



Madras Crocodile Bank Trust/
Centre for Herpetology

MASTER PLAN



Operator - Madras Crocodile Bank Trust
Duration - 10 Years
Year of Submission - December 2013

**MADRAS CROCODILE BANK TRUST /
CENTRE FOR HERPETOLOGY**

MASTER PLAN

Operator: Madras Crocodile Bank Trust / Centre for Herpetology

Duration: 10 years

Year of Submission: December 2013

INTRODUCTORY NOTE

This Master Plan has been structured in Parts and Chapters, following the Checklist for Master Plan Submission provided as a guide by the Central Zoo Authority (Ministry of Environment and Forests). All matters in the said checklist have been addressed to the extent applicable and all necessary Annexures are provided at the end in Part IV as required.

Additional information by way of Appendices, not specifically sought by the CZA, but provided by the Madras Crocodile Bank Trust as a means of providing a better understanding of the activities and the future plans of the zoo, is provided at the end of the Master Plan, after the Annexures.

The soft copy of the Master Plan is submitted in the folder " Madras Crocodile Bank MP for CZA ". The main file containing the Master Plan is in MS Word. Annexures and Appendices are included in Part IV – Annexures to the Master Plan and for the most part, these appear within the Word file itself. However, documents such as the Proposed Layout which are not in Word format are submitted separately (in jpg format or similar) and links are provided within the Word file to the target file so as to make for seamless readability. All the Word and other files are included in the above mentioned folder.

A listing of references to research / scientific publications quoted in the body of the Master Plan is also attached.

LIST OF CONTENTS

INTRODUCTORY NOTE	1
ACKNOWLEDGEMENT	5
PREFACE.....	6
FOREWORD	7
PART- I.....	8
CHAPTER I - INTRODUCTION.....	8
a. History of the Zoo	8
b. Vision of the Zoo	8
c. Mission of the Zoo.....	8
d. Strategy of the Zoo	9
e. Objectives.....	9
f. Physical Features	9
g. Geology	10
h. Rock and Soil.....	10
i. Flora and Fauna in Zoo Premises.....	11
j. Climate	11
k. Rainfall.....	11
l. Seasons	12
m. Approach	12
n. Demography of the surrounding area	12
o. Legal status of the Land	13
p. Sources of pollution, if any	13
q. Difficulties and Achievements	13
CHAPTER II - APPRAISAL OF PRESENT ARRANGEMENT & CONSTRAINTS	14
a. Animal Section, veterinary section, store and feed etc.	14
b. Animal Collection Plan (existing)	19
c. General Zoo Administration Section.....	19
d. Research	22
e. Conservation breeding.....	22
f. Education and Awareness.....	24

g. Any other activities peculiar/unique to the zoo	26
PART II.....	27
CHAPTER III - FUTURE OBJECTIVES INCLUDING VISION, MISSION STATEMENT / THEME AND STRATEGY.....	27
CHAPTER IV- FUTURE ACTION PLAN	33
i) Proposed/Recommended animal collection plan	33
ii) Layout map (approved).....	33
iii) Proposal to address the inadequacies and shortcomings identified in appraisal report	33
iv) Peculiar problems of the zoo	34
CHAPTER V- PERSONNEL PLANNING.....	36
CHAPTER VI - DISASTER MANAGEMENT	37
CHAPTER VII - CONTINGENCY PLAN	38
1) Animal rescued from wild.....	38
2) Escape of animals from enclosures	38
3) Monkey and dog menace	39
4) Arrangement of food in case of strike/non-supply by contractor	39
5) Snakebite.....	39
6) Visitors getting injured/visitors falling inside enclosure.....	40
8) Epidemics.....	41
9) Breakdown of power supply	42
10) Free ranging/feral animal menace	43
CHAPTER VIII-CAPACITY BUILDING	44
CHAPTER IX - E-GOVERNANCE.....	47
CHAPTER X - BUDGET.....	48
a. Broad budget analysis for implementing the plan.....	48
c. Day to day maintenance.....	50
PART III.....	51
CHAPTER XI- MANAGEMENT PLAN (BUDGET)	51
PART - IV	52
Annexures	52
Appendices	71
REFERENCES CITED IN THE MASTER PLAN	97

ACKNOWLEDGEMENT

Many people and institutions have helped in the development of this document, through advice, information and other help relating to the development and continual improvement of the Crocodile Bank. The following people were specifically involved in the preparation of the maps and text related to the Master Plan, including this document.

Zhayyn James

Bill Ziegler

Samir Whitaker

Ritika Kapur

Colin Stevenson

Present Trustees and Staff, Madras Crocodile Bank

The survey and list of the flora of the Madras Crocodile Bank campus was compiled by K.M. Kopperundevi and P. Nehru, Centre for Floristic Research, Department of Botany, Madras Christian College, Chennai - 6000 059

PREFACE

The Central Zoo Authority's stipulation of a Master Plan has provided the opportunity for the Madras Crocodile Bank to evaluate, assess and re-visit the organization's facilities and programs, and make informed choices and decisions. Started in 1976, this year- 2013- is the Madras Crocodile Bank's 37th year. This is a substantial passage of time, enough to be able to see the effects and implications of decisions taken in the beginning and in the ensuing years.

In discussions, surveys and other planning processes connecting with developing the Masterplan, several resources have played a part. Apart from the specific institutions and people mentioned in the acknowledgements, we are visited- and used as a resource- by a wide range of zoo staff from all over the world. Over the years they have brought in valuable and current ideas about a variety of zoo improvement issues, including feeding strategies, signage, transporting techniques and veterinary interventions.

It also became obvious, over this planning process, how unique the Crocodile Bank is. Yes, it is a zoo, but with a much stronger conservation base than most others, both in India and abroad. Apart from having started and developed three field stations- one in the Andamans, one in the king cobra habitat of Agumbe, Karnataka, and one on the banks of the Chambal River, there have been literally hundreds of conservation interventions for endangered reptile species and their habitats. Much of this work has been done in partnership with other organizations such as the Bombay Natural History Society, WWF, India and the National Centre for Biological Sciences (with whom we have a Memorandum of Understanding), and/or government agencies and departments.

Thus, the needs and directions of the Crocodile Bank are more varied and diverse than that of other zoos. For example, research facilities, equipment storage, observation and holding pens and an updated library are essential. This has made the process of developing the Masterplan, both intensive and challenging. The network of Madras Crocodile Bank's conservation and education activities make it a much more enriching experience for the visitor. And of course, the impact on the visitor is deeper and more meaningful.

Zai Whitaker

Trustee

Madras Crocodile Bank Trust / Centre for Herpetology

FOREWORD

जयराम रमेश
JAIRAM RAMESH



ग्रामीण विकास मंत्री
भारत सरकार
कृषि भवन, नई दिल्ली-110114
MINISTER OF RURAL DEVELOPMENT
GOVERNMENT OF INDIA
KRISHI BHAVAN, NEW DELHI-110 114

Foreword

It was with considerable pleasure that I visited the Madras Crocodile Bank in December, 2010 and saw for myself the magnificent work they are doing for reptile conservation in India, and in particular the critically endangered gharial.

The Central Zoo Authority has recently approved the Crocodile Bank's new Masterplan and it appears that this 37 year old institution has become one of the world's premier reptile conservation facilities. I wish them all success with their ambitious plans which I am confident they will fulfill.

Yours faithfully

Jairam Ramesh
(Jairam Ramesh)

1/9/13

PART- I

CHAPTER I – INTRODUCTION

a. History of the Zoo

The Madras Crocodile Bank is a non-profit charitable Trust, and has been involved in reptile conservation since its inception in 1976. The Madras Crocodile Bank is located 45 kilometers due south of Chennai, and 14 kilometers north of the famous temple town of Mamallapuram along the East Coast Road. Its total acreage is 7.33 acres. Its location on the East Coast Road near the tourist town of Mamallapuram, and the high water table in this location, are the two main factors that contributed to the initial choice of this site.

The Madras Crocodile Bank was started by a group of people with a common vision, with very limited funding. Initially one enclosure was constructed, and a small ticket fee charged to augment the funds. World Wildlife Fund, IUCN and other conservation agencies contributed, as did individual donors.

The zoo serves as a primary regional resource for wildlife conservation through programs that encourage the protection of animals and their ecosystems, promote the advancement of conservation science and provide enjoyable conservation education for our visitors. Its Centre for Herpetology is recognized globally for its conservation efforts both *in situ* (in the wild) and *ex situ* (at home), providing funding and staff support to dozens of projects over the years. One of the greatest accomplishments of the Madras Crocodile Bank is to wake up the public, and especially millions of children, to the wonder of the world of reptiles.

b. Vision of the Zoo

To develop and run a world-class reptile zoo.

c. Mission of the Zoo

To promote the conservation of reptiles and amphibians and their habitats through education, scientific research and captive breeding. Efforts are focused on, but are not limited to, Indian species and ecosystems and include both in-situ and ex-situ components.

d. Strategy of the Zoo

The Madras Crocodile Bank runs on income generated from ticket sales and small grants from organizations for specific projects. However payments for the day to day running and maintenance, and staff salaries is carried out from the visitor income.

e. Objectives

The Trust Deed of the Madras Crocodile Bank lists the following objectives:

- Conservation of nature and natural resources, reptiles and amphibians in particular
- Study of crocodilians and all reptiles, create public awareness of their role in nature
- Public education and awareness building about reptiles at the Madras Crocodile Bank
- Breeding endangered reptiles for conservation
- Assist the GOI to implement the Wildlife Protection Act of 1972
- Conduct reptile surveys and carry out follow-up actions

f. Physical Features

Topography :

1. A central road rises from 1 to 2.5 meters at the apex of the zoo (the East Coast Road)
2. Bodies of water holding crocodiles have individual perimeter wall; hence sloped banks, specific to the species, for purposes such as basking, egg laying, and maintaining a healthy social hierarchy.
3. There are no mountains, valleys, or landfills on the premises.
4. A detailed map of the physical layout of the zoo is given in the Appendix 1 .

Physical Features :

1. Substratum: Naturally fine grained sand, with modifications made for easier visitor movement (embedded rocks/random rubble packed underneath the sand), and in enclosures, such as a layer of red-soil/loam packed with leaf litter, for terrestrial chelonians.

2. Outcrops: A large sand mound adjacent to the gharial enclosure provides pressure for a 500 liter syntax tank, servicing the animal food processing area, part of the vegetable/fruit garden, and 4 crocodile enclosures.

3. Physical features within enclosures: Shy, forest dwelling crocodiles, like the West African Dwarf Crocodile, have inbuilt "caves" for them to retreat to. Others are logs (for basking on/hiding under), rocks, combination/stand alone physical/visual barriers. Combinations of dense over storey, mulch, and water (via sprinkler) create damp, cool conditions, suitable for taxa from cooler habitats.

4. Land Use: Apart from the enclosures, the Zoo layout includes mosaics of garden patches which provide vegetables and fruit, (largely for the lizard and turtle/tortoise collection), a service road, rain water storage tanks, filtration systems, and a "nature path", with endemic scrubland flora. Firewood is collected regularly (dry branches) and disposed with permanent/casual laborers. There are no other agrarian activities/grazing permitted within the compound.

g. Geology

The Madras Crocodile Bank Trust, is situated on the southeast coast of India, along the coast of the Bay of Bengal. With an average elevation of 6m above sea level, the geology of Chennai mostly consists of clay, shale and sandstone. The coastal zone where Madras Crocodile Bank is situated, is sandy, with quick percolation of water runoff. The coastlines of India, especially in the southeast, consist of Cenozoic era rock types, similar to that of the alluvium deposits found in the Indo-Gangetic plains during the same era.

h. Rock and Soil

Chennai city has been classified into three regions based on geology: sandy areas, clayey areas and hard-rock areas. Madras Crocodile Bank falls under the sandy area, though clayey soil is found around all the natural ponds in the adjoining village of Vadanamelli. Rocky areas are found further inland. The sandy soil found at Madras Crocodile Bank allows water in our natural ponds to filter and penetrate easily. Over the years croc compost has naturally mixed with the soil, making it rich in nutrients. The sand also acts as a good conductor of heat

1. Substratum: Naturally fine grained sand, with modifications made for easier visitor movement (embedded rocks/random rubble packed underneath the sand), and in enclosures, such as a layer of red-soil/loam packed with leaf litter, for terrestrial chelonians.

2. Outcrops: A large sand mound adjacent to the gharial enclosure provides pressure for a 500 liter syntax tank, servicing the animal food processing area, part of the vegetable/fruit garden, and 4 crocodile enclosures.

3. Physical features within enclosures: Shy, forest dwelling crocodiles, like the West African Dwarf Crocodile, have inbuilt "caves" for them to retreat to. Others are logs (for basking on/hiding under), rocks, combination/stand alone physical/visual barriers. Combinations of dense over storey, mulch, and water (via sprinkler) create damp, cool conditions, suitable for taxa from cooler habitats.

4. Land Use: Apart from the enclosures, the Zoo layout includes mosaics of garden patches which provide vegetables and fruit, (largely for the lizard and turtle/tortoise collection), a service road, rain water storage tanks, filtration systems, and a "nature path", with endemic scrubland flora. Firewood is collected regularly (dry branches) and disposed with permanent/casual laborers. There are no other agrarian activities/grazing permitted within the compound.

g. Geology

The Madras Crocodile Bank Trust, is situated on the southeast coast of India, along the coast of the Bay of Bengal. With an average elevation of 6m above sea level, the geology of Chennai mostly consists of clay, shale and sandstone. The coastal zone where Madras Crocodile Bank is situated, is sandy, with quick percolation of water runoff. The coastlines of India, especially in the southeast, consist of Cenozoic era rock types, similar to that of the alluvium deposits found in the Indo-Gangetic plains during the same era.

h. Rock and Soil

Chennai city has been classified into three regions based on geology: sandy areas, clayey areas and hard-rock areas. Madras Crocodile Bank falls under the sandy area, though clayey soil is found around all the natural ponds in the adjoining village of Vadanamelli. Rocky areas are found further inland.

The sandy soil found at Madras Crocodile Bank allows water in our natural ponds to filter and penetrate easily. Over the years croc compost has naturally mixed with the soil, making it rich in nutrients. The sand also acts as a good conductor of heat

making it perfect for the reptilian residents here at Madras Crocodile Bank to bask on.

i. Flora and Fauna in Zoo Premises

The Madras Crocodile Bank campus is home to a diverse variety of free ranging fauna and flora. Our inventories have recorded 26 species of spiders, 12 species of amphibians, 11 species of lizards and 11 species of snakes so far. About 70 species of trees on campus provide ample shelter to host a teaming heronry and roost site for local and migrant birds. We have records of more than 50 species of birds sighted in the vicinity of our campus. (See also Part IV g)

j. Climate

Chennai experiences tropical savanna climate with distinct wet and dry seasons, i.e., summer (Mar – May), winter (Nov – Feb) and monsoon (Jun - Oct). Being positioned on the thermal equator along the coast of Bay of Bengal, it faces little variations in climate throughout the year. The temperature ranges between 38°C, on an average being the warmest in the month of May and 20°C, on an average being the coldest in the month of January. Relative humidity ranges from 39% to as high as 95%. Seasonal rainfall is 1100 – 1300 mm annually, influenced by the North-Western winds and the South-Eastern winds with a wind speed of 0-16 mph varying through the year. Maximum days of precipitation have been recorded in the month of October. Cloud cover also varies between 39% and 79%, though the hours of sunlight in a day does not vary much through the year with a difference of only 54 minutes seasonally, with more than 10 UV-Index on most days.

k. Rainfall

Chennai receives most of its rainfall during the North-East Monsoon (Oct - Dec), and to a lesser extent, the South-West Monsoon (Jun - Sep). The city also receives sporadic showers in January and February.

The annual precipitation in Chennai is in the range of 1100 - 1300 mm, significantly higher than the national average of 800mm.

There is a significant drop in temperatures during the North-East monsoon, maintaining an average of about 26 degrees Celsius during the period.

l. Seasons

Chennai experiences three seasons: summer, monsoon, and winter. Summer usually begins in the month of March and lasts till June with temperatures varying between 35- 45 ° C. This is accompanied with a high level of humidity. The monsoon brings scanty rainfall during the South-West monsoon (Jun-Sep). Most of the rainfall comes from the North-East monsoon (Oct-Dec), picking up moisture over the Bay of Bengal and bringing the city approximately two thirds of its annual rainfall. The temperature between October and December can vary between 21- 31° C.

Winters are not severe. However, December through February are the mildest months and the temperatures can vary between 19- 28 ° C. Cyclones in the Bay of Bengal hit the city occasionally during November - December. The humidity during this period is moderate.

m. Approach

Madras Crocodile Bank is located about 40 kms south of the southern suburbs of Chennai city and the approach, along the East Coast Road, is direct north-to-south. Being en route to the temple town of Mamallapuram, it is on one of the main visitor routes out of Chennai city. Chengelpet is 50 kms inland, and Pondicherry is 85 kms to the south.

n. Demography of the surrounding area

The East Coast Road is a divider between the scenic Coromandel Coast on the east and small agricultural/fishing communities on the other (inland) side. Vadanammeli village on the other side of the road from Madras Crocodile Bank, was one such typical village, of about 650 people, when the Madras Crocodile Bank was started. Over the years, it has seen increasing prosperity because of the tourists coming to the Madras Crocodile Bank. Similarly but to a lesser extent, the other villages along the ECR have also grown, because of improved transport to and from Chennai city and other outlying towns and cities such as Kancheepuram, Chengelpet and Mamallapuram. One factor of concern and rapid change is the fact that several industries and businesses including software companies are moving into this prime agricultural area; farmers with small and big holdings are selling out to these companies and to housing colonies. Vast stretches of paddy land have disappeared. The sons and daughters of people who were farmers in the 70s, have better education and employment opportunities but there is no one to work on family farms; so the few that are left are increasingly difficult to sustain. Some of the villages that have focused on fishing in the past, are also turning to other

occupations though there have been some good initiatives such as fish marketing cooperatives. There is always a community of foreigners living in Mamallapuram, small or big depending on the time of year.

o. Legal status of the Land

All the land on which the Madras Crocodile Bank is situated, 7.33 acres, and the satellite facility, 1 acre, is owned by the Trust.

p. Sources of pollution, if any

No sources of pollution have been noted.

q. Difficulties and Achievements

The layout map of the present facility is included as Appendix 1. Since initial and further funding was very limited, enclosures were added on one by one as and when money was available. It is a mix of large holding pens and small terrariums, cages and ponds. Three of the original large pens have natural ponds, since the freshwater table on this coast is high and close to the ground, though it has receded over the years. The others are concrete ponds, with filtration systems.

The biggest and continuing challenge faced at Madras Crocodile Bank, is funding. The organization runs on ticket sales income and small grants for specific projects and programs. It runs two significant field stations in the Andaman Islands and at Agumbe in Karnataka. It also supports the Gharial Conservation Alliance, which identifies and funds Gharial studies and conservation initiatives. Additionally, it has many field conservation projects.

The achievements of the Madras Crocodile Bank have been recognized and appreciated both in India and abroad, and fall within five main categories: conservation breeding, zoo displays, education/awareness, research, and training. A list of Madras Crocodile Bank's scientific publications is given in Appendix 2, as also a List of Endangered Species bred here in Appendix 3. Several hundred muggers were given to state Wildlife Departments for release in the wild or for captive rearing. Details of the education programs are given later on in the following Chapter (Chapter II). Training in husbandry has been given to staff from many zoos including zoos in Cambodia (Siamese crocs), Nepal (Chelonians), Hyderabad (king cobras), and Port Blair (survey techniques). The list of scientific publications and articles by Madras Crocodile Bank staff numbers over 3000.

CHAPTER II - APPRAISAL OF PRESENT ARRANGEMENT & CONSTRAINTS

a. Animal Section, veterinary section, store and feed etc.

Madras Crocodile Bank houses over 2000 reptiles of 3 Orders:

Reptiles	No. of species
Snakes	8
Crocodylians	18
Turtles	13
Lizard	4

Current housing facility

By far the most number of crocodylians at Madras Crocodile Bank are the muggers, which now number about 2000.

These animals are currently housed in four high density enclosures, and two lower density enclosures.

The enclosure designs for all reptiles on exhibit are species-specific and are essentially made close-to-natural habitat.

Veterinary Section

The Veterinary Section is headed by Dr. Gowri Mallapur, an invited member of the IUCN-Species Survival Commission Crocodile Specialists Group (SSC-CSG) assisted by other consultants such as vet surgeons. There are a number of prominent crocodylian/reptile vets available for expert consultancy such as Dr Fritz Huchzermeyer, Dr Brian Stacy, Dr Antoine Cadi, Dr Paolo Martelli and others.

While enclosure design and management practices are of such standards that mortality is low at the facility, veterinary intervention is sometimes needed. Preliminary research has indicated that parasitism is a problem, particularly in juveniles of the critically endangered *Batagur kachuga*. Recent cases of sub-cutaneous lesions indicative of "SCUD" in the softshell turtle *Lissemys punctata andersonii*, and a possible mycobacterium infection in

Crocodylus palustris have been observed. Other veterinary issues are neoplasia in *Python molurus* and *Ophiophagus hannah*, bronchial pneumonia in *Crocodylus palustris*, miscellaneous maladies such as traumatic injuries in crocodiles, fractured shells in turtles. Multi-taxa research on veterinary issues, to be used to guide husbandry and management, are done. Routine practices at Madras Crocodile Bank include the following :

- i) Screening for endo-parasites in all species, using direct smears, sedimentation technique, and zinc-sulphate centrifugation technique; micro-photographs of unidentifiable parasites are sent to experts for verification
- ii) All animals that die are necropsied according to guidelines established by Veterinary Specialist Group, of the IUCN SSC-CSG, Richardson *et al.* (2002) for crocodylians, and Mader (1998) for testudines and snakes.
- iii) Cultures and sensitivity testing and possible development of a histopathology database for Crocodylian diseases.
- iv) Ongoing thermal profiling of enclosures can identify normal activity ranges for reptiles.
- v) Baseline information collection on reproductive status of all necropsied animals, inclusive of number of eggs, fat body status, number of follicles undergoing atresia, etc.
- vi) Madras Crocodile Bank contributes veterinary presentations and workshops at zoo gatherings and the team is a resource for reptile facilities at other zoos. The present infrastructure will be upgraded in order to improve both preventive and treatment processes.

Current Facilities

- Laboratory for conducting routine manual blood and stool analysis. This was set up with the help and support of CZA in the form of a received grant. The activities of this lab currently include screening for endo-parasites in all species, using direct smears, sedimentation technique, and zinc-sulphate centrifugation technique; micro-photographs of unidentifiable parasites are sent to experts for verification

Equipment available- Refrigerator and deep freezer to store samples, oil immersion light microscope, manual blood count analysis equipment, centrifuge, micro-photography equipment.

- When necessary, clinical examination and intervention of most animals is done on site.

- A Post mortem area and equipment. All animals that die are necropsied according to guidelines established by Richardson *et al.* (2002) for crocodylians, and Mader (1998) for testudines and snakes.
- A basic surgery set-up.
- Record maintenance set-up as per CZA requirements.

Store and feed supply section

Narrow snouted crocodiles such as the fish eating Gharial, get fish, broad-snouted crocodiles get beef, chicken, rats, and emu meat. Juvenile crocodiles of all species get a mixture of grasshoppers, crabs, snails, and small fish. The turtles get a variety of seasonal greens, much of which is grown in our own nursery. In addition, carrots, beans, crustaceans, and Soya pellets are fed in the breeding season, particularly for our breeder Red Crowned Roof turtles, a few months prior to egg laying. Snakes have rats caught from nearby agricultural areas, and an in-house rat breeding enclosure provides smaller sizes of rats for juvenile/smaller species of snakes. Lizards are fed on forest cockroaches, grasshoppers, chicken, and snails. Addition of multi-vitamins to feed is generally not practiced, though Vitamin D supplementation is given to lizards housed indoors, with consultation of the veterinarian.

Much of what is fed to animals at Madras Crocodile Bank is freshly caught/grown. In the case of surplus feed, it is stored in a refrigerator (for e.g. greens), and used within two days. The freezer section houses chicken. The 50 KV generator ensures there is no spoilage of feed, as a fridge is able to function 24 hours a day. The current amount of feed coming into Madras Crocodile Bank can assure sufficient quality and quantity for the new reptiles to be added to the collection of the Centre for Herpetology.

Some constraints include:

1. High water levels in the monsoons causes reduction in the quantity of fish acquired by the local co-operative located at the village.
2. The large number of crocodiles (i.e. Marsh crocodiles) in densely stocked pens poses a challenge at feeding time; however more feed than required is provided, and left-overs are weighed and removed the next day). Individual feeding is also done.

Sanitation section

Trash is collected everyday and removed appropriately, ensuring cleanliness always. Clinical waste and refuse is regularly removed and disposed of in an approved manner. A safe and effective program for the control or deterrence of pests and vermins using biological control is in place and is maintained throughout the zoo. Health risks posed by the use of hoses on animals is minimal.

Maintenance section

Maintenance at Madras Crocodile Bank starts at 0800 every morning and lasts till 1200 hrs when permanent staff/casual labor leaves for the lunch period. Two groups of staff are engaged in cleaning and maintenance of the over 60 enclosures in the morning. In this period enclosures are cleaned of litter left behind by the visitors in the park, leftover feed, and fecal matter. Following this, pond levels are topped up. During the nesting season all enclosures where eggs might occur are checked meticulously. Maintenance staff return at 1330 and remain till 1730; in this period, procedures include feed preparation and distribution, necessary transfers of sick/injured crocodiles and size sorting, measurements and weighing and purchase requests such. With increasing employment opportunities at the village level, it is becoming more and more difficult to find people to do this kind of work and we need to find ways to recruit and motivate young persons, men and women, who will see this type of job as a long term career.

Security section

Security at the Madras Crocodile Bank has always been a major area of focus because crocodilians are potentially dangerous animals, and the public has to be educated on appropriate behavior. Safety walls (double walls) exist in all enclosures where people can reach in with their hands, or in some cases weld mesh is affixed to the wall. In addition, there are warning boards at every enclosure. Also, animals at Madras Crocodile Bank have to be protected against plastic bags, bottles etc. which may inadvertently get into the enclosures. This is communicated to the visitors through informative/pictorial signage. A watchman is stationed at the Young Reptiles section, and on public holidays (e.g. Christmas and the South Indian festival of Pongal), up to 12 extra security staff are recruited locally. All security staff are trained and advised on productive interactions with visitors (being polite and courteous). Night-time security consists of two guards walking the perimeter and inner path-ways/roads.

Sanitation section

Trash is collected everyday and removed appropriately, ensuring cleanliness always. Clinical waste and refuse is regularly removed and disposed of in an approved manner. A safe and effective program for the control or deterrence of pests and vermins using biological control is in place and is maintained throughout the zoo. Health risks posed by the use of hoses on animals is minimal.

Maintenance section

Maintenance at Madras Crocodile Bank starts at 0800 every morning and lasts till 1200 hrs when permanent staff/casual labor leaves for the lunch period. Two groups of staff are engaged in cleaning and maintenance of the over 60 enclosures in the morning. In this period enclosures are cleaned of litter left behind by the visitors in the park, leftover feed, and fecal matter. Following this, pond levels are topped up. During the nesting season all enclosures where eggs might occur are checked meticulously. Maintenance staff return at 1330 and remain till 1730; in this period, procedures include feed preparation and distribution, necessary transfers of sick/injured crocodiles and size sorting, measurements and weighing and purchase requests such. With increasing employment opportunities at the village level, it is becoming more and more difficult to find people to do this kind of work and we need to find ways to recruit and motivate young persons, men and women, who will see this type of job as a long term career.

Security section

Security at the Madras Crocodile Bank has always been a major area of focus because crocodilians are potentially dangerous animals, and the public has to be educated on appropriate behavior. Safety walls (double walls) exist in all enclosures where people can reach in with their hands, or in some cases weld mesh is affixed to the wall. In addition, there are warning boards at every enclosure. Also, animals at Madras Crocodile Bank have to be protected against plastic bags, bottles etc. which may inadvertently get into the enclosures. This is communicated to the visitors through informative/pictorial signage. A watchman is stationed at the Young Reptiles section, and on public holidays (e.g. Christmas and the South Indian festival of Pongal), up to 12 extra security staff are recruited locally. All security staff are trained and advised on productive interactions with visitors (being polite and courteous). Night-time security consists of two guards walking the perimeter and inner path-ways/roads.

Water supply section

Water supply is acquired from ground water, and is recycled in 5 enclosures. Frequency of water change depends on the volume of water to be changed, and the well-being of the animal(s) living therein. Only three enclosures now have a natural aquifer, others have been concretized for maximum water retention. Collaboration with the Anna University has yielded important information on water quality and management and treatment.

Disposal of solid and liquid waste - sewerage

As a zoo which gets visitation of over 5 lakhs per year, and maintains over 2,000 reptiles, the management of solid and liquid waste at Madras Crocodile Bank is an ongoing activity. PET bottles are collected by a vendor once a week. Paper is used for cleaning and providing substrate in enclosures. Kitchen waste goes into a compost pit. There is a separate compost area for leaf litter and animal waste. Organic products are used for housekeeping, (e.g. Effective Micro-organisms, made of three micro bacteria).

Croc manure is used as a fertilizer on campus.

Visitors' Amenities

Visitor's amenities exist at Madras Crocodile Bank in the form of drinking water taps, bathrooms (totally six, three for ladies, and three for gents), zoo education facilities, and a central visitor information centre.

Lawns and Garden - Landscape Section

Much research and planning have gone into landscaping the overall campus as well as the individual enclosures. Low-maintenance species associated with crocodile habitats, such as *Pandanus*, are used as also various grasses and shrubs. Earth mounds, boulders, logs and driftwood enhance the visual attraction of enclosures. An avenue of trees has been planted along the main pedestrian viewing track. The constant movement of crocodiles in and out of the water, makes bank vegetation a challenging task.

An onsite plant nursery provides fodder for our herbivorous reptiles (i.e. Aldabra tortoises and some of the larger river turtles). A near complete listing of Madras Crocodile Bank's flora, which has changed since the 1970s from a few spindly *Casuarina* to what currently exists, is given in Annexure (g) in the Part IV Annexure section (item (g) of the checklist).

The gradient of Madras Crocodile Bank follows a gradual slope from the sea-shore up to *ca.* 30 meters on the East Coast Road. There are 5 major gradients from the East Coast Road-downwards, which provide a selection of different thermal profiles for each gradient.

The predominant substrate is fine to large grained sand, which is mixed with mulch and leaf-litter. This is collected and introduced to enclosures in order to provide hiding/nesting areas for our mound-nesting crocodilians.

b. Animal Collection Plan (existing)

Annexure (e) (Part IV – Annexures to the Master Plan, item (e) in the checklist) outlines the existing collection of reptiles. The collection plan is made with reference to the space available at Madras Crocodile Bank, the conservation significance of the species, and the availability of suitable feed and maintenance expertise. Two large units of our collection plan are:

- a. Larger, charismatic animals that attract crowds/aid in publicity (our largest crocodile, Jaws III is fed every Sunday at 1630 hrs)
- b. Lesser known, endangered or data deficient species that require conservation breeding, such as the critically endangered Red-crowned roof turtle.

c. General Zoo Administration Section

List of Honorary and Paid Positions at Madras Crocodile Bank

Ex-Officio Trustees

Mr. Romulus Whitaker (Founder)
The Regional Deputy Director (Wildlife Preservation, Southern Region)
The Joint Director Tamil Nadu Tourism Department

Trustees

Mr. Ashish Gupta	Mr. Samit Sawhny
Ms Zahida Whitaker	Mr. R. C. Swamy
Ms. Kamini Sundaram	Mr. Satyajit Mayor

ADMINISTRATIVE/RESEARCH PERSONNEL

Chief Executive Officer	K. Muralidharan
Chief Operating Officer	Dr. Gowri Mallapur

Director, Research and Conservation

Dr Ravi Chellam

Curator

Nikhil Whitaker

Curatorial Assistants

Ajay Kartik & Aaranya Gayathri

Executive officer (GCA)

Tarun Nair

Education Officer

Sandeep Varma

Program Manager

Mittal Gala

Marketing and promotions

Vineeth Vincent

ANET Asst Director

Tasneem Khan

ANET Research Co-ordinator

Saw John Aung Thong

ANET Admin Officer

Jocelyn Panjikanan

ANET Education Officer

Smita Madhoosudan

Researchers

Tarun Nair- Gharial

Shakthi Sritharan-Gharial

Dipti Humraskar- Gharial

Saniya Chapolod- Gharial

Suyash Katdare- Gharial

Manish Chandi- Human ecology

Marianne Manuel- Marine Ecology

Adhith Swaminathan- Sea Turtle Conservation & SCCS

Shailendra Singh- Freshwater turtles and Gharial

Ashutosh Tripathy- Freshwater turtles and Gharial

Shashwat Sirsi- Fresh Water turtles

M. Muralidharan- Sea Turtle Conservation

Amrita Tripathy- Sea Turtle Conservation

Nupur Kale- Sea Turtle Conservation

Robin Abraham- Amphibians & Fresh water Fish

Ayesha Prasad- Ecology

Dhiraj Bhaisare- Rainforest Ecology

Ajay Giri- Rainforest Ecology

Ramprasad Rao -Rainforest and Freshwater Fish

Accounts and Maintenance Staff

Mr. M. Mohan	Accountant
Mr. V. K. Munusamy	Maintenance In-Charge
Mr. K. Kannappan	Ticket Counter Clerk
Mr. V. Gangadurai	Chief Reptile Keeper
Mr. S. Nagarathinam	Assistant Reptile Keeper
Mr. S. Sampath	Snake Keeper
Mr. R. Thangaraj	Office Assistant
Mr. C. Dhanasekaran	Assistant to Education officer
Mr Selvamani	Guide
Mr Tham Bahadur	Watchman
Mr Mohansundaram	Research Assistant
Mr T Mohan	Jr Office Assistant
Mr C Purushotaman	Jr Office Assistant
Mr Gynanamurthy	Ticket Checker
Ms. V. Amutha	Enclosure Maintenance

Ms. S. Shanti	Enclosure Maintenance
Ms. J. Parimala	Enclosure Maintenance
Ms. M. Indradevi	Hospitality

d. Research

Research within Madras Crocodile Bank and in the field has covered a wide range of herpetological topics since 1976 and has resulted in several hundred scientific publications. A list of publications for last couple of years is included in Appendix 4.

A main strength of the facility is that it functions as a large outdoor laboratory, in which over 2,400 reptiles of different taxa live and breed. Madras Crocodile Bank houses 18 species of crocodylians, over 13 species of freshwater turtles and tortoises, 4 species of lizards and 8 species of snakes. Select enclosures are wired to record all the basic environmental parameters to facilitate studies on the biology of the reptiles. The animals quickly habituate to the presence of visitors, so the facility affords an excellent opportunity to observe and document behavior and social interactions at close range, many of which are rarely, if ever, seen in the wild.

e. Conservation breeding

The Madras Crocodile Bank, the first crocodile conservation breeding centre in Asia, was founded in 1976 to conserve the three Indian crocodylians and establish programs for the conservation and propagation of other species of endangered reptiles. Over the years, 1500 crocodiles and several hundred eggs have been supplied to various State Forest Departments for restocking programs in the wild, and for setting up of breeding facilities in other states in India and neighboring countries. King cobras and several species of crocodiles, monitor lizards and turtles have been supplied to several zoos in India and abroad. Madras Crocodile Bank researchers have also conducted crocodile surveys for states in India and other countries. One trustee and three senior staff member are members of the Crocodile Specialist Group (CSG) under the IUCN Species Survival Commission. Conservation breeding will always play a major role in Madras Crocodile Bank's activities.

Our conservation breeding program currently includes the following species of crocodylians (with their status as listed in the IUCN Red List):

Gharial (*Gavialis gangeticus*) - Critically endangered
Tomistoma (*Tomistoma schlegelii*) - Endangered
Siamese Crocodile (*Crocodylus siamensis*) - Critically endangered
African Slender-snouted Crocodile (*Mecistops cataphractus*) - Data deficient
West African Dwarf Crocodile (*Osteolaemus tetraspis*) - Data deficient

Conservation breeding is also conducted for Indian Roof Turtles (*Batagur kachuga*) and the Travancore tortoise (*Indotestudo travancorica*). *B.kachuga* has been breeding at Madras Crocodile Bank since 2003; twenty-six juveniles have been sent back to the Kukrail Gharial and Turtle Rehabilitation Centre for release into the wild. Captive breeding of the king cobra in 1996 resulted in 30 hatchlings of which over a dozen have been sent to Indian and foreign zoos.

Madras Crocodile Bank started the first sea turtle surveys and conservation program in India. This has included a hatchery at the Crocodile Bank beach and a mobile exhibition each week during the nesting season. Literally hundreds of articles, sections of books, leaflets, films and TV programs were done to spread awareness about the threats to the Olive Ridley on the Coromandel Coast. Surveys and studies are carried out by its staff and other naturalists. Reports and recommendations to stakeholders have played a major role in the conservation of Indian reptiles.

India is home to 32 species of freshwater turtles and tortoises, some of them highly endangered. A ten year project titled "Conservation of freshwater turtles and tortoises of India" was initiated during 2004 in collaboration with several state forest departments. The project covers the states of Uttar Pradesh, Madhya Pradesh, Rajasthan, Orissa, West Bengal and the north eastern states.

Conservation breeding activities currently are focused on taxa from India and abroad. Primary conservation breeding programs at Madras Crocodile Bank currently, are those for the Red Crowned Roof turtle (*Batagur kachuga*), Northern River Terrapin (*Batagur baska*), Tomistoma (*Tomistoma schlegelii*), Siamese Crocodile (*Crocodylus siamensis*), African Slender-snouted Crocodile (*Mecistops cataphractus*), and the West African Dwarf Crocodile (*Osteolaemus tetraspis*). Other species listed in the collection plans have been chosen for their status, which is mostly data-deficient, or critically endangered.

Our modus-operandi for conservation breeding of select taxa are supported by units outside of Madras Crocodile Bank, such as the Laboratory for Conservation of Endangered Species, and the Central Zoo Authority, primarily to acquire breeding groups of those species that are currently single sex (i.e. *Batagur baska*). All animals are micro-chipped/tail-scute clipped, and extensive notes on the environment, nutrition, and health

of these taxa are maintained as part of Madras Crocodile Bank's regular records system. The donation of the ISIS/ZIMS package by the CZA has also gone a long way in enabling the maintenance of records of individuals in a consistent, scientific, and internationally recognized manner.

f. Education and Awareness

Community and school programs: Madras Crocodile Bank has ongoing environmental education (EE) programs for the communities and schools in the surrounding area. These include nature camps; training workshops for teachers, youth from fishing villages and resource personnel; and mobile exhibitions and campaigns. Other activities include field trips and education programs for the nature clubs from rural schools. The Puppet Theatre is often used as part of the program to generate environmental awareness among children. School and college students get a guided tour by the Education Officer and allied staff.

Daily Visitor Education: Visitors to the Madras Crocodile Bank are given talks and demonstrations. Informative signboards about crocodiles and their conservation, biology, behaviour and about general ecological issues are spread around the park. Visitors are encouraged to talk to Madras Crocodile Bank staff and ask questions, and learn about reptiles and conservation in general. Madras Crocodile Bank also has the largest herpetological library in India, with access for field researchers, biologists, students and volunteers. In Madras Crocodile Bank's Audio-Video Room, films are shown and personalized lectures are given.

Seasonal Programs: Madras Crocodile Bank has several educational activities that are seasonal such as turtle walks, mobile sea turtle educational shows, snake and amphibian walks, workshops and camps.

Publications and Films: Over 1000 popular articles by Madras Crocodile Bank staff have been published in newspapers, magazines and academic publications, as well as many books and contributions to books. The following films made by Madras Crocodile Bank staff in collaboration with other organizations/individuals are in the Madras Crocodile Bank collection:

DOCUMENTARY FILMS

- *Irulas, Hunter-Gatherers in the Space Age*, English 18 minutes, 1985
- *Periyar* 23 minutes, 1986
- *Banking on Crocodiles*, 20 minutes, 1986
- *Snakebite!*, English and Hindi, 27 minutes, 1986

- *A Cooperative for Snake Catchers*, English, 20 minutes, 1988
- *Seeds of Hope*, Tamil, English, Hindi and Telugu, 23 minute, 1989
- *Silent Valley*, English, Malayalam and Tamil, 53 minute, 1991
- *Rat Wars*, English 26 minutes, 1993
- *Treasured Islands*, English, Hindi, 1994
- *Keralensis*, 3 min, 1995
- *King Cobra*, English, 53 minutes, 1996
- *Spunky Monkey*, 43 minutes, 1997
- *Croc Man*, 18 minutes, 1998
- *Croc Crusader*, 25 minutes, 1999
- *Thunder Dragon*, 53 minutes, 1999
- *Snake Hunter*, 53 minutes, 2001
- *Snake Hunter - Costa Rica*, 53 minutes, 2001
- *Mugger Crocodiles of Sri Lanka*, 53 minutes, 2001
- *Croc Chronicles - Sri Lanka*, 26 minutes, 2002
- *Snake Wranglers - Venom Harvest*, 26 minutes, 2002
- *Croc Chronicles - Papua New Guinea*, 26 minutes, 2003
- *The King Cobra and I*, 48 minutes, 2005
- *Supersize Crocodiles*, 52 minutes, 2006
- *Romulus Whitaker and the Dragon Chronicles*, 52 minutes, 2008
- *Crocodile Blues*, 52 minutes, 2008
- *Secret Life of the King Cobra*, 52 minutes, 2008
- *Million Snakebites*, 48 minutes, 2010
- *Leopards: 21st Century Cats*, 48 minutes, 2013

FEATURE FILMS

- *The Boy and the Crocodile*, Tamil, Hindi and English, 105 minutes, 1989

Technical education, training and expertise exchange: Herpetologists and conservationists from around the world visit Madras Crocodile Bank and its field stations. The ongoing and close cooperation with the IUCN/SSC Crocodile Specialist Group, IUCN/SSC Tortoise and Freshwater Turtle Specialist Group, the Turtle Survival Alliance (which has a back office at the Madras Crocodile Bank) as well as the Gharial Conservation Alliance and the Viper Specialist Group, allows zoo staff to assist with several fund-raising activities for reptile conservation in India. Madras Crocodile Bank staff attend, and

contribute to, veterinary, conservation, husbandry and zoo planning workshops and other professional gatherings.

NatureQuest: Clubbing for Conservation: Three organizations namely the publishing house Orient Blackswan Pvt. Ltd. (OL), the Madras Crocodile Bank Trust (Madras Crocodile Bank), and Trust for Environmental Education (TREE)- launched *NatureQuest* in 2003. It is a program to raise awareness about wildlife and conservation, a meeting ground for people interested in this area. *NatureQuest* programs include talks, discussions, photo and painting exhibitions, slide shows, wildlife documentary screenings, and interactive sessions with filmmakers, researchers, and conservationists.

Friends of the Madras Crocodile Bank Club: As part of Madras Madras Crocodile Bank's on-going Environmental Education Programme, the *Friends of the Madras Crocodile Bank Club* was launched. Members of this Club contributed to Madras Crocodile Bank's conservation efforts by volunteering for various activities.

This has now evolved into the Docent program, which is more structured. Nature lovers from a wide range of backgrounds - students, artists, doctors - stay at the Madras Crocodile Bank over weekends or during holidays, and help with routine maintenance and visitor education and outreach.

g. Any other activities peculiar/unique to the zoo

Amateur herpetologists or just people who are interested in reptiles, can come and be a part of structured programs at Madras Crocodile Bank which allow them to observe animal behavior, zoo activities and interact with the staff. Schools send students for short internships. No opportunity is turned down, which could further environmental awareness and conservation initiatives.

PART II

CHAPTER III - FUTURE OBJECTIVES INCLUDING VISION, MISSION STATEMENT / THEME AND STRATEGY

The future objectives of Madras Crocodile Bank depend largely on financial issues, and its ability to generate the funds for major (largely structural) development, additional staff, professional development and required expertise such as architects, artisans, and other resource persons. Broadly, the objectives of the Master Plan of the Madras Crocodile Bank, which is known as one of the best crocodilian conservation breeding facilities in the world are:

- To expand and improve the current exhibits, and add several new ones
- To improve husbandry and care
- To improve ex-situ conservation by regularly breeding all of the worlds endangered crocodilian species as well as several of the critically endangered reptiles and amphibians.
- To improve Environmental Education by orienting and training Education Officers
- To improve in-situ conservation by activities like: Scientific advice in Human/crocodile conflict incidents, supporting Gharial and Turtle field research and conservation, supporting research and conservation of King Cobras (*Ophiophagus hannah*) and Water Monitors (*Varanus salvator*). Both these species have been selected as part of the CZA's Conservation Breeding Initiative.
- To improve networking with other national and international zoos in husbandry and ex-situ and in-situ conservation efforts and cooperative management as well as with WAZA, conservation NGOs like IUCN, WWF and others.
- To conduct reptile conservation workshops, training courses for reptile keepers in national / international zoos etc.
- Improvement and development of holding areas as well as maintenance areas

Education: The purpose and guiding principles of the education department at Madras Crocodile Bank are aimed at creating a visitor experience that is meaningful, instructive, and stimulating, as well as to encourage them to contribute towards wildlife conservation.

There is already a very strong education department and future steps would include:

1. Provision of better training to education officers
2. More training workshops and courses on herpetology for the staff
3. Building further on the present Docent / Volunteer program
4. Focus on developing more well-designed education programs that complement school curriculums as well as follow education standards and can be used locally, regionally and nationally.
5. Further enhance the atmosphere of an 'outdoor classroom'

Zoning/Nature Trails

The development of the education trails will be based on the layout of the exhibits and the establishment of specific zones of importance. Some geographical zones that have been identified in the layout are:

Asian Section

The Americas Section

The Amazon Section

African Section

The learning concept at Madras Crocodile Bank will aim to show not just the animals housed at the park, but also depict the complexities of habitats, biological diversity and the interdependency of all these living things within the planet and their far reaching effects on human society.

Visitor engagement:

Seeking to involve the visitor from the moment they enter Madras Crocodile Bank, the tickets would be designed to incorporate messages of conservation and how to make the most of the visit. The ticket collector will be trained to greet the visitors with information of interest at the park on that day. Training will be given to develop the communication skills

of Madras Crocodile Bank staff, so that interaction with the public will be as positive and educational as possible.

Signage

Signage will be improved and the number of informative and interactive signs will be increased and specifically designed to cater to multi-lingual and age-range visitation. Local artisans will be contracted to make new signs and improve existing ones using local materials, such as stone work (for which the nearby town of Mamallapuram is famous). Information will be simplified for visitors using illustrations and simple themes.

Using exhibits as education tools

The new education perspective will promote exhibits that are ideas and not just housing objects. These exhibits will portray complex themes in a simple and straightforward way, such as the evolution of crocodylian species painted along the walls of the exhibit. Conservation messages and pictures will be placed at strategic points.

There will be ridges on the walls of enclosures, to show the difference between the tails, backs, jaws, teeth – we will use all senses to get the visitors thinking and observing! They will blow bubbles in the water to see what a croc does during courtship. Children will be able to crawl into an artificial nest site, to see just what it feels like to be a croc egg or hatchling. Using props within enclosures, such as models of a fishing boat with fishing nets in the gharial enclosure, can provide the viewers with new perspectives and kindle further interest as well as highlight conservation issues. Signs will explain their presence, and how they affect gharials in the wild.

Other Interactive Activities

Visitors will have a wide range of diverse activities to choose from. Rather than being passive viewers and just looking at seemingly sleeping reptiles, the concept is to allow people to get involved. Several interactive game-based props will be made such as weighted pulleys that show how strong crocodiles are, weighing machines that help the visitor compare his/her weight with that of a reptile, and material replicating the feel of the skin of different reptiles that a visitor can touch (and realize that they are not sticky or slimy). All these would further awareness and empathy for reptiles.

Tailored Programs

Since the animals would be housed based on regions, educational programs could also include specific geographical and habitat information.

Each talk, guided tour or lesson plan would be designed and planned to suit different age groups/backgrounds and would be multilingual. Building on Madras Crocodile Bank's position as an outdoor lab, some programs will be conducted based on various school curriculums such as CBSE.

Discovery Posts

A 'Discovery Post' that deals with one idea, topic or species will be set up at regular intervals. Themes can be changed weekly to feature all reptiles. This post will allow the public a chance to ask the education officer or Madras Crocodile Bank volunteers specific questions.

Volunteer programs

Madras Crocodile Bank has a volunteer program, in which college students and professionals from India and other countries stay at the Madras Crocodile Bank and work on particular projects and activities that are commensurate with their own interests but which also benefit the zoo. For example, a biology student helped with a turtle morphometrics study, and an art student designed signboards and also helped with a python brooding project. Apart from their focal activities, they are also involved in the day to day routine at Madras Crocodile Bank, such as cleaning, visitor interaction and feeding. This program has excited and motivated many young people and many have then chosen a career in the field of natural history and conservation. Many of today's' reputed conservation biologists have had their beginnings at Madras Crocodile Bank viz. Karthik Vasudevan (WII), Kartik Shanker (IISc/CES), Indraneil Das, Manjula Tiwari (NoAA). Many more have spoken and written about how inspiring and motivating the Madras Crocodile Bank experience was. Some feedback comments follow, from volunteers:

From Simay Yaycioglu:

"The Madras Crocodile Bank was a very nice experience for me, from which I'm going to take a lot of experience home. Employees are super friendly and the atmosphere great. The tasks are very varied. Besides a project in which I could work, I helped with feeding and monitoring of turtles and animals in the nursery. Additionally, I checked the temperature variations of the

Anacondas and helped to plan a new anaconda enclosure. It was a lot of fun and I contributed and was also able to relax. Looking forward to the next visit :)"

From Vaishnav Suresh:

"Easily describable as one my most cherished experiences and memory, the volunteer program at Madras Crocodile Bank was a dream come true. My stay at the Madras Crocodile Bank was over a period of 15 days but the knowledge i gained was worth way more. Working alongside the experienced and reputable staff was an honor and the amount of care and concern they had for the reptiles was overwhelming. There was attention paid to every detail regarding the welfare of not only the animals but volunteers as well. I'm proud and grateful for having been given the opportunity. My tasks at the Madras Crocodile Bank included everything from assisting in landscaping and cleaning of the enclosures to (after much eager waiting) feeding the smaller animals in the nursery. The most memorable day has to be the day the Gharial in nursery A and B were caught, weighed and marked. The facilities at the Madras Crocodile Bank turned out to be far better than I had hoped, with the well equipped library with wi fi facilities and an audio-visual room. Food and refreshments were in plenty and on time. In short, my volunteering at the Madras Crocodile Bank was out of this world and a dream come true I cannot thank all of you for the opportunity and also for your patience. I hope I would be able do it again soon. Thank you once again.

Overnight Camps

Groups of up to 20 students visit the Madras Crocodile Bank for overnight camps which sometimes stretch to several days. The programs conducted during these camps include information about crocodiles and their conservation, as well as other topics within the general area of wildlife and habitat conservation. Staff prepare special presentations, and other activities include walks and hikes outside the campus (with Irula guides as local naturalists), nocturnal activities such as sea turtle walks and croc survey techniques, and assisting in routine maintenance work at the zoo. Prestigious schools and colleges such as Valencia Community College (USA) and Mahindra United World College, Pune are regular users of this program.

The Master Plan includes extension and expansion for all these facilities, including purchase of equipment. The development of the zoo's education office as well as the current main education facility (AV Room) is essential during this phase of development. We will also increase our visitor engagement by broadening our enrichment program for

reptiles. This raises public awareness as well as maintains the physiological and psychological well-being of the animals by using proven reinforcement methods.

CHAPTER IV- FUTURE ACTION PLAN

i) Proposed/Recommended animal collection plan

The proposed animal collection plan incorporates reptiles which would be "crowd pullers" as well as those that are little known and in need of ex-situ conservation action. A good example of this was the breeding of the king cobra in 1996; several of the progeny have been given to Indian zoos.

A list of proposed animals to be collected (other than those already in stock) is included in Appendix 5

ii) Layout map (approved)

The proposed layout map has been submitted and has been approved by the CZA.

A copy of this is included in the Annexure a.

iii) Proposal to address the inadequacies and shortcomings identified in appraisal report

Animal Section

Proposed future housing and exhibit facilities are detailed in the layout map. It is also proposed that a satellite facility be constructed to house the surplus animals, which are valuable assurances against extinctions in the wild. The Layout Plan for the satellite facility has been approved by the CZA and is also included in Annexure a.

Veterinary Section

The veterinary lab will be improved within a short period of time. A large quarantine area is also on the agenda during development. A necropsy shed, surgical instruments, and temperature monitoring equipment have been bought from the CZA's grant for our Lab Development, and future plans include ultrasound, portable x-ray facilities, and laparoscopy units for diagnostic purposes. It is also planned to have a temperature controlled in-patient facility for monitoring the health of animals that might be under treatment.

Store and feed supply section-NA

Maintenance section- NA

Water supply section

The long-term plan is to adopt recycling systems (stand-alone or combined) for all the reptile enclosures.

Security Section- NA

Disposal of solid and liquid waste

The overall plan is re-cycle all the waste for use within the Madras Crocodile Bank itself.

Energy Requirement

Energy would be required for the following purposes: office and living accommodation, street and site lighting, croc pond pumps for water renewal, Hot water for domestic and other usage. The plan is to use only renewable energy resources such as solar power for energy to the extent possible.

Waste Management

Waste management will cover kitchen waste, animal waste, organic waste, leaves, wood, grasses, paper, plastic etc. The present systems will be improved, and waste storage areas increased and secured against rats and other vermin. Research is being done on bio-char and other waste disposal plants. These will be implemented as and when funds are available.

Visitors Amenities

There are shady sit-down corners with benches and tables but these need to be increased so that family picnics are possible at a variety of locations. The new entrance area including parking space, which also houses the guest service facilities, gift shop ("Nature shop") etc. allows us to increase public awareness and education by offering new displays, books, guided tours and special events. The development of the zoo's office as well as the current main education facility is essential.

Landscape-NA

iv) Peculiar problems of the zoo

Surplus animals: At the time of documenting this Master Plan, Madras Crocodile Bank has over 1200 surplus crocodilians, most of them *Crocodylus palustris*. It is proposed that a satellite facility be constructed 40 kms. away at Thandarai, Chengelpattu, where Madras Crocodile Bank owns an acre of land. The layout plan for this has already been approved by the CZA. This plan is especially important because of PWD's plan of road expansion on the ECR, which will remove almost an acre of Madras Crocodile Bank's land.

Finances: Large amounts of money will have to be raised for the developments required by the CZA, which are also consistent with the Centre for Herpetology's objectives. One is the addition of several new physical structures. The Veterinary Lab has been upgraded thanks to a grant from the CZA. Other important developments are access roads for wheel chairs, exhibits, and development of the satellite facility. In addition, further laboratory development is required, including an ultra-sound scanner, portable x-ray unit, and improvement of the operation theatre. Large buildings in the planning process include the accommodation for staff, office premises, and frontage area.

Climate factors: Chennai has a hot summer, during which reptiles from more temperate locations need to be climatologically controlled within their enclosures. Considering that we have bred the king cobra in 1996 and have continued maintaining this rain forest species, as well as the Travancore tortoise, this has not been a problem. Environmental control has also been a crucial concept of our temperature sex determination studies in crocodilians, and the low cost but highly effective components in the incubators can be modified for enclosure temperature/humidity control.

CHAPTER V- PERSONNEL PLANNING

The staff profile will remain as per the list given in the General Zoo Administration section (Chapter II, c). This list also includes the recently added position of a Chief Executive Officer who will focus upon and oversee the developments and progress of the Master Plan.

CHAPTER VI - DISASTER MANAGEMENT

Fire: There are fire extinguishers placed in strategic locations in the park as well as in the off display areas. Specific extinguishers for the diesel power generator are also available, as well as for diesel storage. These are maintained by professionals on an annual basis.

Cyclone: Trees are pruned prior to the monsoon season and staff contact information is updated. All emergency equipment such as generators are checked. A two week supply of essentials including medicines is ordered before the storm season. In case of a specific cyclone warning for the Chennai area, all vehicles are filled with fuel. Large signage, umbrellas, etc. are taken down. All potential "flying debris" that is lying around are stored away and all windows shuttered. Animals that need to be moved to safer enclosures within the zoo are moved. Extra food is provided. Vehicles are put in safe locations.

In the event of a storm surge warning, sand bags are placed along pen walls at a height of 3-4 bags, in addition to a line of bags along chain-link fence on beach. Staff evacuation procedure, if necessary, is in place with only skeleton staff staying on duty. Zoo is closed immediately in case of a storm / tsunami warning.

Tsunami: Due to the coastal location, and especially after the 2004 tsunami, the Madras Crocodile Bank is prepared for this eventuality.

- All on-site staff are kept updated on the situation, via internet, television, radio, or network/contacts.
- In the event of an earthquake occurring in adjacent/connected ocean areas such as Sumatra (giving about 6 - 10 hours of travel time for tsunami), security staff will be put on ocean-watch to check for a lowering of sea level.
- Arrangements for the shifting of staff to higher ground, and if necessary, the evacuation of all on-site staff will be made. All contact information, important medicines as well as vital documents are stored in an easily accessible location that is known to key staff.

Law and Order: In case of law and order breakdown, extra help is recruited from the local village. If necessary, Mamallapuram Police Station is close at hand.

Feed Supply: Multiple vendor sources are located for various types of feeds to ensure that there is no shortage of feed or disruption in supply. Please also see Chapter VII, point 4 in the following pages.

CHAPTER VII - CONTINGENCY PLAN

1) Animal rescued from wild

Madras Crocodile Bank staff have been called on numerous occasions by the Wildlife Department, to catch and transfer "nuisance crocodiles". Equipment and trained catchers are sent, and use widely practiced methods to catch and transfer the animal, including night-shining for eyes, traps with bait, netting and noosing. Methods of capture vary depending on the size of the animal and the nature and size of the habitat. Transfer is effected by the Forest Department in specially made holding crates with ventilation and padding to avoid injury.

2) Escape of animals from enclosures

The primary consideration in the capture process is human safety: not only the safety of the members of the capture team, but also the safety of the other zoo staff and visitors. Also, the safety of the animals in the zoo collection must be carefully evaluated. These considerations will have a major influence on the capture technique that is used. Other things such as the equipment that is available, familiarity with it, capture team members, and the location, have an impact on the capture technique to be used.

INITIAL REACTION

Notification of animal escapes may occur in two ways: observation by an employee, or by a visitor. There are subsequently 3 important points to keep in mind:

1. Keep track of the escaped animal at all times.
2. Inform the zoo office by radio/phone in order to mobilize security and capture efforts.
3. Maintain the safety of zoo visitors until zoo security personnel arrive. This can be accomplished by requesting visitors to keep a safe distance from the escaped animal. When zoo security personnel arrive they will keep visitors out of the area of the escaped animal and may even close a section of the zoo at the request of the capture team coordinator.

CAPTURE PROCEDURE

The Curator decides on the scale and size of the capture operation. For example, a small crocodile will be captured by one or two keepers, but a large crocodile or venomous snake

would require a larger team. He will also decide on the method of capture and will supervise the capture efforts, including collection equipment such as ropes, catch poles, nets, gloves, etc.

If immobilization is necessary this will be carried out under the zoo vet's supervision.

Following an escape and capture, the capture team should evaluate the process to improve future performance.

3) Monkey and dog menace

There are occasionally monkeys in the zoo and the incidence is on the decline because of improvement in securing human and animal food storage and serving/feeding areas. There have been no attacks on staff or visitors, or on the zoo animals. The boundary wall excludes stray dogs. Care is taken to keep all exit/entry points under staff supervision always.

4) Arrangement of food in case of strike/non-supply by contractor

Feed supply is acquired according to species specific requirements and numbers of the species. The fact that feed for all the animals at Madras Crocodile Bank comes from local sources ensures that it is freshly processed. There is a wide range of feed requirements because Madras Crocodile Bank deals with carnivores (crocodilians), herbivores (tortoises and some turtles), and omnivores (some lizards and turtles).

For crocodilians, daily access to food is not necessary. They are fed weekly or bi-weekly, depending on the species, age and size. The same applies to the larger snakes and lizards.

Crocodile ponds with low to moderate densities are stocked with live fish, which are caught and supplied on contract by people from Vadanemmeli village which is across the road from the zoo.

The food for herbivores can be easily acquired, even in the case of a strike. Furthermore, Madras Crocodile Bank has a well maintained nursery that grows browse items for turtles and tortoises such as C-14 grass, papayas, and herbs.

5) Snakebite

The following protocol is displayed at the venomous snakes' enclosures, and staff are expected to follow it in case of a bite from a caged or wild snake.

VICTIM PROCEDURE

1. Activate Emergency Alarm.
2. Secure snake if possible – if snake is out of enclosure and cannot be secured easily, note its location and inform assisting keeper.
3. Notify Curator, assisting keeper that a venomous snakebite has occurred, the type of snake and location of the bite.
4. Keep seated.

ASSISTING STAFF PROCEDURE

1. Notify Security that a venomous snakebite has occurred. They will call ambulance / next hospital. Contact numbers are located at important and central sites in the zoo.
 2. Have victim sit down - keep victim calm. Initiate first aid:
 - A. Remove all rings, bracelets, jewelry, etc.
 - B. Keep bitten area immobilized at or below heart level.
 - C. First aid should be appropriate for the family of snakes involved.
 1. For Elapid bites apply elastic bandage as tightly as you would for a sprain.
 2. For Viperid bites. DO NOT use a constriction band or tourniquet.
 - E. For all bites, immobilize the affected area with a sling, (if upper extremity), or splint (lower extremity).
 - F. Place appropriate and individual medical information with victim. Make sure these go to the hospital with the victim
- 6) Visitors getting injured/visitors falling inside enclosure**

Should any nature of visitor injury or trauma occur, there are standby vehicles and drivers at all times for removal to a nearby hospital (Chettinad Hospital) located 8 kms. away or a clinic, several of which we are in contact with. First Aid materials are available in all important locations like main office, feed shed, education interpretation booth etc.

7) **Fighting among animals**

Crocodiles in high densities, and species which are highly territorial- for example, the salt-water crocodile- will fight with each other. The best strategy has proven to be prevention, by moving smaller cohorts into isolated enclosures. These are then designated surplus animals so they can be sent to other zoos. Enclosures are constructed such that visual barriers, both on land and in the water, as well as pens themselves reduce the chances of conflict between crocodiles. When fights are observed by keepers, they are broken up by physically entering the enclosure with wooden poles and prodding the tail region, which is a lot less sensitive than the jaws.

8) **Epidemics**

In epidemiology, an epidemic occurs when new cases of a certain disease, in a given population, and during a given period, substantially exceed what is expected based on recent experience. Epidemiologists often consider the term outbreak to be synonymous to epidemic, but the general one typically perceives outbreaks to be more local and less serious than epidemics.

High population densities lead to a decline in the quality of a number of environmental factors and interfere with the carrying out of routine management operations both resulting in severe health related consequences. The direct effects of over crowding may seem quite obvious and have been reported many times before. Every major environmental requirement for normal crocodylian growth and maintenance is affected by over crowding. The continual excretion of waste by literally hundreds of crocodiles into a limited volume of water has the inevitable result of poor water quality. The organic-rich pond themselves are optimal environment for a variety of micro organisms, thus exposing the chronically stressed animals to potential pathogens. Providing even food distribution also presents problems.

While every attempt is made spread the food equally as much as possible, with such numbers, it is doubtful that the weaker animals can compete effectively. In addition, the occurrence of dominance hierarchies has shown to play a significant role the daily life of captive crocodylians. Therefore, it can be assumed that social stress as animals under high density compete for food, basking spots and territory could have negative implications on health, particularly during the breeding season when such interactions are magnified

Regular management and maintenance of some enclosures is also hampered by high density. The logical solution to poor water quality would be to increase the frequency of cleaning which is done in enclosures (those with smaller animals) that are designed for

efficient draining and refilling. Furthermore, the act of cleaning itself poses problems with safety in maneuvering such a large number of mature animals.

The recognition of all animals exhibiting symptoms of morbidity amongst such a large number of crocodiles is difficult and in many incidences, impossible. Some ailing animals, can be identified by their wasting body condition or the development of dermatitis or cutaneous abscesses. These animals are then removed and isolated and treated as required.

Post-Mortem Findings: A uniform regimen for post-mortem examination is being followed at Madras Crocodile Bank using a formatted data sheet including date of death signalment, and enclosure number. Every animal presented is measured for morphometric data. In addition, each animal is given a body condition score on a best- worst scale of one to ten. Each system is then systematically evaluated for extraordinary findings, with observations being recorded on the datasheet. All animals are fully evaluated regardless of obvious external trauma. Incidence of animals being presented with external wounds more often than not reveal internal findings, suggesting that the damage may be inflicted after death.

Management: Unfortunately, until a solution to decrease the number of crocodiles at Madras Crocodile Bank is present, like the expedited building and completion of the satellite facility, there is little that can be done. Isolating and medicating such a volume of crocodiles is extremely difficult and labour and cost intensive. Furthermore it is difficult to justify treatment when the animals will eventually be re-introduced to the same crowded enclosures. Measures to continue improving the animals' environment such as water changes and equal food distribution and close monitoring of mortality will continue.

In regard to maintaining isolation of affected enclosures and minimizing the risk of transfer of pathogens to other enclosures, none of the high-density ponds drain into other enclosures. A definitive diagnosis will be pursued in each case as the occurrence of any infectious agents must be immediately identified due to potential risk to other residents species at Madras Crocodile Bank.

As for the present, the following is the general plan to deal with this:

- 1) Speedy completion of the satellite facility
- 2) Requests for *C. palustris* at other facilities.

9) **Breakdown of power supply**

A 50 KV generator has been donated to Madras Crocodile Bank by the Mahindra group, which takes over during power cuts or breakdowns.

10) Free ranging/feral animal menace

Does not occur because of the boundary wall.

CHAPTER VIII-CAPACITY BUILDING

Madras Crocodile Bank has been always interested in sustainable improvement of zoo management capacities. Because of this, the attendance of senior staff members at meetings conducted by CZA is required, as is ongoing contact with international leading zoos and zoo organizations like WAZA, SEAZA, AZA and EAZA. All this plays a major role in increasing our knowledge in modern zoo development, ex-situ conservation management and husbandry techniques like environmental and / or behavioral enrichment. Madras Crocodile Bank also shares its own knowledge in multiple ways with other zoos. There are regular interactions with Forest Departments also. The personal membership of both the Assistant Director and the Curator in the IUCN Species Survival Commission Crocodile Specialists Group as well as the Managing Trustee's membership in the same organization guarantees high quality standards in ex-situ management of species as well as in environmental education for both zoo employees and visitors.

Capacity developing will cover the broad areas of:

- Vocational Training at Village Level
 - Capacity building/design inputs related to art and craft skills, culture and natural heritage.
 - This will provide employment for local inhabitants who already possess the knowledge and skills, but lack the capacity for effective advertising and marketing. These will lead to further programs related to the production of specific goods and services, such as screen printing, sewing, and cooking classes.
- Entrepreneurial Training
 - Capacity building for various aspects of visitor handling and interaction.
 - Basic business skills required for running a kiosk (how to keep a register, budget, advertise, value-add).
 - Catering and cooking skills for restaurants and vendors, display, delivery and dealing with customers in a friendly and welcoming manner.
 - Driving courses for local guides and provision of transport, interacting with people of different racial, language and cultural backgrounds.

- Educational and Awareness Workshops

- Environment care and access to cleaner technology with local material, local skills and local traditional styles.
- Basic health and sanitation.
- Environmental conservation.
- Sustainable practices of water and other resource usage.
- Beach cleanliness.
- Highlighting local wildlife observation and identification.

Benefits

Capacity building for future economic and environmental sustainability:

- Improving local *health and sanitation infrastructure and awareness*, with benefits for both local inhabitants and tourists. Madras Crocodile Bank promotes scientific and hygienic disposal of solid and other waste. It also provides and promotes clean and hygienic toilet and sanitation facilities for staff and tourists.
- Improving *business and entrepreneurial skills* of local community.
- Improving and encouraging *local skills, arts and crafts*.
- The observational skills of the local Irula tribe are one of the highlights of anyone visiting Madras Crocodile Bank and Vadanemmel village. This is an area where extensive capacity building potential exists. With adequate advertisement it will become a 'must see' activity for both foreign and local tourists.

Environmental (Conservation and Climate change)

- Programs aimed at improving the local environment and increasing awareness about conservation and climate change will have a dual impact on long-term sustainability as well as increasing eco-tourism.
- Programs aimed specifically at fishing communities residing on the beach will help preserve the sanctity of the beaches which are a constant draw for tourists, especially from abroad.

- Awareness of the importance of wildlife to local communities, such as the bird rookery at Madras Crocodile Bank, the nesting of olive Ridley's sea turtles on the beach, the existence of roosting colonies of giant fruit bats in village banyan trees, the presence of a number of species of interesting reptiles in the area are all important, but under-utilized/publicized attractions for tourists.
- Madras Crocodile Bank will further promote 'green' business through the provision of organic, pesticide free, clean and healthy food outlets, based on local cuisine.

CHAPTER IX - E-GOVERNANCE

Madras Crocodile Bank has had a promotional internet site for many years, providing information about the zoo, its conservation activities in situ and ex situ, education programs, publications, photos and current ecological news and information.

Apart from the web-site, Madras Crocodile Bank also maintains a very informative blog (www.madrascrocbank.blogspot.com) and a Face Book and social media presence.

The International Species Information System (ISIS) data base is accessed through the internet to update and manage transfers, and to keep notes for our collection.

CHAPTER X - BUDGET

a. Broad budget analysis for implementing the plan

Budget estimates, made with the assistance of our Architects are included in Appendix 6 (both Madras Crocodile Bank Main Facility & the Satellite facility).

The budget provides separately for the construction of buildings, enclosures, roads and pathways, site level infrastructure and demolition works (of existing pens which need to be redesigned). Madras Crocodile Bank expects the development to cost around Rs. 17 crores and this is to be arranged through capital campaigns and fund raising drives. The implementation of the Master Plan and the proposed budget will also require funding from government and other sources, which shall be explored as applicable.

Due to the staggered development of the Madras Crocodile Bank / Center for Herpetology, the species mentioned in the species collection plan will be collected and added at intervals when new sections are completed.

b. Construction & development

Following is a brief description of each activity that the Madras Crocodile Bank proposes to undertake, provided the provision of adequate funding.

Entrance Area and Parking Lot:

- * Emphasis is placed on improving the entrance and making the "face" of the Madras Crocodile Bank attractive and inviting. Madras Crocodile Bank frontage will be made more attractive, visitor friendly and parking facilities will be upgraded to cope with the increasing load facilitated by booming tourism to Mamallapuram and Pondicherry

Tourist resting spots

This would include activities like landscaping, development of parks, fencing, compound walls, and related works.

- * Small parks will be developed as tourist resting spots, along with small kiosks and play areas for children
- * Fencing will be made more attractive and provide better security for visitors
- * Grading and landscaping will improve the aesthetic quality of the area; waste collection and handling will be further improved

Improvement in solid waste management and sewerage management to international standards

Solid waste collection receptacles will be placed at more frequent intervals

- * Waste will be segregated and composted, wherever possible
- * Recycled containers will be encouraged, and plastic bags discouraged at all outlets
- * Sewerage will continue to be scientifically managed, and improvements will be made to water-saving technologies currently in use
- * Awareness programs will be conducted in the village for the construction and use of low-cost, ecologically designed toilets

Construction of wayside amenities

- * Well maintained toilets will be provided at more frequent intervals for the use of visitors and their drivers
- * Shops showcasing local arts and crafts will be promoted and their design made attractive to tourists with a price range to cater to both economy and high end visitors

Signage

- * Signage will be improved and numbers of informative and educational signs will be increased, specifically designed to cater to multi-lingual visitation
- * Local artists will be contracted to make new signs and improve existing ones using local materials, such as carved stone slabs, and make them more attractive to visitors
- * Training will be given to develop the marketing and advertising skills of local people, interaction with the public, and cleanliness of the area

Reception Centre

- * A reception centre will be built to increase the visibility of the Madras Crocodile Bank and showcase local heritage
- * Information on environmental and social issues will be highlighted using attractive and informative displays

Public exhibits:

For most of the reptiles, especially crocodylians, top-side and underwater exhibits are proposed. The size of exhibits will be standardized (average stocking one male, one to three females) , so there is space for future collection plans.

Off-exhibit enclosures:

For surplus animals and gene bank maintenance, the construction or renovation of off-exhibit enclosures is proposed.

Library:

It is proposed to computerize the library with security measures and to increase the space for using it as a conference room as well.

Education/ Public Awareness-Center:

This will include structure and equipment for continuous shows of reptile films, power-points, televised talks and demonstrations. There will be set times for particular programs.

Lab/Vet Lab

Well equipped labs for both the zoo needs as well as for in-situ research and training courses.

Behavioral study and filming facilities

Off-exhibit underwater and top-side enclosures, naturally designed and landscaped, for studies as well as filming.

Senior Staff Quarters, Researcher and Paying Volunteers quarters, Students Dorm, Up market visitor huts for eco-tourists, Public toilets, Feed Shed and maintenance shed - projects to be developed within the next 10 years and when capital / funding will be available

c. Day to day maintenance

During all the proposed development and construction work the day to day maintenance schedule needs to be secured. It is not possible and not proposed to close the zoo during all these activities of development.

PART III

CHAPTER XI- MANAGEMENT PLAN (BUDGET)

As of now, the budget breakdown is broad (as given above in Chapter X table) and will be implemented as per funds received. It shall be the goal of the Madras Crocodile Bank to implement the various changes indicated in the Master Plan in a phased manner, in a way which causes least disturbance to the animals at the zoo and as little interruption of the zoo operations as possible. As more details emerge regarding amounts and timelines, these will be sent to CZA.

PART - IV

Annexures

- a. Layout Plan (already approved)
- b. Layout map indicating distribution of electricity line
- c. Layout map indicating storm water
- d. Older maps - not applicable
- e. Existing animal collection plan / inventory (male : female)
- f. Free living species in the zoo campus
- g. Flora and fauna
- h. Staffing pattern.
- i. List of buildings, other than animal enclosures
- j. Document evidencing legal status of land (trust deed)

Note: the above are in line with the Annexures indicated in the CZA Checklist for Master Plan, Part IV

Annexure (a)

Layout plan depicting the future setup

Please see attached.

LAY OUT PLAN OF MADRAS CROCODILE BANK TRUST, MAMALLA PURAM

Annexure (a)



THIS DRAWING AND DESIGN ARE THE SOLE PROPERTY OF THE ARCHITECT AND SHALL NOT BE REPRODUCED, COPIED, REPRODUCED OR USED IN ANY OTHER MANNER WITHOUT THE WRITTEN CONSENT OF THE ARCHITECT.



Approved
entails
 B.S. BOND
 Member Secretary
 Central Zoo Authority
 (Ministry of Environment & Forests)
 Govt. of India, New Delhi

LEGEND - SYMBOLS

BUILDING - EXISTING	[Symbol]
BUILDING - PROPOSED	[Symbol]
BUILDING - MODIFIED/ADDITIONS	[Symbol]
VISITOR PATHWAY - EXISTING	[Symbol]
VISITOR PATHWAY - PROPOSED	[Symbol]
SERVICE PATHWAY - EXISTING	[Symbol]
SERVICE PATHWAY - PROPOSED	[Symbol]
SERVICE ROAD - PROPOSED	[Symbol]
ENCLOSURE - EXISTING	[Symbol]
ENCLOSURE - PROPOSED	[Symbol]
ENCLOSURE - MODIFIED/ADDITIONS	[Symbol]
TO BE DEMOLISHED/REMOVED	[Symbol]
EXISTING CONTOURS	[Symbol]
EXISTING TREES	[Symbol]
GREEN BELT	[Symbol]
DRINKING WATER POINT	[Symbol]
TOILET	[Symbol]
SHELTER	[Symbol]
KIOSK	[Symbol]
PRIMARY CIRCULATION ROUTE	[Symbol]
SECONDARY CIRCULATION ROUTES	[Symbol]
VIEWING GALLERY	[Symbol]
1 METRE WALL	[Symbol]

LEGEND - ENCLOSURES

ASIAN SECTION	THE AMERICAS SECTION
E.01 GHAFIAL / KACHUGA	E.09 HOPELET'S CROCODILE + MUSK TURTLE
E.02 PHILIPPINE CROCODILE	E.10 YOUNG CROCODILE DISPLAY
E.03 SIAMESE CROCODILE	E.12 ORINOCO CROCODILE
E.04 AUSTRALIAN FRESHWATER CROCODILE + AUSTRALIAN LIZARDS + SNAKES	E.13 AMERICAN CROCODILE
E.05 TOHISTOMA + TURTLES	E.14 AMERICAN ALLIGATOR
E.06 NEW GUINEA CROCODILE + TURTLES + SNAKES	E.15 CUBAN CROCODILE
E.07 SALTWATER CROCODILE	E.16 YOUNG CROCODILES + LIZARDS + TURTLES
E.08 MUGGER CROCODILE + INDIAN SNAKES + SMALL LIZARDS + TURTLES	
E.11 GHAFIAL RIVER DISPLAY	

LEGEND - ENCLOSURES

THE AMAZON SECTION	INTERPRETATION CENTRE
E.17 SPECTACLED CAIMAN	B.19 YOUNG CROCODILIANS + YOUNG TURTLES + SMALL LIZARDS + SNAKES + CHINESE ALLIGATOR
E.18 SMOOTH-FRONTED CAIMAN + TURTLES	E.27 "JAW'S IN" (SALTWATER CROCODILES)
E.19 DWARF CAIMAN + TURTLES	E.28 ALGABA TORTOISE + SULEATA TORTOISE
E.20 BOA CONSTRICTOR + TURTLES	
E.21 BLACK CAIMAN	
E.22 ANACONSAS	
E.23 YACARE CAIMAN	
E.24 PIRANHAS	
E.25 BROAD-SHOULDER CAIMAN	
E.26 GREEN NOUANA + RHINOCEROS ISUANA	

LEGEND - ENCLOSURES

AFRICAN SECTION	CHILDREN'S SECTION	LAND OF THE DRAGONS
E.31 WEST AFRICAN OHARB CROCODILE	E.30 SMALL TORTOISES	E.35 KEMOOD DRAGONS + ASIAN WATER MONITOR LIZARD
E.32 AFRICAN SLENDER-SINGUATED CROCODILE	E.32 CROCODILE UNDERWATER VIEWING	
E.34 NILE CROCODILE		

LEGEND - BUILDINGS AND FACILITIES

B.01 ENTRANCE BLOCK 01	F.01 2-WHEELER PARKING
B.02 ENTRANCE BLOCK 02	F.02 VISITORS' CAR PARKING
B.03 FEED STORAGE	F.03 BUS BAY
B.04 STORAGE	F.04 ENTRANCE PLAZA
B.05 HOSPITAL / VET UNIT	F.05 CHILDREN'S PLAY AREA
B.06 LIBRARY	F.06 NURSERY PEN
B.07 INCUBATION COGH	F.07 HOLDING PEN
B.08 LABORATORY	F.08 STAFF CAR PARKING
B.09 SMALL REPTILE HOLDING PENS	F.09 CARCASS DISPOSAL
B.10 SMALL REPTILE HOLDING PENS	
B.11 FEED SHED	
B.12 VISITORS' TOILETS	
B.13 KEEPER'S RESTROOM	
B.14 GARAGE	
B.15 WORKSHOP	
B.16 FEED SHED	
B.17 AUTOPSY ROOM	
B.18 STAFF QUARTERS	
B.19 INTERPRETATION CENTRE	
B.20 WATER VIEWING AREA	

AREA STATISTICS
 TOTAL SITE AREA = 34,641.45 SQ.M.
 TOTAL ENCLOSURE AREA = 10,713.99 SQ.M.

NOTES
 THIS DRAWING IS BASED ON SURVEY DRAWING PROVIDED BY THE CLIENT. CONTOUR INTERVAL IS 0.30 M.
 ALL DIMENSIONS ARE IN METRE. ALL DIMENSIONS TO BE READ AND NOT BRASSHED.
 ANY DIMENSIONS TO BE BROUGHT TO THE NOTICE OF THE ARCHITECT IMMEDIATELY.

SCALE: 1:500

DRAWN: JOHN CHANDRASEKHAR
 DATE: 07/03/2012
 CHECKED: PRADEEP KUMAR

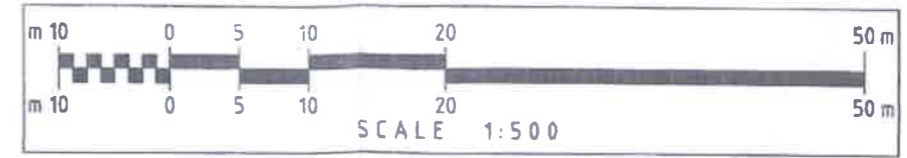
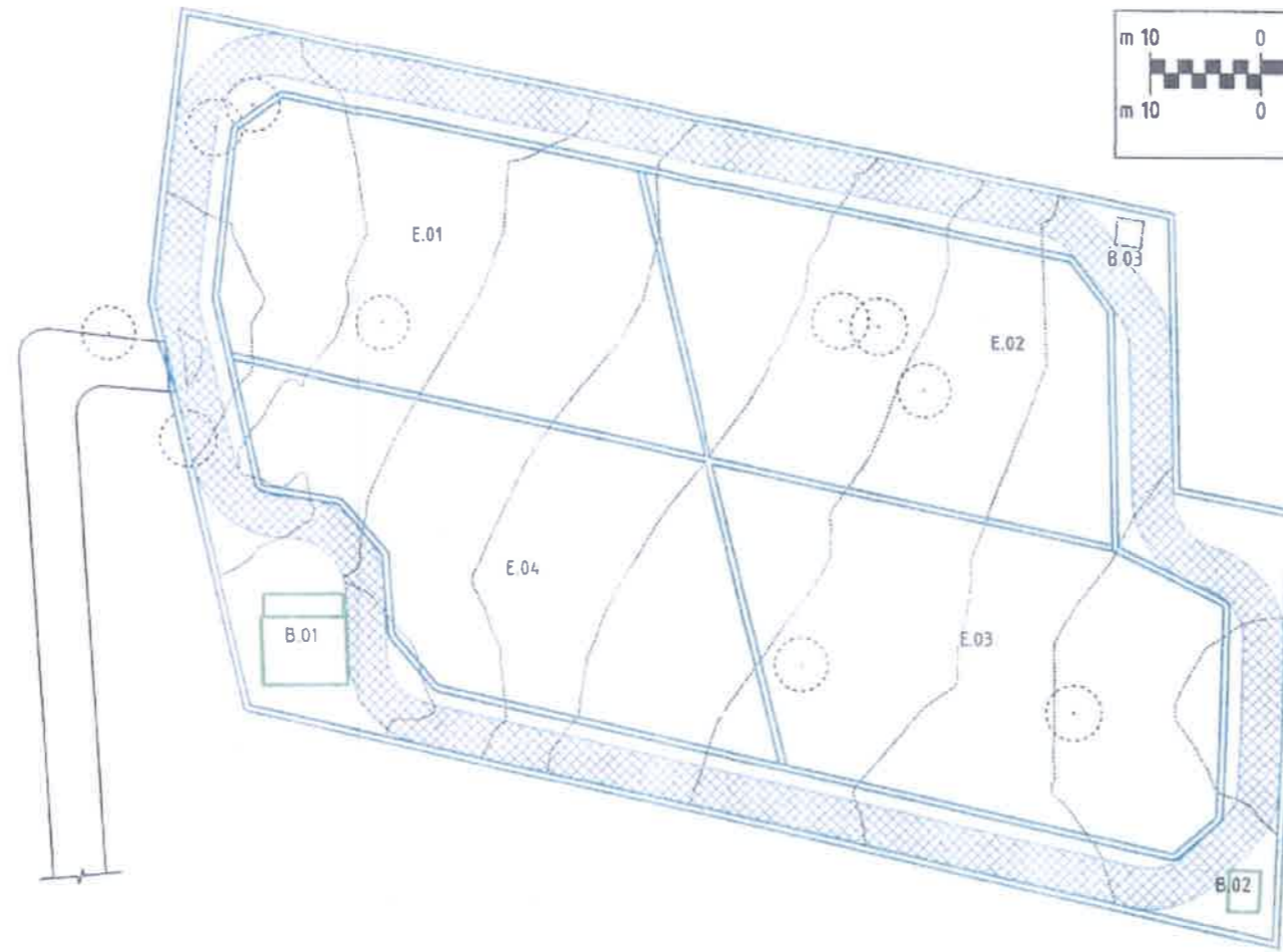
SHEET: PROPOSED LAYOUT MAIN FACILITY [EAST COAST ROAD]

CLIENT: THE MADRAS CROCODILE BANK TRUST

PROJECT: MADRAS CROCODILE BANK MASTER PLAN

ARCHITECT: DIAGRAMMAR

OFF-DISPLAY FACILITY FOR MCBT MAMILLA PURAM



LEGEND :: SYMBOLS

BUILDING :: EXISTING	[Solid black line]
BUILDING :: PROPOSED	[Dashed blue line]
BUILDING :: MODIFIED/ADDITIONS	[Dotted black line]
VISITOR PATHWAY :: EXISTING	[Thin solid line]
VISITOR PATHWAY :: PROPOSED	[Thin dashed blue line]
SERVICE PATHWAY :: EXISTING	[Thin solid line with hatching]
SERVICE PATHWAY :: PROPOSED	[Thin dashed blue line with hatching]
ENCLOSURE :: EXISTING	[Thick solid black line]
ENCLOSURE :: PROPOSED	[Thick dashed blue line]
ENCLOSURE :: MODIFIED/ADDITIONS	[Thick dotted black line]
TO BE DEMOLISHED/REMOVED	[Dashed red line]
EXISTING CONTOURS	[Thin solid line with dots]
EXISTING TREES	[Circle with dot]
2 METRE WALL	[Thick solid blue line]

LEGEND :: ENCLOSURES

E.01	CROCODILES
E.02	CROCODILES
E.03	CROCODILES
E.04	CROCODILES

LEGEND :: BUILDINGS

B.01	CARETAKER'S + FEED SHED
B.02	ELECTRICAL ROOM
B.03	PUMP ROOM

AREA STATEMENT

TOTAL SITE AREA : 3799.74 SQ.M.
TOTAL ENCLOSURE AREA : 2591.26 SQ.M.

Approved
15/11/13
Member Secretary
Central Zoo Authority
(Ministry of Environment & Forests)
Govt. of India, New Delhi

15/11/13
15/11/13

R. B. A.
15/11/13

THIS DRAWING AND DESIGN ARE THE SOLE PROPERTY OF THE ARCHITECT AND SHALL NOT BE TRACED, COPIED, REPRODUCED, MODIFIED OR LENT IN ANY OTHER MANNER WITHOUT THE PRIOR WRITTEN CONSENT OF THE ARCHITECT

NOTES
THIS DRAWING IS BASED ON SURVEY DRAWING PROVIDED BY THE CLIENT
CONTOUR INTERVAL IS 0.250 m

ALL DIMENSIONS ARE IN METRIC
ALL DIMENSIONS TO BE READ AND NOT MEASURED ANY DISCREPANCIES TO BE BROUGHT TO THE NOTICE OF THE ARCHITECT IMMEDIATELY

SCALE :: 1:500
DRWN:: JOHN | CHKD:: KALPANA
DATE: 20.11.2012
DWG.NO: 010 | CROC | MP | SAT | PL-PR



SHEET
PROPOSED LAYOUT
SATELLITE FACILITY
[THANDARAI]

(OFF-DISPLAY)

CLIENT
THE MADRAS CROCODILE BANK
TRUST

ARCHITECTS
DIAGRAMMAR



1008 1st Flr, 22 Church Road, Madurai, Tamil Nadu 625 004 | www.diagrammar.in

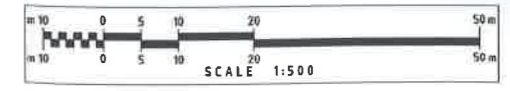
Annexure (b)

Annexure (c)

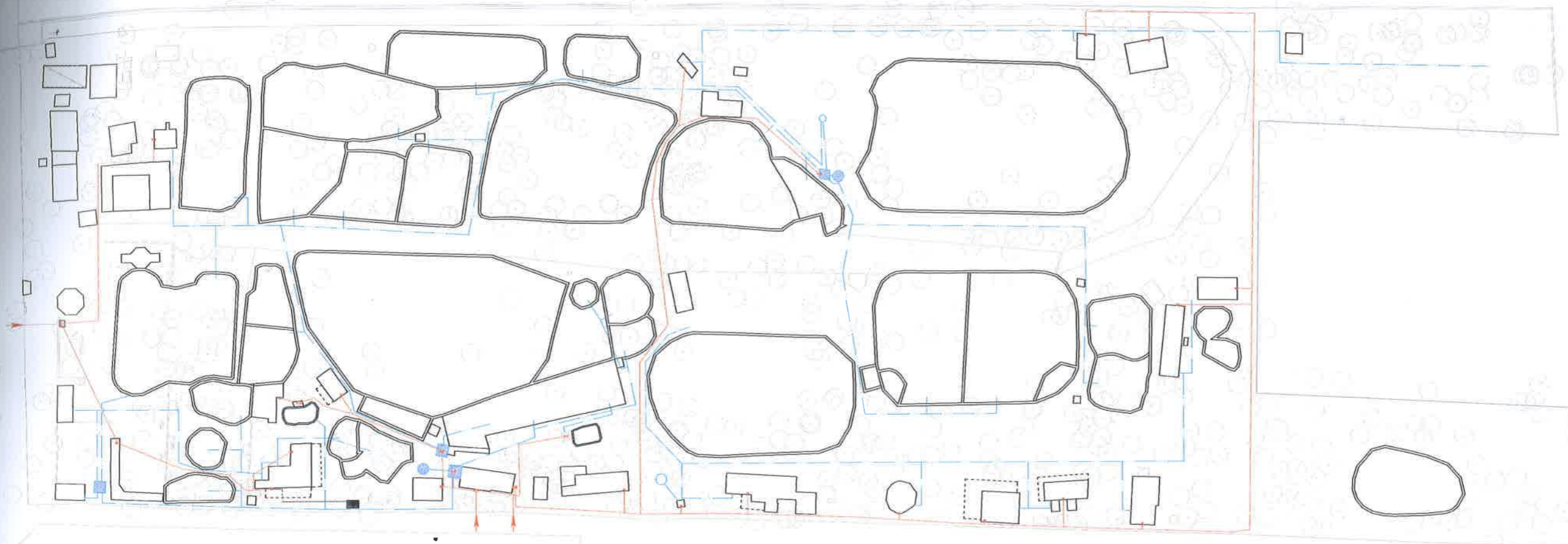
Layout map indicating distribution of electricity line

Layout map indicating storm water

Please see attached.



THIS DRAWING AND DESIGN ARE THE SOLE PROPERTY OF THE ARCHITECT AND SHALL NOT BE REPRODUCED, COPIED, REPRODUCED, MODIFIED OR LENT IN ANY OTHER MANNER WITHOUT THE PRIOR WRITTEN CONSENT OF THE ARCHITECT



NOTES
THIS DRAWING IS BASED ON SURVEY DRAWING PROVIDED BY THE CLIENT
CONTOUR INTERVAL IS 0.50 m

ALL DIMENSIONS ARE IN METRIC
ALL DIMENSIONS TO BE READ AND NOT ASSUMED
ANY DISCREPANCIES TO BE BROUGHT TO THE NOTICE OF THE ARCHITECT IMMEDIATELY

SCALE: 1:500
DRAWN: JOHNS | CHECK: KALPANA
DATE: 20.11.2012
DWG NO: 010 | CROC(MP) | MAIN | PL-EL

SHEET
ELECTRICAL + PLUMBING
LAYOUT : MAIN FACILITY
[EAST COAST ROAD]

CLIENT
THE MADRAS CROCODILE BANK
TRUST

PROJECT
MADRAS CROCODILE BANK
MASTER PLAN

ARCHITECTS
DIAGRAMMAR

LEGEND - SYMBOLS	
PLUMBING - PUMP HEAD	
PLUMBING - WELL	
PLUMBING - WATER LINES	
ELECTRICAL - EB METER	
ELECTRICAL - PUMP	
ELECTRICAL - ROUTING	
ELECTRICAL - INCOMING LINE	

Annexure (d)

Older maps if available to indicate stages of development - NOT APPLICABLE

Existing Animal Collection Plan / Inventory (Male:Female)

	Species	Common Name
	CROCODILIANS	
1	<i>Crocodylus palustris</i>	Mugger or marsh crocodile
2	<i>Crocodylus porosus</i>	Saltwater Crocodile
3	<i>Gavialis gangeticus</i>	Gharial
4	<i>Caiman crocodylus</i>	Spectacled Caiman
5	<i>Caiman yacare</i>	Yacare Caiman
6	<i>Paleosuchus palpebrosus</i>	Cuvier's Dwarf Caiman
7	<i>Alligator mississippiensis</i>	American Alligator
8	<i>Crocodylus siamensis</i>	Siamese Crocodile
9	<i>Crocodylus niloticus</i>	Nile Crocodile
10	<i>Mecitops cataphractus</i>	African Slender Snouted Crocodile
11	<i>Osteolaemus tetraspis</i>	West-African Dwarf Crocodile
12	<i>Crocodylus moreletti</i>	Morelet's Crocodile
13	<i>Tomistoma schlegelii</i>	Tomistoma
14	<i>Crocodylus johnstoni</i>	Australian Fresh-water Crocodile
15	<i>Crocodylus rhombifer</i>	Cuban Crocodile
16	<i>Melanosuchus niger</i>	Black Caiman
17	<i>Paleosuchus trigonatus</i>	Scheider's Dwarf Caiman

18	<i>Caiman latirostris</i>	Broad Snouted Caiman
	TOTAL 18 Species	
	SNAKES	
1	<i>Python molurus</i>	Indian Rock Python
2	<i>Python reticulatus</i>	Reticulated Python
3	<i>Naja naja</i>	Spectacled Cobra
4	<i>Eryx whitakerii</i>	Whitaker's Sand Boa
5	<i>Coelognathus helena helena</i>	Trinket Snake
6	<i>Eunectes notaeus</i>	Yellow Anaconda
7	<i>Eunectes murinus</i>	Green Anaconda
8	<i>Lampropeltis triangulum sinaloae</i>	Sinaloan Milk Snake
	TOTAL 8 Species	
	FRESHWATER TURTLES	
1	<i>Nilssonina gangetica</i>	Indian soft shelled turtle
2	<i>Lissemys punctata andersonii</i>	Indian flapshell turtle
3	<i>Lissemys punctata</i>	Indian flapshell turtle
4	<i>Batagur baska</i>	River terrapin
5	<i>Batagur kachuga</i>	Red-crowned Roof Turtle
6	<i>Batagur dhongoka</i>	Three striped Roof Turtle
7	<i>Pangshura tectum</i>	Indian Roofed Turtle
8	<i>Pangshura t. circumdata</i>	Indian Roofed Turtle

9	<i>Hardella thurjii</i>	Crowned River Turtle
10	<i>Geochelone elegans</i>	Star Tortoise
11	<i>Indotestudo travancorica</i>	Travancore tortoise
12	<i>Melanochelys trijuga</i>	Indian Black Pond Turtle
13	<i>Dipsochelys gigantea</i>	Aldabra Giant Tortoise
14	<i>Staurotypus triporcatus</i>	Mexican Giant Musk Turtle
TOTAL 14 Species		
LIZARDS		
1	<i>Dracaena guianensis</i>	Caiman Lizard
2	<i>Tiliqua scincoides</i>	Blue Tongue Skink
3	Iguana iguana	Green Iguana
4	<i>Psammophilus dorsalis</i>	Rock Agama
5	<i>Hemidactylus triedrus</i>	Termite Hill Gecko
TOTAL: 5 Species		

Inventory (Male : Female)

Name of Animal		Male	Female	Unknown
Caiman Dwarf	<i>Paleosuchus palpebrosus</i>	1	1	17
Caiman Spectacled	<i>Caiman crocodylus</i>			49
Caiman Yacare	<i>Caiman yacare</i>		3	
Crocodile Aligator American	<i>Alligator mississippiensis</i>		2	
Crocodile Australian Freshwater	<i>Crocodylus johnstoni</i>	1		
Crocodile False Gharial	<i>Tomistoma schlegelii</i>	1	1	
Crocodile Long Snouted (Gharial)	<i>Gavialis gangeticus</i>	3	5	61
Crocodile Marsh (Muggger)	<i>Crocodylus palustris</i>			1860
Crocodile Morelets	<i>Crocodylus moreletii</i>	1	2	13
Crocodile Nile	<i>Crocodylus niloticus</i>	2	3	7
Crocodile Salt Water	<i>Crocodylus porosus</i>	6	5	28
Crocodile Siamensis	<i>Crocodylus siamensis</i>	1	1	32

Crocodile Snouted African Slender	<i>Mecistops cataphractus</i>		4	
Crocodile West African Dwarf	<i>Osteolaemus tetraspis</i>	2		
Python Indian - Rock	<i>Python molurus</i>	1	1	24
Python Regal / Reticulated	<i>Python reticulatus</i>		1	
Cobra Indian	<i>Naja naja</i>	1		
Terrapin River (batagur)	<i>Batagur baska</i>		2	
Crowned river turtle	<i>Hardella thurjii</i>		1	
Tortoise Aldabra/Giant	<i>Dipsochelys gigantea</i>			4
Tortoise Indian Star	<i>Geochelone elegans</i>			8
Turtle Crowned River/Roof	<i>Batagur dhongoka</i>	1	4	0
Turtle Fresh Water / Indian Soft-shelled	<i>Lissemys punctata</i>			44
Turtle Ganges Soft-shelled	<i>Nilssonina gangeticus</i>			9
Turtle Indian Roofed	<i>Pangshura tentoria circumdata</i>			26
Turtle Indian Tent	<i>Pangshura tecta</i>			2
Travancore tortoise	<i>Indotestudo travancorica</i>			25
Turtle Red Crowned Roofed	<i>Batagur kachuga</i>			89
Caiman Lizard	<i>Draceana guianensis</i>		1	
Cuban crocodile	<i>Crocodylus rhombifer</i>	2	3	
Black caiman	<i>Melanosuchus niger</i>		1	
Cuvier's dwarf caiman	<i>Paleosuchus trigonatus</i>	1	1	
Rock agama	<i>Psammaophilis dorsalis</i>	1	1	0
Blue tongued lizard	<i>Tiliqua scincoides</i>	1	1	0
Trinket snake	<i>Coegenanathus helena</i>	1	2	0
Milk snake	<i>Lampropeltis spp.</i>	0	0	1
Green Iguanas	<i>Iguana iguana</i>			3
Green anaconda	<i>Eunectes murinus</i>			2
Yellow anaconda	<i>Eunectes notaeus</i>			3
Termite Hill Gecko	<i>Hemidactylus triedrus</i>	1	2	0
Total		28	48	2307

Free living species occurring in the zoo campus**Annexure (f)****Flora and Fauna****Annexure (g)**

The below listing of flora and fauna also includes free living species occurring in the zoo campus – item (f) in Part IV, Annexures to the Master Plan. Annexures (f) and (g) are thus combined.

FLORA**TREES**

Botanical Name	Family	Local Name
1. Calophyllum inophyllum	Clusiaceae	Punnai
2. Terminalia bellirica	Combretaceae	Thandri
3. Wrightia tinctoria	Apocynaceae	Veppalai
4. Pterocarpus marsupium	Fabaceae	Vaengai
5. Acacia auriculiformis	Mimosaceae	Seemai kodukapuli
6. Tamarindus indica	Caesalpiniaceae	Puli
7. Albizia lebeck	Mimosaceae	Vaahai
8. Crateva adansonii	Capparidaceae	Maavilingam
9. Leucaena leucocephala	Mimosaceae	Javundili
10. Bassia latifolia	Sapotaceae	Iluppai
11. Crescentia cujete	Bignoniaceae	Thiruvottukkai
12. Polyalthia longifolia	Annonaceae	Nettilingam
13. Ficus religiosa	Moraceae	Arasan
14. Morinda pubescens	Rubiaceae	Nuna
15. Annona squamosa	Annonaceae	Seetha
16. Cordia oblique	Cordiaceae	Naruvuli, Mookuchali
17. Syzygium cumini	Myrtaceae	Naaval
18. Terminalia catappa	Combretaceae	Naattu badam
19. Grevillea robusta	Proteaceae	Silver oak
20. Terminalia arjuna	Combretaceae	Marudhu
21. Delonix regia	Caesalpiniaceae	Neruppu kondrai
22. Azadirachta indica	Meliaceae	Vaambu
23. Mangifera indica	Anacardiaceae	Maa
24. Borassus flabellifer	Arecaceae	Panai
25. Caesalpinia bonduc	Caesalpiniaceae	Kazharchikkai
26. Millingtonia hortensis	Bignoniaceae	Maramalli
27. Ziziphus jujube	Rhamnaceae	Illandai

28. <i>Drypetes roxburghii</i>	Euphorbiaceae	Vellaiazhinjil
29. <i>Mimusops elengi</i>	Sapotaceae	Magudam
30. <i>Erythrina variegata</i>	Fabaceae	Kalyana murakkan
31. <i>Citrus aurantifolia</i>	Rutaceae	Ellumichai
32. <i>Ficus benghalensis</i>	Moraceae	Aalam
33. <i>Carica papaya</i>	Caricaceae	Pappali
34. <i>Peltophorum pterocarpum</i>	Caesalpiniaceae	Ayalvaahai
35. <i>Cycas circinalis</i>	Cycadaceae	NA
36. <i>Caryota urens</i>	Arecaceae	Koondalpanai
37. <i>Anacardium occidentale</i>	Anacardiaceae	Mundiri
38. <i>Holoptelea integrifolia</i>	Ulmaceae	Aavi
39. <i>Thespesia populnea</i>	Malvaceae	Poovarasu
40. <i>Pongamia pinnata</i>	Fabaceae	Pungam
41. <i>Dalbergia lanceolaria</i>	Fabaceae	NA
42. <i>Sterculia foetida</i>	Sterculiaceae	Peenari, Paeyilavam
43. <i>Phoenix sylvestris</i>	Arecaceae	Eecham
44. <i>Albizia amara</i>	Mimosaceae	Usilai
45. <i>Tecoma stans</i>	Bignoniaceae	NA
46. <i>Eucalyptus globules</i>	Myrtaceae	Thailam
47. <i>Murraya exotica</i>	Rutaceae	Kattu karuvaepilai
48. <i>Lepisanthus tetraphylla</i>	Sapindaceae	Thoithan
49. <i>Butea monosperma</i>	Fabaceae	Murakkan
50. <i>Pisonia alba</i>	Nyctaginaceae	Nacchakotti
51. <i>Cassine glauca</i>	Celastraceae	NA
52. <i>Ailanthus excelsa</i>	Simaroubaceae	Peenari
53. <i>Garcinia spicata</i>	Clusiaceae	NA
54. <i>Strychnos nux-vomica</i>	Strychnaceae	Etti
55. <i>Chloroxylon swietenia</i>	Meliaceae	Porasu
56. <i>Gyrocarpus americanus</i>	Euphorbiaceae	Thanakku
57. <i>Samanea saman</i>	Mimosaceae	Thoongu moonchi maram
58. <i>Moringa pterygosperma</i>	Moringaceae	Murungai
59. <i>Casuarina equisetifolia</i>	Casuarinaceae	Savukku
60. <i>Lanea coromandelica</i>	Anacardiaceae	Odiyam
61. <i>Pithecellobium dulce</i>	Caesalpiniaceae	Kodukkapuli
62. <i>Guazuma tomentosa</i>	Sterculiaceae	Thaenpoosani
63. <i>Ceiba pentandra</i>	Bombacaceae	Ilavam panchu
64. <i>Barringtonia speciosa</i>	Lecythidaceae	NA
65. <i>Duranta repens</i>	Verbenaceae	NA
66. <i>Hibiscus tiliaceus</i>	Malvaceae	NA

SHRUBS

Botanical Name	Family	Local Name
1. <i>Justicia adhatoda</i>	Acanthaceae	Adathoda
2. <i>Calotropis gigantea</i>	Asclepiadaceae	Erukku

3. <i>Jatropha gossypifolia</i>	Euphorbiaceae	Karuppu kattamani
4. <i>Cassia alata</i>	Caesalpiaceae	Seemai agathi
5. <i>Rauvolfia tetraphylla</i>	Apocynaceae	Paambu kala
6. <i>Memecylon umbellatum</i>	Melastomataceae	Kasan
7. <i>Glycosmis mauritiana</i>	Rutaceae	Konji
8. <i>Hibiscus rosa-sinensis</i>	Malvaceae	Chembaruthi
9. <i>Pedilanthus tithymeloides</i>	Euphorbiaceae	Kannadikalli
10. <i>Lawsonia inermis</i>	Lythraceae	Marudhani
11. <i>Securinega leucopyrus</i>	Euphorbiaceae	Vellaipilianji
12. <i>Manihot esculenta</i>	Euphorbiaceae	Maravalli

CLIMBERS AND CREEPERS

Botanical Name	Family	Local Name
1. <i>Combretum albidum</i>	Combretaceae	Vadathiruppi
2. <i>Canavalia ensiformis</i>	Fabaceae	Thambattankai
3. <i>Abrus precatorius</i>	Fabaceae	Kundumani
4. <i>Bougainvillea glabra</i>	Nyctaginaceae	Kagithapoo
5. <i>Pergularia daemia</i>	Asclepiadaceae	Utthameni
6. <i>Clitoria ternatea</i>	Fabaceae	Sangupoo
7. <i>Cardiospermum halicacabum</i>	Sapindaceae	Mudakkathan
8. <i>Solanum trilobatum</i>	Solanaceae	Thoothuvalai
9. <i>Tiliacora acuminata</i>	Menispermaceae	Kodiyetti, Perum katukodi
10. <i>Tylophora indica</i>	Asclepiadaceae	Nanjaruppan
11. <i>Ipomoea quamoclit</i>	Convolvulaceae	Mayilmanikkam
12. <i>Coccinia grandis</i>	Cucurbitaceae	Kovai
13. <i>Mukia maderaspatana</i>	Cucurbitaceae	Musumusukai

HERBS

Botanical Name	Family	Local Name
1. <i>Waltheria indica</i>	Sterculiaceae	Pavala poondu
2. <i>Tridax procumbens</i>	Asteraceae	Vettu kaya poondu
3. <i>Commelina bengalensis</i>	Commelinaceae	Kanagkozhai
4. <i>Corchorus aestuans</i>	Tiliaceae	Punnakkukeerai
5. <i>Achyranthes aspera</i>	Amaranthaceae	Naayuruvi
6. <i>Hybanthus enneaspermus</i>	Violaceae	Oarithazh thamarai
7. <i>Vernonia cineria</i>	Asteraceae	Neichatti
8. <i>Euphorbia heterophylla</i>	Euphorbiaceae	Paalperukki
9. <i>Sida acuta</i>	Malvaceae	Arivapoondu
10. <i>Indoneesiella echioides</i>	Acanthaceae	Gopuram thangi
11. <i>Merremia tridentata</i>	Convolvulaceae	Avaiyarkoonthal
12. <i>Barleria prionitis</i>	Acanthaceae	Mullu kanakambaram
13. <i>Evolvulus alsinoides</i>	Convolvulaceae	Vishnukranthi

14. <i>Capsicum annum</i>	Solanaceae	Milagai
15. <i>Cymbopogon citratus</i>	Poaceae	Elumichampillu
16. <i>Sansevieria roxburghiana</i>	Agavaceae	Marul
17. <i>Sansevieria trifasciata</i>	Agavaceae	Varikathazhai
18. <i>Talinum triangulare</i>	Portulacaceae	Rajathikeerai
19. <i>Commelina erecta</i>	Commelinaceae	Silanthi kizhangu
20. <i>Acalypha indica</i>	Euphorbiaceae	Kuppai meni
21. <i>Andrographis paniculata</i>	Acanthaceae	Nilavaambu
22. <i>Catharanthus roseus</i>	Apocynaceae	Nithyakalyani
23. <i>Phyllanthus amarus</i>	Euphorbiaceae	Keezhanelli
24. <i>Boerhavia diffusa</i>	Nyctaginaceae	Mookkarattai
25. <i>Sida cordifolia</i>	Malvaceae	NA
26. <i>Solanum nigrum</i>	Solanaceae	Manithakkali
27. <i>Oldenlandia herbacea</i>	Rubiaceae	NA
28. <i>Glinus oppositifolius</i>	Molluginaceae	Thorakeerai
29. <i>Abutilon indicum</i>	Malvaceae	Thutthi
30. <i>Micrococca mercurialis</i>	Euphorbiaceae	NA
31. <i>Dipteracanthus prostratus</i>	Canthaceae	Vedikkai

FAUNA

ARACHNIDS

1. *Argiope versicolor*
2. *Argiope aemula*
3. *Argiope anasuja*
4. *Argiope pulchella*
5. *Gasteracantha geminata*
6. *Gasteracantha mammosa*
7. *Cyclosa insulana*
8. *Parawixia*
9. *Tetragnatha* sp.
10. *Leucauge decorata*
11. *Tetragnatha mandibulata*
12. *Theridion* sp.
13. *Hippasa* sp.
14. *Citrophora citricola*
15. *Citrophora cicatrosa*
16. *Crossopriza lyoni*
17. *Oxyopes rufisternum*
18. *Peucetia viridans*
19. *Oxyopes* sp.
20. *Pardosa pseudoannulata*
21. *Plexippus petersi*
22. *Plexippus paykulli*

23. *Telamonia dimidiata*
24. *Thomisus pugilus*
25. *Olios milleti*
26. *Neosparassus* sp.

1. *Turdoides affinis*
2. *Megalaima haemacephala*
3. *Merops philippinus*
4. *Merops orientalis*
5. *Pycnonotus cafer*
6. *Pycnonotus luteolus*
7. *Pycnonotus jocosus*
8. *Corvus splendens*
9. *Corvus macrorhynchos*
10. *Hierococcyx varius*
11. *Cacomantis passerines*
12. *Streptopelia chinensis*
13. *Dicrurus macrocercus*
14. *Nycticorax nycticorax*
15. *Ardeola grayii*
16. *Aegithina tiphia*
17. *Ceryle rudis*
18. *Alcedo atthis*
19. *Halcyon smyrnensis*
20. *Haliastur Indus*
21. *Milvus migrans*
22. *Haliaeetus leucogaster*
23. *Eudynamis scolopacea*
24. *Vanellus indicus*
25. *Acridotheres tristis*
26. *Oriolus oriolus*
27. *Otus bakkamoena*
28. *Athene brahma*
29. *Psittacula cyanocephala*
30. *Psittacula krameri*
31. *Copsychus saularis*
32. *Accipiter badius*
33. *Nectarinia lotenia*
34. *Nectarinia zeylonica*
35. *Artamus fuscus*
36. *Apus affinis*
37. *Cypsiurus balasiensis*
38. *Dendrocitta vagabunda*
39. *Amaurornis phoenicurus*
40. *Dinopium benghalense*

BIRDS

- White headed babbler
- Coppersmith barbet
- Blue tailed bee-eater
- Small bee-eater
- Red vented bulbul
- White browed bulbul
- Red-whiskered bulbul
- House crow
- Jungle crow
- Common hawk cuckoo
- Indian plaintive cuckoo
- Spotted dove
- Black drongo
- Black crowned night heron
- Indian pond heron
- Common iora
- Pied kingfisher
- Small blue kingfisher
- White throated kingfisher
- Brahminy kite
- Black kite
- White bellied sea eagle
- Asian koel
- Red-wattled lapwing
- Common myna
- Eurasian golden oriole
- Collared scops owl
- Spotted owlet
- Blossom headed parakeet
- Rose ringed parakeet
- Oriental magpie robin
- Shikra
- Loten's sunbird
- Purple rumped sunbird
- Ashy swallow shrike
- House swift
- Asian palm swift
- Indian treepie
- White breasted waterhen
- Lesser flameback woodpecker

41. *Clamator coromandus*
42. *Zoothera citrina*
43. *Ardea alba*
44. *Egretta garzetta*
45. *Bubulcus ibis*
46. *Mesophoyx intermedia*
47. *Phalacrocorax niger*
48. *Muscicapa dauurica*
49. *Terpsiphone paradisi*
50. *Dendronanthus indicus*
51. *Motacilla flava*
52. *Pericrocotus cinnamomeus*
53. *Tyto alba*
54. *Pitta brachyura*
55. *Ptyonoprogne concolor*
56. *Centropus sinensis*
57. *Otus bakkamoena*
58. *Upupa epops*
59. *Orthotomus sutorius*
60. *Prinia socialis*

- Chestnut winged cuckoo
- Orange headed thrush
- Great egret
- Little egret
- Cattle egret
- Intermediate egret
- Little cormorant
- Asian brown flycatcher
- Asian paradise flycatcher
- Forest wagtail
- Yellow wagtail
- Small minivet
- Barn owl
- Indian pitta
- Dusky crag martin
- Greater coucal
- Collared scops-owl
- Common hoopoe
- Common tailorbird
- Ashy prinia

LIZARDS

1. *Calotes versicolor*
2. *Mabuya carinata*
3. *Sitana ponticeriana*
4. *Chamaeleo zeylanicus*
5. *Hemidactylus frenatus*
6. *Hemidactylus leshenaultii*
7. *Hemidactylus flaviviridis*
8. *Hemidactylus brookii*
9. *Varanus bengalensis*
10. *Lygosoma punctata*

- Common garden lizard
- Brahminy skink
- Fan-throated lizard
- Indian chameleon *rare
- Southern house gecko
- Bark gecko
- Common house gecko
- Brook's gecko
- Common Indian monitor lizard
- Striped skink

SNAKES

1. *Ptyas mucosa*
2. *Amphiesma stolata*
3. *Macrophistodon plumbicolor*
4. *Ahaetulla nasuta*
5. *Dendrelaphis tristis*
6. *Lycodon aulicus*
7. *Lycodon striatus*
8. *Eryx johnii*
9. *Bungarus caeruleus*
10. *Naja naja*

- Indian rat snake
- Stripped keelback
- Green keelback
- Common vine snake
- Common Bronzeback tree snake
- Common wolf snake
- Barred wolf snake
- Common sand boa
- Common krait
- Spectacled cobra

Staffing pattern

The staff profile will remain as per the list given in the General Zoo Administration section (Chapter II, c). For the sake of completeness of this section, the main positions are reproduced below:

List of Honorary and Paid Positions at Madras Crocodile Bank

Ex-Officio Trustees

Mr. Romulus Whitaker (Founder)

The Regional Deputy Director (Wildlife Preservation, Southern Region)

The Joint Director Tamil Nadu Tourism Department

Trustees

Mr. Ashish Gupta

Samit Sawhny

Ms Zahida Whitaker

R. C. Swamy

Ms. Kamini Sundaram

Satyajit Mayor

ADMINISTRATIVE/RESEARCH PERSONNEL

Chief Executive Officer

K. Muralidharan

Director, Research and Conservation

Dr Ravi Chellam

Asst Director/ Onsite veterinarian

Dr Gowri Mallapur

Curator

Nikhil Whitaker

Curatorial Assistants

Ajay Kartik & Aaranya Gayathri

Executive officer (GCA)

Tarun Nair

Education Officer

Sandeep Varma

Program Manager

Mittal Gala

Marketing and promotions

Vineeth Vincent

ANET Asst Director

Tasneem Khan

ANET Research Co-ordinator

Saw John Aung Thong

ANET Admin Officer

Jocelyn Panjikanan

ANET Education Officer

Smita Madhoosudan

Researchers

Accounts and Maintenance Staff

Note: The existing staff strength may be increased during the implementation of the Master Plan based on requirement, work load and other factors.

List of buildings other than animal enclosures

1. Toilet Block
2. Ticket Counter
3. Gift Shop
4. Veterinary / Incubation labs
5. Administrative Office
6. Library
7. Curator's Office
8. Education Officer's Office
9. Assistant Curator's Office
10. Audio-visual room
11. Director's House
12. Guest House (3 nos.)
13. Puppet Theatre
14. Feed storage room
15. Maintenance shed
16. Pump shed (3 nos.)

Other documents, notifications, etc.

Please see Trust Deed attached indicating ownership of land.



4 JUL 7
1155
24.826

444927 V. Jhinu vengadam
V. சி. வெங்கடாசலி
Phone: 444927
முத்துமங்கலம் கம்பவுரை, V. V. DEVAN & CO
No. 1, கங்குல் பஸ்ஸ்டேட் சி.டி., 4/105, MOUNT RD.
கோட்டை-18, தாய்மரடு. Teynampet, MADRAS 18

The Madras Crocodile Bank Trust

THIS INDENTURE OF DEED OF DECLARATION OF TRUST and appointment of Trustees required at Madras this 26th day of August, 1976 between Madras Snake Park Trust represented by its Director, Romulus Whitaker and having its registered office at Deer Park, Madras.600 022, and The World Wildlife Fund - India having their registered office at Hornbill House, Shahid Bhagat Singh Road, Bombay 400 023, (herein-after called the AUTHORS of the Trust), which expression wherever used in these presents shall subject to the context mean and include their heirs and each of their heirs, executors, administrators, successors, in office legal and Personal representatives and assigns witnesseth:

WHEREAS based on a world wild study by the Survival Service Commission of the International Union for the Conservation of Nature and Natural Resources, Switzerland, and World Wildlife Fund, Switzerland, and on recommendations made by the

Romulus Whitaker



1028 -
K

Document No 1028 of 1976
Containing 13 Sheets

[Signature]
Joint Sub-Registrar
Exercising Powers of
District Registrar.

Presented to the effect of the [redacted]
of Madras and Law of No. 278-50
and between [redacted] and [redacted]

[Signature] by
Ayym Uo Romulus Whitaker

EXECUTION ADMITTED BY

Romulus Whitaker, Director Madras
son of Dr. R. E. Whitaker
24 Arundale Nagar
Madras 41

IDENTIFIED BY

[Signature] Nandagopal s/o Rama Srinany, no: 65,
Srinanthi St, Madras-1. (Bar)
S D Chae ~~Chaitanya~~ s/o. Dama Vandaravan, Madras
village. Madras 73 (Employee)

[Signature] Ayym Uo

[Signature]

Joint Sub-Registrar
Exercising Powers of
District Registrar.

Registered no 1028 of 1976
of Part 4 Volume 415
pages 235 to 242



9267
NIPP

1156
24.876

The Madras Crocodile Bank
Trust

V. Thiruvengadam
Card No: 444827

V. சிவசுந்தரம்
சென்னை நகர நிர்வாகம்,
சா. 1, கந்தி ஸ்டேஷன் சா. 1,
சென்னை-18, தமிழ்நாடு.

-page two-

Indian Board for Wildlife, New Delhi, through their various publications and Madras Snake Park Trust under its Reptile Preservation and Research Programme it is considered necessary and urgent to start a Trust so as to undertake,

creation of a Crocodile Bank for the 3 endangered species of the Indian type, the Marsh, the Salt Water and the Gharial.

AND WHEREAS the World Wild Life Fund-India, initially sponsored the preliminary survey of the crocodiles of India during 1973/74 by way of grants and followed up with an offer to support our co-ordinated effort to protect and save the 3 endangered species arising out of the survey report.

AND WHEREAS the Madras Snake Park Trust along with World Wildlife Fund who had already conducted a survey of the crocodiles in India and having the capacity and technical knowhow

Ronulus Whitaker



925
NNT

1157
24.8.76

The madras CROCODILE BANK
Trust

V. Jhinu Vengadam
Gardhul: 44
V. Jhinu Vengadam
Gardhul: 44
Gardhul-18. Gardhul.

-page three-

to start the conservation of the 3 endangered species and whereas the World Wildlife Fund and the Madras Snake Park are now desirous of starting a Crocodile Bank in the interest of the abovenamed and attainment of the following objects, namely:

- a) to study croc^odilians and promote public appreciation of the role of these reptiles in nature and to exhibit these animals in natural surroundings for the education of the public which is of foremost importance in preventing their exterminations in future;
- b) to educate the public by encouraging visits to the centre which will ultimately help their appreciation of the ecological importance of crocodiles in nature;
- c) to establish a centre initially for purposes of stocking and breeding the 3 endangered species of crocánilians eventually to release them in the wild to maintain ecological balance in nature that has been upset by excessive, unwanted and illegal hunting and capturing for commercial purposes in recent years

Remulus Wintater



1158
24.8.76

The Madras Crocodile Trust

V. Jhinuengadam
Gandhinagar 444887
V. S. S. S. S. S.
Gandhinagar Gandhinagar,
Gandhinagar Gandhinagar,
Gandhinagar Gandhinagar.

-page four-

- d) to eventually supply surplus juvenile crocodiles of suitable sizes to Forest Departments of States in India requiring crocodiles for release in protected areas and for other propagation projects;
- e) to generate a powerful public opinion to help against unwarranted killing of crocodilians for sport or commercial purposes;
- f) to assist the Government of India in their implementation of the statutes relating to crocodiles in the Indian Wild Life Act, 1972;
- g) to organise a team of specialists who will be trained intensively in the conservation of crocodiles while making them available to the various National and International Organisations to

Romulus Whitaker



10 AUG
1976

1159

24.8.76

The Madras Crocodile Bank
Trust

V. Thiruvengadam

சென்னை: 444887

V. சிவசாலை

மாண்புமிகு அமைச்சர்,
உயிர்வள அமைச்சு,
பி. டி. வீதி, சென்னை 18.

-page five-

conduct surveys and follow up programmes as and when necessary;

h) to undertake research and establish a programme for the conservation and propagation of other species of reptiles;

i) to promote the conservation objectives of the project's co-sponsors, World Wildlife Fund-India, a branch of World Wildlife Fund Morges, Switzerland, by bringing out necessary booklets and publications, sign-boards etc.

j) to canvass for subscriptions and funds for the World Wildlife Fund;

k) to plan World Wildlife Fund nature-oriented projects for local areas.

1) PROVIDED that none of the above objects shall be pursued with the objective of the Madras Crocodile Bank deriving profits or pecuniary gain from the sale of live reptiles or by the sale of their skins, hides or other products and that all such sales

Roumber
Whitaker



GAUG
1976

1160
24.8.76

The Madras Crocodile Bank
Trust

V. Thiruvengadam

Card No: 44487

V. Thiruvengadam

சென்னைப் பின்புலம்,
No. 1, சென்னை மாநகரம் சாலை,
சென்னை-18. தமிழ்நாடு.

-page six-

shall be made as far as possible to Govern-
ment Departments or agencies with the objective
of recovering only such costs as may have
been incurred by the Madras Crocodile Bank
in the procuring, breeding and transporting
of such reptiles. Provided further that all
such sales shall be approved by the Trustees
of the Madras Crocodile Bank as to the party
to whom such sales shall be made and the rate
and other terms at which such sale shall be
made.

AND WHEREAS adequate funds are required
for the development and explanation of the
Project, to bring an adequate number of cro-
codiles for breeding and for the purposes of
publications and other education aids to the
public and for the preservation of these
endangered reptiles, the need is felt to
augment its resources.

*Revenue
Whitaker*



V. Thiruvengadam

1163
24.8.76

1163
24.8.76

The Madras Crocodile Bank
Trust

சென்னை: 441927

V. சிவசுப்பிரமணியன்
சென்னை-18, அழகர் கோட்டை
சென்னை-18, அழகர் கோட்டை

-page eight-

AND WHEREAS it is decided to create an Educational Trust for the aforesaid purpose by these Presents.

NOW THIS INDENTURE OF DEED OF DECLARATION TO TRUST WITNESSETH:

KNOW ALL MEN BY these presents, that we the authoris of this Trust do and doth hereby declare and make it known to all to whom it may concern that the Trust under name and style of Madras Crocodile Bank Trust be formed and constituted with the sum of Rs. 10,000/- (Rupees Ten Thousand Only) invested as trust property in the said Trust along with the land bearing Survey No. 355/7, 8, 9 ~~and~~, Village Vadenammeli No. 50 in the District of Chingleput and Structures thereon, and that they shall do, pertain and form part of the endowment known as Madras Crocodile Bank Trust and are hereby dedicated

Per
V. Thiruvengadam

-page nine-

to promote the educational activities of the said Bank and the like.

The Authors aforesaid further declare and direct that the said properties do hereby vest in a Board of Trustees which shall initially consist of members; At the commencement the following are appointed Trustees:

<u>Sl.No.</u>	<u>Name</u>	<u>Address & Occupation</u>
1.	Mr Romulus Whitaker	Care of Madras Snake Park, Madras 600 022
2.	Mr A N Jagannatha Rao	No.18 - 4th Main Road, Gandhinagar, Adyar, Madras-600 020
3.	Mr S Meenakshisundaram	Advocate, 'Janaki' 14 Guindy Road Adyar Madras 600 020
4.	Mr Zafar Futehalay	Vice President, WWF Dodda Bubbi Post Via Vidyanagar Bangalore
5.	Wild Life Warden, Madras	Office of the Chief Conservation of Forest, Madras. 600 006
6.	Mr M C Ranganathan	Chartered Accountant, 9 Mangalapuram Madras
7.	Nominee of the World Wildlife Fund unspecified hereunder	
8.	Nominees of the World Wildlife Fund unspecified hereunder	

Romulus Whitaker

-page ten-

9. Deputy Director, Tourism, Fort St.
Madras George,
Madras.600009
10. The President, Pancha- Vadanemmeli
yat Union, Vadanemmelli

The properties acquired as Trust properties and dedicated as such shall be inalienable and the Trustees shall not sell or mortgage or create any encumbrance whatever on the Trust save and except when all Trustees concur in that behalf, subject, however, to such terms as have been set out hereunder for the extinguishment of the Trust. They shall collect the entrance fee, donations, rents and profits from the properties, pay taxes and other public demands payable to the Government and Corporation, incur the necessary expenditure for the accommodation, travel etc. of an expert herpetologist and other staff and utilise the balance to the improvement and maintenance of the Crocodile Bank and/or invest the surplus thereof in such securities or deposits as the Trustees in their absolute discretion may think fit.

The number of Trustees shall at no time exceed 10 or be less than 6. Out of the total number of Trustees elected at any time, 2 of them shall be nominated by the World Wildlife Fund in their absolute discretion. The two persons so nominated by World Wildlife Fund shall be ex-officio,

*Ronaldus
Whitaker*

-page eleven-

trustees hereof but they shall in no way be liable for any loss or damage caused to any person or property or misappropriation of funds, etc. merely by reason of their being Trustees herein. In the event of the number of Trustees being increased, the World Wildlife Fund shall have the right to elect such further or other Trustees or Trustee as may be necessary for the purpose of maintaining the present proportionate representation of the World Wildlife Fund on the Board of Trustees.

The Trustees shall hold office for an initial period of three years. At the end of the three years two of the Trustees shall retire by lots every year thereon. The remaining Trustees shall appoint two new Trustees in the vacancy caused by such retirement and the new Trustees shall hold office for a period of three years of such appointment, if so desired by the remaining Trustees. Provided, however, that the above shall not apply to the nominees of World Wild Life Fund whose appointment and retirement shall be at the sole discretion of the World Wildlife Fund.

DISQUALIFICATION: The Holder of the office of Trustees shall vacate his office if he is adjudged insolvent, or become lunatic

*Ronny
Whitaker*

-page twelve-

or a person of unsound mind or is convicted of an offence involving moral turpitude or if he does not attend any three consecutive meetings of the Trustees, without there being sufficient cause for such absence. Save and except that the Trustees appointed by the World Wild Life Fund shall not cease to be Trustees and that their appointment and removal shall be solely at the discretion of the World Wildlife Fund. India. On the occurring of any vacancy in the office of Trustees for any of the reasons hereinabove mentioned or by reason of resignation, death, incapacity or removal by and order of Court, unwillingness to accept the office, the remaining Trustees shall elect together a Trustee to fill the vacancy, subject to the rights of World Wild life Fund to nominate a Trustee as hereinabove mentioned.

MANAGEMENT: The provisions of the Indian Trusts Act shall mutatis mutandis apply for this deed of Trust. The Trustees may appoint a Director of the Madras Crocodile Bank and such other staff members if they in their joint decisions deem necessary. The said Director and/or staff members so appointed shall be responsible for the management of the Crocodile Bank and its properties, collection of rent or profits, maintenance of accounts, etc. The Director or staffmembers shall hold office for such time as the Trustees in their

*Ramulu
Whitaker*

-page thirteen-

absolute discretion think fit. The Trustees may, if they so think fit, appoint one of themselves to be Director and/or staff member.

The Trustees shall meet as often as may be necessary, but not less than once in three months and shall pass the accounts, approve and pass the budget of expenses and sanction all expenses of a special nature. The annual statement of receipts and expenditure ending March every year and property statement shall be published at such meeting as may be fixed and arranged by the Trustees.

On the Trust being extinguished by the main purposes for which this Trust was established being completely fulfilled, i.e. on the three species of crocodiles being no longer endangered the Trustees of the Trust shall distribute the properties of the Trust moveable and immoveable equally between the World Wild Life Fund and the Madras Snake Park Trust and for such purposes they shall being in, sell or transfer any or all assets of the Trust and execute such documents, deeds, releases, etc. as may be necessary.

IN WITNESS WHEREOF THE AUTHOR of the Trust has set his hand and seal the day and year first above written.

Witness:

1. S. B. Chandra Sekhara
2. P. Manjappa

Romulus
Whitaker

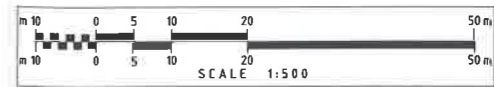
Appendices

(These are provided as additional information by way of tables, lists, etc. t for a better understanding of Madras Crocodile Bank's activities and plans. References to these Appendices may be seen in various places in the Master Plan.)

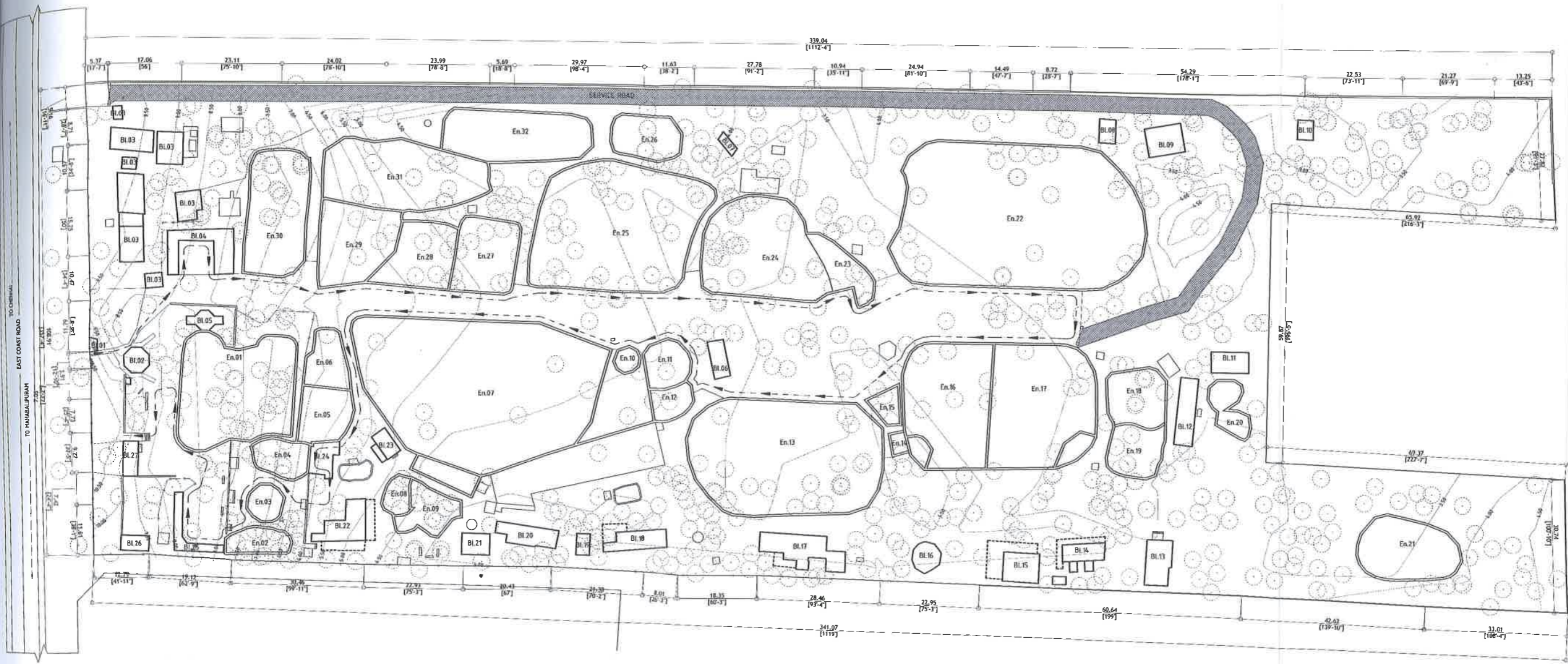
1. Existing site plan
2. Publications of the Madras Crocodile Bank Trust / Centre for Herpetology
3. List of Endangered Species Bred at Madras Crocodile Bank
4. Recent publications of the Madras Crocodile Bank Trust / Centre for Herpetology
5. Proposed Animal Collection Plan
6. Architect's Estimate of Costs (as required in Chapter X, Budget Section)

Existing Layout

Please see attached.

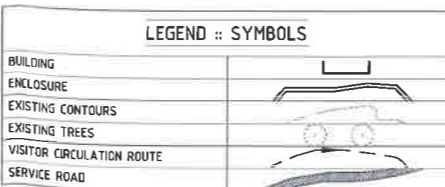


THIS DRAWING AND DESIGN ARE THE SOLE PROPERTY OF THE ARCHITECT AND SHALL NOT BE REPRODUCED, COPIED, REPRODUCED, MODIFIED OR USED IN ANY OTHER MANNER WITHOUT THE PRIOR WRITTEN CONSENT OF THE ARCHITECT



LEGEND :: ENCLOSURES

En.01 MUGGER CROCODILE	En.17 SALTWATER CROCODILE
En.02 WEST AFRICAN DWARF CROCODILE	En.18 YOUNG CROCODILES
En.03 YACARE CAIMAN	En.19 BLACK CAIMAN
En.04 ADULT GHARIAL	En.20 MORELET'S CROCODILE + TURTLES
En.05 SIAMESE CROCODILE	En.21 SPECTACLED CAIMAN
En.06 NILE CROCODILE	En.22 GHARIAL RIVER DISPLAY
En.07 MUGGER CROCODILE	En.23 SPECTACLED CAIMAN
En.08 SMOOTH-FRONTED CAIMAN	En.24 MORELET'S CROCODILE
En.09 TORTOISE	En.25 MUGGER CROCODILE
En.10 AUSTRALIAN FRESHWATER CROCODILE	En.26 ISOLATION PEN
En.11 AFRICAN SLENDER-SNOUDED CROCODILE	En.27 SALTWATER CROCODILE
En.12 DWARF CAIMAN	En.28 TOMISTOMA
En.13 MUGGER CROCODILE	En.29 AMERICAN ALLIGATOR
En.14 ALDABRA TORTOISE	En.30 GHARIAL / KACHUGA
En.15 BROAD-SNOUDED CAIMAN	En.31 MUGGER CROCODILE
En.16 "JAWS III" (SALTWATER CROCODILE)	En.32 MUGGER CROCODILE



LEGEND :: BUILDINGS AND FACILITIES

Bl.01 TICKET BOOTH	Bl.17 DIRECTOR'S HOUSE
Bl.02 OFFICE	Bl.18 CURATOR
Bl.03 IRUKA CO-OPERATIVE	Bl.19 PYTHON PEN
Bl.04 TURTLE HAVEN	Bl.20 LIBRARY
Bl.05 SHOP	Bl.21 AUDIO-VISUAL ROOM
Bl.06 INTERPRETATION CENTRE	Bl.22 OFFICE
Bl.07 FEED SHED	Bl.23 VETERINARY LAB
Bl.08 NECROPSY ROOM	Bl.24 U/WATER VIEWING GALLERY
Bl.09 GARAGE/WORKSHOP	Bl.25 SNAKE HAVEN
Bl.10 FEED SHED	Bl.26 VISITORS' TOILETS
Bl.11 STORAGE	Bl.27 SHOP
Bl.12 SNAKE PENS	
Bl.13 STAFF QUARTERS	
Bl.14 STAFF QUARTERS	
Bl.15 CANTEEN	
Bl.16 ROUND HOUSE (QUEST HOUSE)	

AREA STATEMENT
 TOTAL SITE AREA :: 34,641.45 SQ.M.
 TOTAL ENCLOSURE AREA :: 11,342.75 SQ.M.

NOTES
 THIS DRAWING IS BASED ON SURVEY DRAWING PROVIDED BY THE CLIENT
 CONTOUR INTERVAL IS 0.50 m

ALL DIMENSIONS ARE IN METRIC
 ALL DIMENSIONS TO BE READ AND NOT MEASURED
 ANY DISCREPANCIES TO BE BROUGHT TO THE NOTICE OF THE ARCHITECT IMMEDIATELY

SCALE: 1:500
 DRAWN: JOHN | CHKD: KALPANA
 DATE: 20.11.2012
 DWG NO: B10/CROC/IMP/MAIN | PL-EX

SHEET
 EXISTING LAYOUT
 MAIN FACILITY
 [EAST COAST ROAD]

CLIENT
 THE MADRAS CROCODILE BANK TRUST

PROJECT
 MADRAS CROCODILE BANK MASTER PLAN

ARCHITECTS
 DIAGRAMMAR

Publications Of The Madras Crocodile Bank Trust / Centre For Herpetology

Chandi, M.

2007. Chandi, M.. A Road into Tribal Imagination. The Light of the Andamans. **32**: issue 9-10, pp 21-23. Port Blair. 2007. Chandi, M. On the sighting of the Lesser Coucal, *Centropus bengalensis* in the Andaman Islands. Miscellaneous notes *Journal of the Bombay Natural History Society* **104**: **2** pp 15-16, May- Aug
2008. Chandi, M. Meroe: The Rumbling Island. In *'The Rumbling Island. True Stories from the forests of India'* (Ed) Zai Whitaker. Puffin Books, India. Pp 64-79.

Das, I

2007. "Not available". Lizard species erroneously or doubtfully reported from Borneo. Sarawak Museum Journal, new series 62(83):151-174.
2007. *Dendrelaphis kopsteini* (Kopstein's Bronzeback Tree Snake). Geographic Distribution. *Herpetological Review* 38(2):220.
2007. Some forgotten descriptions of *Nasikabatrachus* (Anura: Sooglossidae). *Herpetological Review* 38(3):291-292.
2008. Two new species of *Pelophryne* (Anura: Bufonidae) from Gunung Murud, Sarawak (northwestern Borneo). *Raffles Bulletin of Zoology* 56(2):225-233.

Das, I. & Others

2007. Status of knowledge of the Malaysian herpetofauna. In: Status of biological diversity in Malaysia & threat assessment of plant species in Malaysia. L. S. L. Chua, L. G. Kirton & L. G. Saw (Eds). pp:31-81. Forest Research Institute Malaysia, Kepong. (I. Das & N. Yaakob.)
2007. Cryptic species as a window on diversity and conservation. *Trends in Ecology and Evolution* 22(3):148-155 (D. Bickford, D. J. Lohman, N. S. Sodhi, P. K. L. Ng, R. Meier, K. Winker, K. Ingram & I. Das.)
2007. A new species of *Microhyla* (Anura: Microhylidae) from the Malay Peninsula. *Hamadryad* 32(1):304-314. (I. Das, N. S. b. Yaakob & J. Sukumaran.).

2007. Sources of larval identities for amphibians of India. *Hamadryad* 32(1):330–357. (I. Das & S. K. Dutta.)
2007. Rediscovery of *Mictopholis austeniana* (Annandale, 1908) (Squamata: Agamidae). *Current Herpetology* 26(1):45–47. (A. Das & I. Das.)
2007. *Kaloula baleata* (Brown Bull Frog). Geographic Distribution. *Herpetological Review* 38(2):214–215. (F. Kraus & I. Das.)
2007. *Cyclemys dentata* (fire scars). *Herpetological Review* 38(3):329–330. (K. A. Jensen & I. Das.)
2007. Responsible vouchering in turtle research: an introduction and recommendations. In: *Defining turtle diversity. Proceedings of a workshop on genetics, ethics, and taxonomy of freshwater turtles and tortoises, Cambridge, Massachusetts, 8–12 August 2005.* H. B. Shaffer, N. N. FitzSimmons, A. Georges & A. G. J. Rhodin (Eds). *Chelonian Research Monograph* 4:147–156. (C. Lehn, I. Das, M. R. J. Forstner & R. M. Brown.)
2007. Foreword. In: *An identification guide to the freshwater turtles and tortoises of Malaysia, Singapore, Indonesia, Brunei, the Philippines, East Timor and Papua New Guinea.* p:2. (Mark Auliya, author). *TRAFFIC Southeast Asia, Kuala Lumpur.*
2007. Species diversity, elevational distribution and reproductive modes in an amphibian community at the Matang Range, Sarawak (Borneo). *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut* 104(2):141–174. (I. Das, A. Jankowski, M. Iqbal Makmor & A. Haas.)
2008. A new species of *Eutropis* (Squamata: Scincidae) from Sri Lanka. *Zootaxa* 1700:35–52. (I. Das, A. de Silva & C. C. Austin.)
2008. Observations on the influence of seasonality, lunar cycles, and weather condition on freshwater turtle activity in Sarawak, East Malaysia (Borneo). *Asiatic Herpetological Research* 11:37–42. (K. A. Jensen & I. Das.)
2008. The herpetofauna of Nallamala Hills, Eastern Ghats, India: an annotated checklist, with remarks on nomenclature, taxonomy, habitat use, adaptive types and biogeography. *Asiatic Herpetological Research* 11:110–131. (C. Srinivasulu & I. Das.)
2008. A second specimen of *Complicitus nigrigularis* (Ota & Hikida, 1991). *Hamadryad* 32(2): 32(2):82–84. (I. Das & M. Lakim.)

2008. New species of *Luperosaurus* (Squamata: Gekkonidae) from the Crocker Range Park, Sabah, Malaysia (Borneo). *Zootaxa* (1719):53–60. (I. Das, M. Lakim & P. Kandaung.)
2008. An inventory of reptiles of Gunung Mulu National Park, Sarawak, Malaysia (Borneo). *Sarawak Museum Journal* 63(84):127–167. (I. Das, B. Clark, S. Clark & E. McArthur.)
2008. *Hylarana raniceps* (white-lipped frog). Predation. *Herpetological Review* 39(1):77–78. (T. Riehl, A. Haas & I. Das.)
2008. Larval identities of *Ansonia hanitschi* Inger, 1960 (Amphibia: Bufonidae) and *Polypedates colletti* (Boulenger, 1890) (Amphibia: Rhacophoridae) from East Malaysia (Borneo). *Salamandra* 44(2):85–100. (A. Haas & I. Das.)
2008. A guide to the amphibians and reptiles of Tasek Merimbun Heritage Park, Brunei Darussalam. Brunei Museums Department, Bandar Seri Begawan. 92 pp. (I. Das, S. Nyawa & J. K. Charles.)
2008. Rediscovery of the missing syntypes of *Mabuya nagarjuni* Sharma, 1969 (Reptilia: Scincidae) in the collection of the Zoological Survey of India. *Journal of the Bombay Natural History Society* 104(2):25–26. (C. Srinivasulu & I. Das.)
2008. *Pelochelys cantorii*. Conservation biology of freshwater turtles and tortoises. A. G. J. Rhodin, P. C. H. Pritchard, P. P. van Dijk, R. A. Saumure, K. A. Buhlmann & J. B. Iverson (Eds). Chelonian Research Monograph Number 5. Chelonian Research Foundation, Lunenburg, Massachusetts. pp:1–4.
2008. Amphibians of the Indomalayan region. In: Threatened amphibians of the world. pp:71–79. S. Stuart, M. Hoffmann, J. S. Chanson, N. A. Cox, R. J. Berridge, P. Ramani & B. E. Young (Eds). Lynx Ediciones, Barcelona/IUCN- The World Conservation Union, Conservation International and NatuServe, Washington, D.C. (R. Bain, S. D. Biju, R. Brown, I. Das, A. Diesmos, S. Dutta, D. Gower, R. Inger, D. Iskandar, Y. Kaneko, M. W. N. Lau, M. Meegaskumbura, A. Ohler, T. Papenfuss, R. Pethiyagoda, B. Stuart, M. Wilkinson & F. Xie.)
2008. Diversity and conservation status of the Western Ghats amphibians. In: Threatened amphibians of the world. pp:80–82. S. Stuart, M. Hoffmann, J. S. Chanson, N. A. Cox, R. J. Berridge, P. Ramani & B. E. Young (Eds). Lynx Ediciones, Barcelona/IUCN- The World Conservation Union, Conservation International and NatuServe, Washington, D.C. (S. D. Biju, R. G. Kamei, G. Bhatta, V. Giri, N. Cox, I. Das & F. Bossuyt.)

2008. New species of *Anomochilus* (Anomochilidae) from Sabah, northern Borneo. Journal of Herpetology 38(3):584–591. (I. Das, M. Lakim, K. K. P. Lim & H. H. Tan.)

2008. Herpetofauna of the Pulau Banggi group of islands off north-eastern Borneo. Herpetological Review 39(3):296–298. (I. Das & K. B. Hee.)

Lang, J. and others

Lang, J.W. & Whitaker, S. (2011) Application of Telemetry Techniques in Crocodylian Research: Gharial (*Gavialis gangeticus*) spatial ecology in the Chambal River, India. Telemetry in Wildlife Science. ENVIS Bulletin.

Nair, T. and others

Choudhary, S., Dey, S., Dey, S., Sagar, V., Nair, T. and Kelkar, N. (2012) River dolphin distribution in regulated river systems: implications for dry-season flow regimes in the Gangetic basin. Aquatic Conservation: Marine and Freshwater Ecosystems. 22: 11-25. doi: 10.1002/aqc.1240

Nair, T. (2011) Of dams, dacoits and death-The saga of the Chambal gharials. Sanctuary Asia, June, 60-62.

Nair, T. (2011) India to launch a brave new initiative to save the Critically Endangered Gharial. SPECIES - Magazine of the Species Survival Commission. Issue 53, January - June, 21, 2011.

Whitaker, N.

2007. Extended parental care in the Siamese crocodile *Crocodylus siamensis* (Schneider). Russian Journal of Herpetology. 14 (3): 203 – 206

Gowri Shankar, P. & N. Whitaker. 2009. Ecdysis in the King Cobra (*Ophiophagus hannah*). Russian Journal of Herpetology. 16 (1): 1 – 5

Choudhury, B.C., Singh, L.A.K., Rao, R.J., Basu, D., Sharma, R.K., Hussain, S.A., Andrews, H.V., Whitaker, N., Whitaker, R., Lenin, J., Maskey, T., Cadi, A., Rashid, S.M.A., Choudhury, A.A., Dahal, B., Win Ko Ko, U., Thorbjarnarson, J & Ross, J.P. 2007. *Gavialis gangeticus*. In: IUCN 2009. IUCN Red List of Threatened Species. Version 2009.2. <www.iucnredlist.org

- Whitaker, N. & J. Vijaya. 2009. Biology of the Forest Cane Turtle *Vijayachelys silvatica*, in South India. *Chelonian Conservation and Biology* 8(2): 109-115
- Meganathan, P.R., B. Dubey, K.N.Jogayya, N.Whitaker, & I. Haque. 2010. A novel multiplex PCR assay for the identification of Indian crocodilians. *Molecular Ecology*. 10 (4): 744 -747
- Whitaker, N. 2010. Le Trionyx du Gange *Nilssonia gangetica* (Cuvier, 1824). *Cheloniens* 18: 30 – 32.
- Whitaker, N. 2010. Captive Breeding of the Critically Endangered Red-Crowned Roof Turtle *Batagur kachuga* (Gray 1831) at the Madras Crocodile Bank Trust. Chapter 18 *IN ENVIS*, Volume 12 (1): 143 – 148
- Whitaker, N. & J. Vijaya. 2009. Biology of the Forest Cane Turtle *Vijayachelys silvatica*, in South India. *Chelonian Conservation and Biology* 8(2): 109-115
- Meganathan, P.R., B. Dubey, K.N.Jogayya, N.Whitaker, & I. Haque. 2010. A novel multiplex PCR assay for the identification of Indian crocodilians. *Molecular Ecology*. 10 (4): 744 -747
- Whitaker, N. 2010. Le Trionyx du Gange *Nilssonia gangetica* (Cuvier, 1824). *Cheloniens* 18: 30 – 32.
- Whitaker, N. 2010. Captive Breeding of the Critically Endangered Red-Crowned Roof Turtle *Batagur kachuga* (Gray 1831) at the Madras Crocodile Bank Trust. Chapter 18 *IN ENVIS*, Volume 12 (1): 143 – 148
- Whitaker, N. 2012. Reproduction and Morphology of the Travancore Tortoise (*Indotestudo travancorica*) Boulenger, 1907. Chapter 3, Pp. 47 - 64, In *Morphometrics*. Rijeka, Croatia. ISBN 978-953-51-0172-7.
- Arun Kanagavel, Rajkumar Sekar, Nikhil Whitaker & Rajeev Raghavan. 2012. A Malabar Pit Viper, *Trimeresurus malabaricus* (Jerdon, 1854) morph from the southern Western Ghats, *Reptile Rap* 14, June 2012: 27 – 28
- Britton, A.R.C., R. Whitaker, & N. Whitaker. 2012. Here be a Dragon: Exceptional Size in a Saltwater Crocodile (*Crocodylus porosus*) from the Philippines. *Herpetological Review*. 43 (4): 541 – 546
- Whitaker, N. 2012. Reproduction and Morphology of the Travancore Tortoise (*Indotestudo travancorica*) Boulenger, 1907. Chapter 3. Pp. 47 – 64. In: Christina Wall (Ed.) *Morphology*. ISBN 978-953-51-0172-7, InTech. Rijeka, Croatia

Whitaker, N., P. Gowri Shankar, & R. Whitaker. 2013. Nesting ecology of the King Cobra (*Ophiophagus hannah*) in India. *Hamadryad*. Vol. 36 (2): pp 101 – 107.

Whitaker, R.

2007. Sustainable Use of the Lake Chamo Nile Crocodile Population (with Nikhil Whitaker). Project Document prepared for African Parks (Ethiopia), Nechsar National Park Project. Addis Ababa, February, 52 pp

2008 Observations on burrows dug by Mugger Crocodiles in Bundala N.P., Sri Lanka (with Brady Barr, A. de Silva and P. Ratnasiri). *J. Bombay Nat. Hist. Soc.*

List Of Endangered Species Bred At Madras Crocodile Bank

	Comon Name	Species	IUCN Red List Categorisation	Indian Wildlife Protection Act (1972) Categorisation
1	Indian Gharial	<i>Gavialis gangeticus</i>	Critically Endangered	Schedule I
2	Mugger	<i>Crocodylus palustris</i>	Vulnerable	Schedule I
3	Red Crowned Roof Turtle	<i>Batagur kachuga</i>	Critically Endangered	Schedule I
4	Ganges Softshell Turtle	<i>Nilssonia gangetica</i>	Vulnerable	Schedule I
5	Travancore Tortoise	<i>Indotestudo travancorica</i>	Vulnerable	Schedule IV
6	Three Striped Roof Turtle	<i>Batagur dhongoka</i>	Endangered	Schedule IV
7	King Cobra	<i>Ophiophagus hannah</i>	Vulnerable	Schedule II
8	Siamese Crocodile	<i>Crocodylus siamensis</i>	Critically Endangered	Exotic
9	Tomistoma	<i>Tomistoma schlegelii</i>	Endangered	Exotic
10	West African Dwarf Crocodile	<i>Osteolaemus tetraspis</i>	Vulnerable	Exotic

Recent Publications Of The Madras Crocodile Bank

1. Arun Kanagavel, Rajkumar Sekar, Nikhil Whitaker & Rajeev Raghavan. 2012. A Malabar Pit Viper, *Trimeresurus malabaricus* (Jerdon, 1854) morph from the southern Western Ghats, Reptile Rap 14, June 2012: 27 – 28
2. Britton, A.R.C., R. Whitaker, & N. Whitaker. 2012. Here be a Dragon: Exceptional Size in a Saltwater Crocodile (*Crocodylus porosus*) from the Philippines. Herpetological Review. 43 (4): 541 – 546
3. Choudhary, S., Dey, S., Dey, S., Sagar, V., Nair, T. and Kelkar, N. (2012) River dolphin distribution in regulated river systems: implications for dry-season flow regimes in the Gangetic basin. Aquatic Conservation: Marine and Freshwater Ecosystems. 22: 11-25. doi: 10.1002/aqc.1240
4. Lang, J.W. & Whitaker, S. (2011) Application of Telemetry Techniques in Crocodilian Research: Gharial (*Gavialis gangeticus*) spatial ecology in the Chambal River, India. Telemetry in Wildlife Science. ENVIS Bulletin.
5. Meganathan, P.R., B. Dubey, K.N.Jogayya, N.Whitaker, & I. Haque. 2010. A novel multiplex PCR assay for the identification of Indian crocodilians. Molecular Ecology. 10 (4): 744 -747
6. Nair, T. (2011) Of dams, dacoits and death-The saga of the Chambal gharials. Sanctuary Asia, June, 60-62.
7. Nair, T. (2011) India to launch a brave new initiative to save the Critically Endangered Gharial. SPECIES - Magazine of the Species Survival Commission. Issue 53, January - June, 21, 2011.
8. Whitaker, N. & J. Vijaya. 2009. Biology of the Forest Cane Turtle *Vijayachelys silvatica*, in South India. Chelonian Conservation and Biology 8(2): 109-115
9. Whitaker, N. 2010. Le Trionyx du Gange Nilssonina gangetica (Cuvier, 1824). Chelonians 18: 30 – 32.
10. Whitaker, N. 2010. Captive Breeding of the Critically Endangered Red-Crowned Roof Turtle *Batagur kachuga* (Gray 1831) at the Madras Crocodile Bank Trust. Chapter 18 IN

ENVIS, Volume 12 (1): 143 – 148

11. Whitaker, N. 2012. Reproduction and Morphology of the Travancore Tortoise (*Indotestuo travancorica*) Boulenger, 1907. Chapter 3, Pp. 47 - 64, In Morphometrics. Rijeka, Croatia. SBN 978-953-51-0172-7.

12. Whitaker, N. 2012. Reproduction and Morphology of the Travancore Tortoise (*Indotestudo travancorica*) Boulenger, 1907. Chapter 3. Pp. 47 – 64. In: Christina Wall (Ed.) Morphology. ISBN 978-953-51-0172-7, InTech. Rijeka, Croatia

Popular

Mittal Gala and Gayathri Selveraj, Amphibian Awareness 'Leap Day' report, pg 12-13, and 15, Zoo's Print, vol xxvii No 3, March 2012

Saveus magazine- Article on MCBT

Ex-situ update: A quarterly of the CZA. 2 articles have been published in this.

Proposed Animal Collection Plan

Proposed collection plan for amphibians at MCBT / CFH

No.	Common Name	Scientific Name	Sex Ratio	Justification*
1	Parachuting frog	<i>Rhacophorus pseudomalabaricus</i>	3:6	CD, RV
2	Common Indian Toad	<i>Duttaphrynus melanostictus</i>	3:6	EV
3	Mercury's bush frog	<i>Mercurana myristicapalustris</i>	3:6	RV

Proposed collection plan for crocodilians at MCBT / CFH

No.	Name	Scientific Name	Sex ratio	Justification
1	Philippine crocodile	<i>Crocodylus mindorensis</i>	1.2	CD, RV, EV
2	American crocodile	<i>Crocodylus acutus</i>	2.2	CD, RV, EV
3	Orinoco crocodile	<i>Crocodylus intermedius</i>	1.2	CD, RV, EV
4	New-Guinea Crocodile	<i>Crocodylus novaeguinea</i>	1.2	CD, RV, EV
5	Chinese alligator	<i>Alligator sinensis</i>	2.3	CD, RV, EV

Proposed collection plan for lizards at MCBT / CFH

No.	Common Name	Scientific Name	Sex ratio	Justification
-----	-------------	-----------------	-----------	---------------

1	Tegu	<i>Tupinambus teguixin</i>	2.2	RV, EV
2	Thorny Devil	<i>Moloch horridus</i>	2.3	RV, EV
3	Beaded lizard	<i>Heloderma horridum</i>	2.3	RV, EV
4	Spiny Tailed Lizard	<i>Uromastyx hardwickii</i>	2.2	RV, EV
5	Horsfield's Spiny Lizard	<i>Salea horsfieldii</i>	1.2	CD, RV, EV
6	Anaimalai Spiny Lizard	<i>Salea anamallayana</i>	1.2	CD, RV, EV
7	Green forest lizard	<i>Calotes calotes</i>	1.2	CD, RV, EV
8	Elliot's Forest Lizard	<i>Calotes eliotii</i>	1.2	RV, EV
9	Andaman's giant gecko	<i>Gekko verreauxi</i>	2.3	CD, RV, EV
10	Kollegal Ground Gecko	<i>Geckoella kollegalensis</i>	2.3	RV, EV
11	Reticulated gecko	<i>Hemidactylus reticulatus</i>	2.3	RV, EV
12	Golden gecko	<i>Calodactylodes aureus</i>	2:3	RV, EV
13	Annamalai gecko	<i>Geckoella annamalaiensis</i>	2:3	RV, EV
14	Prashad's gecko	<i>Hemidactylus prashadii</i>	2:3	RV, EV
15	Green tree monitor	<i>Varanus prasinus</i>	2:2	RV, EV, CD
16	Yellow monitor lizard	<i>Varanus flavescens</i>	2:3	RV, EV, CD
17	Water monitor	<i>Varanus salvator</i>	1.2	RV, CD
18	Komodo dragon	<i>Varanus</i>	2.2	RV, CD, EV

		<i>komodoensis</i>		
19	Bearded Dragon	<i>Pogona vitticeps</i>	2.2	RV, EV

Proposed collection plan for snakes at MCBT / CFH

Native Species

No.	Common Name	Scientific Name	Sex ratio	Justification
1.	King cobra	<i>Ophiophagus Hannah</i>	1.1	CD, RV, EV
2.	Indian rock python	<i>Python molurus</i>	1.2	CD, RV, EV
3.	Black cobra	<i>Naja oxiana</i>	2.2	CD, RV
4.	Andaman cobra	<i>Naja kouthia</i>	1.2	CD, RV, EV
5.	Central Asian Cobra	<i>Naja oxiana</i>	1.2	CD, RV, EV
6.	Banded krait	<i>Bungarus fasciatus</i>	1.1	RV, EV
7.	Slender coral snake	<i>Calliophis melanurus</i>	1.2	CD, RV, EV
8.	Levantine viper	<i>Macrovipera lebetina</i>	2.2	CD, RV, EV
9.	Himalayan pit viper	<i>Gloydius himalayanus</i>	2.2	RV, EV
10.	Hump-nosed pit viper	<i>Hypnale hypnale</i>	2.2	RV, EV
11.	Malabar pit viper	<i>Trimeresurus. malabaricus</i>	2.2	RV, EV
12.	Medo pit viper	<i>Trimeresurus medoensis</i>	2.2	RV, EV
13.	File Snake	<i>Acrochordus granulates</i>	1.2	RV, EV

14.	Banded trinket snake	<i>Elaphe popyracea</i>	1.2	RV, EV
15.	Black-headed Royal snake	<i>Spalerosphis atriceps</i>	1.2	RV, EV
16.	False cobra	<i>Pseudoxenodon macrops</i>	2.2	CD, RV, EV
17.	Saw scaled viper	<i>Echis carinatus</i>	2.2	RV, EV
18.	Russell's Viper	<i>Daboia russelli</i>		RV, EV
19.	Common Krait	<i>Bungarus caeruleus</i>	1.2	RV, EV
20.	Brown Vine Snake	<i>Ahaetulla pulverenta</i>	2.2	CD, RV, EV
21.	Green Vine Snake	<i>Ahaetulla nasutus</i>	2.2	EV
22.	Rat snake	<i>Ptyas mucosa</i>	1.2	EV
23.	Forstens cat snake	<i>Boiga forstenii</i>	2.2	RV, EV
24.	Dog face water snake	<i>Cerberus rynchops</i>	2.2	RV, EV
25.	Ornate flying snake	<i>Chrysopelia ornate</i>	2.2	CD, RV, EV
26.	Bridal snake	<i>Dryocalamus nympa</i>	2.3	CD, RV, EV

Non-native species

No.	Common Name	Scientific name	Sex Ratio	Justification
1.	Boa constrictor	<i>Boa constrictor</i>	1.2	EV
2.	Green Tree Python	<i>Morelia viridus</i>	2.2	EV, RV
3.	Ball Pythons	<i>Python regius</i>	2.2	EV
4.	King snake	<i>Lampropeltis spp.</i>	2.2	EV
5.	Corn snake	<i>Elaphe guttata</i>	2.2	EV

6.	Rat snake	<i>Pantherophis guttatus</i>	1.2	EV
7.	Pygmy Rattle snake	<i>Sistrurus miliarius</i>	2.2	EV, RV
8.	Cotton mouth	<i>Agkistrodon piscivorus</i>	2.2	EV, RV
9.	D'Alberty Python	<i>Leiopython albertsii</i>	1.2	RV

Proposed collection plan for turtles and tortoises at MCBT/CFH

No.	Species	Scientific name	Sex ratio	Justification
1	Cochin Forest cane turtle	<i>Vijayachelys silvatica</i>	3:4	CD,RV
2	Elongated tortoise	<i>Indotestudo elongata</i>	3:4	CD
3	Giant Asian tortoise	<i>Manouria emys</i>	2:3	CD,RV,EV
5	Leithi's soft-shell turtle	<i>Aspideretes leithii</i>	1:2	CD,RV
6	Indian Peacock soft-shell turtle	<i>Aspideretes hurum</i>	1:2	RV,EV
7	Spotted pond turtle	<i>Geoclemys hamiltonii</i>	2:3	RV,EV
8	Brown roofed turtle	<i>Pangshura smithii</i>	2:3	EV
9	Asian giant soft-shell turtle	<i>Pelochelys cantorii</i>	1:2	CD,RV,EV
10	River terrapin	<i>Batagur baska</i>	0:2	CD,RV,EV
11	Indian eyed turtle	<i>Morenia petersi</i>	2.4	RV,EV
12	Assam roofed turtle	<i>Pangshura sylhetensis</i>	2:3	RV,EV
13	Alligator snapping turtle	<i>Macrochelys temminckii</i>	1.2	EV
14	Mata mata	<i>Chelus fimbriata</i>	2.2	EV

* Explanation (Justification)

CD - Conservation Dependent

RV - Research Value

EV - Educational Value

ESTIMATE OF CONSTRUCTION COSTS FOR THE MAIN FACILITY					
S.No	DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
BUILDINGS					
1	New Buildings [Higher specs] - Completed shell with flooring, plastering painting, electrical conduiting, plumbing, tiling, doors and windows. Eg: offices, quarters, interpretation centre, toilet blocks		m2	33,200.00	
	Entrance Block	555.00			1,84,26,000.00
	Interpretation Centre	450.00			1,49,40,000.00
	Staff Quarters	1,010.00			3,35,32,000.00
	Toilet Block	65.00			21,58,000.00
2	New Buildings [Lower Specs] - Completed shell with flooring, plastering painting, electrical conduiting, plumbing, tiling, doors and windows. Eg, feed shed, store rooms, lean-to structures etc	130.00	m2	25,000.00	32,50,000.00
3	Repurposed Buildings - assuming 30% civil modification to walls and openings, complete re-roofing, complete re-doing of electrical conduiting, plumbing, plastering, painting, flooring tiling	730.00	m2	23,250.00	1,69,72,500.00
SUB TOTAL				Rs.	8,92,78,500.00
ENCLOSURES					
4	Non-viewing enclosure barriers - new construction	640.00	Rm		
	Random Rubble - 7ft ht			5,480.00	35,07,200.00
	Brickwork - 7ft ht			5,670.00	
5	Non-viewing enclosure barriers - existing refurbished	920.00	Rm		

	Random Rubble - 4ft ht			2,070.00	19,04,400.00
	Brickwork - 4ft ht			2,130.00	
6	Viewing area of enclosure barriers - new construction	215.00	Rm	12,950.00	27,84,250.00
7	Viewing area of enclosure barriers - existing refurbished	570.00	Rm	10,110.00	57,62,700.00
8	Concrete lining for enclosure waterbodies	2,700.00	m2	3,125.00	84,37,500.00
9	Excavation, earthwork, and shaping for enclosures	11,000.00	m3	390.00	42,90,000.00
10	Landscaping within enclosures	2,700.00	m2	650.00	17,55,000.00
11	Special features in enclosure design		PS		
12	Keeper access points	40.00	Nos	27,000.00	10,80,000.00
13	Animal access points	35.00	Nos	26,000.00	9,10,000.00

S.No	DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
14	Barrier Top Planter	150.00	Rm	2,000.00	3,00,000.00
	SUB TOTAL			Rs.	3,07,31,050.00
ROADS AND PATHWAYS					
15	Roading	2,300.00	m2	2,200.00	50,60,000.00

16	Storm Drain	910.00	Rm	1,300.00	11,83,000.00
17	Visitor's pathways	2,870.00	m2	1,425.00	40,89,750.00
18	Visitor's pathway edge/ kerb detail	2,000.00	Rm	1,010.00	20,20,000.00
19	Keeper pathways	1,665.00	m2	1,010.00	16,81,650.00
20	Keeper pathway edge/ kerb detail	2,370.00	Rm	1,010.00	23,93,700.00
SUB TOTAL				Rs.	1,64,28,100.00
SITE LEVEL INFRASTRUC TURE					
21	Site level electrical works		PS		0.00
22	Site level water supply, drainage and sanitation works		PS		0.00
SUB TOTAL				Rs.	0.00
SITE LEVEL INFRASTRUCTURE					
23	Entrance Plaza - including ramps, steps, built in seats, planters etc	806.10	m2	1,700.00	13,70,364.90
24	Parking areas - Bus, car and two wheeler stall areas, access driveways.		m2		
	4-Wheeler Parking Driveway	475.00		2,500.00	11,87,500.00
	4-Wheeler parking stalls	515.00		2,500.00	12,87,500.00

	2-Wheeler parking	180.00		2,500.00	4,50,000.00
	Busbay	240.00		2,500.00	6,00,000.00
25	Visitor area gardens and landscaping	2,800.00	m2	975.00	27,30,000.00
26	Site level excavations, earthworks and shaping.	6,000.00	m3	430.00	25,80,000.00
27	2m high compound wall				
	Outer Compound Wall	970.00	Rm	1,800.00	17,46,000.00
	Inner Compound Wall	485.00	Rm	1,800.00	8,73,000.00
28	Front compound wall and gates/ barriers: 5ft ht compound wall with 4ft high security mesh above including 7nos. Hinged gates of size 12ft wide by 5ft high in MS - duco painted	1.00	LS		12,00,000.00
29	Special features for entrance facade		PS		0.00
30	Signage systems		PS		0.00
31	Kiosks and shelters	18.00	Nos	91,000.00	16,38,000.00
32	Site level electrical fittings and fixtures		PS		0.00
33	Sculptures and artworks		PS		0.00
	SUB TOTAL			Rs.	1,56,62,364.90
DEMOLITION WORKS AND OTHER MISCELLANEOUS WORKS					

34	Site clearing, levelling	12,500.00	m2	110.00	13,75,000.00
35	Tree felling, lopping and stacking	40.00	Nos	6,000.00	2,40,000.00
36	Safety barricades – scaffolding frameworks with metal sheet barricades	1,090.00	m2	1,500.00	16,35,000.00
37	Demolition of buildings till ground level	865.00	m3	950.00	8,21,750.00
38	Removal and stacking of existing tile/sheet roofing	980.00	m2	300.00	2,94,000.00
39	Demolition of compound and barrier walls till ground level	720.00	Rm	1,150.00	8,28,000.00
40	Demolition of concrete lining for enclosure waterbodies	2,700.00	m2	620.00	16,74,000.00
41	Demolition of foundations	455.00	m3	1,400.00	6,37,000.00
42	Clearing the debris from the site	500.00	Load	800.00	4,00,000.00
43	Airconditioning	25.00	TR	35,000.00	8,75,000.00
44	Detailed Topographical Survey of Open Areas	34,641.45	m2	7.00	2,42,490.15
45	Detailed Survey of Existing buildings	730.00	m2	38.00	27,740.00
SUB TOTAL				Rs.	90,49,980.15

GRAND TOTAL	Rs. 16,11,49,995.05
-------------	---------------------

NOTES:

The rates used for estimation are based on current market rates for a set of assumed specifications. Final costs will depend on approved final details, specifications and designs.

ESTIMATE OF CONSTRUCTION COSTS FOR SATELLITE FACILITY	
--	--

S.No	DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
BUILDINGS					
1	New Buildings [Lower Specs] - Completed shell with flooring, plastering painting, electrical conduiting, plumbing, tiling, doors and windows. Eg, feed shed, store rooms, lean-to structures etc	10.00	m2	23,500.00	2,35,000.00
2	Repurposed Buildings - assuming 30% civil modification to walls and openings, complete re-roofing, complete re-doing of electrical conduiting, plumbing, plastering, painting, flooring tiling	53.00	m2	23,250.00	12,32,250.00
SUB TOTAL				Rs.	14,67,250.00
ENCLOSURES					
3	Non-viewing enclosure barriers - new construction Hollow Concrete Blocks- 7ft ht	350.00	Rm	1,800.00	6,30,000.00
4	Concrete lining for enclosure water bodies	685.00	m2	3,125.00	21,40,625.00
5	Excavation, earthwork, and shaping for enclosures	2,000.00	m3	390.00	7,80,000.00
6	Landscaping within enclosures	685.00	m2	650.00	4,45,250.00
7	Keeper access points	8.00	Nos	27,000.00	2,16,000.00
8	Animal access points	4.00	Nos	26,000.00	1,04,000.00
SUB TOTAL				Rs.	43,15,875.00
ROAD AND					

PATHWAYS					
9	Roading	730.00	m2	2,200.00	16,06,000.00
SUB TOTAL				Rs.	16,06,000.00
SITE LEVEL INFRASTRUCTURE					
10	Site level electrical works		PS		0.00
11	Site level water supply, drainage and sanitation works		PS		0.00
SUB TOTAL				Rs.	0.00
SITE DEVELOPMENT					
S.No	DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
12	2m high compound wall				
	Outer Compound Wall	280.00	Rm	1,800.00	5,04,000.00
13	12ft Gate	1.00	Nos	80,000.00	80,000.00
14	Site level electrical fittings and fixtures		PS		0.00
SUB TOTAL				Rs.	5,84,000.00
DEMOLITION WORKS					
15	Site clearing, levelling	1,250.00	m2	110.00	1,37,500.00
16	Tree felling , lopping and stacking	RATE	Nos	6,000.00	

		ONLY			
17	Safety barricades – scaffolding frameworks with metal sheet barricades	RATE ONLY	m2	1,500.00	
18	Demolition of buildings till ground level	RATE ONLY	m2		
19	Demolition of compound and barrier walls till ground level	RATE ONLY	Rm	1,150.00	
20	Demolition of concrete lining for enclosure waterbodies	RATE ONLY	m2	620.00	
21	Demolition of foundations	RATE ONLY	m3	1,400.00	
22	Clearing the debris from the site	RATE ONLY	Load	800.00	
	SUB TOTAL			Rs.	1,37,500.00
	GRAND TOTAL			Rs.	81,10,625.00

NOTES:

The rates used for estimation are based on current market rates for a set of assumed specifications. Final costs will depend on approved final details, specifications and designs.

Summary of Costs:

Construction of Main Facility	16,11.49,995
Construction of Satellite Facility	81,10,625
Total	16,92,60,620

REFERENCES CITED IN THE MASTER PLAN

ANURADHA, U. (2002): Studies on the treatment of Crocodile wastewater by root zone treatment system – Anna University, Chennai

PRASAD, S.K. (2002) : Solid waste management at the Madras Crocodile Bank – Anna University, Chennai,

RANGANATHAN,S. (2001): Ecological Status of the Madras Crocodile Bank – Anna University, Chennai

STACY, B. (1999). The trouble with high density. In Proceedings of the Crocodile Specialist Group.

RICHARDSON, K., G.J.W. WEBB, & S.C. MANOLIS. (2002). Crocodiles: Inside Out. A Guide to the Crocodilians and their Functional Morphology. Surrey Beatty & Sons (Pubs). Pp 172

MADER, D.M. (1996). Reptile Medicine and Surgery. Mader, D.R. (Ed.). Saunders, Philadelphia. Pp. 512