3rd march 1981
Indira Gandhi Zoo Park
vi Sakhapatnam.

Dear Mr. Chowdhury,

Your letter is first to hand. Thank you for your enquiry on different matters. I have been observing all the procautions you told me for crocodiles, especially for hatchlings. I have even planted the grass but not successful. Hatchling pool is being provided with gunny bags to keep the temparature in the nights normal. During these days the growth rate of the Hatchlings are not encouraging. I must say the growth has almost ceased. The wall around the pools has not yet Constructed due to certain problems Anyhow at present all the Crocodiles are in good condition. Further I would like to inform that the mating in breeding Crocodiles has taken place continuously three days early in the morning at 6.30 (am). This has been observed on 6-1-81, 7-1-81 and on 8-1-81. Afterwards nothing has been observed. Prior to its mating I could observe the female was after the male and used to hit with its tail. But the male was not responded. On the day time (mid afternoons) male used to sit over the female. This has occured in two occasions. Now the female is Scratching the ground in the moat. Here a lot of sea turtle poaching is going on. We have tried to trap them on two occassion, but we could not, due to the lack of vehicle in the right moment.

Ridley turtles are visiting the Coast from Mid November onwards and laying the eggs. These turtles are reported to have visited the Coast from Revupolavaram, Bheemili, Pudimadaka, visakhapatnam beaches. We tried to rear two turtles when they were caught and brought over to the Zoo. They did not take any ~~food~~ food material. I have provided sea-moss, ~~[illegible]~~ i.e sea algae and small sea crustaceans. Please let me know the rearing technique of these turtles. Should we maintain the absolute salinity (I mean pH) what the seawater is containing?. I send you the measurements of the hatchling within a day or two. Definitely I keep you informs everything about Zoo Crocodiles.

I have ~~[illegible]~~ already sent one plan regarding serpentarium along with one animal attendant. He brought it back when he didn't find you there. By that time I came to know you were at Madras. Again I sent it with ~~[illegible]~~ one of our clerks who visited Zoo on official visit. He also forgot to hand it over. Again now I am sending it by post. Please do visit Zoo once again for suggestions and to ~~[illegible]~~ give some advises on rearing certain reptiles including snakes. We got some snakes but not taking feed. By the by you have not sent me ~~any add~~ address of any body

Yours sincerely
Thulasi

Thank you very much for the photographs. Still the stag has not shed its multiple antlers. Closing with the complements of the season. Pl. Convey my regards to Mr. Mohan Pillai.

Yours sincerely
Thulasi

1928 1981 Hatching

	Set laid	Clutch size	Hatch date	Hatched	Spoiled eggs	Survived as on 1 July	Remarks
1981	30 March 81	30	12.6.1981	27	2 spoiled 1 ~~[illegible]~~ [illegible]	26	★

Pers Comm: Mr Tulsi Rao (3/7/1981)

★ Remarks – The process of ~~egg~~ nest opening was not observed. Compact ~~[illegible]~~ matted nest for the last ~~one~~ 2 week before hatching was loosed on 11th June 2PM and croaking noise was heard by using stethos. Nest opened & exposed by Mr Tulsi Rao. ~~At~~ 10 to 15 minutes after croaking sounds were – to which the mothers had no response. Only 1 egg with a hatched was taken out and the nest was closed. Every 7PM the mother cheated the nest, and attend the nest for 2 hrs. At 11PM the mother opened the nest – waited till the hatching emerged from the eggs and took one upper bunch to water at an interval of 20 minutes each for few(3) and thereafter one hour each and up to morning it has taken out 16. Next morning 6 AM onwards up to 11 AM a total of 26 were removed by mother + one removed by Tulsi Rao + one died embryo. Feeding by the hatchings started after 2 days with chopped fish and mined beef.

INDIAN POSTS AND TELEGRAPHS DEPARTMENT



Date Stamp

Copied side

Desk message /8/

RECEIVED
[FROM]
[BY]
[AT] 16 HRS 00 MTS.

TO

Binod Choudhry

Zoo park,

Hyderabad.

TELEGRAM NO. J 162

THIS MARGIN

NOTHING TO BE WRITTEN OR GUMMED IN

FIRST FOLD

O 1255 N 93 Visakhapatnam 8 12

= crocodile layed Eggs Letter Follows =

= Thulsi =

SECOND FOLD

Note : Sequence of entries in this Telegram is—Class of Telegram, time handed in serial number, office of origin, date service instructions [if, any], number of words, text and sender's Name [if, any] Particulars at the foot of the Telegram are for Departmental use only.

This form must accompany any enquiry relating to this Telegram within 45 days of the date of booking

Binod C. Choudhury

NEHRU ZOOLOGICAL PARK
HYDERABAD - 500 264.
INDIA

.....

1. 1978 yearclass introduced in the breedpool in April 1982 (Size 60 cm)

2. One was killed on ..... by the female & male.

Required info

① June Measurements of all yearclass.

	Measurement	Age	N
1. 1981	1982 June	1 yr	26
2. 1980	— do —	2 yr	10
3. 1979	— do —	3 yr	1
4. 1978	— do —	4 yr	2

Dear Mr. Chowdhuriji,

Namasthe: thank you for your letter, I am herewith sending the negatives you sent long back (of release of S. Water crocodiles). I am yet to send Rs 80/- regarding the photos prints of these.

Regarding the article Breeding biology of IGZP Crocs, I invite you desire to be one of the Co-authors. Kindly make a trip to vizag at your earliest possible time: We are going to release some crocs in the newly constructed Holding pool on 7th of this month by the Secretary FERD; Please do come with the statistics I gave you during your trips of the crocos of IGZP. Also bring the photos of dead crocodiles (In the nest) of 1982 Stocks.

Rest in person

Yours sincerely

J Prakash Rawal

2/10/82

9th Feb 1982.
I [illegible] (VSP)

Dear Chowdhury Sab,

How do you do? I haven't heard anything from you. I received your letter from Berhampur a day later of your sheduled departure from ~~your~~ Waltair as I was on Pongal leave. I have despatched one copy of yours drafted material on crocodiles long back. I hope you ~~would~~ might have received it. We sent a proposal for Salt water crocodile complex and almost approved by the C.F., I may please be advised in designing the hatchery for Salt water corocodile and the possible problems that might occur in future.

Director of CCBMTI has promised to spare space for our article in their next issue. Please let me know what happened.

Any news regarding wildlife activities; seminars etc. Why don't you make a trip to Waltair in this month?

I am eagerly awaiting for your reply.

Close with the best wishes of the season.

Yours sincerely
[illegible]
[illegible]

अन्तर्देशीय पत्र कार्ड
INLAND LETTER CARD



To

MR. BINOD CHOWDHURY
CROCODILE COMPLEX
NEHRU ZOOLOGICAL PARK
HYDERABAD (A.P)

पिन PIN

तीसरा मोड़ THIRD FOLD

इस पत्र के भीतर कुछ न रखिए NO ENCLOSURES ALLOWED

प्रेषक का नाम और पता :— SENDER'S NAME AND ADDRESS :—

from K Jhansi & Co
I.G Park (VSP)

पिन PIN



पहला मोड़ FIRST FOLD

दूसरा मोड़ SECOND FOLD

यहाँ फाड़ कर खोलिए TO OPEN CUT HERE

IGP. VIZAG MATCHING

1981 Stock (1987 Stock)

Sl no	TBR	Wt	Remarks clipboard
1	58	820 gm	811
2	67	880 gm	811
	70	920 gm	811
4	68	820 gm	811
5	57	840 gm	811
6	(86)	(950 gm)	811
7	58	865 gm	811
8	65	820 gm	811
9	64	800 gm	811
10	67	900 gm	811
	65	870 gm	811
12	64	900 gm	811
13	68	900 gm	811
14	66	(790) gm	811
15	59	820 gm	811
16	61	830 gm	811

January 1982

Age - 18 months 1984 1983

Sl no	TBR	Wt	Remarks
17	65	920	811
18	(57)	860	811
19	67	870	811
20	75	940	811
21	70	890	811
22	68	800	811
23	27	420	Tail/Loss

1446 65.7 1906

(57 - 86)

866

(790 - 950)

January 1983

Mating observed in the 1st week of January

on 11th & 12th 1983 courtship & fore play observed

also on 16th

vegetation in breeding pool needs removal

Binod C. Choudhury

NEHRU ZOOLOGICAL PARK
HYDERABAD - 500 264.
INDIA

28/6/82

1. 1921 Nest opened at 11.30 AM after

Eggs laid
2.4.82
28.6.82

28
31
28
87 days

2. Foul smelling dead embryos seen and on total opening the following more seen.

4 Infertile eggs
4 Unemerged dead embryos
3. Partially emerged
21. Hatched dead

28/32
3 87.5% fertility

32 eggs total - Random sample hatching size
28 cm Average

Size of Eggs (1 sample)

82 x 49
75 x 52
77 x 47

all infertile eggs

~~Embryos~~ hatchings must have died at least 10.15 days back.

Binod C. Choudhury

NEHRU ZOOLOGICAL PARK
HYDERABAD - 500 264.
INDIA

IGZP Mugger Breeding

Year	Date of Egg laying	Clutch size	Date of Hatching	Incubation method	No Hatched	Remarks
1977	Eggs laid in water	–	–	–	nil	Eggs laid in water
1978	not known	not known			15	
1979					16	
1980		16			12	
1981	29.3.81	29	1/2.6.82	In situ	26	
1982	2.4.82	32	not found on 28/6/82	In situ	nil	Hatchlings died within the nest-unable to open the nest-fertility 87.5%
1983	23.3.1983	12	–	–		Eggs laid on land without digging a nest hole
1984	not known	18	8/6/84	In situ	15	new nesting site
1985						

Binod C. Choudhury

NEHRU ZOOLOGICAL PARK
HYDERABAD - 500 264.
INDIA

.....

1G2P Breeding Pool

1 Male + 1 female Adult (3-½ yr old)

2 Juveniles size of 1978 yearclass introduced in April 1982

1 killed by the female

Age of wild caught ones (Attributed (less yearclass)

New Captive Breeding Facility for Saltwater Crocodiles
at Vizag Zoo

The new breeding pool for the Saltwater Crocodile, Crocodylus porosus was inaugurated in June 1989, with the introduction of one 3.6m male and five 2.5 to 2.9m females. The 60m X 30m enclosure is provided with two pools. The main pool is 30m X 20m X 2.5m in size and the subsidiary pool is 6m X 5m X 2m. The smaller pool is at a higher elevation and water ~~enters this pool~~ flows down in to the main bigger pool. Provision has been made to create ~~an~~ atmosphere of mangrove creek by planting mangrove vegetation and landscape surrounding the pool. A 15 HP water pump twice ~~fills~~ overfills the pool, to create artificial flooding of landscape to create a tidal effect surplus water flows down in to a natural pond below the breeding pool ~~where~~ stocked ~~fish farming~~ with fish to ~~be~~ used as food for the crocodiles.

June 1983

1528. Vizag.

① Breeding pool (Muggur) - Eggs laid on top (12 spoiled eggs) spotted on 2nd March.

1979 - 2 (1 mixed with 1980 & 1 in breeding pool)

② Hatchling pool - 1980 stock too cramped - Needs to be shifted to bigger pool - Perhaps to the holding pool from which the ♀ can be shifted to Breeding pool.

1981 stock - Good growth.

1982 } No stock
1983 }

③ S.W. Breeding pool - Not yet complete. Pandanus and allied trees can be planted in Mid to end June. Alangrove only after overturbine is common.

Wanted from Chilka

1. Breeding pool, Kelsh
2. 1980/81 stock June 1983 Measurements
3. Photographs of Mating (Mags as well)

[signature] 8/9/10

Binod C. Choudhury

NEHRU ZOOLOGICAL PARK
HYDERABAD - 500 264.
INDIA

8 July 1984

1984 Mugger Breeding Results

Date of oviposition : not known

Locating the eggs on : Hatching date

Hatched on : 8 June 1984

Clutch size : 18 eggs + 2 infertile (18)

No. hatched : 15 + 1 died - 16 ✓

Nesting site : new nesting site

Information by : U. Thulsi Rao.

4th January 1982
Visakhapatnam.

Dear Mr. Chowdhury,

Wish you a happy and prosperous New year. I am in receipt of your two letters. Sorry for the delay in giving you reply. I am herewith sending a copy of your manuscript on crocodiles duly filled in blanks with appropriate data. Thank you very much for your initiation and pursuance in this regard. Why not you modify this, and publish a ~~comparat~~ comparative study on captive crocodiles observed both at N2P & IG2P with respect to that of wild ones. This year also I am observing on our breeding crocodiles. Mating has not yet been taken place. What about your crocodiles. There is one book on bio-chemistry of Nile crocodiles in our institute if I remember well. Could you please secure and send it to me at your earliest convenience. We have submitted a plan and estimate to C.F. regarding our would be coming crocodile complex at IG2P. Could you please suggest ~~any~~ the design for hatchery to the Estuarine crocodile so as to avoid the difficulties if at all if any experienced earlier by Mr. Sudhakar Kar and others. I will be sending the measurements of the current years hatchlings in the ~~return~~ next letter within a day or two.

Closing with the best wishes of the season.

Yours lovingly
Jhulasing Jo
4/1/82

MUGGER CROCODILE BREEDING AT
INDIRA GANDHI ZOOLOGICAL PARK, VISHAKHAPATNAM. AP.

A pair of mugger crocodile (C. palustris) on exhibit at Indira Gandhi Zoological Park, Vizag, India (since 1977) started breeding in the year 1977. Initially housed in a rectangular pool of 5.7m X 3.2m X 1.2m dimension without any surrounding landarea to bask, the female laid six eggs in the pool water in April 1977 which resulted in no hatching. These eggs were no small development. In July 1977 this pair of mugger were shifted into a new enclosure of 300 m² area with a central crescent shaped pool of 20m X 2.8m X .6m size. The land to water area were in the proportion of 3:1. The land area surrounding the pool is well vegetated. A 1.85m steep walled moat infrared separates the visitors from the crocodiles (Fig 1)

In 1978 June 15 hatchlings were obtained from the clutch of eggs laid by the female in this enclosure and since then the female has been breeding successfully. In 1979 sixteen hatchlings in 1980 twelve hatchlings and in 1981 twenty seven hatchlings have been resulted from this pair (Table I). Eggs laid were allowed to hatch in situ in the enclosure every year, though hatchlings were removed after hatching for rearing in specially designed hatchling pools. Detailed observations were recorded by VTR in the 1980 breeding season. The breeding season commenced from September 1980 and ended with hatching in June 1981. During this period, the following nesting, hatching & parental care behaviours have been noticed

Courtship.

From mid September 1980, the male ~~[illegible]~~ and the female were observed to be bushing in proximity to each other, ~~At~~ times the male resting his chin on top of the females body. Earlier, they used to remain apart from each other and occupy different ~~[illegible]~~ forward bushing areas. During the next three months ~~right~~ upto the last week of December there was virtually no change in their normal behaviour pattern. In the last week of December ~~both~~ the pair were observed to take to water quite frequently with male circling around the female.

Mating - Actual mating was observed only on ~~two~~ ~~days on~~ 6th and 7th January 1981 in the early hours of the day between 0600 hrs to 0700 hrs. The male approached the female in water from behind, ~~and~~ scratching (slapping) her with his right fore limb just near the base of the tail behind the hind limbs. Advancing further ahead the male muzzled the female on her ~~face~~ snout. This behaviour continued for ~~quite~~ about 10 minutes ~~and~~ while so doing the pair was quite mobile and covered the total water area in the pool. The male grabbed the female in his fore limbs just behind her neck region from top and the tail region of both were meeting laterally such that the cloacal regions of both ~~[illegible]~~ were facing each other. Mating took place on an average for 20 seconds and continued for several times both the days.

On the morning of 15th March 1981

Nesting: The female mugger was observed scraping the ground near the enclosure wall on the north-east and north west corners. She made several such attempts in the morning and afternoon using her forelimbs. Within one week she had made four trial pits in a 2mt radius. The trial pits were mere scraps on the hard ground except the deepest one measuring 15cm in depth in a loose substrate. From 22nd March to 29th March the female mugger did not show any activity. On 30th March she emerged with the missing bulge in the midtrunk region. On checking the land area the nest was located on the north-eastern side of the enclosure. She had laid the eggs the previous night on 29 March 1981. This nest was a freshly made one and not one of the four trial pits made earlier. The egg chamber had been carefully covered with some dried leaves scattered on top. The top eggs were 16.5cm below the surface. Eggs were left in the nest for natural incubation.

Nest guarding: While checking the land area surrounding the pool to locate the nest, the female mugger exhibited extreme aggressiveness and charged at all intruders. She remained in water only after seeing a large number of people. From 31st March to 15th May the female was observed very near the nest - most of the time facing it and charged at anyone entering the enclosure. Though the nest was under the shade of a bamboo clump the female never changed her place even for bushes in

The sun. She used to enter the water for a short while during the night and had her usual ~~food~~ normal diet. From 15th May she abandoned the nest and was observed basking away from the nest regularly.

Hatching and parental care of young:

On June 11, after 72 days of incubation, the nest was ~~[illegible]~~ checked at 14.30hrs while the mother was in water. The nest was opened and the top layer of eggs were exposed. At 16.00hrs, the feeble grunts were heard from the eggs. Two eggs were removed ~~and~~ ~~[illegible]~~ for opening and two healthy hatchling emerged out of them. The nest of the eggs ~~[illegible]~~ in the nest were covered up again to observe the actions of the mother. At 1800hrs, the female approached the nest and rested for one hour with her chin on top of the nest and moved very little from the nest till 23.00hrs.

Around 23.00hrs the female used her snout and fore limbs to open the nest and exposed the eggs. Each emerging hatchling was taken into the water about m from the nest by the mother keeping it in her mouth. By 1100hrs of 12th June the female carried 24 hatchling in to the water. During this time the mother were ~~carried~~ ~~[illegible]~~ cracked or ~~hatchling~~ or carried ~~cracked~~ an egg in to the water.

Since the nest soil was too hard and compact, at

each interval of mother carrying one hatchling in to water and returning back to nest. The nest-soil was loosened by digging by one of the Observers. The final count of eggs showed 29 eggs of which two were infertile and one had a half developed embryo.

As soon as the mother returned to the nest, the previously released hatchling in water was removed by using a scoop net. All but one hatchling were removed from the parents enclosure. However during all this handpening the male mugger exhibited no interest in the operation nor exhibited any aggressiveness.

Discussion:

From:

B.C.Choudhury,
Research Assistant,
Crocodile Scheme,
Nehru Zoological Park,
Hyderabad.

To:

The Conservator of Forests,
Wild Life Management,
Andhra Pradesh,
Hyderabad.

Sir,

Sub - Release of Saltwater Crocodiles in the Breeding Pool at IGZP, Vizag - Submission of Report -Reg.

Ref - CF(WLM) Ref. No. 410/W3/84 dated 23.6.1984 .

.....

Five saltwater crocodiles (Crocodylus porosus) ; one male and four female were transported to Indira Gandhi Zoological Park, Vizag on 27.6.1984 by road transport as the crates containing crocodiles were too large to be transported by train as proposed earlier. The maximum size of crates allowed by railways is 2.5m X 1.5m. The crates designed to shift crocodiles measured 3.5m X 1m X .3m.

Accompanied by the undersigned and the Forest Range Officer of the Crocodile Scheme, the crocodiles reached Vizag at 9PM on 28.6.1984 and were released into the breeding pool the next day at 5Pm.

Following release the crocodiles were under constant observation till 3 PM of 1st July 1984. No territorial behaviour or agnostic behaviour could be observed during this period. However, a 24hour observation schedule has been arranged to rule out any possible victimisation of smaller size classes by the larger ones.

I am enclosing a note on the crocodiles released in the pool, their care and management and request the Conservator of Forests, Wild Life Management to kindly communicate the same to the Curator, Indira Gandhi Zoological Park, Vizag.

Yours faithfully,

sd/

Dated 13th July 1984.

(B.C.Choudhury)

Copy submitted to Wild Life Warden, Wild Life Investigation for favour of information.

17/84

Rec. No. 410/W3/84,
Dated 9-8-1984.

6759/S

Office of the Conservator of Forests,
Wildlife Management, A.P., Hyderabad.

OFFICE OF THE CURATOR
NEHRU ZOOLOGICAL PARK
16-8-84

Sub: Release of salt water crocodiles in the breeding pools of I.G.Z.P. Vizag - Reg.
Ref: Report of Sri B.C.Choudhury, Research Asst. Crocodile scheme NZP. Hyd., dt. 13-7-84.

While enclosing herewith a copy of note on care and Management of Salt water Crocodiles released in the breeding pools at Indira Gandhi Zoological Park, Vizag on 29-6-84 for taking necessary action.

The Receipt of the note may be acknowledged.

~~Yxxxxxfaithfxxxxx~~

Sd/-,
Conservator of Forests,
Wildlife Management,
A.P., Hyderabad.

To
The Curator, Indira Gandhi Zoological Park, Vizag.

Copy to Sri B.C.Choudhury, Research Asst. for information.

/t.c.b.o./

13/8/84
Manager.

A NOTE ON

CARE & MANAGEMENT OF SALTWATER CROCODILES

RELEASED IN THE BREEDING POOL AT IGZP, VISHAKHAPATNAM.

A NOTE ON
CARE & MANAGEMENT OF SALTWATER CROCODILES
RELEASED IN THE BREEDING POOL AT IGZP, VISHAKHAPATNAM .

By B.C.Choudhury, Research Assistant, Crocodile Scheme, Hyderabad

JULY 1984.



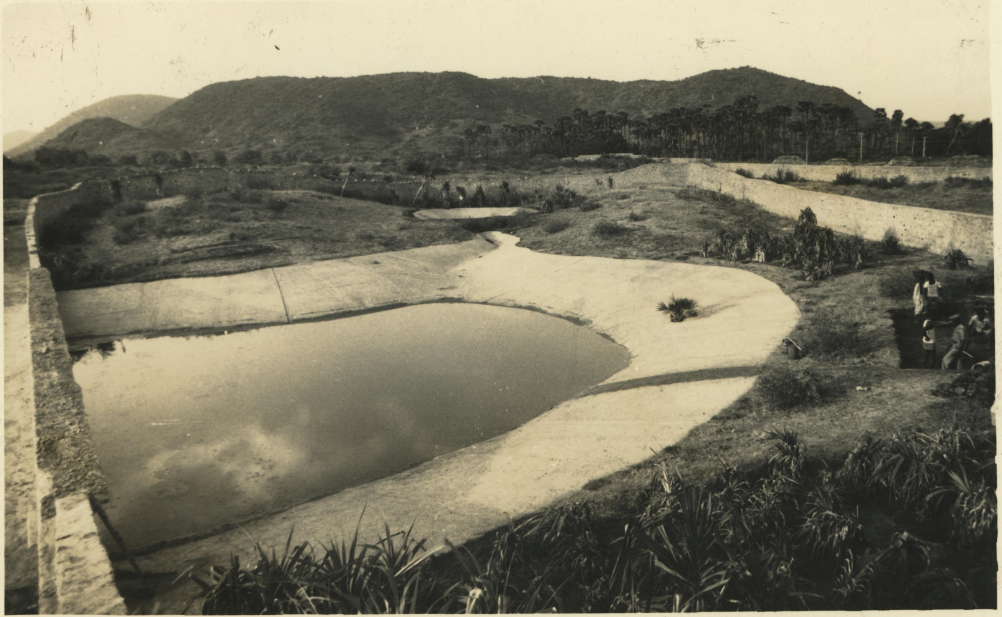
Plate Captions:

Top: A wideangle view of the new saltwater crocodile Breeding pool at Indira Gandhi Zoological Park, Vishakhapatnam.
Bottom: The 3.6m male saltwater crocodile after being released from the transport crate.

Photographs: B.C.Choudhury.







C O N T E N T S

Introduction	1
The release stock, identification markings and origin	2
Behaviour of the animals	4
Food and Feeding	5
supplements	6
antibiotics	6
deworming	7
Past records of sickness	7
Precautions	7

A NOTE ON CARE AND MANAGEMENT OF SALTWATER CROCDILES RELEASED IN THE CAPTIVE BREEDING POOL AT I.G.Z.P, VIZAG ON THE 26th JUNE 1984 .

The new saltwater crocodile breeding pool at the Indira Gandhi Zoological Park , Vizag was made ready towards the end of 1983. From January 1984 landscaping work taken up and several species of mangrove plants brought from Coringa Wildlife Sanctuary and Vizag backwaters were planted on the landarea surrounding the pool. Besides, these locaLy available Pandanus sp. was also planted to give the pool an an appearance of mangrove area. By May 1984 most of these plants had established.

From the stock of saltwater crocodiles Crocodylus porosus , being reared at the Crocodile Rearing Complex (CRS) at Nehru Zoological Park four female of seven to eight year age ranging in size 2.1 to 2.5m were chosen to be released in the breeding pool. (Females of 2.3m are known to have laid infertile eggs in captive collections at various zoos in the country).

A single male individual of 3.6m on exhibit at the Nehru Zoological Park, Hyderabad was also chosen to be released into the new breeding pool.(Crocodilians are polygamous and a single male often courts and mates with several females ranging from two to six in number. In captive breeding pools at Thailand and Papua New Guinea a single male is used with up to ten females. This also helps in diminishing male territorial fights which often results in casualities).

Accordingly , a total of five (four female and one male) were captured,measured,marked (for future identification) and crated for transportation on 27 June 1984. Following a journey by truck the stock reached Vizag on the night of 28 June and were released into the pool on 29 June 1984 at 5 Pm.

The Release stock , Identification markings and Origin:

Scute clipping method has been adopted to mark the crocodiles (for future identification) released into the breeding pool.

Three female measuring 2.5m/69 Kg , 2.25m/55 Kg and 2.17m/48 Kg have come from the North Andaman Islands in June 1976 as eggs. The eggs came to Madras where after an incubation of eight weeks they hatched in August 1976. As one week old hatchlings they were brought to the Nehru Zoological Park in September 1976 at an average size of 30cm/100gm. At an age of one year as yearlings they were shifted to the Crocodile Rearing Complex (CRS) and since then they were being reared at the CRS. To denote the year of origin (1976) , the dorsal double crested scutes of the tail region were clipped. Looking at an crocodile from its tail towards the head the double crested scutes of the tail region are counted starting from the point where the single crested scutes start. The 7th scute of the left side and the 7th scute of the right side were clipped denoting the year of origin as 1976. Three females have the clipping code (7th left and 7th right) which can be seen even from a distance of 20 to 30m .

One female measuring 2.10m/40 Kg has its origin in the Bhitar Kanika Sanctuary in Orissa. Hatched in July 1977 at the Crocodile Rearing Complex at Dangmal it was brought to Nandan Kanan for a short period of six months from where along with two other it was brought to CRS in October 1980. It measured then 1.3m/6.5 Kg. On arrival at CRS its 7th left and 7th right double crested scutes were clipped denoting its year of origin as 1976 . (FIGURE I).

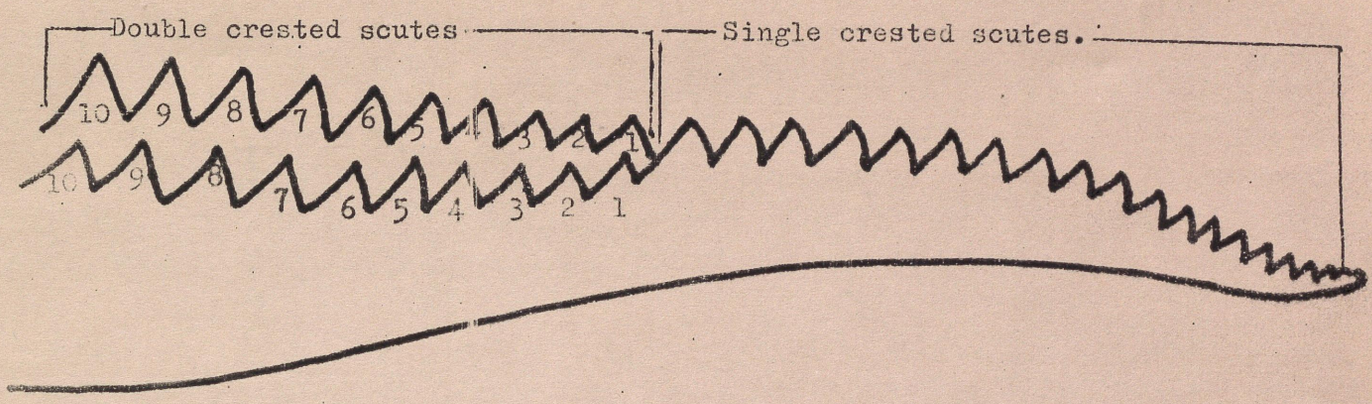
Krishna having come from the wild (caught in the Krishna river estuary in Andhra Pradesh in January 1979) gives no indication of its origin and age. As such no clipping code has been given to it.

Krishna - the lone male in the group was caught in the Krishna river estuary in January 1979, and was brought to the Nehru Zoological Park on 14 January. Since no population of wild saltwater crocodile are known to occur in Andhra Pradesh it is believed that Krishna may have strayed out from one of the existing wild populations of saltwater crocodiles in Orissa, Srilanka or the Andaman Islands. While being captured in the wild Krishna had suffered some injuries on his snout and has the permanent deformity in that region following complete healing. At the time of capture Krishna measured 3.52m. In October 1980 he was measured and sexed and had gained only an increase of 3cm measuring 3.55m. He was measured and weighed in June 1984 again prior to release into the new breeding pool and measured 3.60m and 100 Kg.

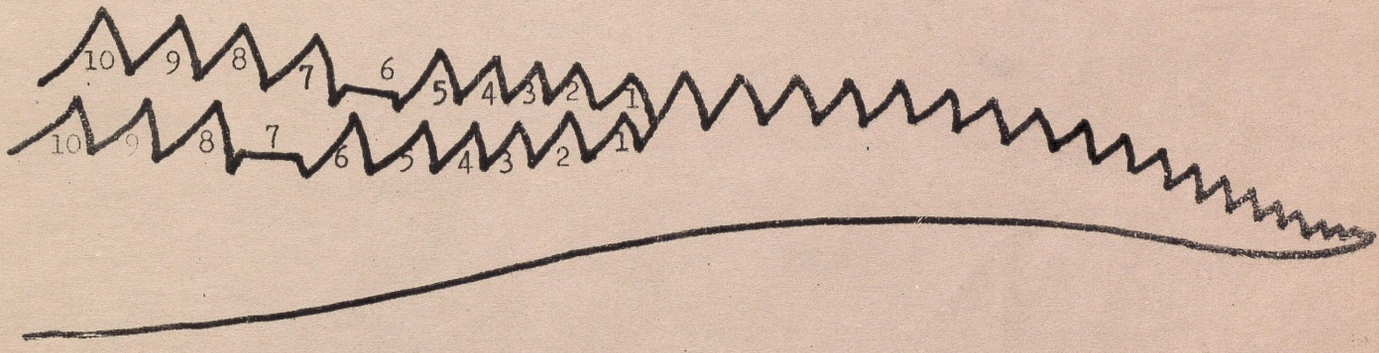
For details of the identification marking codes used please see Fig. I.

DETAILS OF THE CROCODILES RELEASED IN THE BREEDING POOL:

Sl. No.	Size	Weight	Sex	Hatched in the Year & Age	Identification markings and Origin.
1.	3.6m	100Kg	Male	Not Known	Wildcaught from Krighna river in January 1979. Injury marks on snout.
2.	2.5m	69Kg	Female	1976 / 8yrs	7th left and 6th right dorsal doublecrested scutes clipped. Origin from Andaman Islands.
3.	2.25m	55Kg	Female	1976/8yrs	------ do ------
4.	2.17m	48Kg	Female	1976/8yrs	------ do ------
5.	2.10m	40Kg	Female	1977/7yrs	7th left and 7th right double crested scutes clipped. Origin Orissa.



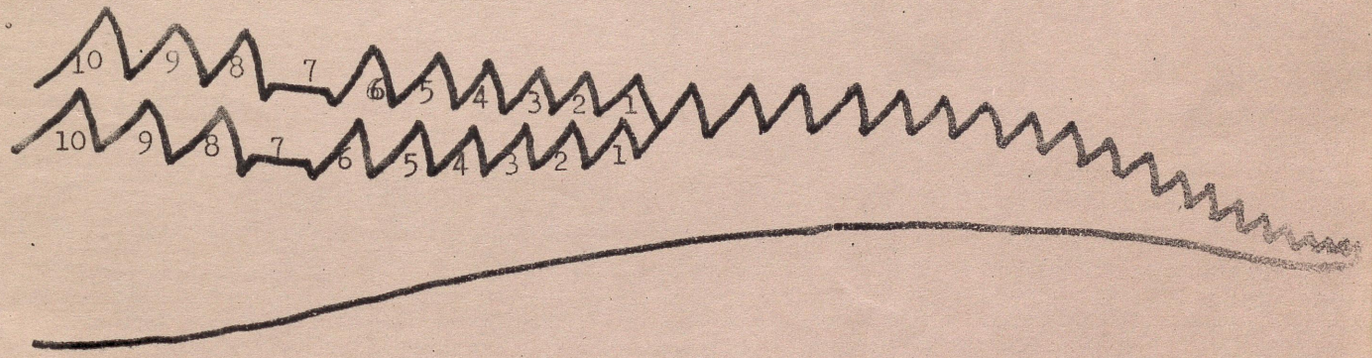
KRISHNA (MALE) . SIZE 3.60m , 100 Kg , NO CLIPPING.



FEMALE 1. SIZE 2.50m , 69 Kg , 7th left and 6th right scute clipped.

FEMALE 2. SIZE 2.25m , 55 Kg , 7th left and 6th right scute clipped.

FEMALE 3. SIZE 2.17m , 48 Kg , 7th left and 6th right scute clipped.



FEMALE 4. SIZE 2.10m , 40 Kg , 7th left and 7th right scute clipped.

FIGURE I . IDENTIFICATION MARKINGS (SCUTE CLIPPINGS) , SIZE & WEIGHT OF SALT WATER CROCODILES RELEASED IN THE BREEDING POOL AT IGZP, VIZAG .

Behaviour of the animals:

Saltwater crocodiles are basically solitary by nature and from the size of 1.5m even the females try to assert a territory both on land and in water. As such it is extremely difficult to form compatible breeding group. Fighting and injuries ingroups kept together is very common. Victims tend to remain isolated in a corner and refuse to go to water. They usually suffer from dehydration and from secondary infections caused by the wounds and die of septicemia.

Amongst the stock released in the breeding pool, Krishna is the largest and having come from the wild is not quite used to humans. He is basically shy and dives into water on being approached. However, on land he is aggressive . In the new breeding pool , he may try to establish a territory of its own - now that he is with several other females for the first time. This may take a little time - perhaps a month or two.

The biggest female (blind on one eye) was the dominant female amongst the rest, but being reared separately for a long period may not exhibit such behaviour immediately.

Other three females may soon form their own heirarchial grouping depending on their size and need to be constantly watched. When such fights ensure usually the snout gets injured and heavy laceration results near the tail region.

Each one of them (including the male) may prefer to select a favourite basking spot on land, in the shade of a bush or near a tree trunk. Invariably they prepare a shallow wallow (depression on the ground) and damage the root systems of the trees. Care should therefore, be taken to protect the mangrove plants of the breeding pool which are already in a depressed pit and the crocodiles may find this an ideal spot.

Food and Feeding:

Except Krishna, the male crocodile , all the four female are used to dead meat (beef) and fish. They are also used to cpture and eat live fish released in the pool as also to live or freshly killed birds and small mammals. Since most fights occur during feeding they are fed in separate feeding areas.

Krishna does not eat dead meat or fish. He has the record of going off feed for a period of over one year (from January 1979 to January 1980) following his capture from the wild. During all these period he was known to have taken a paddybird and a cat , both of which strayed into his enclosure. From January 1979 , even-though live fish were being released into the pool, he seldom touched them as also the dead meat. From January 1980 he was observed feeding on the livefish. Once he started on a regular diet a quantity of 750 gm / day of live fish was being given to him. Once in a month or even a fortnight he was given a live chicken or a guineapig as feed supplement.

The females were conditioned to a particular feeding time (1500 hrs) of the day. All of them were given a quantity of 350 to 500gms/ each /day.

Recommendad Quantity of food:

Krishna (male)	1 Kg	250gm beef	750gm livefish.
Four females	2 Kg 0.5kg/each/day	1.250 beef	750gm livefish.
Total	3 Kg	1.5 Kg beef	1.5 Kg livefish

However, it is expected that the intake of food may be higher in the hot and humid climate of Vishakhapatnam and therefore after a period of observation the quantity may be increased. However, the total quantity of food consumed should not exceed the maximum of 2% of their body weight. (per day).

It is suggested that any change in the quantity of food being given should be carried out during the months of March (begining of summer), July (beginning of monsoon) and November (onset of winter). Crocodiles generally consume very little food in winter.

All the crocodiles are conditioned to a particular feeding time and also have acequired the habit of jumping and chasing the person with the feed bucket at feeding time. They can be avoided by using a long stick.

It is suggested that in the new breeding pool,20 to 30 Kg of livefish should be stocked initially following which a replenishment of 1.5kg of livefish can be done everyday. This helps the crocodiles to capture live food as and when they want it and the management to get over the problem of procuring livefish everyday.

Supplements:

At an interval of one week to a fortnight freshly killed bandicoots, rabbits , guinea pigs or chicken with fur and feather can also be given. Other than providing a variety to the diet they help in a propmer calcium to phosphoros ratio in the diet which should be 1:2 . Additionally Osto - Calcium syrup in the ratio of 10ml/kg of beef may be added in the feed everyday. Some multi vitamin supplement can also be given.

If marine or brackish water feed is given everyday there is no need to add extra salt in the feed but it is suggested that the beef being given should be soaked in a salt solution (common salt) for period of half an hour before being fed.

Antibiotics:

Antibiotic drugs like Hostacycline was being given at the rate of 5gm/beef for a period of five days at an intaerval of four months in the month of February,June and October. Following antibiotics the dosage of multivitamins was usually increased.

Deworming:

Though no specific endoparasites have been recorded with the stock while they were at the Crocodile Rearing Complex at Hyderabad, a routine quarterly deworming schedule was being followed. Deworming drugs are mixed with the feed given for a period of three to five days and was usually in the month of February, May, August and November.

Past records of sickness:

All the stock released into the breeding pool at IGZP had no major sickness record while they were at the CRS at Hyderabad. However, all of them had at sometime or other had external injuries caused by territorial fights. The wounds were usually at the base of the tail, hind legs, on the back and snout tip. Following injury they were usually sprayed with Acri-flavin solution (~~1x~~ 1:1000) and Furacin ointment applied. If the wounds were severe some additional antibiotics were also given in feed to avoid secondary infection.

Such fightings and injuries may become the single most major problem with the stock at IGZP. The victims have to be treated as soon as wounds are seen and since they would refuse to go into water , water has to be sprayed on them to avoid dehydration.

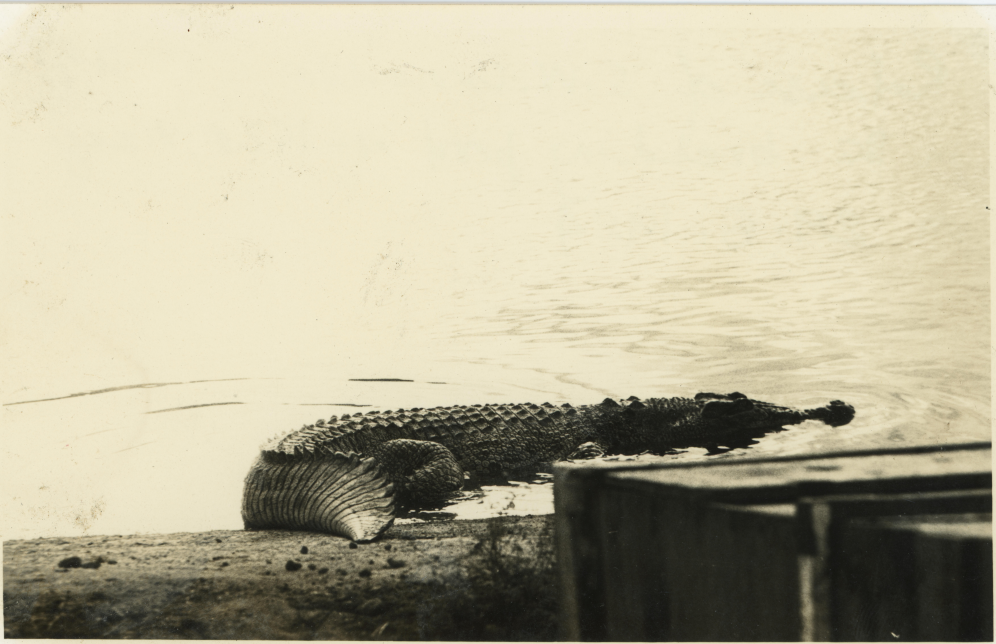
Precautions:

Saltwater crocodile behaviour is unpradictable. Sometime they exhibit aggressive behaviour with no past record of such behavhour. Therefore, it is always safe to maintain a safe distance from them while feeding or pool cleaning, Even at the time of removing dead uneaten food. At no time a single keeper should go in to the enclosure. Everytime a keeper enters into the enclosure he should have a long bamboo with him to keep crocodiles away from jumping at him.

13/7/84

Dated 13 July 1984.

(B.C.CHOUDHURY)



Release of S.W. Crocodiles 29
in the breeding pond at-1920, Vizag
on 29.6.1984.

SOME ASPECTS OF BEHAVIOUR AND BREEDING BIOLOGY OF CROCODYLUS PALUSTRIS (Mugger) OBSERVED AT INDIRA GANDHI ZOOLOGICAL PARK.

A pair of Mugger Crocodile (Crocodylus palustris) on exhibit at Indira Gandhi Zoological Park, Visakhapatnam since 1973, started breeding from the year 1977. Housed in a pool of 5.35 M X 3.20 M X 1.20 M size without any basking area, the female laid eggs in the water resulting in no hatchling. Consequently, the breeding pair was shifted into a new enclosure of size 70 Mts., Circumference X 1.85 Mt., depth (Area 390 M^2) during July with a 77% of land and 33% water area. The crescent shaped pool of 20 M X 2.8 X 0.60 M dimensions (33.6 M^3) is surrounded by a well vegetated land area and a 1.85 mt. steep walled moat, separating visitors from the animals on exhibition. In June 1978, the eggs laid by the female hatched and 26 hatchlings were obtained. In 1979, fourteen hatchlings and in 1980 sixteen hatchlings were reported to have been hatched. In all these years the eggs remained in the natural nest site and were never disturbed till the date of hatchling.

A more detailed observations were made for 1981 breeding season right from the courtship and mating activity by the pair in the winter months of 1980-81, followed by nesting activity, parental care and hatchling.

COURTSHIP & MATING:-

From September 1980 the male and the female were observed to be basking at one place which was not the normal behaviour. Earlier, they used to stay apart and occupy different basking places.

Between September to December there was no display by the male or female (regarding) any specific courtship behaviour. It was noted on 6 th and 7th January early morning around 06.00 hours that mating has come under observation in the water.

MATING BEHAVIOUR: At 05.30 Hrs., male crocodile approached the female from the back, in the water and slightly slopped the female at its tail and reached the females snout. Both have taken a turn round in the crecent pool and came closer to each other keeping the males snout on its mate entwining the tails. Cloacal opertures of both the animals were just opposite and the mating took place on an average for 20 seconds in the water.

(Contd., 2.

NESTING ACTIVITY: The first sign of nesting activity was observed on 15th March, 1981, when the female was seen making trail pits on the North-east and North-west corner of the enclsoure. The female started scratching and digging the ground with the forelimbs during the early morning hours and again in the afternoons. Four such trial pits were made at a distance of 2 Mts., apart within a period of one week. The trial pits were mostly scrpes on the hard late~~s~~rite soil but the deepest one was slightly more than 15 cm in an area where the substrata was rather loose. Between 22nd March 29th March there was no activity by the female. On the 30th March the female was observed to be very thin on its ~~belly~~ mid trunk region and the whole land area was checked. The nest was located on the North eastern side of the enclosure. From this it was known that the nest has been laid in the night on 29th March, 1981. The nest was a new nest hole and not any of the four trial pits. The nest was made compact by the female and was also covered by dried leaves. It would have been difficult to locate the nest, but for our regular observation. On checking, the first layer of eggs were seen to be at 16.5 cm below the surface The mother exhibited extreme aggressiveness and charged at all intruders. The nest was disturbed only to ~~the extent of~~ recordi~~ng~~ nest temperature and ~~for~~ to count~~ing~~ the eggs. However, the aggressiveness of the mother did not permit us to count the eggs. The nest was left as it was in the nature for incubation.

NEST GUARDING & PARENTAL CARE: ~~The~~ from the next day the female was observed near to the nest facing it, and charged ~~any~~ at intruders. At nights she used to enter the water for a short while. The task of guarding the nest did not allow her to bask in the sun as the nest was under the shade of a bamboo clump and other vegetation. She continued to exhibit xxx days such behaviour upto 15th May, ~~but~~ a total incubation period & nest guarding period during this ~~(period)~~ her feeding behaviour was normal and she was fed her normal diet. She was never observed near the nest after 15th May, but was seen basking regularly.

On 11th June after 72 days of incubation the nest was disturbed at 14.30 hrs., without the knowledge of the mother. The nest was opened, the top layer of eggs were exposed and checked for crocking sound of the hatchlings. At 16.00 hrs crocking noise (was heard heralding the emergence of) hatchlings. Only two eggs were opened, the hatchlings were removed out and the nest was covered up again.

(Contd., 3.

At 1800 hrs., the female approached the nest and was resting on the nest for an hour. Around 23.00 hrs., she opened the nest by using her snout and front ~~tunbs.~~ limbs. Each emerged hatchling was taken into the water by the mother, keeping it in her mouth. This process continued till 11.00 hrs of 12th June. During this time the mother never cracked an egg but only carried into the water those hatchlings that have already emerged. A total of 24 hatchlings were removed by the mother into the water making a total of 26 hatchlings In an interval of each removal of hatchling by the mother, the nest soil was loosened to assist the mother. In this way of total of 29 eggs were counted of which three eggs turned out to be spoiled (with) one ~~(hairing)~~ having an half developed embryo. Everytime the mother liberated a hatchling in water and returned to the nest. The liberated hatchlings (were) removed out by a scoop net. Except for one hatchlings, all hatchlings were removed out from the parent's enclsoure. During all these (hours) the male mugger exhibited no interest in the (operation) nor (displayed) any aggressiveness.

Asst. Curator
I.G.Z. Park.

Table

Mugger crocodile (C. palustris) Breeding record in ~~[illegible]~~ Indira Gandhi Zoological Park Visakhapatnam. A.P.

Year	Date of egg laying	Clutch size	Date of Hatching	Incubation Total period ~~Hatched~~	Total Hatch	Remarks
1977	not known	—	—	—	—	Eggs laid in water
1978	not known	—	3 June	—	15	Total number of eggs laid not counted
1979	—	~~16~~	—	—	16	
1980	—	16	—		12	
1981	29 March	29	11 June	72	26	—
1982	2 April					

28°C ± 2°C
27°C ± 2°C

Statesman. 27-10-80

Census Of Crocodiles In Andamans

The Andaman and Nicobar Islands administration, for the first time, will undertake a census of crocodiles in the islands, official sources said in Calcutta on Friday, reports UNI.

The administration has decided to form a special squad to locate the reptile and preserve wild fauna and flora of the islands.

The administration will also set up a saline water crocodile and turtle farm, the sources added.

Calcutta

BREEDING OF MUGGER CROCODILE IN VIZAG ZOO

A pair of mugger crocodile(Crocodylus palustris,Lesson) on exhibit since 1973 at Indira Gandhi Zoological Park,Vizag,India started breeding in the year 1977. Initially housed in a rectangular pool of 5.3mX3.2mX1.2m dimension without any basking area,the female laid six eggs in April 1977 which proved infertile.These eggs also had no shell development. In July 1977 they were shifted to a new enclosure of 390m^2 area,with a central cresent shaped pool of 20mX2.8mX.6m dimensions.The land area surrounding the pool is well vegetated.A 1.85m steep walled moat infront separates the visitors fr-om the crocodiles (Fig 1 and Plate 1).

In June 1978, four hatchlings were obtained from the single clutch of egg laid by the female in this enclosure and since then the female has been successfully every year. In 1979, sixteen, and in 1980, twelve hatchling and in 1981 twentyseven hatchlings resulted from this breeding.pair(Table 1) Eggs laid were allowed to hatch in-situ in the enclosure everyyear,but,the hatchlings were removed from the parents for separate rearing in specially designed hatchling pools.

During the 1980-1 nesting season detailed observations were recorded by KTR. In this paper all observations observed between September 1980 to June 1981 are reported. These includes courtship,mating,nesting,nest guarding, hatching and parental care. in the sequential order.

Courtship: From mid-September 1980,the male and the female were observed to be basking in proximity to each other.At times the male was observed resting his chin on top of the females body.Earlier they used to bask at either end of the pool in their own favourite basking ares.During the next three months up to the last week of December the pair were observed to take to water quite frequently with male circling the female in water.

Mating:Actual mating was observed only on the 6th and 7th of January 1981 in the early hours of 0600 to 0700 hours. The male approached the female from behind in water and slapped(scratched) the female near the base of the tail with his right forelimb. Slowly advancing further ahead the male muzzeled the female on her snout. This behabiour contineued for about 10minutes. While in this activity the pair were quite mobile and covered the entire area of the pool. The male,then,grabbed the female by his forelimbs just behind her neck region from top and the tail region of both were meeting laterally such that the cloacal regions of both were facing each other. Mating took place on an average for 20 seconds and contineued for several times both the days.

Nesting:Since the morning of 15th March 1981,the female mugger was observed scraping the ground near the enclosure wall on the north-east and north-west corners.She made several such attempts and within one week she had made four trial nest pits using her forelimbs. The trial pits were mere scraps on the ground and the deepest one measured only 15cm deep. All these were with-in a radius of 2m in a very loose substrate.

Year	Constant Commenced on	Meeting observed on	Trial nest digging started on	Nests laid on	Hatching Date
1981	3rd week Sept	6-7 January	15 March	29 March	11 June
1982	Last week Sept	11 Jan	28 March	2 April	—
1983	3rd week Sept	2 January	no nests dug	23 March	—

a clutch of xxxxxxx was laid and this resulted in hatchlings. Out of the total ~~[illegible]~~ ——— hatchlings since being reared in 1978 a total of are now surviving, and some of them ~~[illegible]~~ are now destined to be released back in to the wild mugger habitats in the state of Andhra Pradesh.

* Separate predator proof rearing pools comprising of standard hatchlings and yearling pools as recommended by FAO

The female exhibited no activities from 22nd to 29th March, but, on the 30th of March she looked quite emacipated with the clear bulge missing from her mid-trunk region. Suspecting egg laying the land area surrounding the pool was checked and a freshly made nest on the north-eastern side of the pool wwas located. The egg chamber had been covered by the mother with some additional leaf matter. The top layer of eggs were below 16.5cm below the surface. Except for a provision to record nest temperature no other disturbance was done to the nest and the nest was left in site for incubation.

Nest Guarding: While the nest was being searched inside the enclosure the female exhibited extreme aggressiveness and charged at almost everyone who entered inside. Only when she was threatened with big poles she remained in water. As soon as the nest checking job was over and all men came out of the pool the female came rushing to the nest site and remained there. From the next day to 15th May she remained near the nest with her chin resting on the nest and charged at anyperson entered the enclosure to record temperature. She even refused to go to sunlight for basking even though the nest was below a large bamboo clump in total shade. She only used to enter the pool water for a short while in nights and during the entire incubation period had her normal diet. From the 15th of May she left the nest and was observed basking in the sunlight on the opposite end of the pool.

Hatching and Parental Care: On June 11, after 72 days of incubation, the nest was checked at 14.30hrs while the mother was in water for feeding. The nest was opened and the top layer of eggs were exposed and two eggs were removed. These two eggs were opened and two completely developed hatchlings were taken out. At 1600hrs feeble grunts were heard from the nest and to observe the reactions of the mother the nest was again covered . At 1800hrs the mother approached the nest and after resting for on the nest in her usual fashion started opening the nest around 2300hrs using her forelimbs and snout.

She totally uncovered the nest exposed the eggs and each emerged hatchling was carried by her into the pool water about 3m away from the nest. She took the hatchlings in her mouth and liberated them in the water. This process contineued till 1100hrs of 12th June and the female carried a total of 24 hatchlings in to the water. The mother never cracked or carried an egg in to the water, Since the nest soil was compact and hard at each interval of the mother carrying an hatchling into water and returning back the nest soil was loosened by the observers. The final count of eggs showed 29 eggs of which one was infertile and one had a half developed dead embryo.

As soon as the mother returned to the nest releasing the hatchling in water the released hatchling was removed from the pool by the help of a scoop net for rearing in specially designed hatchling pools. All but one hatchling were collected for rearing elsewhere. Throughout during all this time the male mugger exhibited no interest nor any aggressiveness towards the intruders. personnels observing in the enclosure.

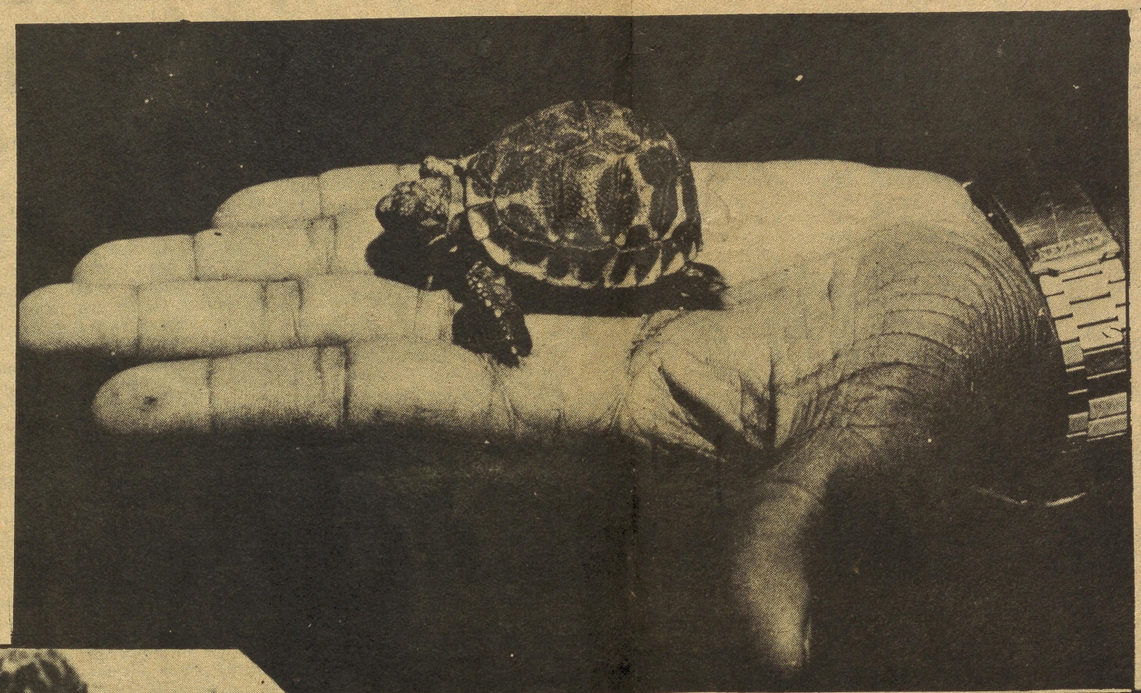
~~Discussion:~~

~~The nest laid on 1982 was opened~~ After waiting for 87 days, on 28 June ~~1983~~ the nest laid on 2 April 82 was investigated, suspecting some damage to the eggs. The nest surface was very compact and a crowbar was used to dig open the nest and 2 partially emerged dead embryos were seen. Apparently the mother could not dig open the compact nest, nor the embryos could succeed to come out on their own. The mother mugger which had deserted the nest for the last 3 weeks was visibly aggressive during this operation and ~~towards~~ ~~charged~~ rushed ~~to~~ the nest site after some 15 to 20 minutes. She took ~~a~~ the eggs in her mouth and rolled it for a while and then dropped it back in the nest. After remaining near the nest for over ~~two~~ one hour she went back to the pool and we resumed our operation of removing all decomposed dead ~~and~~ embryos and ~~embryos~~, unhatched eggs and cleaning and closing the nest area. The total land area was checked ~~for~~ and it was decided to loosen the substrate either by digging up the ~~area~~ or by adding fresh redearth and sand mixture as an aid for the next (1983) nesting season.

1982 season

1983 season

Rearing crocodiles and tortoises



The officials of the Indira Zoological Park in Visakhapatnam had some problems in rearing the young crocodiles and tortoises. For seven years the eggs laid by the crocodiles could be hatched successfully but they did not survive for long. This last one year, however, the zoo officials succeeded in taking remedial measures.

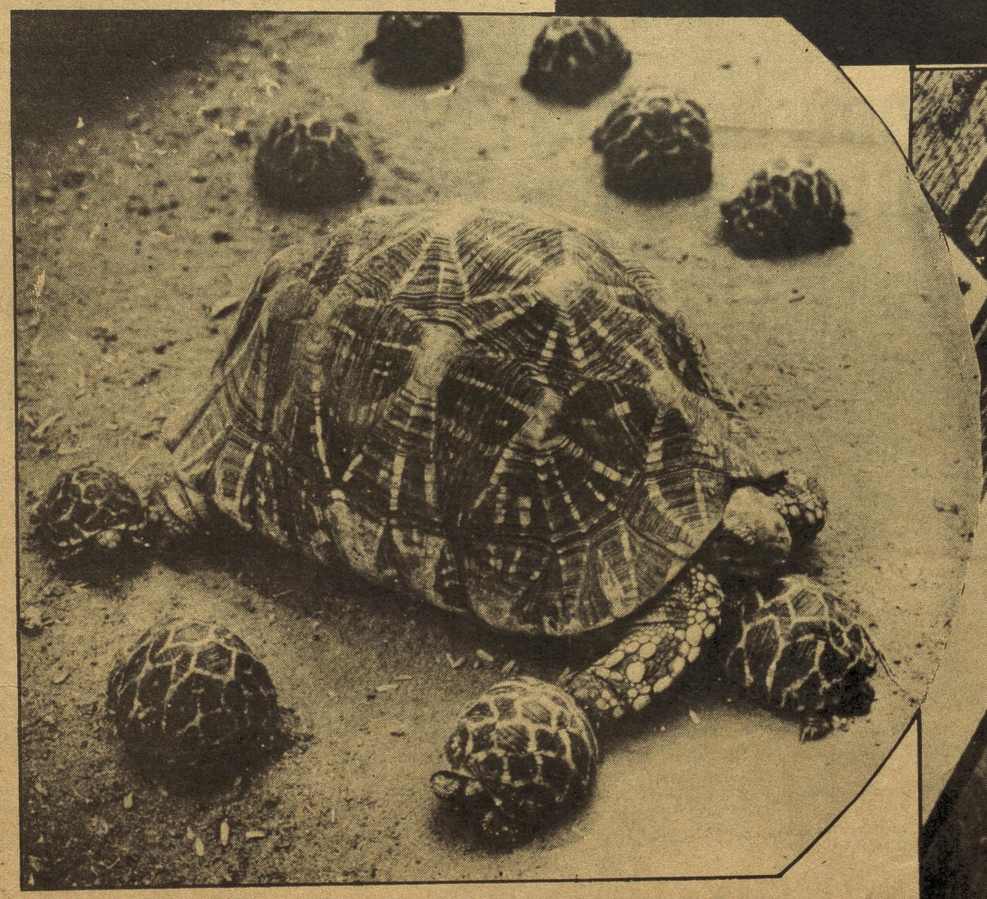
In 1977 the zoo had one male and one female crocodile only. Eighty eggs were laid but soon after hatching 70 baby crocodiles died. The same thing repeated in 1982 and 1983. The crocodiles lay eggs in sand pits and cover them up with sand. To confuse possible enemies, they dig some other pits and cover them up too. In the last two years there was a problem. The sand over the pits with eggs got hardened and hence the crocodiles could not unearth their eggs.

After continuous observation and getting expert advice, the zoo officials discovered that the baby crocodiles were dying for want of enough calcium and that they do not eat dead fish and crabs, etc. Live fish, crabs and prawns is their correct food. Crabs are rich in calcium. So the feeding techniques were changed with the result that there are 35 baby crocodiles and 18 big ones now in the zoo.

Similar experiments had to be conducted on the eating habits of sea tortoises also. One tortoise called Hawks Bill was secured by the zoo officials two years ago but it died recently. It was kept in ordinary tap water. It refused to take the feeding given. Another tortoise of the same category was secured again. It was discovered that the tortoise survives best in water mixed with 50 per cent of sea water and if it is fed live fish, crabs and prawns. Now there are 25 big and 40 baby tortoises which ordinarily live on ground only.

Mr Tulasi Rao, curator, said that now the zoo is going to rear bears.

Valliswar





A tortoise with the young 'uns (above) and crocodiles (right) at the Visakhapatnam zoo. It was discovered that the right food for both these is the calcium-rich live fish, crabs and prawns.

1G2P Mugger Breeding Records

	Breeding group Adults	S.Adults	Hatching results
1978	♂ I × ♀ I	3 not sexed	13 hatched / 4 survived Pers Comm P.S. Reddy
1979	-do-	-do-	16 hatched / 8 survived Pers Comm P.S. Reddy.
1980	-do-	-do-	12 hatched / Pers Comm.

1977 the female laid eggs in water. No land area for bashing.

IGZP vizag 1978

	Adults		SAdults		Juveniles	
	♂	♀	♂	♀ n.s	not	sexed
	1	1	–	–	3 1978	50cm
	4.U	origin not known			Silaru origin	
1978						13/4
1979						16/8
1980						12

15
2n

5/25

1.14
1.70
2.27
2.85
3.40
3.40
3.85
5.33

28.2.8.00

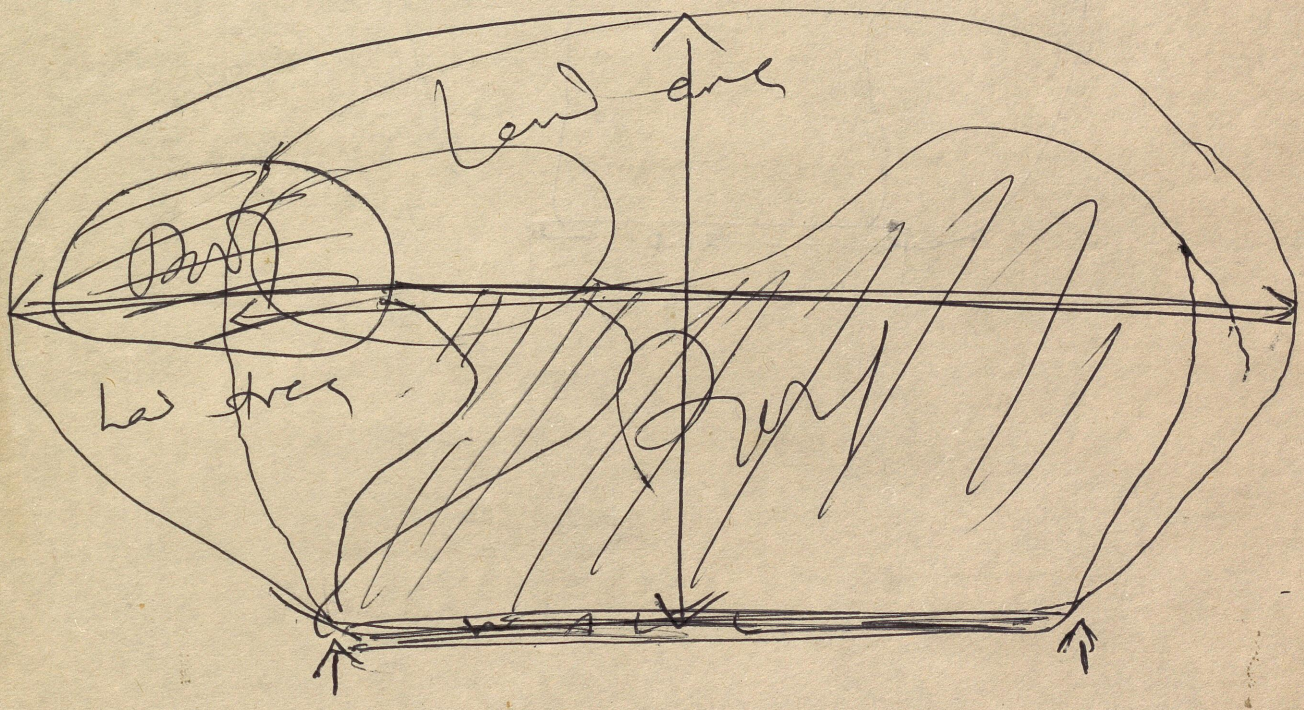
85 × 4

Binod C. Choudhury

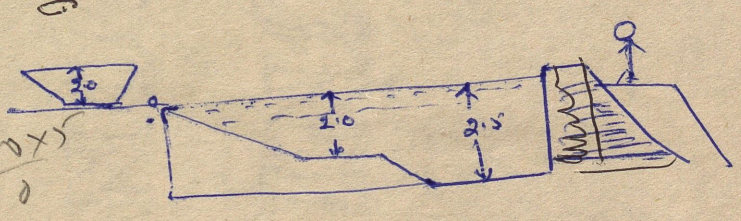
NEHRU ZOOLOGICAL PARK
HYDERABAD - 500 264.
INDIA

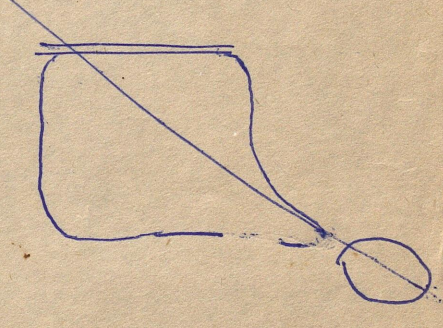
S.W. Crocodile Breeding Pool at 1928 Visag.

Dimensions. Total Area.



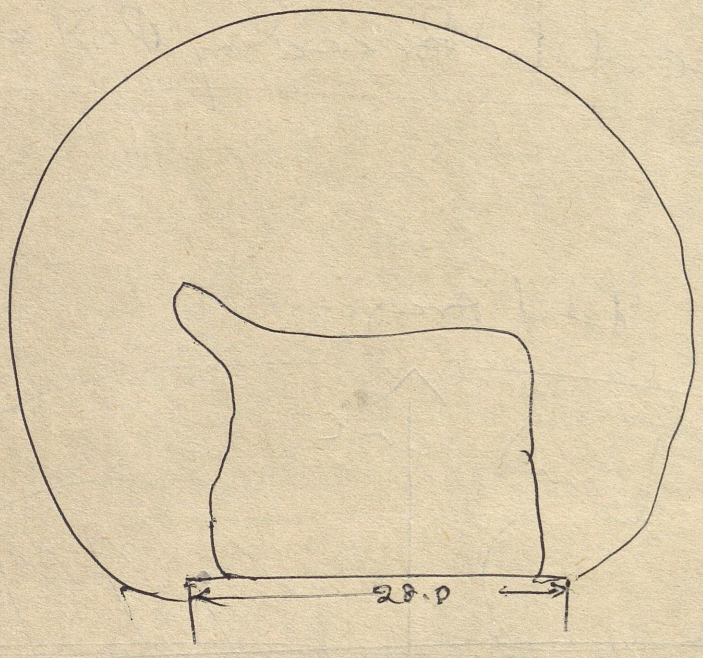
2 lakh gallons (6 times)

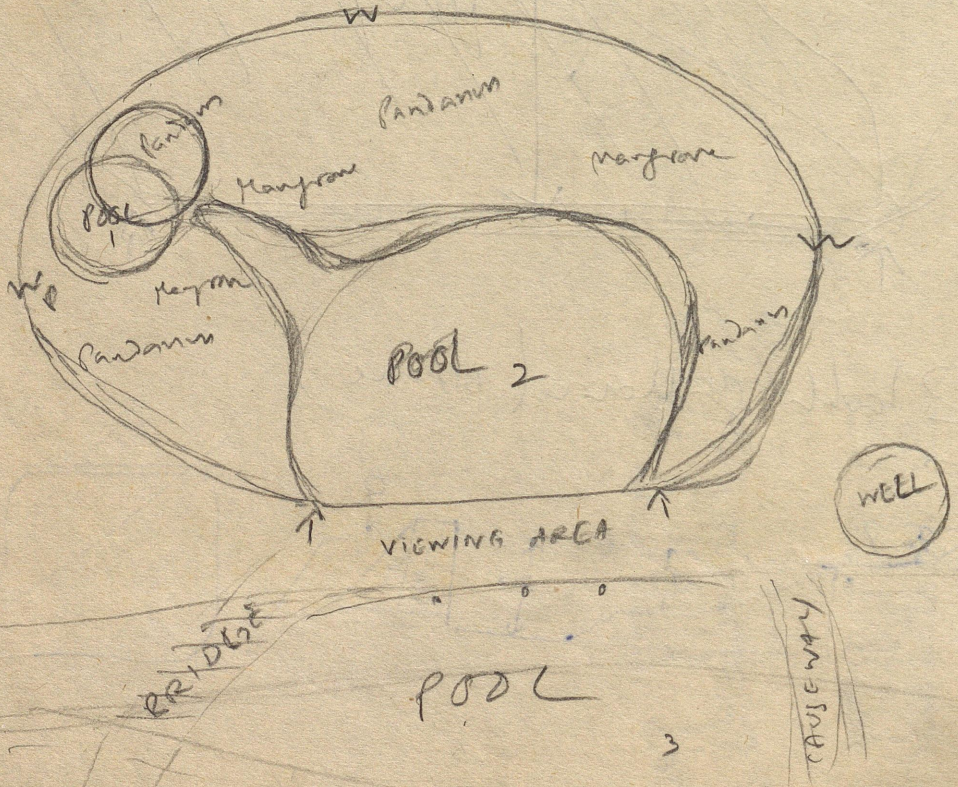




2,00,000 x 5
10,00,000

2,00,000 20,00,000 litre


28.0


Pandanus
Mangrove
POOL 1
POOL 2
VIEWING AREA
WELL
BRIDGE
POOL
RAILWAY

Binod C. Choudhury

NEHRU ZOOLOGICAL PARK
HYDERABAD - 500 264.
INDIA

.....

New Captive Breeding facility for saltwater crocodile at Nizam Zoo.

- B. C. Choudhury, Research Officer
Ar Crocodile Conservation Project, NZP Hyd.

The new breeding pool for the saltwater crocodile was inaugurated in June 1984, with the introduction of one 3.5m male and five 2.5 to 2.9m females. This 60m × 30m enclosure is provided with two gradient pools, with simulated with mangrove vegetations and with fluctuating water level and the summary area has been.

Deaths

Date Recd | from | Remarks

Andhra University

4.4.1973 1 death due to heat stroke

Come from wild

1.12.1977

23.1.1978

1978 hatched

5 deaths

6

12.11.1978 - Croc Baby (1)

13.11.78 - (2)

2 death -

29.12.78

23.3.79

19.9.79

24.10.79

1/yearling

25.12.79

2 hatching

1.1.80

1

4+2

1979

12.8.80

1

5.10.80

1/y

26.10.80

1/y

27.10.80

1/y

28.10.80

1 yearling

14 - 12

1980 2 hatching

1. Weighing machine
2. Taxidermy book -
3. Feed chart (Zoo)
4. Breeding of wilfarinals in captivity.

Breeding results

1. Present survivals

1978	1979	1980	W.C.	B.P.	Total
2	1	11	2	2	18

5. Tony Pooley - Crocodile Rearing [illegible] copy

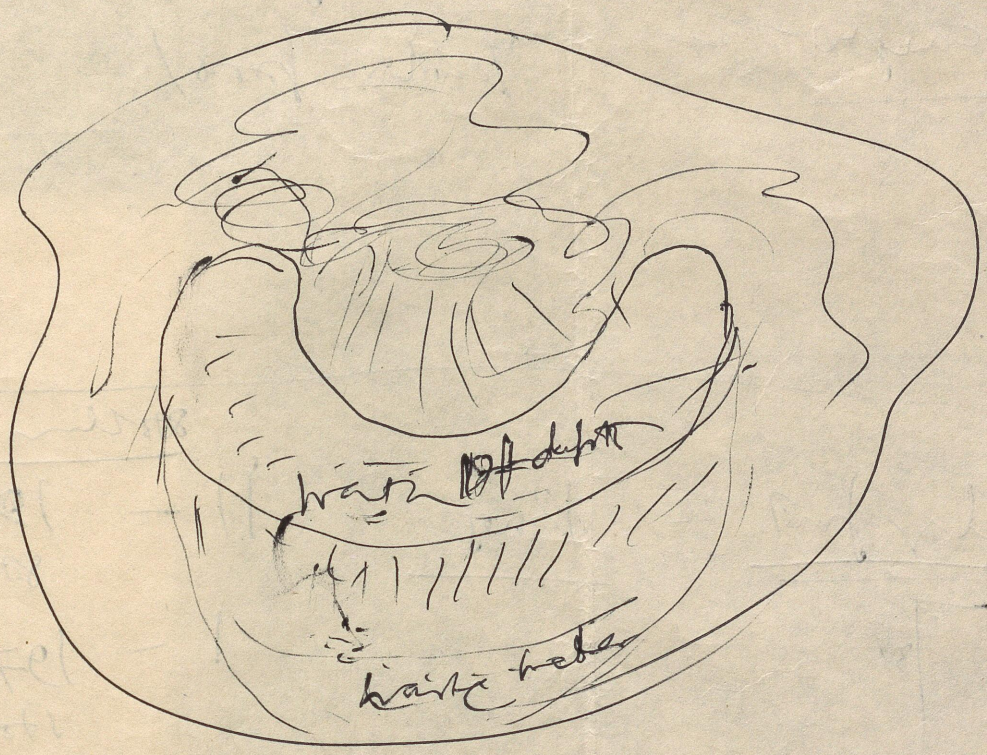
6. Frye Book on loan

7. Enquire about Gopals books.

8. Mayurs newsletter (Tej kumar)
~~to~~ Mr Tulsi Rao.

9. Address of 1. T Parker - Free
2. Cheetah -
3. Parks - free
4. BNHS - Membership - 5

1G2P



To the scale Sketch

1 Male + 1 Female Breeding pair

+ 2 wild caught + Yearling pool

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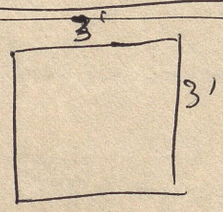
1 hatchling pool — 12 nos. 11 — 1980 stock



1 — 1979 stock

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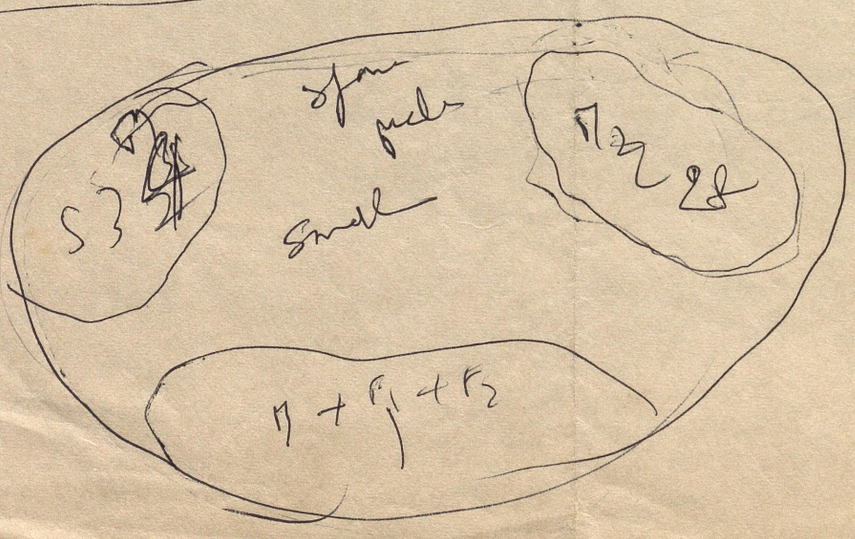
1 yearling pool 4 nos. 2 wild caught —

2 1978 stock

12 + 4 + 2 = 18 total at 1920



27 sept

1978 1980 hatchlings

Measurement on 15. March 1981 (9 months)

Sire	Head	S-V	TTL	
1	60	200	415	* 1979 hatchling
2	65	210	400	
3	60	195	400	
4	58	195	405	
5	56	186	380	
6	57	170	355	
7	55	190	375	
8	56	170	390	
9	57	170	336	
10	56	182	382	
11	55	184	385	
12	57	191	382	

IGZP 1980 hatchlings

Measured on 4.10.1980

Sno	Head (S to occiput)	~~TBL~~	Remarks
1	8.0	36.8	
2	8.0	35.9	
3	8.2	35.0	
4	8.6	39.0	Rt eye blind.
5	8.4	36.5	
6	8.2	36.0	
7	7.4	31.2	
8	7.8	34.5	
9	8.0	37.0	Rt eye bulging
10	8.4	33.0	
11	8.5	35.0	Left eye blue
12	8.2	35.8	

1978 hatchlings

1	9.0	40.0

On 27.10.80, one hatchling of 1980 died.

Breeding of Mugger Crocodile in IGZP VISHAKHAPATNAM

A pair of mugger crocodile (Crocodylus palustris) on exhibit at IGZP, Vishakhapatnam since 1972 started breeding from the year 1978 ~~[illegible]~~ 1977 housed in a 4 m x 4 m pool with no surrounding land area, in 1977 April the female laid eggs in the water resulting in no hatching. In 1978 the male and female were shifted in to a modified crocodile exhibit enclosure (Pig) with a 70 % of land and 30 % water area. A crescent shaped pool of dimension with a maximum depth of cm was surrounded by a well vegetated land area and a ft steep walled dry moat separating visitors from the exhibited animals. In June 1978 the eggs (Cubitt Lysiar unknown) laid by the female hatched and 15 hatchlings were obtained. In 1979 ___ eggs were laid and 16 hatchlings were obtained. In the year 1980 a total of 16 eggs were laid on ~~the~~ ___ and 12 hatchlings emerged on ___. In all these years the eggs remained in the natural nest site and were not ~~never~~ disturbed till the date of hatching. For 1981 ~~[illegible]~~ breeding season a more detailed observation pattern

was maintained in the first observations started with courtship and mating activity by the pair in the winter months of 1980-81, followed by nesting activity, just pairing, parental care and hatchings.

Courtship and mating:

From September 1980 the male and female were observed to be basking at one place which was not the normal behaviour. Between September to December there was no display by the male or the female, nor any specific courtship behaviour was noted. On 6th & 7th January early morning around 6.00 hrs mating was observed in water.

mating behaviour:

Nesting activity: The first sign of nesting activity was observed on 15th March 1981, when the female was seen making trial pits on the north-east and north-west corner of the enclosure. The female started scratching and digging the ground by the forelimbs during the early morning hours and again in the afternoons. Four such trial pits were made at a distance of 2mts apart, with in a period of one week. The trial pits were mostly scraps on the sand laterite soil of the enclosure but the deepest one was slightly more than 15cm in an area where the substrate was rather loose. Between 22nd March to 29th March there was no activity by the female. On 30th March the gravid female was observed to be very thin and on its belly and the whole area was checked. The nest was located on the north eastern side of the enclosure. From this it was known that the nest was laid on 29th March 1981. The nest was a new nest hole and not any of the four trial pits. The nest was made completely by the female and was also covered by dry leaves. It would have been difficult to locate the nest but for an regular observation on checking the first layer of eggs were seen to be at 16.5cm below the

surface. The mother exhibited extreme aggressiveness and charged at all intruders. The nest was disturbed only to the extent of recording nest temperature and for counting the eggs. However, the aggressiveness of the mother did not permit us to count the eggs. ~~and~~ The nest was left as it is in the nature for incubation.

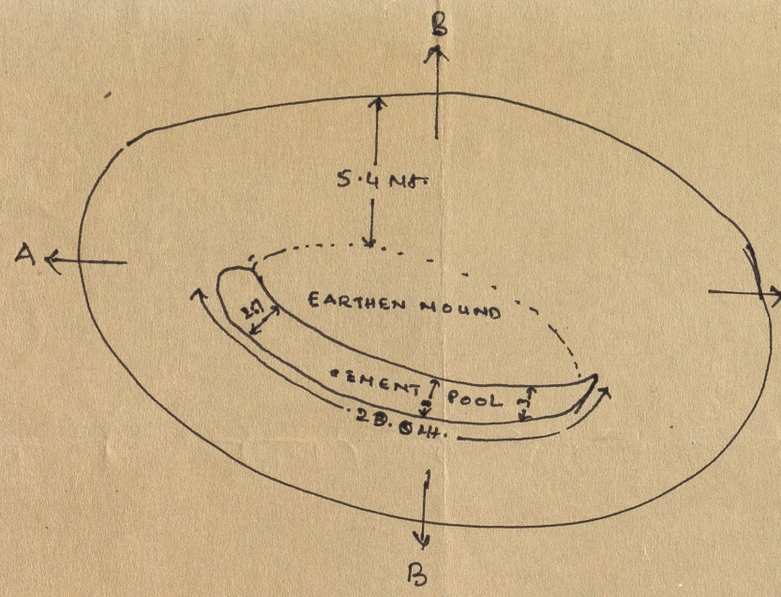
Nest guarding and parental care. From the next day the female was observed near the nest facing it and charged any intruder. At night she used to enter the water for short while. Her nest guarding did not allow her to bask on the sun as the nest was under the shade of a bamboo clumps and other vegetation. She continued to exhibit such behaviour up to 15th May, but during this time her feeding behaviour was normal and she was fed her normal diet. She was never observed near the nest after 15th May but was seen basking regularly.

On 11th June after 72 days of incubation ~~at~~ ~~B~~ ~~[illegible]~~ The nest was disturbed at 1480 hrs, without the knowledge of the mother. The nest was opened, the top layer of eggs

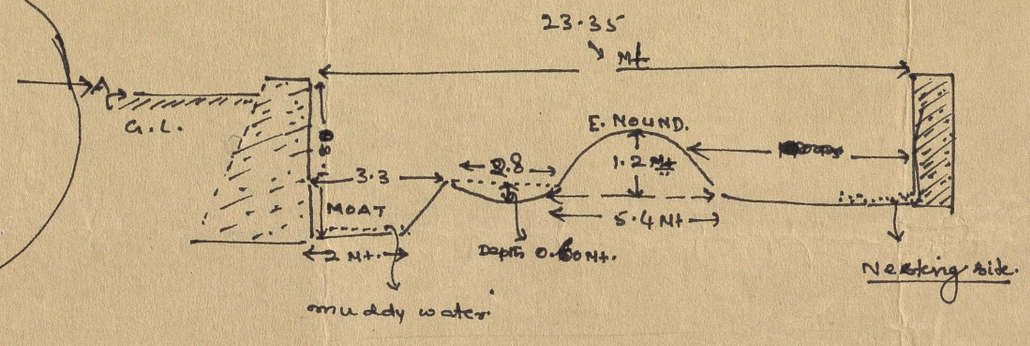
were exposed and wheeled for croaking noise of the hatchlings. At 1600 hrs croaking noise by the ready to hatch hatchlings were heard. Only two egg were opened, ~~and~~ the hatchlings was removed out and the nest was covered again. At 1800 hrs the female approached the nest and was resting on the nest for an hour or so. Around 23 hrs she opened the nest by using her snout and front limbs. Each emerged hatchling was taken in to the water by the mother, keeping it in her mouth. This process continued till 1100 hrs of 12th June. During this time the mother never cracked an egg but only carried to water those hatchling that have already emerged. A total of 24 hatchlings were removed by the mother in to the water making a total of 26 hatchlings. In ~~the process~~ interval of each removal of hatchling by the mother, the nest soil was loosened to assist the mother. In this way a total of 29 eggs were counted of which three eggs turned out to be spoiled of which one had an half developed embryo. Everytime the mother liberated a hatchling in water and returned to

the nest. The liberated hatchling was removed out by a ~~net~~ scoop net. Except for one hatchling all hatchlings were removed out from the parents enclosure. During all these time the male mugger exhibited no interest in the process nor exhibited any aggressiveness.

Plan & Sectional Elevation of the MOAT OF Breeding Crocodile at Inzpark



SECTION A-A



Length of the Section B-B = 17.15 Mt.

Size of the Enclosure: 70 Mts Circumference. x 1.85 Mt Depth.

Area of " : 390 M^2

Land area: 77%.

Water Area: 33%.

Size of the cement pool: 20 M x 2.8 M x 0.60 Ms (33.6 M^3)

[signature]
13/6/5.