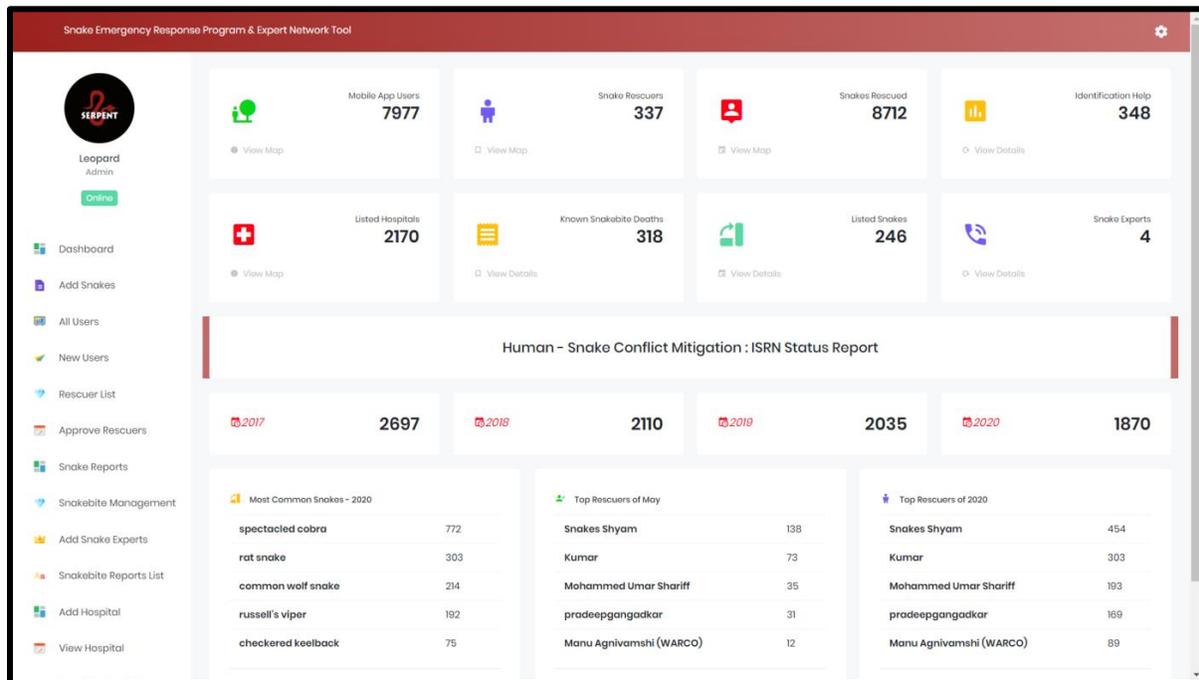
Through this component, in collaboration with Gerry Martin, we are collecting venom samples nationwide for studies on whether snake venoms differ regionally in the same species of snakes. Samples are also being tested for efficacy of antivenom against the venom of different snakes from across India. This data will be useful in the process of improving the quality and modernizing the production of venom for better and more effective antivenom. We visited Rajasthan and Andamans for venom collection and the samples collected have been transferred to our collaborator Dr Kartik Sunagar’s Evolutionary Venomics laboratory, Indian Institute of Science, Bangalore where analysis of samples is underway. One manuscript has been recently published (please see “Beyond the Big Four” at | <https://doi.org/10.1371/journal.pntd.0007899>) and a few more scientific publications are in preparation.

Technological Interventions

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

In addition to this, we have developed ‘SERPENT’, a mobile app for multiple aspects of snakebite, such as rescuer information, snake identification and hospital searches, and educational films made by our team. This app was released in December and so far has about 8000 users. It is unique and the first of its kind in India. The app has also shown measurable results of snake rescues. An online guide to Indian snakes and contacts of snakebite experts are the key specialties. Below is a summary of the data.

Overview of 'Hospital Locator' data



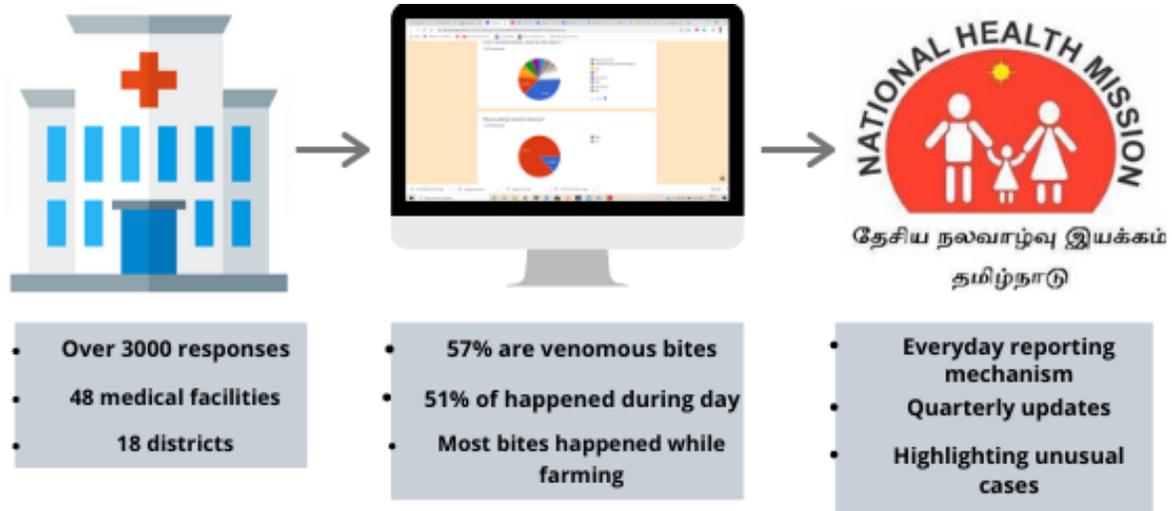
An update on app's performance on 20/05/2020

Interfacing With Government

We have partnered with the National Health Mission Tamil Nadu State for the collection of epidemiological data and established a snakebite registry for the state, a project that we hope will be replicated nationwide. The snakebite registry now has over 3000 entries from various government medical facilities across Tamil Nadu. The multiple parameters of information sourced is further used for data-driven mitigation measures. Also, we are training doctors in the identification of snakes, and their ecology.

We are assisting the Commissionerate of Industries and Commerce to improve the infrastructure of the Irula Snake Catchers' Industrial Cooperative Society so that it meets the standard operating guidelines issued by the World Health Organisation. This will contribute to the manufacturing of better antivenom and facilitate extensive research.

Recently we have been asked by the Indian Council for Medical Research to participate in the creation of a White Paper that illustrates the burden of snakebite and necessary measures to be taken to mitigate it, to be submitted to the Office of the Prime Minister. It is expected that the White Paper will be submitted during the month of July 2020.



Progress of the snakebite registry

Important Conferences & Meetings Attended

- Romulus Whitaker delivered a talk 'Snakebite in India' at the International Herpetological Symposium, United Kingdom and on king cobra conservation at the Venomous Herpetology Symposium, Florida
- Ganeswar Ch presented on the Snake Conservation and Snakebite Mitigation project at the Victorian Herpetological Society's quarterly meeting, Melbourne
- Ajay Kartik presented on 'Snakebite Scenario in India' at the 'High-Level Meeting & Workshop on Snakebite' in Kathmandu, Nepal
- AllwinJesudasan presented on 'Snakebite in India' at the 9th World Congress of Herpetology, New Zealand
- Romulus Whitaker and Ganeswar Ch participated in the National Snakebite Task Force Meeting, New Delhi
- Ajay Kartik presented about the Snake Conservation and Snakebite Mitigation project at the National Symposium on Challenges in Snakebite Management, Karnataka
- Ajay Kartik was a panellist at the 1st Field Epidemiology Training Programs India Conference (FETP-ICON) 2020, Tamil Nadu
- Mr Ganeswar Ch was a panellist at the International Conference on Sustainability Education, New Delhi
- Ajay Kartik visited the Andaman Islands and Rajasthan for venom collection
- A snakebite experts meeting was hosted at the Croc Bank

Press And Media Coverage

The team gave ensured press coverage in order to spread information about snakebite. We participated in television interviews, radio interviews and internet podcasts in addition to newspaper and magazine articles.

Links to articles are listed below

1. Hello FM radio interview
>https://drive.google.com/folderview?id=16s37MJLv5VE0V0n12jWKXdRInzo_CVUy
2. TV interviews
><https://www.youtube.com/watch?v=61oWHV--Ypc&feature=youtu.be> ,
><https://www.youtube.com/watch?v=BzgKkd8HPuA>
3. Online articles
><https://india.mongabay.com/2018/02/shortage-and-decreasing-efficacy-of-asvs-india-faces-a-snakebite-treatment-double-whammy/>
><https://medium.com/google-earth/by-collecting-data-on-snakebites-and-mapping-treatment-locations-india-hopes-to-reduce-snakebite-f33cd783079e>
><https://www.dtnext.in/Astro/TopNews/2018/09/14010052/1088365/Study-under-way-to-track-snake-biteprevalent-areas.vpf>
><https://scroll.in/article/870584/india-faces-double-the-sting-of-snakebites-as-anti-snake-venom-supply-runs-short-efficacy-drops>
4. Magazines publications
>https://rstmh.org/sites/default/files/files/RSTMH%20%E2%80%93%20Snakebite%20Report%202019%20v2_1.pdf
><https://drive.google.com/file/d/0BwfF9FrZccTMmptajdsNXJTdzB5VmJfdmxXQVlrS19ZQndr/view?usp=sharing>



Newspaper and magazine articles

Going forward:

We are in the process of evaluating our activities and measuring the impact; this will be published as peer-reviewed papers with a focus on epidemiology and socio-economic constructs surrounding snakebite. We are aiming to cover more districts and states and partner with more NGOs. We are in constant touch with the Tamil Nadu government in conducting more education & capacity building programs and collecting data systematically for the upcoming academic year. We have made strong progress in interfacing with the government and through our recent efforts, the Prime Minister Office is likely to broadcast “Mann Ki Baat” on the burden of snakebite.

Gallery



Education program at a school



Snakebite experts meeting at MCBT



Training workshop for Forest Department



Farmer using gumboots

IN THE FIELD

Agumbe Rainforest Research Station (ARRS)

Human-Snake Conflict:

Below are the numbers of rescues/resolutions of human-snake conflicts this year.

King cobra: 140

Spectacled cobra: 114

Python: 7

Russell's viper: 2

Rat snake: 2

Awareness programs

Over 30 awareness programs were conducted through the year. Additionally, there were interactions with daily visitors at the base, and onsite awareness programs during every rescue call. This continues to make the local community more and more comfortable about having kind cobras and other snakes as neighbours.



29/02/2020. One of the several visits to ARRS and KCEC field sites by Forest Department recruits...



....including from 30 from Lakshdweep



16/03/2020. King Cobra Conservancy President NaiaHaast and Vice President Joe Wasilewski and Ms Karyn Wheatley (River Banks Zoo-USA) visited ARRS and KCEC field sites.

King Cobra telemetry :

The below extract from the telemetry log, will provide an idea of the work being done, and its results.

April 2019 was quite an eventful month for the King Cobra Ecology and Conservation project. The king cobra breeding season was in full swing and M5, the male king cobra which we had been tracking since 2018, was on the scent trail of a female. After having two separate fights with other males over the previous few weeks, on April 3rd he combatted a light-colored male at the base of a large tree in a forest patch near Kaimara. M5 retreated after this fight and rested in some leaf litter a short distance away, while the other male climbed the large tree and entered a hole at a height of 12 feet. After a day's rest, on April 4th, M5 approached the other male in the tree and they began fighting once again. The combat began on the tree, but both snakes fell to the ground and continued fighting there (Fig. 1). After this , M5 left the forest

patch and began moving back towards Kalmane. We never saw any female king cobra in the area, but we assume there was one in the tree along with the light-colored male.

On April 10th, another male king cobra, M6, was implanted with a radio transmitter and released in Konapura. A Discovery Channel film crew was there to document the surgery, release, and tracking of M6. For the first few weeks, tracking M6 was challenging as this king cobra was not as accustomed to our presence as was M5. Initially, we tracked M6 from a distance, without being able to see him, as he would sometimes move away if we got too close. Over time, he became comfortable with our presence and was less nervous.

In the first week of May 2019, we witnessed M6's first hunt: a medium-sized spectacled cobra in the village of Nantur. On May 3rd, M6 scared a spectacled cobra out of a network of burrows under a banyan tree that was across the road from a small areca plantation with an adjoining cowshed and house. The next day, M6 crossed the road and inspected the plantation and cowshed until he finally settled down under some debris inside the cow shed that night. Its owner was uncomfortable with M6 spending the night there, but we managed to convince her it would be okay. The next morning, M6 came out of the cowshed and basked for a few minutes before he stuck his head into a burrow along the edge of the cowshed and dragged out a spectacled cobra by its head (**Fig. 2**). We witnessed M6 feed on it. The owner was grateful to M6 for having removed a venomous snake from the property!

On May 6th, M5 captured a large spectacled cobra by its head in a banana plantation and consumed it (**Fig. 3**). That both our tracked kings, M6 and M5 fed on spectacled cobras on consecutive days is interesting.

As the monsoon season began, M6 moved towards Bidargodu, and M5 towards Heggodu. On June 4th, M6 circled a large haystack outside a house a few times before going underneath it. M6 remained under that haystack for 20 days and we only got to know that he had consumed a rat snake underneath it from the scales in his faeces. On June 25th, he came out from under the haystack, basked, sloughed his skin, and then proceeded to capture and consume another large rat snake in the paddy field a few hundred meters away. Meanwhile, M5 had also eaten a rat snake and shed his skin on June 12th.

July 2019 brought heavy rain and significant flooding. M6 was forced to change his resting spot due to the raised water level and crossed a river twice until he found higher ground. On July 17th, M6 climbed up a tree just a few meters away from his resting spot and knocked down a large female Malabar pit viper. He grabbed it by the head and swallowed it (**Fig. 4**), after which he resumed foraging after a rest of just three days. On July 31st, M6 caught and ate a medium-sized rat snake near Begar.

After this meal, M6 rested in a burrow in a paddy field next to the Begar river. On August 8th, the river overflowed into the paddy field, flooding M6's burrow. M6 crossed the river back into Bidargodu and resumed resting on a hill near where he had caught the rat snake on June 25th.

Meanwhile, M5 fed on a rat snake in a flooded paddy field on August 21st and a Malabar pit viper on August 27th.

September 2019 was uneventful as both snakes spent the majority of their time resting. On October 15th, we added another king cobra to the project: F3, a female that we implanted with a transmitter and released in Anandur. Like M6, F3 was initially skittish and difficult to track, but she soon became comfortable with our presence. Interestingly, F3's home range seems to be nested within M6's territory, so they have come in close proximity to one another on several occasions between December 2019 and March 2020.

*On December 21st, F3 caught a large rat snake in Ballehalli at around 1600 and only finished swallowing it at 2356 (**Fig. 5**). M6 caught a medium-sized rat snake in the middle of Malali village and consumed it in front of 20-30 onlookers on January 1st, 2020. On January 24th, M6 shed his skin and caught a large spectacled cobra inside a burrow on the 27th (**Fig. 6**). M6 pulled the snake out of the burrow and swallowed it over the course of 1.5 hours. On January 15th, F3 ate a rat snake of unknown length inside a network of burrows in Belluru.*

*In February 2020, M6 and F3 spent a lot of time foraging in the very same paddy field in Talurangdi. That particular field had a number of rat snakes which we observed mating on two occasions and in male combat once. On February 9th, M6 attacked two mating rat snakes but he ended up missing both of them as they escaped in different directions. On February 19th, F3 ate a rat snake at that same spot (**Fig. 7**). On the 21st, M6 and F3 were in two burrows just 20 meters apart along the same trench. M6 was still on the hunt for prey while F3 was resting after her meal. That afternoon, M6 came out and began moving towards F3's burrow but crossed paths with a medium-sized rat snake halfway in between. M6 swallowed it hastily and returned to the same burrow. A few days later, M6 came out of his burrow and moved within 3 feet of F3 before going into a forest patch. F3 was still inside her burrow.*

In March 2020, M6 caught another rat snake but did not follow F3's scent trail. F3 moved into a rock pile near the center of Talurangdi and another male king cobra approached her three times over the course of two weeks, but they did not mate. As far we know, neither M5 nor M6 got into any male combats in March 2020.



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



Figure 7

Gharial Ecology Project

In 2019, the Gharial Ecology Project (GEP), updated from the earlier Gharial Conservation Alliance (GCA), continued monitoring the gharial resident in the National Chambal Sanctuary (NCS) and surrounding areas. In addition, the GEP has acted in an advisory capacity for various other gharial-related research and conservation activities in south Asia, most notably in Nepal. Three EDGE Fellows, working through the Zoological Society of London (ZSL) are currently doing research on gharial, including two in Nepal, and one in India. Jailabdeen A. is Project Coordinator for the GEP, and now based in Garhaita, on the lower Chambal. Pankaj Kumar, our main tracker and field researcher works closely with Jai, and several apprentice trackers year-round. Adjusted for accuracy in size categories, counts tallied 80 mature males with a ghara, plus 59 "near-mature" males, 525 reproductive and "near-reproductive" females, 435 subadults, 295 juveniles and 151 yearlings. In 2019, we tallied 469 nests overall in the NCS, with 185 in the upper stretch and 284 nests in the lower Chambal. Of these, at least 297 nests hatched, and 172 were lost.

GEP continues to gain the attention of the wider conservation community within India, as well as worldwide. The project activities were filmed in April and again in June, as part of an upcoming episode for the Indian TV series ON THE BRINK, sponsored by the Habitats Trust of India. The international zoo community supports many of the project activities, with the

Wildlife Conservation Society, Montgomery Zoo (Alabama, USA), and Los Angeles County Zoo, as well as the continued support of the Prague Zoo/City of Prague. CrocFest support has also been crucial, in addition to Eddy Even, Berlin Zoo, Butterfly World, and other donors.

Jailabdeen has been able to continue his PhD research on gharial acoustic communication, with a third year of breeding season observations and recordings, as well as detailed studies during the post-hatching crèche associations of young and adults. The explosive "popping" sounds (produced by big-ghara, male gharial only, are unique to this species, and are used in a variety of stereotyped patterns, distinctive to each individual male, and the particular social context related to these. Popping frequency increases during breeding, varies from year to year, and provides a good predictor of nesting and hatching to follow. In addition, popping may be used to effectively identify and monitor the number of large resident males. Unlike other crocodylians, popping produces "temporal", rather than frequency based acoustic signals, but how these are actually produced remains enigmatic.

In addition to using a variety of methodologies, mostly with remote imaging and monitoring, using game cameras and increasingly small, portable action cameras set up at strategic basking and nesting sites, we have been using quadcopter drones to complement our annual surveys of gharials at basking sites early in the season, as well as nesting and guarding activities just prior to the annual monsoon high water. Drones are allowing us to access areas, particularly in the upper river stretches that are difficult to reach by boat, or on foot, and also are useful in doing nest counts and monitoring the fate of hatchlings in crèches.

The GEP continues to catch and tag gharial of various sizes, and in recent years has concentrated on smaller gharial, including small juveniles and subadults, in an effort to understand how attached these wild residents are to particular "home" areas, presumably near where they hatched. In 2019, comparison telemetry studies were conducted of wild resident juveniles, and "head-started" captive raised juveniles released at 2-4 years of age and 1-2m total length in size. These studies are revealing that there is substantial predation on the "released" gharial by subadult and adult mugger crocodiles. In addition, the "head-starts" tend to be less residential and wander widely, especially soon after release. This approach is the first real attempt to use science-based evidence to examine the utility of the captive rearing programs which have been the "hallmark" of gharial conservation in India, but to date, has not been a particularly effective and successful strategy globally.

In late 2019, additional wild resident gharial were captured and tagged in both the downstream (N=14) and upstream (N=10) stretches of the NCS. In particular, three satellite linked radios equipped with GPS locators were attached to three adult gharial, two in the upstream (a big-ghara male, 4.8m total length; a female, 3.5m total length) and one in the downstream (a female; 3.3m total length). The sat tags communicate via satellite to an internet data site where the gharial's locations can be visualized. All three individuals are still providing valuable data as of June 2020, including the nesting and post-hatching activities of the two females that laid eggs. The sat tagged male is guarding a large crèche from a colonial nest site near where he was

tagged. The upstream female moved into a tributary river of the Chambal, now designated as a wildlife sanctuary, the Kuno Wildlife Park, where she nested, and five other nests, with attendant females were discovered to use this area also.

As a valuable member of the GEP team, Dr. Ashutosh Tripathi has provided continuity and leadership in conducting the varied outreach and educational programs. In 2019, he conducted one capacity building program, a teacher training session, visited and produced 13 village school programs, conducted 14 community programs in riverside villages, and hosted three international wildlife days. The Program Coordinator also worked with other Educational Officers, as well as community education professionals from other NGOs, to develop additional games and activities. Follow-ups in rural village schools, with half day visits to multiple classes, were an important component in the Teacher Training Program, to ensure that the various environmental themes and messages were reaching the students. In addition, attractive and informative handouts were produced, and distributed.

In addition to the community and capacity building work, GEP anticipates developing an interactive website which will function as a resource center for gharial conservation within India, as well as globally. Jailabdeen's EDGE project will focus on website development, and also making a well designed internet platform, complete with short videos and presentations that promote gharial conservation.

During 2019, Dr. Jeff Lang, Senior Advisor to the GEP, traveled to Europe in late September where he visited the Prague Zoo, a major source of GEP funding, the ZSL Offices in London where he met with staff of the EDGE Program, the Chester Zoo hosted by Iri Gill, Senior Curator, and on to the European Crocodylian Network Meeting in early October in Kilkenny, Ireland. He presented the KeyNote talk there on the GEP recent activities. In mid November, Dr. Lang traveled to Shanghai and the Yangtze Valley where he was able to meet with the two major research groups in China studying the Chinese Alligator, and presented a major talk on gharial and the GEP studies at each venue..



Jailabdeen A., Project Coordinator, Gharial Ecology Project (GEP), readies a DJI Mavic quadcopter drone used to survey up and down the river channels and sandbanks at the upstream Nadigoan ferry crossing site, where the capture team concluded the 2019 catch-tag operation. Drones are being used to explore and map the river course, establish missions to document population numbers and compositions of gharial and mugger aggregations up and down Chambal



Jailabdeen A. and Gaurav Vashishtha pose with their handiwork, a successfully attached satellite radio transmitter, built by Advanced Telemetry Systems, Isanti Minnesota USA. The usual procedure, start to finish, once a gharial was captured and restrained, to measure, take samples, attach radio(s), and weigh, then release took 1-2 hours per animal. Animals caught early in the day were often held until later in the day, before release, in an effort to maximize radio tagging larger animals, preferably mature adults. Each gharial was scute clipped for permanent identification, and samples retained for DNA analyses for regional and individual markers



Close-up of ghara on male gharial, captured at Baroliat the upstream site, known to be a traditional breeding and nesting site, and used for decades by the MPFD to provide wild eggs that were removed from natural nests within NCS for captive rearing at Deori. This male showed very little sign of scarring or wounding in the head region, especially on the snout. Behavioral observations, albeit brief in early Dec, suggest that this young male may be a contender for breeding but is not yet a fully dominant breeder. In previous years, a number of prolonged challenges, sometimes in 2-3 breeding seasons in succession, were witnessed amongst large males contesting for dominance at an established breeding site.



View of a small building which is being constructed for use of the GEP, as an upstream project base. For decades, the Forest

Department (MP) has used this village as an informal base for gharial-related conservation activities, such as wild egg collection for captive-rearing at Deori, and as a rendezvous point for conducting upstream surveys in the National Chambal Sanctuary (NCS). Land owners prevent sand mining on this stretch of river, but are under constant pressure from the surrounding river communities to engage in this illegal activity. In this village, 7 brothers own all the land



View of the Baroli sandbank, in early Dec 2019, used by a large group of adult and subadult gharial for daytime basking. The large, dark male (in foreground), with a large ghara clearly visible, was captured at this site, and tagged with an Iridium satellite radio transmitter, for remote tracking.



More than 130 students assembled at yard at Jaunani UPS, a riverside village along the lower Chambal in Etawah District, UP. This program was a follow-up to the Teacher Training workshop held in late May (Figs. 5-8). It included a session on the gharials living in the Chambal, and current threats to their survival, as well as a class on snakebites. Similar follow-ups were done in the primary schools in other riverside villages (see Figs 2, 4, &11)



Primary school students (100+) parade thru Jarhali Village on International Vulture Awareness Day on 7 September. Dr. Ashutosh Tripathi (center, left) leads the entourage after holding class visits focused on the importance protecting wildlife. The chanted slogans included "If you want to live, let them live," and "they are natural scavengers and help clean up our ecosystem."



A Teacher training Workshop was jointly held with the support of the Uttar Pradesh Forest Dept, the Gharial Ecology Project (GEP), and the District Primary Education Dept. at a FD Rest House, on the Chambal River, in Sashon Village on 22May.



In Amdapur village, the evening program was attended in late November on a chilly evening by a large, young audience watching videos and a presentation on Chambal river ecology, focusing on gharials and turtles. 80+ were in attendance.

Articles and Papers

News Clips 2019-2020

1. Feeling rattled – The Hindu – July 14, 2019
2. Vipers of Karnataka – Seshadri KS - Focus – July 15, 2019
3. On the crocodile beat – The Hindu – March 19, 2019
4. High Life: Gliding Frogs of the Western Ghats – Dr Seshadri KS
5. A Life among animals – The Hindu Metroplus – August 7, 2019
6. Friends of Snakes – The Hindu Metroplus – September 4, 2019
7. Croc of Ages – The Hindu Metroplus – January 22, 2020
8. Muthalaipuraanam – Dinakaran (Tamil) – November 24, 2019
9. Sutralilkatrom - Mangaiyarmalai (Tamil) – June 15, 2019
10. Clash of the Titans_ when the King Cobra Meets a Rock Python – Roundglass–May 2020
11. Fighting the Indian snakebite epidemic – Gnaneswar Ch – iherp – Dec 2019
12. Bats: The fall from Grace – Dr Seshadri KS – Nature in focus – April 2020

Scientific Papers 2019-2020

1. E. Bardi*, E. Lubian, N. Whitaker, S. Romussi. 2018. Preliminary study on hematological values of two endangered turtle species: *Indotestudo travancorica* and *Batagurkachuga*. Proceeding of Veterinary and Animal Science Days 2018, 6th- 8th June, Milan, Italy.
2. Khanelwal PC, Hedrick TL, How Biomechanics, path planning and sensing enable gliding flight in a natural environment- 2020.
3. Augustine, L. B.C. Moore, V. Waller, S.D. Bailey, A. Kartik and K. Guyton II. 2018. Copulatory Directional Asymmetry and Implications for Crocodylian Reproduction. 164-171. In: Crocodiles. Proceedings of the 25th Working Meeting of the IUCN-SSC Crocodile Specialist Group. IUCN: Gland, Switzerland.
4. Litschka-Koen T, Pons J, Tiglao PJ et al. Case reports of tropical snakebite victims illustrate the vital humanitarian role and challenges of community action groups: RSTMH Special Report on Snakebite. London: RSTMH, 2019 (Ajay Kartik co-author)
5. Kartik, A.- Note on aberrant morphology in *Bungarus caeruleus*. Herpetological Review
51(1), 2020 pp 138
6. Yatin Kalki, Fowlea piscator (Checkered Keelback). Oophagy (NHN) - Checkered keelback feeding on the eggs of a Malabar Gliding Frog. Herpetological Review 51(1), 2020
7. Yatin Kalki & Ajay Giri, *Dendrelaphis grandoculis* (Large-eyed Bronzeback). Diet (NHN) - Large-eyed Bronzeback feeding on a Malabar Gliding Fro. Herpetological Review 51 (1), 2020.

8. Yatin Kalki, Piyush Dholariya, Robin Huizinga, & Ajay Giri, *Dendrelaphis grandoculis* (Large-eyed Bronzeback). Reproduction (NHN) - First report on clutch size for Large-eyed Bronzeback, obtained from a DOR female. *Herpetological Review* 51(1), 2020
9. Yatin Kalki & Chi-Ting Hsu, *Monilesaurus rouxii* (Roux's Forest Lizard). Diet (NHN) - Roux's Forest Lizard feeding on a Boxer Mantis. *Herpetological Review* 51(1), 2020
10. Yatin Kalki, Najanaja (Spectacled Cobra). Diet (NHN) - Spectacled cobra feeding on Indian Palm Squirrel pups and a Black Rat. *Herpetological Review* 51(1), 2020
11. Yatin Kalki, Shubham Adhi and Chaitanya Shukla, *Bungarus caeruleus* (Common Indian Krait) – Absence of mid-dorsal hexagonal scales in an aberrant common Indian krait – presence of mid-dorsal hexagonal scales from midbody to tail in an aberrant Common Indian Krait. *Herpetological Review* 50(2), 2019.

DONOR LIST 2019-2020

1	FOUNDATION FOR ECOLOGICAL SECURITY	CONSERVATION SPACES & PRACTICES	3,00,000.00
2	CHARITIES AID FOUNDATION INDIA	ENRICHING THE CROCODILE BANK EDUCATION PROGRAM	19,23,648.00
3	REPTILE GARDEN	KING COBRA ECOLOGY CONSERVATION	1,75,286.00
4	MONTGOMERY ZOOLOGICAL SOCIETY	KING COBRA ECOLOGY CONSERVATION	69,914.00
5	GEMEIN SCHAFT DER FUERDERER	KING COBRA ECOLOGY CONSERVATION	78,660.00
6	ZOOLOGICAL SOCIETY OF LONDON	GHARIAL ECOLOGY PROJECT	4,65,963.00
7	PRAGUE ZOO	GHARIAL ECOLOGY PROJECT	10,39,229.00
8	VICTORIAN HERPETOLOGICAL SOCIETY	GENERAL DONATION	53,258.61
9	COROMANDAL INTERNATIONAL LIMITED	REPTILIAN CONSERVATION	39,50,000.00
10	INFOSYS FOUNDATION	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	10,00,000.00
11	BENEVITY	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	3,60,574.28
12	UNITED WAY OF CHENNAI	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	68,800.00
13	THE UK ONLINE GIVING FOUNDATION	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	89,481.43
14	CHENNAI MISSION	SNAKE CONSERVATION AND SNAKEBITE	

		MITIGATION	2,50,000.00
15	NASS COM FOUNDATION	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	8,749.93
16	SRINIVASAN SERVICES TRUST	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	3,60,000.00
17	INTERNATIONAL HERPELOGICAL SOCIETY	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	2,09,258.23
18	MODDELEZ.INC	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	5,000.00
19	KREA UNIVERSITY	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	10,000.00
20	TVS MOTOR COMPANY LIMITED	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	25,00,000.00
21	USV PRIVATE LIMITED	SNAKE CONSERVATION AND SNAKEBITE MITIGATION	10,00,000.00
22	CENTRAL ZOO AUTHORITY	ZOO KEEPERS WORKSHOP	2,20,000.00
23	WILDLIFE FOUNDATION	MARSH CROCODILE MONITOR MOVEMENT	60,000.00
24	DANAMOJO ONLINE PVT LTD	GENERAL DONATION	3,52,067.59

INCOME AND EXPENDITURE STATEMENT 2019-2020

Income

Particulars	INR
Ticket Sales	2,15,49,270.00
Research Grants	1,48,56,409.79
Donations & Rent	13,95,749.35
Environment Education	13,84,340.00
Adopt an Animal	3,20,000.00
Bank Interest	22,01,320.00
Croc Shop sales	10,46,600.00
ARRS	19,46,216.97
ANET	4,50,03,653.00
Total	8,97,03,559.11

Expenditure

Sl.no	Particulars	INR
1	Salary and Wages	1,43,08,686.00
2	Reptile Feed Costs	48,14,483.00
3	Maintenance and Upkeep	34,42,956.00
4	Pen Maintenance and Upkeep	41,02,225.00
5	Research	99,69,642.12
6	Environmental Education Expenses	2,80,123.00
7	ANET	11,30,519.35
8	ARRS	24,02,647.43
9	Croc Shop Expenses	2,65,634.00
10	Administrative Expenses	22,46,367.18
	Total	4,29,63,283.08

Visitation to Madras Crocodile Bank 2019-2020

Sl.No	Month	Total no of visitors
1	April-2019	29754
2	May-2019	47124
3	June-2019	27258
4	July-2019	22767
5	August-2019	31319
6	September-2019	26555
7	October-2019	34976
8	November-2019	30084
9	December-2019	50188
10	January-2020	52370
11	February-2020	34440
12	March-2020	14686
	Total	401521

AFFILIATED INSTITUTIONS

(Committees/ Membership/ Collaboration/ Consultation/ Editorial/ Networking)

International Union for the Conservation of Nature (IUCN)

IUCN/SSC Crocodile Specialist Group

IUCN/SSC Tortoise and FWT Specialist Group

IUCN/SSC Marine Turtle Specialist Group

IUCN/SSC Indian Subcontinent Reptile & Amphibian

Group IUCN/SSC Captive Breeding Specialist Group

IUCN/SSC Sustainable Use of Wild Species Group

National Centre for Biological Sciences, Bangalore

Centre for Cellular and Molecular Biology,

Hyderabad World Congress of Herpetology

World Wide Fund for Nature (WWF) - India & International

Wildlife Institute of India, Dehradun

Bombay Natural History Society, Mumbai

Centre for Environment Education,

Ahmedabad Chicago Herpetological Society,

USA

Fauna and Flora International, UK

Development Alternatives, New

Delhi Chennai Snake Park Trust

Irula Tribal Women's Welfare Society, Chennai

Irula Snake Catchers' Cooperative Society,

Chennai International Association of Zoo
Educators, UK Jersey Wildlife Preservation Trust,
UK
Turtle Survival Alliance
Niligiri Wildlife Association, Ootacamand
Central Zoo Authority of India, New Delhi
Salim Ali Centre for Ornithology & Natural History, Coimbatore
Madras Veterinary College, Chennai
Madurai Kamaraj University,
Madurai Pondicherry University,
Pondicherry
Andaman & Nicobar Islands State Wildlife Board, Port Blair
Andaman & Nicobar Islands State Level Environmental Council, Port Blair.
Andaman & Nicobar Islands 'Monitoring Committee for the Working Plan for the South
Andaman Division'.
Andaman & Nicobar Coastal Zone Management
Authority. Andaman's Science Association, Port Blair
Society for the Andaman & Nicobar Ecology, Port Blair
Auroville Index Seminum, Tamil Nadu
Ashoka Innovators for the Public, New
Delhi Kalpavriksh, Pune
Coral Reef Monitoring Network- South East Asia, Sri Lanka
Dakshin Foundation, Bangalore Karnataka
Survival International, UK
Trust for Environmental Education (TREE), Chennai
Zoo Outreach Organisation, Coimbatore
The Indian people's Tribunal on Environment & Human Rights, Mumbai
The Wildlife Trust of India, New Delhi
Smithsonian Institution, USA
Marine Conservation Society, U K.
UNEP/Conservation for Migratory Species of Wild Animals, Germany

People Involved with Indian Snakebite Initiative

1. Dr. David Williams (Global Snakebite Initiative/University of Melbourne)
2. Dr.KartikSunagar (IISc)
3. Gerard Martin (TGMP)
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. ShaleenAttre (WTI/Indiansnakes.org)
10. KedarBhide (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