To

~~Jaad~~ ~~DR. Mohd. Wahiuddin~~
~~Sahab~~

MR. CHOUDRY (Sorry for the spelling)

Sir

DR. GOWHER ALI

Nehru Zoo. Park

Hyderabad
9-1-1989

My Dear Choudary,

Namkar.

Hope this letter finds you in best of health and "New year" spirits.

HAPPY NEW YEAR TO YOU.

Dr. Navin & DR. Rana attended the National Seminar of Zoo Vet. at Chandigarh. No Vet. from your institute was there. Though I received the invitation from the Chatbir Zoo Director, but could not attend due to financial problem. They were not prepared to provide the 40 Rs Charges for me. We had our fresh elections of Association and the WILD LIFE HEALTH & Dr. C.P. Chandra Asst. Director of Trivandrum Zoo is the Secretary cum Treasurer now and Dr. S.D. Sharma is the President and Editor of W-L. Health. Thanks God I am relieved of the responsibilities!

How are you feeling on there. It must be

very cool. Cool. now, there. Dr. Kala came to Hyd. I could not meet him. The reptile house is inaugurated and open for public. It is a Master piece work. I am sure you will like it.

Kindly let me know whether you have sent our paper at Bangalore to any journal for publication? If so — the name of the journal.

The rest is fine. Dr. Hem Raj is transferred back to the A.H. Dept. Mr. John Samuel is retired from the Service, but still residing in the same quarter. Most probably you will be attending the Elephant Seminar at Trichur. If so, Probably there is a chance to meet you at Hyd. Dr. C.N. Achyya is also attending the Seminar.

With regards

Yours

Dr

19-2-81/3/B
Khaja Pahadi
Mir Alam Tank road
Hyd. 500264 A.P.

(Dr. Ali Hasan

CCF(M)
TRIVANDRUM-695 014

REFYR LET WL 6. 4354/87 DATED 16TH OCT. (.) PROPOSE
CARRY OUT SURVEY 12TH — 15TH NOV. KINDLY
CONFIRM (.)

CHOUDHURY
~~OFFICER INCHARGE~~
MAICARA

4/11

ATX 2015 Vehicle

New Tyres ——— Rs 4900/- Tyres fit done

New Battery (Rotating Bill

New Roof top sheet ——— Rs 300/- Done (1000/-

Body dents, welding & Painting ——— Rs 1500/- Done

~~Engine Painting~~

Spring leaf Settings / Shave ——— done 500/-

Body Bolt / Bush etc settings / Shaves ——— 225+100 = Rs 325 (rounded to ...) 1000/-

Over all shave change / turning & overhaul ———

Shaves Cover ———

~~Engine~~ ~~Head~~ ~~Cylinder~~

Miscelaneous repairs

~~Engine~~ - 17,000/-

Rubber Band –

100/- Mattress for Spring Bed

125/- Mattress for Body

~~Fish~~

95/- Less Commission

75/- Less Body

170/-

NEWS FROM WII CHIMBAN RESEARCH PROJECT

The WII Chimban Research Project is expanding their activities of their research field station and changing from aquatic herpetofauna to aquatic mammals. Our Animal Behavior JRF who is completing one year of field survey of chimbans has identified location where he now plans to study genetic distribution and social structure and their relationship with aquatic reptile in general and skeria in particular.

M/s | Oxford University Press
Apollo Bunder Bombay - 400 039.
~~Hudson~~ ~~400 006~~.
Oxford House. ~~Annexe~~

The Bombay Natural History Society (BNHS) was recently awarded the Indira Gandhi Environment Award. This one hundred and four year old non-governmental organisation (NGO) has done commendable service in the field of nature conservation besides making 'Birdwatching' a favourite hobby among the present-day youngsters. In Andhra Pradesh, The BNHS was instrumental in rediscovering The Slender-billed Jerdon Courser after ____ years of its last report and the Golden Gecko in the Srikakulam Sanctuary after ____. The BNHS is also involved in studying the ~~[illegible]~~ biology & habitat requirements of the Great Indian Bustard in Rollapadu Sanctuary. ~~[illegible]~~ Centenary the award for the Lesser Florican report in Kadodi ~~[illegible]~~ in recent times.

Re-written

Breeding & Rutting Season

Opinion differ as to the rearing (Rutting) season of Gaurs in India in wild. Grizmik reports the mating season to be from Nov. to March — the peak ~~being~~ to be in March & April. Dutta et-al (1980) working on Gaurs in Madhya pradesh reports the mating season to be from Nov. to ~~April~~ — the peak period being in March. Krishnan by observing few very young calves (2-3 weeks old) in wild, in the M/o March, April & September has come to a conclusion that there are two main breeding seasons in June-July and in Dec — January. But when he saw few more older ~~calf~~ calves ages 4-6 months during the months March - April with the same herds, he thought that the gaurs breed all the year round.

Receipt of (45) calves at the Nehru Zool. park, Hyd. under our ~~custody~~ age, from the forests of A.P. for over a period of (18) years i.e from 1967 to 1980 and from 1985 to 1987 is also suggestive of two breeding seasons one in Dec & Jan. & the other in

INDIAN ZOO AND WILD LIFE VETERINARIANS ASSOCIATION.

HQS. HYDERABAD.

Dt. -3-1988.

Dear Member,

It is a matter of great regret that Dr.R.K.LAHIRI, the eminent Zoo Veterinarian and Director is no more with us. This dynamic personality was of Great inspiration to us. Inspite of his age and pressure of work he was kind enough to continue to hold the responsibilities both as the president of the I.Z.W.L.V.A. and Chief Member of the Advisory Board of WILD LIFE HEALTH.

It is proposed now to elect Dr.S.D.SHARMA of Delhi, (Chief patrol of I.Z.W.L.V.A.) the President of Indian Zoo and wildlife Veterinarians association and Dr.Jacob Cheran as Chief member of advisory board of Journal, wild life health.

Kindly send your opinion on the following address on or before 15.4.1988.

Yours truely,

Secretary of Indian zoo and wild life veterinariians Association and Treasurer Wild Life Health.

A D D R E S S:

Dr. Mir Gowhar Ali Khan,
H.No.19-2-81/3/B
Khaja Phadi,
Mir Alam Tank Road,
H Y D E R A B A D - 500 264.

June-July. (See graph)

Gestation period

The gestation period of Gaur cows as observed in wild by some workers differ with that of cows bred in captivity. Grizmek and M. Krishnan assume it to be of 9 months i.e between 270 – 280 days. Tarofke, 0 reports it to be (270) days in the European Zoos.

Our observation

Our observation in the three Gaur cows in captivity i.e in the Vellore Zoological park tally. i.e that it is over 10 months. It was (307) days in cow No: 12, (319) days in cow No: 13 and (310) days in cow No: 42. (See table No: IV)

No: of calves at birth

One calf at birth is generally the rule. The same is also recorded in all the seven births at the Vellore Zool. park tally. (See table No: ....) Krishnan also agrees to this rule. but occationally has seen two young calves running with a cow. Grizmik has reported twins in Malayan species

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Husbandry & Breeding of Gaur in Captivity

1

References

(1) Desh Mathur : B.K. Dave and S.S. Tomar - 1981.
Dave, B.K. & Tomar, S.S. "Buffaloe Calf rearing - Hazards and Solutions" LIVESTOCK ADVISOR April 1981. Vol VI - Issue VI -

(2) Dutta J.J; Belsare, D.K; and Chandiramani, S.S. of School of Biological sciences, Bhopal University, M.P. Paper presented on Social behaviour of the gaur in Kanha Tiger reserve, at Bhopal University Bhopal on 1-12-80. MP

(3) Grizmik. → Animal life encyclopaedia Vol. 13 - Mammals IV. Published. 1972...
pp - 36v
by
Van Nostrand Reinhold Ltd. London. 1972

(4) Hubback - 1937

(5) Jarofke, D. Handbook of Zoo medicine Diseases & treatment of wild animals in Zoos, game parks, circuses & Private Collections.
Authors: Prof. H.G. Klos
Dr. E. M. Lang
Contributor - Jarofke, M.
Publishers. Van Nostrand Reinhold Co:
New York. 19....
pp. 257

(6) Krishnan, M. "Indian Wild life in 1959 to 1970".
pp. 134 ← Pub. Bombay Natural History Soc. 1975

P.T.O.

INDIAN ZOO AND WILD LIFE VETERINARIANS ASSOCIATION.

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ADDRESS:

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Khaja Phadi,
Mir Alam Tank Road,
HYDERABAD - 500 264.

(b) Mchugh - 1958 - cited by Grizmik in Anml life encyclopaedia VII. 13. Reinds - 10.

III (Corrections)

(1) The Achg curling up in upp& lip in male & smelling, in case of oestrus is known as "Flehmen"

(2) Gaur No: 12 ♀ female arrived at the N.Z.P. on 22-9-71 and not on 21-1-71 - and she was a breeding ♀.

(3) Gaur No. 11 ♀ male arrived at the N.Z.P. on 27-1-1971.

(4) Breeding male given here: male No. 18 (dead) and male No. 47 (Alive & in the enclosure)

(5) Gaur ♀ No. 19 arrived to the N.Z.P. from Allapally village - Dist. Chanda of State Maharashtra -

TABLE I

YEAR	Accession No.	Date of arrival	Approximate age on arrival	Sex	Date of death	Period Survived in Captivity	Cause of death	Remarks
1	2	3	4	5	6	7	8	9
1967	1	21 Sept. 1967	2 – 3 weeks	Male	1st April '72	4 yr 7 mths	Foot and mouth Disease.	
	2	24 Nov. '67	2 – 3 weeks	Female	25 Aug. 74	6 yr 8 mths	Pneumonia & Nephritis.	
1969	3	1 Jan. '69	1 – 2 weeks	Male	11 Aug. '73	4 yr. 8 mths.	Enteritis & Cirrhosis of liver.	
	4	8 April '69	3 – 4 weeks	Male	13 Feb. '74	4 yr 10 mths	Rickets and general debility.	
	5	20 may '69	3 – 4 weeks	Male	1 Jan. '70	0 yr 7 mths.	Tumour like growth (Peritoneum)	
1970	6	7 April '70	3 – 4 weeks	Female	31 Aug. '72	2 yr 5 mths	Enteritis and cystitis.	
	7	28 April '70	2 – 3 weeks	Female	3 Sept. '70	4 mths	– do –	
	8	20 June '70	2 – 3 weeks	Female	9 Sept 72	2 yr 2 mths	– do –	
	9	5 Oct. '70	2 – 3 weeks	Male	12 Oct. '70	1 week	Retention of urine	
	10	17 Nov. '70	1 – 2 weeks	Female	23 Nov. '70	1 week	Diarrhoea and dehydration.	
1971	11 ✓	27 JAN. '71	4 – 6 weeks	Male ✓	7 April 71	2 months 10 days	Tympanitis associated with Septic Arthritis.	
	12 ✓	22-9-'71 (21 JAN 71)	2 – 3 weeks	Female ✓	6 Oct. 78	7 yr 8 mths. 15 days	Enteritis and hepatitis.	
	13	2 Nov. '71	2 – 3 weeks	Female	2 Feb. 79	7 yr 4 mths	Rinderpest disease. ①	
1972	14.	19 MRCH '72	6 months	Female	14 April 72	24 days	Enteritis	
	15.	24 MRCH '72	1-2 Mths	Male	31 may 74	2 yr 2 mths.	Enteritis with pyelonephritis	
	16.	31 may '72	2 – 3 ~~Mths~~	Male	16 July 72	6 weeks.	pyaemia	
	17.	25 Aug. '72	2 – 3 ~~Mths~~	Female	4 JUN. 74	1 yr 9 mths.	Pneumonia.	
	18.	1 Nov. '72	2 – 3 weeks	Male	18 Feb. 79	6 years 3½ mths.	Rinderpest disease ②	
	19.	6 Nov. '72	2 – 2½ year	Female	19 April 75	2 years 5½ mths.	Heat Stroke (Brought from Chamba, Impregnated in the wild)	
	✓ 20	5 Dec. '72	2 mths.	Female	–	–	–	Send to Trivandrum Zoo.
1973	21	Born in the Zoo to ♀ 19 on 18 Feb. 73	—	Female	7 Dec. '75	2 years 9½ mths	Broncho-pneumonia and Enteritis	2 – 2½ mths. old Foetus was recovered from the womb at P.M.
	22	14 July '73	one month	Female	16 Dec. 73	6 mths.	Hepatitis & fibroid lungs.	
	23	9 Sept. '73	one month	Female	–	–	Sent to Trivandrum Zoo.	
	24	9 Sept. '73	one month	Female	–	–	– do –	
	25	2 Nov. '73	one month	Female	–	–	– do –	
	26	6 Nov. 73	2			14 days		

40	23rd April 78	1–2 weeks	male	30 April 78	1 week	Hepatitis	
41	25 April 78	1–2 weeks	Male	1 May 78	1 week	Bronchopneumonia	
42 (Radha)	25 April 78	1–2 weeks	female				Now on exhibit.
43	26 April 1978 Born in the 30 ♂ 9 12	—	Male	Feb. 1979	Eleven 1 yr 3 mts.	Rinderpest.	(5)
44	8-5-1978 Born the 30 ♂ 9 No: 13	—	Male	Feb. 1979	9½ months	Rinderpest.	(6)
45	18 May 78	2 weeks	Male	30 May 78	¾ weeks.	Retention of urine	
46	29 July 78	1–2 weeks	Male	30 July 78	1 day	Enteritis and hepatitis	
			Male				Now on exhibit
1980 47 (Krishna)	10 NOV. 80 (10-11-80)	2 months	male				Now on exhibit
					1½ months	Haemia & pneumonia.	
1984 48	25 Jan. 84	1 week	female	6-3-84			
					About 2 years (1-10-9)	Hepatitis & nephritis	
1985 49	3 April. 85	2 weeks	male	12 Feb. 87			
50	Born on 12.11.85 ♀ No: 42 ♂ No: 47	—	female (parvathi)				Now on exhibit.
							Now on exhibit
1987 51	10 Aug. 87	2–3 weeks.	male				Now on exhibit along with mother.
52	Born on 16-9-87 ♀ No: 42 ♂ No: 47	—	female				

	✓20	5 Dec. '72	2 Mths.	Female	–	–	–	Sent to Trivandrum Zoo.
1973	21	Born in the Zoo to ♀ 19 on 18 Feb. 73	–	Female	7 Dec. '75	2 years 9½ Mths	Broncho-pneumonia and Enteritis	2 – 2½ Mths. old foetus was recovered from the wound on P.M.
	22	14 July '73	one month	Female	16 Dec. 73	6 Mths.	Hepatitis & Fibroid lungs.	
	23	9 Sept. '73	one month	Female	–	–	Sent to Trivandrum Zoo.	
	24	9 Sept. '73	one month	Female	–	–	– do –	
	25	2 Nov. '73	one month	Female	–	–	– do –	
	26	6 Nov. 73	3 – 4 weeks	Female	10 Nov. '73	4 days ~~not as~~	Non-acclimatisation ascertainable	
1974	27	30 April '74	3 – 4 weeks	Female	–	–	Sent to Trivandrum Zoo.	
1975	28	8 June '75	4 – 6 Mths.	Female	21 July '75	6 weeks	Not ascertainable.	
	29	20 Sept. '75	3 – 4 weeks	~~Female~~ Male	–	–	Sent to Trivandrum Zoo.	
1976	30	20 April '76	1 – 2 weeks	Male	9 Sept. 75	5 months	Enteritis	
	✓31	19 Nov. '76	1 – 2 weeks	Male	1 Dec. 76	15 days	Not ascertainable	
1977	32 (F1)	Born in the Zoo to ♀ No: 12. on 13 April. 77	–	Female	1 Feb. 79	1yr. 10 Mths.	Rinderpest Disease ♂ 9	
	33 (F1)	Born in the Zoo to ♀ No: 13 on 14 April '77	–	Female	1 Feb. 79	1yr. 10 Mths.	Rinderpest Disease ♂ 9	
	34	23 April '77	2 – 3 weeks	Female	28 May 77 21-1-83	1 month	Enteritis.	
	35	23 April '77	1 – 2 weeks	Female	25 JAN. 79	5yr 9 Mths	Rinderpest disease	Enteritis & Broncho-Pneumonia
	36	2 Sept. '77	2 – 3 weeks	Female	1 Oct. 77	1 month	Enteritis	
	37	20 Nov. '77	2 – 3 weeks	Male	–	–	Sent to Indira Gandhi Zool. Park Visakhapatnam.	
1978	38	14 March '78	2 weeks	Male	28 March '78	2 weeks	Hepatitis	
	39	18 April '78	1 – 2 weeks	Male	9 May '78	3 weeks	Retention of urine.	

P.T.O.

HUSBANDRY AND BREEDING OF GAURS (Bos gaurus) at Nehru Zoological park, Hyderabad.

① DR. MIR GOWHER ALI KHAN ② DR. DATTATRI RAO
&
③. B. C. CHOUDHURY

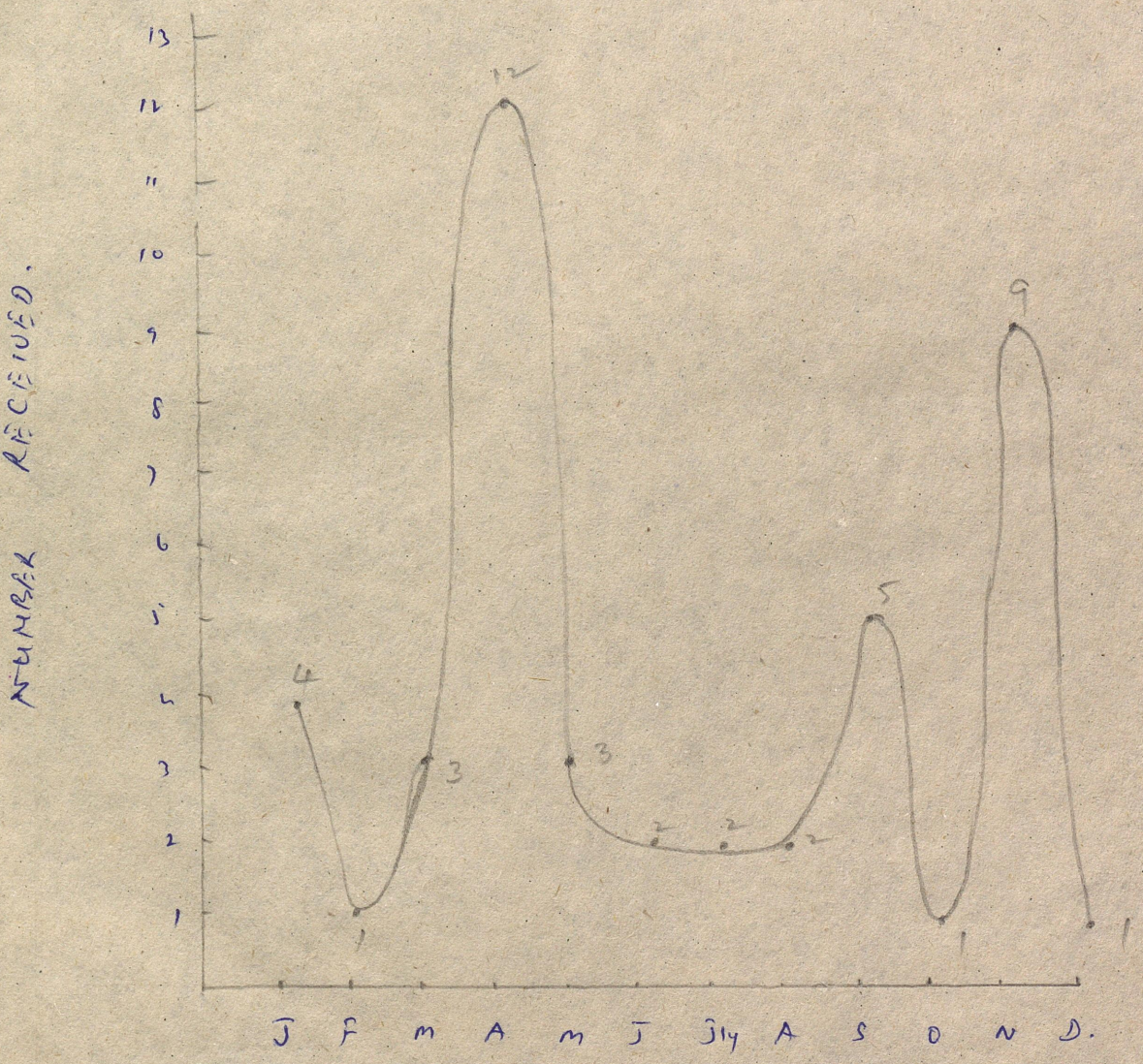
I. INTRODUCTION

The Nehru Zoological park Hyderabad started rearing gaur calves from an estimated age of two to three weeks, received from forests of Warangal and Khammam districts of Andhra pradesh. These locations are the natural habitat of gaurs and the calves that were brought to the Zoo were invariably the ones that come back to villages with the village cattle. Such individuals were found to be suitable for rearing in captivity and the Zoo was successful in breeding them.

From the year 1969 the large open moated enclosure of the Zoo exhibited 6-8 gaurs at any time of the year. The Zoo has received and reared (52) gaurs, out of which 24 were males and 28 females between September 67 to August 87. The first calf to arrive at the Zoo was a male one (21-9-1967) and the last again a male (10-8-87).

(Table I to be Typed here)

Details of Gas Calls received at Nehru Zool. Park Hyd.
Between 1967 to 1987 (20 years)



4.5
+7 BPN
5²

The zoo was successful in breeding
them from 13.4.77 to 16.9.87. from Two males
And three females. During the period 6 calves
(2 ♂ & 4 ♀) were born in the zoo. one gaur cow,
which arrived on 6-11-1972 gave birth to a ♀
Calf on 18.2.'73, was found already impregnated
before Coming to the zoo. This ♀ calf after growing
into an adult, died at the age of 2 years and
9 months, with a foetus of about 2-2½ months
old in her womb.

Unfortunately an epedimic of Rinderpest
disease broke out in the M/o Feb. 1979 and
wiped out 3 ♂ & 3 ♀ the breeding enclosure, leaving
2 Sub-adult females in the quarantine of the
Zoo Hospital, which were protected during the
time of out-break by vaccinating them against
Rinderpest disease using TISSUE CULTURE VACCINE.
Now at the time of writing this article Two male
and three females are being exhibited in the
enclosure. no new Calves could be procured
from the forests from ~~Nov~~ Dec 1980 to Dec 83, because
of again of epedimic of RINDERPEST DISEASE in
ETURNAGARAM SANCTUARY of Warangal district

which broke out in July 1980, and reduced the gaur population to a great extent.

II. PROCUREMENT of CALVES AND TRANSPORT.

Most of the gaurs are captured between the age of 2-3 weeks by the villagers when the mother gaurs move for grazing leaving the sleeping young ones behind.. or the young gaurs when mixed with the village cattle arrive at the villages late in the evening and are picked up by the villagers. These calves then are handed over to the forest officials of that area, who in turn send them to the Zoo. The gaur calves are kept with the forest officials for 2-3 days, then are loaded (Not crated) in to the jeep and are transported to the Nehru Zoological park along with one or two forest guards. Two Sub-adults gaurs were transported in wooden crates in the trucks.

III QUARANTINE REARING & BREEDING ENCLOSURES

The Calves are kept in quarantine for a

Period of 4 weeks and then are transfered to Rearing enclosures. Such rearing enclosures are our "close observation cages", measuring 6 m x 8 m in length and breadth with a height about 2 m. Chain link is provided all round, with a door in front. An asbestos shed in a corner and a tree or two adorn this. The calves are let loose in these enclosures (Feeding etc. is done here) but are taken out by the attendents for a walk and to graze on the lawns for a few hours. After attaining the age of 6 months the calves are shifted to the exhibiting and Breeding enclosures.

Exhibiting and Breeding enclosures } A calf of 6-8 months of age is ready to leave the Care of attendant, and it has learned to eat concentrates and fodder. It is time to introduce it to other members of the family. Before mixing it up with the regular herd, it is held up in a small cradle for a

week, so that it can get used to other members of the group and vice versa. We have found introduction of young calves into the exhibition and breeding enclosure to be satisfactory, as adult gaurs irrespective of sex and age tolerate the young ones very well.

Our breeding enclosure for gaur is very spacious and is situated little away from the visiting public. Entrance to it's south western side is totally banned. This is a 0.5 hectre dry moated enclosure, oval in shape and with night houses to it one side. This has some isolation chambers such as feeding rooms, for treatment and for close observation. The total area of this enclosure is protected on three sides with Chain link and Angle irons. In front there is a dry/wet moat (viewing area) this moat is ..... deep and wide. A few Acacia and Rain trees provide the required shelter and shade.

Gaurs of different age groups and sexes were left in this enclosure. The 9 (No: 19) arrived from Chanda (Maharashtra)

on 6-11-1972 was left in the breeding enclosure along with the following animals.

① Gaur ♀ No. (12) Age — 1 year 2 months
② " ♀ No. (13) Age — 1 year

This ♀ (No: 19) was found already pregnant before arriving at the Zoo, and gave birth to a ♀ calf (No: 21) on 18.2.1973. This was the first birth of a gaur calf recorded in the Nehru Zoological Park, Hyderabad. The calf was brought up by the mother satisfactorily. Later on the following gaurs were introduced in the breeding enclosure.

① Gaur ♂ No: 18 = Age 8 years in June 1973
② Gaur ♀ No: 21 = Age 6 years in May 1973
→ This ♀ calf was already in the B. enclosure along with her mother.
③ Gaur ♀ No 20 = Age 6 years — June 1973.

Female No: 21, born to ♀ No: 19 grew to the breedable age and got mated with the male No: 18 (male's age about 3-2-0 years old at the time of mating) The details of the breeding behaviour etc could not be studied. The

female unfortunately died on 6-12-'75 at the age of 2-9-19 years due to Enteritis and Broncho Pneumonia. And a female foetus about 2-2½ months old was recovered from the uterus.

In the late half of the year 1976 the following gaurs were in the Brady enclosure.

① Gaur ♀ No: 12 Age 4-8-0 years
② Gaur ♀ No: 13 " 4-7-0 "
③ Gaur ♂ No: 18 " 3-10-0 "
④ Gaur ♀ No: — 2 " 0-11-0 "

The Male No: (18) sired both the females No: 12 & 13 and four Calves were born, two in the year 1977 and two in the yea 1978 (Ref. Table No: IV.)

Due to out break of Rinderpest disease (as already mentioned above) both in the Kolam Zoological park, Tejd and in the Elurinagaram wild life Sanctuary Warangal district, we were left with one Male and two female gaur calves only as details follows:-

① Gaur Calf ♂ No: (19) Age 1 Yr 11 Mths
(as on Feb: 1978)

(2) Gaur calf ♀ no: (42) age 1-10-0 months.
(As on Table 7)

There two females were kept in the breeding enclosure, after the findings disease suddenly along with a male no: 47. (see Table 1) the ♀ no: 35, died due to Endotoxis cum Bronchopneumonia on 21-1-83 at the age of 5-9-0 years. The pair kept now Computed ♀ was male no: 47 & ♀ no 42. This male (i.e no: 47) sire the female (no: 42) and two female calves were born on 12-11-85 & 16-9-87 (See Table 10)

IV REARING.

a) **Early care:-** on arrival the calves are housed in quarantine of the Zoo for one month, and are fed with Buffaloe / cow milk. The next day the dung sample and blood smears (~~taken~~ from the tip of the ear) are examined for any helminthic, protozoal or bacterial infection. As a prophylactic measure OVAXALINE Bolus of SAVIBB (Haliquinol 2.5 mg) was administered and was repeated on second and third day. The calves were kept on close observation for one week. Then were given under the care of selected Keepers who were made responsible for feeding, taking them for grazing and looking after their health in the rearing enclosure till six months. By this time they become strong enough to be released in the usual exhibit and breeding enclosure. However only selected specimens were kept in exhibit cum breeding enclosure.

b) **Feeding and feed supplement :-**

The calves were fed on luke warm diluted Buffaloe / cow milk in the ratio of one water to one milk for a week. Then whole milk was given to them. Feeding bottle was used for a day or two. Then onwards they were fed with DISH METHOD & the milk was given in a plastic bowl big enough to hold 3-5 litres of milk or more at a time. we have found it was difficult for the gaur calves to drink milk from the bowl with out the help of the Keepers. The Keeper dips his finger in the milk and then puts it in the calf's mouth so that the calf start feeling the milk taste. Then it starts sucking milk from the milk Bowl using the attendant's finger as a teat & the mother gaur, which is kept dipped in the milk through out its feeding. The calves while consuming milk were usually seen hitting the bowl with their

heads, simulating the phenomenon (11)
of hitting the udder of the mother in order
to increase the let down of the milk. In this
way little quantity of milk was splashed
out of the milk bowl. (~~B.K. DAVE & S.S TOMAR - 1981~~)

(~~Type here Table~~ II)

The Sub-adult and adult gaurs are
fed with CATTLE FEED PELLETS/MASH, consisting
of wheat bran, rice bran, broken maize, powder
ground nut-cake and Molasses. To this concentrate
Mixture, vitamins and mineral salts were added.
The quantity of Concentrates varies with age. An
adult gaur's ration was (8) kilos divided into
two meals, one in the morning and one in the after-
noon. 30-40 kilos of green, consisting of green
Grass, Alfa alfa, fescue leaves and Napier were
also fed.

(c) **Health Care and Hygiene :-**

Besides vitamins and mineral supplements
in the diet broad spectrum antibiotics were
also added in the feed/water to check the

TABLE II

81. No:	Age of the calf (estimated)	Approximate weight	Quantity of milk fed (Dilution 1:1)	Quantity of milk feed (whole milk)	Quantity of Concentrates	Green fodder, (green grass, leaves, Alfa alfa)
(1)	2-3 weeks	23-37 Kilos	1-500 litres morning & after-noon	After a weeks time whole milk 1-500 litre morning & After noon.	nil	nil
(2)	one month	46-61 Kilos	—	3 litres morning & After-noon	—	—
(3)	Two months & three months	—		5 litres morning & After-noon	250 gms	Ad. lib.
(4)	3-4 months	—	—	6-8 LIRS morning & After-noon	500 gms	Ad. lib.
(5)	4-6 months	—	—	Nil	One kilo	Ad. lib.
(6)	Sub-adult usually & Adult.	150 kg. to 400 kg.	—	—	2-4 kilos	Ad. lib.

conditions of stress during inclement (12)
weather, shifting, transport and in the face
of outbreaks of bacterial / viral diseases.

Faecal samples were screened once in
a three months under the microscope to detect
the worm load of the helminthic parasites, and
the animals were dewormed once in every
three months.

The ~~A~~ gaurs right from the age of 6
months and onwards were vaccinated against
Rinderpest and Foot & mouth diseases. Booster
doses every 6 months / one year were also
given. The vaccines used were TISSUE
CULTURE VACCINE (Rinderpest) and FOOT AND
MOUTH DISEASE VACCINE manufactured by
the Indian Veterinary Research Institute
Izatnagar - U.P. and HOECHST pharmaceu-
ticals Ltd. W. Germany.

(d) **Growth** :—

The bodily growth of the gaurs such as
weight, length and height were recorded in
majority of ~~cases~~ calves. The calves were
weighed on AVERY BALANCE, by making them
stand on the platform. we have found

it to be more cumbersome when the calf reaches the age of 8–10 weeks & more as they could not stand with "All fours" on the platform. There was no other alterna-tive arrangement available, hence body weight could not be recorded and maintained. Inspite of this the girth is measured and recorded. The height was taken at the point of shoulder by means of a measuring stick. The body length was also recorded as follows :-

1) Length from nose tip to crown of the head.
2) " " nose tip to dorsal bend of the back.
3) Length from nose tip to root of the tail.
4) Length of the tail.

The body length and height of the calves was recorded till they become 6–8 months old. After this age the calves are difficult to handle and the accuracy of the measurement is lost.

As all ready mentioned the growth-rate was recorded in General individuals but the details for two individuals are

TABLE NO: III (a)

1- Date of arrival to the Zoo = 20-9-1967
2- Sex and age = MALE - ~~15 20 days old~~ 2-3 weeks old
3- Collection No: = I

Sl. No	Date of taking measurements	Age	Length from Nose tip to crown cm.	Length from Nose tip to Dorsal bend cm.	Length from Nose tip to root of the tail cm.	Length of the tail cms.	Height at the shoulder cms.	Weight (Kgs) g
1	20.9.67	2-3 weeks	21.6	76.8	102.0	36.00	79.60	37.500
2.	18.10.67	4-6 weeks	25.2	85.2	105.6	43.20	86.40	61-500
3	10.11.67	8-10 weeks	26.4	91.2	122.4	45.60	90.00	
4.	5-1-68	4½ Mths	33.6	102.00	151.20	51.80	97.20	
5	10.2.68	5½ Mths	37.2	109.20	153.60	55.20	108.00	
6.	4.3.68	6½ Mths	40.80	113.20	156.00	55.60	109.20	
7	19.4.68	8 Mths	42.20	129.60	174.00	60.00	116.40	

TABLE NO: III (B)

1- Date of arrival to the Zoo = 24-11-67
2- Sex and age = female 2-3 weeks
3- Collection No: = (2)

Sl No	Date of Taking measurements	Age	Length From nose tip to Crown	Length from nose tip to Dorsal bend	length from nose tip to last tail	length of tail	Height at the shoulder	weight (in gms)
1	2	3	4 cm	5 cm	6 cm	7 cm	8 cm	9
①	24-11-67	2-3 weeks	21.3 ~~14.00~~	73-20	99.60	33.60	78.00	34-000
②	7-12-67	4-6 weeks	26.20	74.40	99.84	33-60	79.20	43-00
③	5-1-68	8-10 weeks	26-70	77.28	104-88	36-24	85.20	52.00
④	19-2-68	13-~~14~~ weeks	30.00	85.20	118.80	39-60	91.20	
⑤	14-3-68	4½ Months	30.48	87.12	122.40	42.24	96.48	
⑥	19-4-68	5½ Months	33-6	97.20	135-60	48.00	104-40	

TABLE NO: III (c) (Growth of one male & one female calf.)

Age.	Length from Nose tip to Crown (cm) ♂	Length from Nose tip to Crown (cm) ♀	Length from Nose tip to Dorsal bend (cm) ♂	Length from Nose tip to Dorsal bend (cm) ♀	Length from Nose tip to Root of the tail (cm) ♂	Length from Nose tip to Root of the tail (cm) ♀	tail length (cm) ♂	tail length (cm) ♀	Height at Shoulder (cm) ♂	Height at Shoulder (cm) ♀	Weight (Kg) ♂	Weight (Kg) ♀
1	2		3		4		5		6		7	8
2 – 3 weeks (one week)	21.60	21.30	76.8	73.20	102.00	99.60	36.00	33.60	79.60	78.00	37.500	34.000
One and a half month	25.20	26.20	85.2	74.40	105.60	99.84	43.20	33.60	86.40	79.20	61.500	43.000
Two months	26.40	26.70	91.20	77.28	122.40	104.64	45.60	36.24	90.00	85.20	–	52.00
4½ months	33.60	30.48	102.00	87.12	151.20	122.40	51.80	42.24	97.20	96.48		
5½ months	37.20	33.60	109.20	97.20	153.10	135.60	55.20	48.00	108.00	104.40		

Treatment here are of Account No: 1 & 2 (See table I)

given in the table below

(Type line Table III a & b)

V BREEDING.

One pregnant female arrived from ALLUPALLI (Chanda) village of Maharashtra state to the Nehru Zoological park Hyd. on 6-11-1972. A ♀ calf was born to her on 18.2.1973, after 3½ months of her arrival to the Zoo. This ♀ calf reached to her adult hood and expired on 7.12.1975 at the age of 2 years 9 months and 19 days. When the autopsy was done a foetus (female) of about 2-2½ months old was recovered from her uterus. This incident has established the age of puberty to be between 2-2½ years in gaur cow.

The other three females which have bred in this park have given first births at the estimated age of ~~5-7-0~~ 4-8-0, ~~5-5-0~~ 4-7-0 & ~~6-6-0~~ years. The male sired the first two females, and the ~~third female was about 3-8-0 and~~ was five years old.

In the Nehru Zoological park, Hyderabad

The 4 gaurs were observed to be in heat in the early hours of the day. There was a slight swelling of the vulval lips and mucous discharge through vagina. No vocal expression by the females were observed. The males were seen following the females where ever they went, and were found sniffing the posteriors and licking the vulval lips. At the time of acceptance the females were found standing quietly and the males mounted and copulated in the usual manner as seen in domestic cattle. The copulation period was 1–2 minutes. There were 4–5 mountings immediately after the first with in a period of 30–40 minutes. No mating was seen in the evening hours.

? Flehmen

b) Gestation period & Birth of calves.

The gestation period recorded in three females are as follows

♀ No. 12 = 307 days
♀ No 12 = 319 days.
♀ No. 42 = 310 "

Out of 7 births, four took place in Summer months i.e 13-4-77, 14-4-77, 21.4.78

TABLE IV Showing Breeding details of the gaurs (Bos gaurus)

Gaur No: Sex	Date of arrival at the Zoo.	Estimated age at arrival	Date of mating	Age at Mating	Date of Delivery	Gestation Period	Period in between Two Calvings	Sex of the Calf	Remarks.
1	2	3	4	5	6	7	8	9	10
No: 19 Cow	6-11-72	2-2½ years.	Not known	-	18.2.73			♀	This details could not be recorded as the animal got impregnated before coming to the Zoo.
" 12 Cow a)	22.11.71	2-3 weeks	Not recorded	Y. M. D. 4-8-0	13-4-77	could not be recorded	-	♀	
" b)			19-6-77	5-9-0	26-4-78	310 days	1 year 13 days	♂	
" No: 13 Cow a)	2.11.71	2-3 weeks	Not recorded	4-7-0	14-4-77	Could not be recorded	-	♀	
b)			22-6-77	5-8-0	8-5-78	319 days.	1 year 24 days	♂	
" No 21 Cow	Borrowed in Zoo 18.2.73		Not observed	-				♀	The ♀ died at the age of 2-9-0. A foetus about 2-2½ months was recovered from the womb.
No: 18 MALE	1-10-72	2-3 weeks	-	3-9-0					This male served both the females No: 12 & 13. and sired four calves, 2 ♂ & 2 ♀

TABLE IV - (contd.)

Animal No: & Sex	Date of arrival at ICW Zoo.	Estimated age at arrival	Date of mating	Age at mating	Date of Delivery	Gestation Period	Period in between Two Calvings	Sex of ICW Calf	Remarks
1	2	3	4	5	6	7	8	9	10
42 ♀ Radha	25-4-78	1-2 weeks	25/1/85 (25 JAN'85)	7 years	12-11-85	310 days	-	♀ (Parvathi)	I Birth of to Radha.
-do-	"	"	21-11-86 (21 NN'86)	8-10-0	16-9-87	310 days	1-10-0	♀ (Ganga)	II Birth of to Radha.
47 ♂ Krishna	10NN 1980 (10-11-80)	6 weeks	i) 25-1-85 ii) 21-11-86	4-11-0	-	-	-	-	Served ICW ♀ 42 and Sired 2 calves from ♀

(16)

& 8-5-78; two in winter ie 16-2-73 & 12-11-85 and one in Rainy season ie 16-9-87. The Sex of the calves was in the ratio of 2:5 (♂ & ♀) The foetus which died in its mother's womb was a female. The period in between two Calvings was recorded for all the three ♀s and was found to be 1-03-13, 1-0-24 and 1-10-0 years.

(Table No. IV to be Type-here)

DISCUSSION

MATURITY & BREEDABLE AGE :-

Gaur cows like American bison (Bison bison) cows appear to mate for the first time when about 2 years old and have the first calf at 3 years of age (McHugh - 1958) usually the young ones are nursed for 9 months and become pubescent in second or third year (Grizmik)

The breedable age of a Gaur female in captivity in the Nehru Zoological park, Hyd. was found to be 2 - 2½ years. The following incident will throw satisfactory light on this point.

one pregnant gaur cow (No: 19)

(17) arrived from (Chanda) Maharashtra to Nehru (Zoological park Hyd. on 6-11-1972; gave birth to a female calf on 18.2.1973, 3½ months after her arrival. This ♀ calf (No: 21) reached to her adulthood and died on 7-12-1975 at the age of 2 years 9 months and 19 days. When the autopsy was done a foetus (♀) of about 2-2½ months of age was recovered from the uterus. This shows that this gaur cow became pubescent at the age of 2-2½ years and got impregnated when she was 2 years and 7 months old. Gaur Bull (No: 18). was the only adult male available for breeding. This Bull was of 3 years of age at the time of mating. This incident also establishes the breedable age of a Male gaur to be between 2½ to 3 years-

The other ♀ gaur cows (No: 12, 13) have also bred in this breeding enclosure, and were also sired by male No: 18 and gave birth to two calves each in the year 1977 & 78. After a period of about 7 years one Gaur cow No: 42 again gave birth to two females in the year 1985 and 87. She was sired by male No: 47.

The details are given below :-

Sl. No:	gaur cow No:	Daily Delivery	Sex & Ins Calf
1-	No: 12	13-4-77	♀ (No: 32)
2.	No: 13	14-4-77	♀ (No. 33)
3.	No: 12	26-4-78	♂ (No. 43)
4-	No: 13	8-5-78	♂ (No 44)
5.	No 42	12-11-85	♀ (No 50)
6	No 42	16-9-87	♀ (No: 52)

BREEDING & RUTTING SEASON.

opinion differ as to the mating (Rutting) Season of Gaurs in India in wild. The most mating occur in central India in Dec. & Jan. The peak rutting period in south India is from Nov. to March. (Morris-'37) Grizmik reports the mating Season to be from Nov. to March — the peak to be from in March and April. Dutta Pl. 86r et al - 1950, working on Gaurs in Madhya Pradesh reports the mating season to be from Nov. to April — the peak period being in March. KRISHNAN, by observing few very young calves (2-3 weeks old) in

wild in the M/o March, April & September has come to a conclusion that there are two main breeding seasons in June-July and in December and January. But when he also saw few more older calves age 4-6 months during the M/o March-April with the same herd he thought of another breeding period which may be from Dec-Jan. All his observations made him finally to conclude that gaurs breed all the year round (135 pp)

Receipt of (41) calves at the Nehru Zool. Park, Hyd. under one month age from the forests of Andhra pradesh, for over a period of (18) years is from 1967 to 1980 and from 1984 to 1987 is also suggestive of two breeding Seasons one in Dec-Jan and the other in June-July. (See graph) (as per the findings of Dr. Krishnan) but the peak rutting takes place in June-July. (See .... Table no: ---)

GESTATION PERIOD.

The gestation period of Gaur cows as observed in wild by some workers differ with those of cows bred in Captivity. Grizmik and M. Krishnan pp. 36 pp. 134 assumes it to be of 9 months ie between 270-280 days. HORBACK (1937) also opines it to be

g q routes as in domestic cows, but agrees to a great variation observed in captive and wild state.

Our observation in three gaur cows in captivity ie in the velu zoological park, Erg — 1 is that it is over 10 routes. It was (307) days in cow no: 12, (319) days in cow no: 13 and (310 days) in cow no: 4. (See table no: IV)

Jarofke, D. reports the gestation period in European zoos to be (270) days.

No: of calves at birth :—

One calf per birth is generally the rule. The same is also recorded in all the seven Births at the velu zoological park (See table no ....)

+ (In wild according to HUBBACK-1937, Single birth is the rule) KRISHNAN also agrees to this rule, but occasionally has seen two young calves running with a cow. GRIZMIK has reported twins in Malayan species.

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Hand Book of Zoo Medicine
Diseases and treatment of wild animals in zoos KLOS LANG

HUSBANDRY AND BREEDING OF GAURS (Bos gaurus) AT NEHRU ZOOLOGICAL PARK, HYDERABAD. India.

Dr. Mir Gowher Ali Khan, Dattatri Rao, and B.C. Choudhury

I. INTRODUCTION

The Nehru Zoological Park, Hyderabad started rearing gaur (Bos gaurus) calves from an estimated age of two to three weeks, received from forests of Warangal and Khammam districts of Andhra Pradesh. These locations are the natural habitat of gaurs and the calves that were brought to the zoo were invariably the ones that came back to villages with the village cattle. Such villages individuals were found to be suitable for rearing in captivity and the zoo was successful in breeding them. From the year 1969 the large open moated enclosure of the zoo exhibited 6-8 gaurs at any time of the year. The zoo has received and reared (52) gaurs, out of which 24 were males and 28 females between September 67 to August '87. The first calf to arrive at the zoo was a male one (21.9.1967) and the last again a male (10.8.87). (Table-1).

The Zoo was successful in breeding them from 13.4.77 to 16.9.87. from two males and three females. During the period 6 calves (2 and 4) were born in the zoo. One gaur cow, which arrived on 6.11.1972 gave birth to a calf on 18.4.73, was found already impregnated before coming to the zoo. This calf after growing into an adult, died at the age of 2 years and 9 months, with a foetus of about 2-2½ months old in womb.

Unfortunately, an epedimic of Rinderpest disease broke out in the zoo in the month of February 1979 and wiped out 3 and 3 of this breeding enclosure, leaving 2 sub-adult females in the quarantine of the zoo Hospital, which were protected during the time of out-break by vaccinating them against Rinderpest disease using Tissue culture vaccine. Now i.e. At the time of writing this article,

two males and three females are being exhibited in the enclosure. No new calves could be procured from the forests from Dec.1980 to December '83 because of ~~again of epidemic of~~ outbreak of epidemic Rinderpest disease in Eturnagaram sanctuary of Warangal district which broke out in July 1980, and reduced the gaur population to a great extent.

II. PROCUREMENT OF CALVES AND TRANSPORT

Most of the gaurs are captured between the age of 2-3 weeks by the villagers when the mother gaurs move for grazing leaving the sleeping young ones behind or the young gaurs when mixed with the village cattle arrive at the villages late in the evening and are picked up by the villagers. These calves then are handed over to the forest officials of that area, who in turn send them to the Zoo. The gaur calves are kept with the forest officials for 2-3 days, then are loaded (not crated) in to the Jeep and are transported to the Nehru Zoological Park along with one or two forest guards. Two sub-adults gaurs were transported in wooden crates in the trucks.

III. QUARANTINE, REARING AND BREEDING ENCLOSURES

On arrival at the Zoo, the calves are kept in quarantine for a period of 4 weeks, and then are transferred to Rearing enclosures. Such rearing enclosures are our "close observation cages", measuring 6m x 8m ~~x 2m~~ with a 2m height ~~length and breadth with a height about 2m.~~ Chainlink ~~is~~ fence provided all round, with a door in front. An asbestos shed in a corner and a tree or two adore this. The calves are let loose in these enclosures, (Feeding etc. is done here) but are taken out by the attendants for a walk and to graze on the lawns, for a few hours. After attaining the age of 6 months the calves are shifted to the exhibiting and Breeding enclosures.

Exhibiting and Breeding enclosures: A calf of 6-8 months of age is ready to leave the care of attendant, and has learned to eat concentrates and fodder. It is time to introduce it to other

members of the family. Before mixing it up with the regular herd, it is held up in a small crawl for a week, so that it can get used to other members of the group and vice versa. We have found introduction of young calves into the exhibition and breeding enclosure to be satisfactory, as adult gaurs irrespective of sex and age tolerate the young ones very well.

Our breeding enclosure for gaur is very spacious and is situated little away from the visiting public. Entrance to its south-western side is totally banned. This is a 0.5 hectare moated enclosure, oval in shape and with night houses to its one side. This acts as feeding rooms, isolation chamber for treatment and for close observation. The total area of this enclosure is protected on three sides with chain link and Angle irons. In front there is a dry/wet moat (viewing area). This moat is.....deep and wide. Few acacia and Rain trees provide the required shelter and shade.

Gaurs of different age groups and sexes were left in this enclosure. The female (No.19) arrived from Chanda (Maharashtra) on 6.11.1972 was left in this breeding enclosure along with the following animals.

1. Gaur female No.(12) Age - 1 year 2 months.
2. " female No.(13) Age - 1 year

This female (No.19) was found already pregnant before arriving at the zoo, and gave birth to a female calf (No.21) on 18.2.1973. This was the first birth of a gaur calf recorded in the Nehru Zoological Park, Hyderabad. The calf was brought up by the mother satisfactorily. Later on the following gaurs were introduced in this breeding enclosure:

1. Gaur male No.18 Age 8 months in June 1973.
2. Gaur female No.21 This female calf was already in the Breeding enclosure along with her mother.
3. Gaur female No.20 Age 6 months - June 1973.

Female No.21, born to female No.19, grew to the breedable age and got mated with the male No.18, (about 3-2-0 year old at

the time of mating). The details of the breeding behaviour etc. could not be studied. This female unfortunately died on 6.12.'75 at the age of 2-9-19 years due to Enteritis and Broncho pneumonia. And a fem female foetus about 2-2½ months old was recovered from the uterus.

In the later half of the year 1976, the following gaurs were in the breeding enclosure:

1. Gaur female No.12 Age 4-8-0 years.
2. Gaur female No.13 Age 4-7-0 years.
3. Gaur male No.18 Age 3-10-0 years.
4. Gaurs female No.29 Age 0-11-0 years

The Male No.(18) sired both the females No.12 & 13 and four calves were born, two in the year 1977 and two in the year 1978 (Ref.Table No.IV).

Due to out-break of Rinderpest disease (as already mentioned above) in the Nehru Zoological Park, Hyderabad, we were left with two female gaur calves only as detailed follows:

1. Gaur calf female No. (42) Age 10 months (as on Feb.1979)
2. Gaur calf female No. (35) aged 1-10-0 (as on Feb.1979).

These two females were left in the breeding enclosure, after the Rinderpest disease subsided along with a male No.47 (See Table-I). The female No.35, died due to Enteritis cum Bronchopneumonia on 21.1.83 at the age of 5-9-0 years. The pair left now was one male No.47 and female No.42. This male (i.e.No.47) sired the female (no.42) and two female female calves were born on 12.11.85 and 16.9.87 (See Table-IV).

IV REARING

a) Early care: On arrival the calves are housed in quarantine of the zoo for one month, and are fed with Buffaloe/cow milk. The next day the dung sample and blood smears (taken from the tip of the ear) are examined for any helminthic, protozoal or bacterial infection. As a prophylactic measure Quaxaline Bolus of Squibb (Haliquinol 2.5mg) was administered and was repeated on second and third day. The

calves were kept on close observation for one week. Then were given under the care of selected Keepers who were made responsible for feeding, taking them for grazing and looking after their health in the rearing enclosure till six months. By this time they become strong enough to be released in the usual exhibit and breeding enclosure. However only selected specimens were kept in exhibit cum breeding enclosure.

b) Feeding and feed supplement:

The calves were fed on luke warm diluted Buffaloe/cow milk in the ratio of one water to one milk for a week. Then whole milk was given to them. Feeding bottle was used for a day or two. Then onwards they were fed with dish method (Ref 1) in the milk was given in a plastic bowl, big enough to hold 3-5 litres of milk or more at a time. We have found it was difficult for the gaur calves to drink milk from the bowl without the help of the Keeprs. The Keeper dips his finger in the milk, and then puts it in the calf's mouth so that the calf starts feeling the milk taste. Then it starts sucking milk from the milk bowl using the attendant's finger as a teat of the mother gaur, which is kept dipped in the milk through out its feeding. The calves while consuming milk were usually seen hitting the bowl with their heads, simulating the phenomenon of hitting the udder of the mother in order to increase the let down of the milk. In this way, little quantity of milk was splashed out of the milk bowl (~~Table-II~~).

The sub-adult and adult gaurs are fed with Cattle feed pellets/ mash, consisting of wheat bran, rice bran, broken maize, powder ground nut cake and mollases. To this concentrate mixture, vitamin and mineral salts were added. The quantity of concentrates varies with age. An adult gaurs ration was (8) ~~Kilos~~ eight kilogram divided into two meals, one in the morning and one in the afternoon; 30-40 ~~Kilos~~ kilogram of green, consisting of green grass. ~~After~~ Alfa-alfa, fiscus leaves and Napier were also fed. (Table II)

c) Health care and Hygiene:

Besides vitamins and ~~Miusal~~ mineral supplement in the diet, broad

spectrum ~~and~~ antibiotics were also added in the feed/water to check the conditions of stress, during inclement weather, shifting, transport and in the face of outbreaks of bacterial/viral di~~/~~seases.

Faecal samples were screened once in a month ~~under the microscope~~ to detect the worm load of the helminthic parasites, and the animals were dewormed once in every three months.

The gaurs right from the age of 6 months ~~and~~ onwards were vaccinated against Rinderpest and foot and mouth diseases. Booster doses every 6 months/one year were also given. The vaccines used were Tissue culture vaccine (Rinderpest) and Foot and mouth disease vaccine, manufactured by The Indian Veterinary Research Instt. Izatnagar, U.P. and Hoechst Pharmaceuticals Ltd., W.Germany.

d) Growth:

The bodily growth of the gaurs such as weight, height and length were recorded in majority of calves. The calves were weighed on AVERY Balance by making them stand on the platforms. We have found it to be more cumbersome when the calf reaches the age of 8-10 weeks and more as they could not stand with "All fours" on the platform. There was no other alternative arrangement available, hence body weight could not be recorded and maintained. Inspite of this, the girth is measured and recorded. The height was taken at the point of shoulder by means of a measuring stick. The body length was also recorded as follows:-

1. Length from nose tip to crown of the head.
2. Length from nose tip to dorsal bend of the back.
3. Length from nose tip to root of the tail.
4. Length of the tail.

The body length and height of the calves was recorded till they become 6-8 months old. After this age, the calves are difficult to handle and the accuracy of the measurement is lost.

As already mentioned, the growth rate was recorded in several individuals but the details for two individuals are given ~~in the table below:~~ (Table IIIa & IIIb)

V. BREEDING

One pregnant female (No 19 Table I) arrived from Allapalli village of (Kam^N west of Hyd) Maharashtra State to the Nehru Zoological Park, Hyderabad on 6-11-1972 (Nov 1972). A calf was born to her on 18.2.1973 (18 Feb), after 3½ months of her arrival to the Zoo. This calf (No 21 Table I) reached to her adult-hood and expired on 7.12.1975 (December) at the age of 2 years 9 months and 19 days. When the autopsy was done a foetus (female) of about 2-2½ months old was recovered from her uterus. This incident has established the age of puberty to be between 2-2½ (two to two and one half) years in gaur cow.

The other three females which have bred in this park have given first birth at the estimated age of 4-8-0, 4-7-0 and 6-6-0 years. The males (that) sired the first two females and the third female was about 3-8-0 and five years old respectively.

The male that sired the first two females was 3yrs 8 months old and the other male that sired the third female was five years old.

In the Nehru Zoological Park, Hyderabad the gaurs were observed to be in heat in the early hours of the day. There was a slight swelling of the valval tips and mucous discharge through vagina. No vocal expression by the females were observed. The males were seen following the females wherever they went, and were found sniffing the posteriors and licking the the valval tips. At the time of acceptance the females were found standing quietly and the males mounted and copulated in the usual manner as seen in domestic cattle. The copulation period was 1-2 minutes. There were 4-5 mountings immediately after the first within a period of 30-40 minutes. No mating was seen in the evening hours.

(b) Gestation period and Birth of calves

The gestation period recorded in three females are as follows:

No.12 = 307 days.

No.13 = 319 days.

No.42 = 310 days.

Out of 7 births, four took place in summer months i.e. 13-4-77, 14-4-77, 26-4-78 and 8.5.78; two in winter i.e. 18.2.73 and 12.11.85 and one in Rainy season i.e. 16-9-87. The sex of the calves was in the ratio of 2:5 ( ). The foetus which died

in its mother's want was a female. The period in between two calvings was recorded for all the three and was found to be 1-0-13, 1-0-24 and 1-10-0 years. (Table IV)

DISCUSSION

Maturity and Breedable Age:

Gaur cows like American bison (Bison bison) cows appear to mate for the first time when about 2 years old and have the first calf at 3 years of age (Mchugh-1958) usually the young ones are nursed for 9 months and become pubescent in second or third year (Grizmik).

The breedable age of a gaur female in captivity in the Nehru Zoological Park, Hyderabad was found to be 2-2½ years. The following incident will throw satisfactory light on this point.

One pregnant gaur cow (No.19) arrived from Chanda-Maharashtra to Nehru Zoological Park, Hyderabad on 6-11-1972; gave birth to a female calf on 18.2.1973, 3½ months after her arrival. This calf (No.21) reached to her adulthood and died on 7.12.1975 at the age of 2 years 9 months and 19 days. When the autopsy was done a foetus ( ) of about 2-2½ months of age was recovered from the uterus. This shows that this gaur cow became pubescent at the age of 2-2½ years and got impregnated when she was 2 years and 7 months old. Gaur Bull (No.18) was the only adult male available for breeding. This Bull was of 3 years of age at the time of mating. This incident also establishes the breedable age of a male gaur to be between 2½ to 3 years.

The other 2 gaur cows (No.11, 13) have also bred in this breeding enclosure and were sired by male No.18 and gave birth to two calves each in the year 1977 and '78. After a period of about 7 years one gaur cow no.42 again gave birth to two females in the year 1985 and 87. She was sized by male No.47. The details are given below:

Sl.No.	Gaur cow no.	Date of Delivery	Sex of the calf
1.	No.12	13-4-77	(No.32)
2.	No.13	14-4-77	(No.33)
3.	No.12	26-4-78	(No.43)
4.	No.13	8-5-78	(No.44)
5.	No.42	12-11-85	(No.50)
6.	No.42	16-9-87	(No.52)

BREEDING AND RUTTING SEASON

Opinion differ as to the mating (Rutting) season of Gaurs in India in wild. "Most mating occur in central India in Dec. and Jan. The peak rutting period in South India is from Nov. to March (Morris-'37) Grizmik reports the mating season to be from Nov. to March - the peak to be in March and April. Dutta et al 1980, working on Gaurs in Madhya Pradesh reports the mating season to be from Nov. to April- the peak period being in March. Krishnan by observing few very young calves (2-3 weeks old) in wild, in the month of March, April and September, has come to a conclusion that ther there are two main breeding seasons in June-July and in December and January. But when he saw few more older calves aged 4-6 months during the month of March-April, he thought of another breeding period which may be from December, January. All his observations made him finally to conclude that gaurs breed all the year round.

Receipt of (45) calves at the Nehru Zoological Park, Hyderabad under one month age, from the forests of Andhra Pradesh, for ouer a period of (18) years i.e. from 1967 to 1980 and from 1984 to 1987 is also suggestive of two breeding seasons one in December-Jan, and the other in June-July. (see graph) (as per the findings of Mr.Krishnan) but the peak rutting takes place in June-July. (see Table No.).

GESTATION PERIOD

The gestation period of Gaur cows as observed

by some workers differ with those of cows bred in captivity. Grizmik and M.Krishnan assume it to be of 9 months i.e. between 270-280 days. Hubback (1937) also opines it to be of 9 months as in domestic cows, but agrees to a great variation observed in captive and wild state.

Our observation in three gaur cows in captivity i.e. in the Nehru Zoological Park, Hyderabad is that it is over 10 months. It was (307) days in cow No.12; (319) days in cow No.13 and (310) days in cow No.42. (see table No.IV), Jarofke, D. reports the gestation period in European zoos to be (270) days.

No. of calves at birth:

One calf per birth is generally the rule. The same is also recorded in all the seven births at the Nehru Zoological Park (see table No.). In wild according to Hubback-1937, single birth is the rule. Krishnan also agrees to this rule, but occasionally has seen two young calves running with a cow Grizmik has reported twins in Malayan species.

TABLE-I

Year	Accession No.	Date of arrival	Approximate age on arrival	Sex	Date of death	Period serviced in captivity	Cause of death	Remarks
1	2	3	4	5	6	7	8	9
1967	1	21 Sept.1967	2-3 weeks	Male	1 April '72	4 yrs.7 months	Foot and mouth disease	
	2	24 Nov.'67	2-3 weeks	Female	25 Aug.74	6 yrs.8 months	Pneumonia and Nephritis	
1969	3	1 Jan. '69	1-2 weeks	Male	11 Aug.'73	4 yrs.8 months	Enteritis & Cirrhosis of liver	
	4	8 April '69	3-4 weeks	Male	13 Feb.'74	4 yrs.10 months	Rickets and fungal debility	
	5	20 May '69	3-4 weejs	Male	1 Jan.'70	0 yr. 7 months	Tumour like growth (Peritonimus)	
1970	6	7 April '70	3-4 weeks	Female	31 Aug.'72	2 yrs. 5 months	Enteritis and cystitis	
	7	28 April '70	2-3 weeks	Female	3 Sept.'70	4 months	-do-	
	8	20 June '70	2-3 weeks	Female	9 Sept.'72	2 yrs.2 months	-do-	
	9	5 Oct. '70	2-3 weeks	Male	12 Oct.'70	1 Week	Retention of urine	
	10	17 Nov.'70	1-2 weeks	Female	23 Nov.'70	1 week	Diarrhoea and dehydration.	
1971	11	21 Jan.'71	2-3 weeks	Female	6 Oct.'78	7 yrs.8months	Enteritis and Hepatitis.	
	12	27 Jan.'71	4-6 weeks	Male	7 April '71	2 months 10 days	Tympanitis associated with septic Arthinitis.	
	13	2 Nov. '71	2-3 weeks	Female	2 Feb.'79	7 yrs. 4 months	Rinderpest disease	
1972	14	19 March '72	6 months	Female	14 April 72	24 days	Enteritis.	
	15	24 March '72	1-2 months	Male	31 May '74	2 yrs.2 months	Enteritis with pyclonephritis.	

contd....2.....

Table-I contd.....

1	2	3	4	5	6	7	8	9
	16	31 May '72	2-3 weeks	Male	16 July 72	6 weeks	Pyaemia (pyaemia)	
	17	25 Aug.'72	2-3 weeks	Female	4 June '74	1 yr. 9 months	Pheumonia	
	18	1 Nov.'72	2-3 weeks	Male	18 Feb.'79	6 yrs.3½ months	Rinderpest disease	
	19	6 Nov.'72	2-2½ years	Female	19 April '75	2 yrs.5½ months	Heat stroke (Brought from Chanda, in the wild)	Impregnated
	20	5 Dec.'72	2 months	Female	-	-	- Sent to Trivandrum Zoo.	
1973	21	Born in the Zoo to female 19 on 18 Feb.'73	-	Female	7 Dec.'75	2 yrs.9½ months	Broncho-pneumonia and Enteritis	2-2½ months old foctus was recovered from the womb on p.m.
	22	14 July '73	One month	Female	16 Dec. '73	6 months	Hepatitis and fibriod lungs	
	23	9 Sept. '73	One month	Female	—	—	Sent to Trivandrum Zoo.	
	24	9 Sept. '73	One month	Female	—	—	Sent to Trivandrum Zoo.	
	25	2 Nov. '73	One month	Female	—	—	Sent to Trivandrum Zoo.	
	26	6 Nov. '73	3-4 weeks	Female	10 Nov. '73	4 days	not ascertainable	
1974	27	30 April '74	3-4 weeks	Female	—	—	Sent to Trivandrum Zoo.	
1975	28	8 June '75	4-6 nibtgs	Female	21 July'75	6 weeks	Not ascertainable	
	29	20 Sept. '75	3-4 weeks	Female	—	—	Sent to Trivandrum Zoo.	
1976	30	20 April '76	1-2 weeks	Male	9 Sept. '75	5 months	Enteritis.	
	31	19 Nov. '76	1-2 weeks	Male	1 Dec. '76	15 days	Not ascertainable	

contd.....3.....

TABLE-I contd.....

1	2	3	4	5	6	7	8	9
1977	32 (F1)	Born in the Zoo to Female No:12 on 13 April 77	—	Female	1 Feb.'79	1 yr. 10 months	Rinderpest disease.	
	33 (F1)	Born in the Zoo to Female No:13 on 14 April '77	—	Female	1 Feb.'79	1 yr. 10 months	Rinderpest disease	
	34	23 April '77	2-3 weeks	Female	28 May '77	1 month	Enteritis	
	35	23 April '77	1-2 weeks	Female	21.1.83	5 yrs.9 months	Enteritis and Broncho pneumonia	
	36	2 Sept. '77	2-3 weeks	Male	1 October '77	1 month	Enteritis	
	37	20 Nov. '77	2-3 weeks	Male	—	—	———	Sent to Indira Gandhi Zoological Park, Visakhapatnam.
	38	14 March '78	2 weeks	Male	28 March '78	2 weeks	Hepatitis	
	39	18 April '78	1-2 weeks	Male	9 May '78	3 weeks	Retention of urine	
	40	23 April '78	1-2 weeks	Male	30 April 78	1 week	Hepatitis	
	41	25 April '78	1-2 weeks	Male	1 May 78	1 week	Broncho pneumonia	
	42 (Radha)	25 April '78	1-2 weeks	Female	—	—	—	Now on exhibit.
	43	26 April 1978 Born in the Zoo to Female 12	—	Male	Feb. 1979	11 months	Rinderpest	
	44	8-5-1978 Born in the Zoo to Female No:13	—	Male	Feb. 1979	9½ months	Rinderpest	

contd.....

1	2	3	4	5	6	7	8	9
~~45~~	45	18 May '78	2 weeks	Male	30 May '78	3 weeks	Retention of urine	
	46	29 July 78	1-2 weeks	Male	30 July '78	1 day	Enteritis and hepatitis	
1980	47 (Krishna)	10 Nov.'80	2 months	Male	—	—	—	now on exhibit
1984	48	25 Jan. 84	1 week	Female	6 March '84	1½ months	Uraemia and pneumonia	
1985	49	3 April '85	2 weeks	Male	12 Feb.87	About 2 years (1-10-9)	Hepatitis and nephnitis	
	50	Born on 12.11.85 to to Female No.42 and Male No.47.	—	Female (Parvathi)	—	—	—	Now on exhibit
1987	51	10 Aug.'87	2-3 weeks	Male	—	—	—	Now on exhibit
	52	Born on 16-9-87 ~~to~~ Female No.42 and Male No.47	—	Female	—	—	—	Now on exhibit along with mother.

TABLE-II

Sl. No.	Age of the calf	Approx. Wt.	Quantity of milk fed (Dilution 1:1)	Quantity of milk feed (whole milk)	Quantity of concentrates	Green fodder, (green grass, leaves, Alfa alfa)
1	2-3 weeks	23-37 Kilos	1:500 litres morning and afternoon.	After a weeks time whole milk 1-500 litre morning and afternoon	Nil	Nil
2.	One moths	46-61 Kilos	-	3 litres morning & afternoon	-	-
3.	Two months to three months	-	-	5 litres morning & afternoon	250 gms,	Ad. lib.
4.	Three to four months	-	-	6-8 litres morning & afternoon	500 gms.	Ad. lib.
5.	Four to six months	-	-	Nil	One Kilo	Ad. lib.
6.	Sub-adult and adult	Usually - 150 kg. to 400 Kg.	-		2-4 Kilos	Adl.lib.

TABLE-III (a)

1. Date of arrival to the Zoo = 20.9.1967.
2. Sex and Age = Male . 2–3 weeks old
3. Collection No. = I

Sl. No.	Date of taking measure-ments.	Age	Length from nose tip to crown	Length from nose tip to dorsal bend	Length from nose tip to root of the tail	Length of the tail	Height at the shoulder	Weight (Kgs.¿)
1	2	3	4	5	6	7	8	9
			cms.	cms.	cms.	cms.	cms.	
1.	20.8.67	2–3 weeks	21.6	76.8.	102.0	36.0	79.60	37.500
2.	18.10.67	4–6 weeks	25.2	85.2	105.6	43.20	86.40	61.500
3.	10.11.67	8–10 weeks	26.4	91.2	122.4	45.60	90.00	
4.	5.1.68	4½ months	33.6	102.00	151.20	51.80	97.20	
5.	10.2.68	5½ months	37.2	109.20	153.60	55.20	108.00	
6.	4.3.68	6½ months	40.80	113.20	156.00	55.60	109.20	
7.	19.4.68	8 months	42.20	129.60	174.00	60.00	116.40	

TABLE-III (B)

Date of arrival to the Zoo: 24.11.67

Sex and age : Female 2-3 weeks

Collection No.: : (2)

Sl. No.	Date of taking measure-ments	Age	Length from nose tip to crown	Length from nose tip to ~~root of the tail~~ dorsal bend	Length ~~of the tail~~ from nose tip to root of the tail	Length of the tail	Height at the shoulder	Weight (Kgs.)
1	2	3	4	5	6	7	8	9
			cm	cm	cm	cm	cm	
1.	24.11.67	2-3 weeks	21.3	73.20	99.60	33.60	78.00	34.000
2.	7.12.67	4-6 weeks	26.20	74.40	99.84	33.60	79.20	43.000
3.	5.1.68	~~26~~8-10 weeks	26.70	77.28	104.88	36.24	85.20	52.000
4.	19.2.68	13 weeks	30.00	85.20	118.80	39.60	91.20	
5.	14.3.68	4½ months	30.48	87.12	122.40	42.24	96.48	
6.	19.4.68	5½ months	33.6	97.20	135.60	48.00	104.40	

TABLE NO.III (C) Growth of one Male and one Female calf

Age	Length from nose tip to crown (cm)		Length from nose tip to Dorsal bend (cm)		Length from nose tip to root of the tail (cm)		Tail length (cm)		Height at shoulder (cm)		Weight (Kg.)	
	Male	female	Male	female	Male	female	Male	female	Male	female		
1	2		3		4		5		6		7	8
2-3 weeks (One month)	21.60	21.30	76.8	73.20	102.00	99.60	36.00	33.60	79.60	78.00	37.500	34.000
One and a half month	25.20	26.20	85.2	74.40	105.60	99.84	43.20	33.60	86.40	79.20	61.500	43.000
Two months	26.40	26.70	91.20	77.28	122.40	104.88	45.60	36.24	90.00	85.20	—	52.000
$4\frac{1}{2}$ months	33.60	30.48	102.00	87.12	151.20	122.40	51.80	42.24	97.20	96.48		
$5\frac{1}{2}$ months	37.20	33.60	109.20	97.20	153.10	135.60	55.20	48.00	108.00	104.40		

Measurement here are of Account No: 1 & 2 (See Table-I)

TABLE-IV: Showing Breeding details of the Gaurs (Bos gaurus)

Gaur No: & Sex	Date of arrival at the Zoo	Estimated age at arrival	Date of mating	Age at mating	Date of delivery	Gestation period	Period in between two calvings	Sex of the calf	Remarks
1	2	3	4	5	6	7	8	9	20
1. No: 19 Cow	6.11.72	2-2½ years	Not known	-	18.2.73			Female	Other details could not be recorded as the animal got impregnated before coming to the Zoo.
2. No.12 Cow (a)	22.11.71	2-3 weeks	Not recorded	Y.M.D. 4-8-0	13.4.77	Could not be recorded	—	Female	
(b)			19.6.77	5-9-0	26.4.78	310 days	1 year 13 days	Male	
3. No: 13 Cow (a)	2.11.71	2-3 weeks	Not recorded	4-7-0	14.4.77	Could not be recorded	—	Female	
(b)			22.6.77	5-8-0	8.5.78	319 days	1 year 24 days	Male	
4. No: 21 Cow	Born in the Zoo 18.2.73		Not observed					Female	The female died at the age of 2-9-0. A foetus about 2-2½ months was recovered from the womb.
5. No: 18 Male	1.10.72	2-3 weeks	-	3-9-0					This male served both the females No: 12 & 13 and sized four calves 2 males and 2 females.
6. No:42 Female Radha	25.4.78	1-2 weeks	25.1.85	7 years	12.11.85	310 days	—	Female (Parvathi)	I. Birth to Radha
7. No:42 Female									

contd.....2.....

TABLE-IV contd..... -2-

1	2	3	4	5	6	7	8	9	10
7. No.42 Female Radha	25.4.78	1-2 weeks	21.11.86	8-10-0	16.9.87	310 days	1-10-0	Female (Ganga)	II. Birth to Radha
8. No.47 Male Krishna	10.11.80	6 weeks	i)25.1.85 ii)21.11.86	4-4-0	-	-	-	-	Served the Female 42 and sized 2 calves both females

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Longivity/Maximum longivity recorded by Grizmik is 24 years - In the Zoo one male No.19 lived for a period of 6-4-17 and one female No.13 for 7-4-0.

Please refer also Int. Zoo Year Book 19

Stud Book Keeper for Bos gaur is Dr.H.G.Kios, Director, Berlin Zoo.

Births recorded probably taken from Int. Zoo Year Book 1977.

1. Berlin, W.Germany 3/1 (2/0)
2. Bronsville USA 1/1
3. Hyderabad 1 no. (?)
4. Oklahama USA 2/0
5. Omaha, U.S.A. 2/2
6. St.Lovis, USA 0/1
7. Sandiego, WAP, USA 1/0
8. Toronto, CAN 1/0

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Survey findings

(a) Suitability as a saltwater crocodile habitat:

The availability of water bodies in the Sriharikota island reveals that there are only two long shallow depressions (Pedda-vagu and chinna-vagu) running almost parallel to the shore with fresh water but neither of them are perennial.

There are also many smaller streams flowing from west to east receiving water from the Buckingham canal which passes along the western boundary of the Sriharikota island.

Even though the vegetation along the streams are suitable as nesting material for the saltwater crocodile with a preponderence of Cane (Calamus sp.) brakes, the streams seem to be unsuitable for introduction of saltwater crocodile as they remain almost dry during the summer months. Further, with a heavy downpour of rains and constant cyclonic storms, the waterbodies get overflooded and spreads throughout the low-lying island area which may prove to be problematic once the introduced saltwater crocodiles move all over and into the Buckingham canal and/or into the Pulicat lake. Further the streams do not seem to have a good population of fish nor there are a diversified population of small mammals which could serve as the food of saltwater crocodile.

There are a group of tribals Yanadis living in the island who are the original inhabitants. These people are basically hunter-gatherers, dependent on the forest flora and fauna. The limited stretch of freshwater streams are constantly used by these tribals and it would be rather unwise to introduce saltwater crocodile without any guarantee that there would be no man-crocodile conflict. (However, the waterbodies do support a large population of migratory water-fowls including grey pelicans and need to be improved on to support these migratory birds).

Providing Artificial Water Sources

TO DESCRIBE INEXPENSIVE METHODS OF CONSTRUCTING ARTIFICAL WATER SOURCES WHICH REQUIRE A MINIMUM OF CONSTRUCTION.

If you have undertaken a water survey, you know where you need artificial water supplies. These should be inexpensive, easy to build and maintain, and not be an eyesore in the landscape. Two rules of thumb apply:

- an unreliable supply can be worse than none.
- many small sources are better than a few large sources.

Tube wells and anicuts (a small weir across a streambed) are usually more elaborate and costly. Obtain construction manuals and professional assistance for building them. Tubewells will give a reliable, high quality supply and may greatly facilitate tanker supply in large areas.

Checkdams are relatively inexpensive, but then may not hold water throughout the dry season and sediments will have to be removed every year.

This technique describes tanker supply, shallow wells, surface water storage tanks, and diversion of natural sources are described below.

TANKER SUPPLY

A tractor drawn tanker is often an emergency measure during severe drought. If large areas are to be covered, strategically located boreholes reduce hauling distances considerably. Construct temporary waterholes by digging shallow saucer shaped depressions on impervious clay. If the soil will not hold water, use cement or thick polythene sheets weighted with pebbles as a lining. Allow for an overflow into a mud pool for birds and wallowing.

TAPPING SHALLOW GROUNDWATER

An impermeable layer sometimes brings groundwater close to the surface. You can detect such places from local congregations of butterflies, by a lush growth of grass, and the presence of moisture loving tree species.

Digging 1 to 3 meters down should expose water. If the excavation is deeper than about 1/2 meter, level the edge to give it a gradual approach from at least one side. Alternatively, one can cover it and pump the water up into a tank.

SURFACE WATER STORAGE TANKS

Planning

Among the most common artificial water sources are shallow tanks which retain surface runoff behind earth dams. Choose the site by judging catchment area, drainage, and soil condition. Runoff from a small catchment area may never fill the tank. Surplus runoff from a large catchment area can be diverted if there is a natural drainage channel. Seepage can be prevented by constructing the tank on impervious soil or bedrock.

Construction

Begin by digging a saucer-shaped depression using the excavated material to build a dam perpendicular to the flow direction. Excavating the tank in steps allows you to continue work even after rains. While the lower part of the pit is flooded, the higher steps remain dry. If the excavated soil is sandy and permeable, the dam will require a core of clay rising directly from bedrock or from an impervious layer of soil.

DIVERTING NATURAL WATER SUPPLIES

Springs or seepages emerging from sheer cliffs are often inaccessible for wildlife. It is often possible to collect the water in a tank and divert it by gravity feed through pipes to a place where animals can easily reach it. Fine examples of this can be seen at Bhandavghar national park in Madhya Pradesh.

For a reliable, low maintenance system without air valves, one should avoid humps above the fall line. The pipe should be buried a foot or so underground, especially if it is made from polythene.

Similar distribution systems can be developed from village water tanks to divert water to places with less disturbance to wildlife.