1974 Season

		Inest	hatched	total hatched
Chidambaram	17.5.74	33 eggs	x + 39 days 24.6.74	4
		Inest -		
Srirangam (Grandthicut)	19.5.74	27 eggs	x + 22 days	13
		54		17

PTO

1975 Season

MSPT Collection

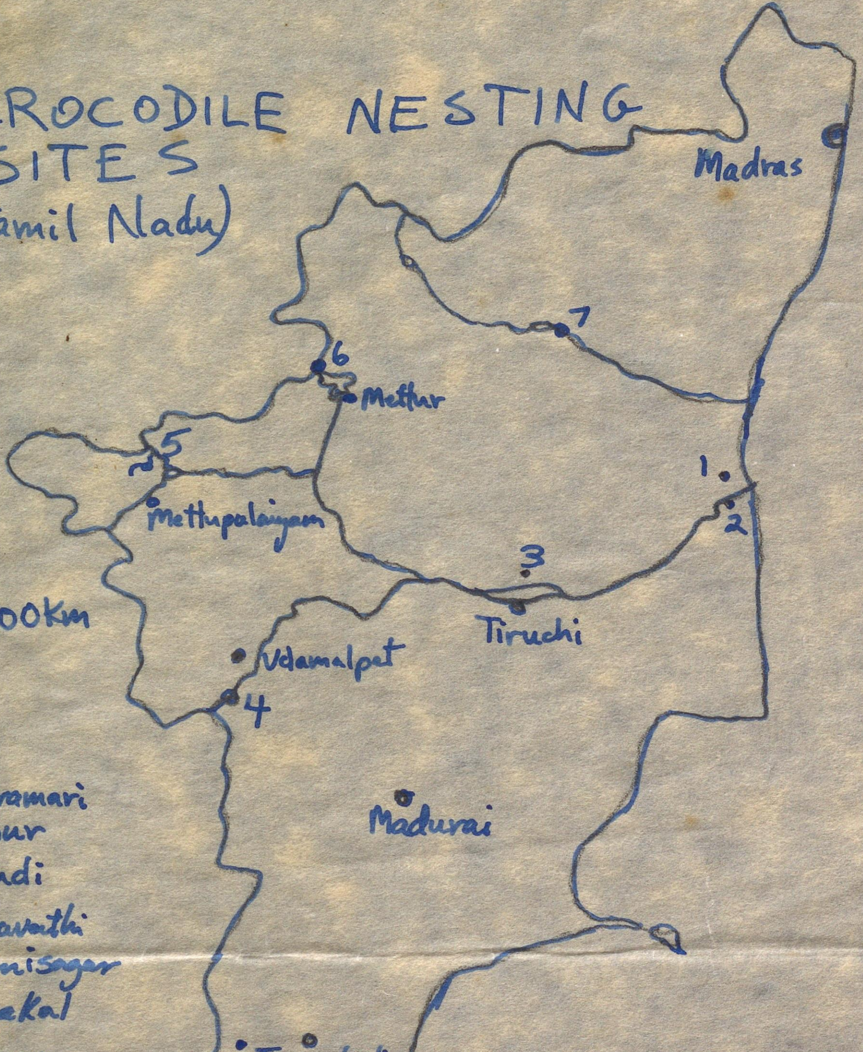
Killikundu	20.4.75	one nest	16 eggs	—	6 hatched
☆ Kedarhalli	??	four nests reported	2 nest could not be seen but no hatchlings 2 nests and hatchlings collected.	28 hatchlings	17 hatchlings were collected 11 hatchlin collected
M.S.P.T laid eggs	8.3.75	one nest	22 eggs		15 hatched (24th May) (77 days)
☆ Hogenakal		one nest	23 hatchlings collected		total 72 ~~15~~

1974 Season

☆ Hatchlings were collected

C-13(c)

CROCODILE NESTING SITES (Tamil Nadu)



1inch = 100Km

1. VaKKaramari
2. Elathur
3. Kilikudi
4. Amaravathi
5. Bhavanisagar
6. Hogenakal
7. Sathanur

make report for '76

[charts must be given!]

COLLECTION AND HATCHING OF MARSH CROCODILE (*C. palustris*) EGGS

1975 Season

The Madras Snake Park collected mugger eggs in Tamil Nadu for the second season this year. During April and May seven nesting sites were visited, and four wild nests were transported to the hatching area in the Snake Park. The areas visited were: 1) Vakkaramari Waterworks, Chidambaram; 2) Elathur, Coleroon River; 3) Kilikuddi Tank, Grand Anicut; 4) Amaravathi Dam, Chinnar and Munnar Rivers; 5) Bhavanisagar, Bhavani and Moyar Rivers; 6) Hogenakal Falls, Stanley Reservoir, Cauvery River; and 7) Sathanur Dam, Ponnaiyar River.

✓1) Vakkaramari Waterworks:- 19.4.75

Area: Forty acre waterworks with two large tanks, feed canal and pumping station. A 30' bund divides the tanks. Sparse vegetation.

No. of mugger: 15 adults and sub-adults.

Nests found: Nest 1 was on the centre bund, 1'/2 metres from the waters' edge. The eggs had been laid the night before (fresh mucous on top egg, scattered fresh earth from digging). The eggs were 8 cms below soil surface under an acaccia bush. what happend to this nest?

A one metre square chicken wire mesh was pegged down on the nest to keep out predators. During the operation a 2'/2 metre adult crocodile, possibly the female, kept close by on the water surface.

Nest 2 was located on the south side of the canal. The eggs had been dug up and eaten by predators, the common ones there being mongooses, jackals, monitors, civets.

Subsequently, the Superintending Engineer for the Waterworks wrote us a very interesting letter; that on 2.5.75 at 9.30 a.m. the staff saw a nesting mugger dig a nest hole on the centre bund and lay 22-28 eggs, after which she turned round and started eating them. This has been reported ~~inxxapkixx~~ to happen in captive conditions (Ahmedabad Zoo, '75), but in wild crocodiles this behavious is difficult to explain.

2) Elathur, Coleroon (branch of Cauvery):- 20.4.75

Area: A sharp double bend in the Coleroon 12 miles from its' entry into the Bay of Bengal has formed a deep channel, where crocodiles were once plentiful. There are several bathing ghats on the south bank of the river.

No. of mugger: Approximately 5.

Nests found: No nests found.

3) Kilikuddi Pond, Grand Anicut:- 20.4.75

Area: Two acre pond, ten miles from Trichy. Declared a Crocodile Preserve in '72.

No. of mugger: 16.

Nests found: Nest 3 was located on the north bank of the pond, 1 metre above and 2 metres from the water line. 20 cms under, the fine clay soil was moist enough to compress into a ball. The nest had 16 eggs, out of which 6 were cracked and 2 rotten. They had been laid around 12.4.75.

The eggs were transferred to a box and Mr Rao flew with them to Madras. The cracked eggs failed to develop in the hatchery and were attacked by ants. Four others also turned rotten and on

20.6.75 only six hatched. One hatchling, which was very weak with a dry skin, died a month later.

4) Amaravathi Dam (Thennar, Kuthirayan and Chinnar Streams):- 22.4.75

Area: 5 sq. km. reservoir within the Anamalai Wildlife Sanctuary. Being a drought year the maximum depth was 15 feet.

No. of mugger: Largest single population noted in Tamil Nadu. In one night count 22 animals were observed, and 14 adults in the day time.

Nests found: On a walk around the entire circumference of the reservoir a total of 11 empty nests were seen (nests 4-14). The eggs had been fairly recently removed by humans. Local tribals said that cow herders, stick and dead fish collectors etc. do not hesitate to take the eggs from a fresh mugger nest. These are either sold to the local hotel or eaten at home. All these eggs had been laid during the first two weeks of April. An estimated 350 hatchlings were thus lost to human predation in Amaravathi alone this year.

Remarks: A point of interest about Amaravathi is the fish catch in relation to the number of crocodiles. Having the largest number of mugger in any one habitat in the State, this reservoir also has one of the largest fish catches in India; sometimes one man may catch as much as 350 kgs a day, the main fish being Tilapia peter mozambique. This situation directly contradicts the popular belief that crocodiles are detrimental to the fish industry. In fact, recent studies in many parts of the world prove the importance and value of crocodilia to Fisheries. (see Biblio)

5) Bhavanisagar, Bhavani and Moyar Rivers:- 25.4.75

Area: Large reservoir, present depth 63 feet.

No. of mugger: About 10. 5 were seen by us.

Nests found: No nests located. Much human activity on all shores; fishing, planting, construction etc.

a) Moyar River

Area: Moyar River joins Bhavanisagar Dam. Broad stream, thick elephant jungle.

No. of mugger: Not known; very scanty population.

Nests found: No nests found, but local Irulas reported regular nesting sites by a few crocodiles.

b) Kedarhalli Stream

Area: Minor tributary of the Moyar which flows down from the Kotagiri Hills through deep narrow chasms. Near Masipatti where the Nilgiri foot-hills start to level out, the stream forms fairly large pools at bends and below falls. There is no road.

No. of mugger: At least 6 breeding size mugger live in pools along the stream. In the 4 km stretch where we camped, we saw 4 adults.

Nests found: Nest 15 was found on the south side of a small pond, 30 feet away from water and 6 feet above water level. The sand was damp 1/2 metre below the surface. There was no shade nearby, and the nest received direct sunlight from 9 to 4. The eggs had hatched

3 days before and we found the (17) hatchlings under a huge overhanging rock 50 metres from the nest. The parent had carried hatched and semi-hatched young to the pond. Shells and 2 freshly dead young lay under the boulder. Some of the young had swollen stomachs (unabsorbed yolk) and three had curled tailse (overheating of nest site). Two had raw umbilical scars.

Nest 16 was located near a pool 1 km upstream from here, 40 metres long and 10 metres wide. The average depth was 1'/2 metres. There was thick mud at the bottomand a large number of fish were dying from clogged gills due to recent rains stirring up the mud.Two adult mugger live in this pool.

15 metres from the pools' edge we saw a slight mound in the bushes, smooth from the passage of a mugger, and wet. Tapping it, we heard soft croaking grunts. In the evening we dug the covering of 25 cms of earth. There were 18 eggs, 11 of which hatched during the next 12 hours. Several were discoloured. The next day these were taken by train to Madras.

Anoth er 3 kms upstream, near a slightly larger pool, we saw nests 17 and 18. The eggs had hatched but there was no sign of the young.

6) H ogenekal, Cauvery River:- 1.5.75

Area: Here the Cauvery has a rocky, swift flowing bed with several large, deep pools. This Melgiri area has scrub and deciduous forest, elephant habitat.

No. of mugger: Unknown, a few scattered pairs.

Nests found: Nest 19 was located on a sand bank about 3 metres from the river. The young had hatched about April 21st and on information from local people 23 young were collected.

7) Sathanur, Ponnaiyar River:- 3.5.75

Area: Approximately 10 sq.mile reservoir, surrounded bydry scrub.

No. of mugger: 10-12 adults.

Nests found: Seven empty nest holes were found (nests 20-26). The eggs had been taken by Irulas and other local people.

Captive breeding at Madras Snake Park:

Our 7 foot 16 year old female laid 22 eggs on March 8th. On 6th May these were transferred to the hatchery. 17 were good eggs, 1 punctured, and four rotten. 15 babies hatched on May 24th. Of these, one was blind in one eye.

Conservation of mugger: Tamil Nadu has representative examples of the two types of mugger habitat which could contribute to conservation: reservoirs, which could be used for artificial breeding and management (collection of eggs, rearing etc), and thosee like Kedarhalli, which could be excellent wild crocodile preserves in primeval habitat, provided efficient protective measures were taken.

Local tribals would be ideal for crocodile breeding projects, as they have considerable experience and knowledge of nesting habits of mugger through collection of eggs for consumption, besides having a natural aptitide and liking for work involved with wildlife.

Natural hatching of mugger eggs:

~~The protective instincts of a mugger are very strong~~

After mating, (in India usually between January and March, though timings may change in severe drought conditions, geographically or in captive animals), the female mugger is ready to lay her eggs after about 2 months. Up to five or six trial nests are made, presumably to check suitability of soil temperature, humidity, consistency etc. The final nest has an average depth of 50-60 cms and the average diametre is about 35 cms. Soil above the nest has been found to be between 5 cms and 22.5 cms. The female digs with her hind feet, only sometimes using her front feet. Occasionally she inserts her snout into the hole; this may be checking for fungus, ants, and other undesirable elements. After laying, ~~xxx~~ (anywhere from 16 to 40 eggs, depending on the size and age of the animal) she covers the nest with the fine loose earth she has dug out and packs it with her body. Under normal conditions she visits the nest every night, or lies near or on the site for 24 hours. On every occasion that we found a wild nest, the tracks of the female were clearly visible from the night before. On some of her nightly visits she dampens the nest, either carrying water in her mouth or perhaps by cloacal evacuation (noted by Reuben David, Ahmedabad Zoo). When, 45-75 days later, the babies start their grunting chorus, she gently digs down to the eggs. The hatched and sometimes semi-hatched babies are carried to the water in her mouth.

The protective instinct of crocodiles is very strong. Both males and females react very strongly to the nasal distress cry of the young. Experiments on this with captive and wild specimens have sometimes had rather frightening results, with 3 or 4 large mugger leaving the water and charging the (human) imitator of the cry open-mouthed.

Artificial incubation and hatching:

Two methods can be adopted. (a) By far the best one is to cover the nest with mesh and have someone keeping constant watch on it.

Hatching success is likely to be far greater this way, as errors in transferring, transporting and duplicating nest site conditions are eliminated. (b) The other method is to transfer the eggs to hatching boxes and transport these to the hatchery. This transfer should be done either within 24 hours after laying or after 20 days. We use wooden boxes 2'x2'x2'. These should be filled with one layer of earth from the nest site, the eggs placed in it, and re-covered with earth.

The method of transferring the eggs to the boxes is of the utmost importance, and should be done very carefully and slowly. As it is removed from the nest, the top of each egg should be marked with a felt pen, and placed in exactly the same position in the box. If it is turned even slightly, the delicate blood vessels may break and the egg will probably not hatch. The eggs should be tightly packed in a mixture of earth, leaves and grass. The best mode of transport to the hatchery is by train, if the distance is great.

Conditions in hatchery: The hatching boxes should be placed in an enclosed area. Air and soil temperatures should be taken at the nest site and duplicated inside the hatchery. Careful temperature and humidity checks should be kept. If possible, cracked eggs should be kept in a separate box, as these attract ants. Efforts should be made to eliminate these and other insects.

Hatching: When the babies are ready to hatch, they start making barely audible grunting sounds. 24 hours after the first sounds are heard, at a cool time of day, the earth covering the hatchlings should be dug up. Those still in shells should be allowed to hatch by themselves.

Hatchling enclosure: It is essential to provide an enclosure safe from predators, with clean water, thick vegetation for hiding, and plenty of food.

Food: Young crocodiles eat voraciously from the 2nd or 3rd day. Insects (beetles, termites, dragon-flies, grass-hoppers), small frogs and fish are taken during the first couple of months, up to the first year. A light bulb hung over the pond is a cheap and easy way of seasonally providing some insects. It is important to remember that if there are too many animals put in for food, e.g. frogs, the feeding rate will go down, so also if there are too few. A balance has to be worked out in each case after careful observation. If these basic requirements are provided, hatchlings can grow an at incredible rate. A few of the one year old hatchlings we have are already a metre long.

Acknowledgements:

The Tamil Nadu Forest Department has always helped and encouraged us in our work. The Fisheries Department allowed us the use of their rest houses and boats on the reservoirs. Thanks to E. Mahadev and members of the Snake Park who once again took to egg collection very enthusiastically, and to Wayne King, Tony Pooley and H.R. Bustard for their valuable help, suggestions and criticisms. As always, special thanks to our Irula friends, whose knowledge of natural hiertory puts- or should put- us all to shame.

Bibliography

Fittkan, E.J. Crocodiles and the Nutrient Metabolism of Amazonian Waters, Amazoniana, IV, 1974

Fittkan, E.J. Role of Caimans in the Nutrient Regime of Mouth-lakes of Amazon Affluents, Biotropica 2, 1970

Pooley, A.C. Conservation and Management of Crocodiles in Africa, J. So. African Wildlife Management Assn, 1973

Yangprppakorn, Uthai, Captive Breeding of Crocodiles in Thailand

Blake, D.K. Rearing of Crocodiles for Commercial and Conservation Purposes in Rhodesia, Rhodesia Science News, 1974

Chabreck, R.H. Effect of Collection Date and Egg Position on Hatching Rate of American Alligator Eggs, 1973

Bird, G.L. The Fisherman's Friend; How the Alligator Helps to Maintain the Fish Supply, Nature, 1931

Crocodile Farming in Rhodesia, Dept. of Nat'l Parks, Rhodesia, 1970

Hunt, R.H. Breeding of Morelet's Crocodiles at Atlanta Zoo, Int'l Zoo Yearbook, 1972

Pooley, A.C. Parental Care in the Nile Crocodiles, Lammeguyer, 1974

Joanen, T. Nesting Ecology of Alligators in Loisiana, S.E. Assoc. Game and Fish Commission, 1969

Bustard, H.R. Preliminary Survey for the Prospects of Crocodile Farming (India), FAO, 1974

Whitaker, R. Notes on Behaviour, Ecology and Present Status of the Marsh Crocodile in S. India, MSP, 1974

1976 Eggs Collection
in Collaboration with MSPT & TNFD)

~~METHODS~~

The ~~A~~ joint ~~[illegible]~~ programme of ~~[illegible]~~ Mugger ~~egg~~ ~~Croc~~ (*Crocodylus palustris*) egg collection for ~~[illegible]~~ artificial hatching by Tamil Nadu forest ~~Dept~~ and Madras Snake Park Trust has been successfully completed in the Southern state of Tamil Nadu. This important Conservation ~~to~~ ~~Collect~~ venture was carried out ~~[illegible]~~ from February ~~to~~ to May 1976. During this season (1976) the following Mugger habitats were ~~[illegible]~~ ~~[illegible]~~ ~~[illegible]~~ visited. ~~for~~

~~METHOD~~:

1. Chidambaram (~~S. Arcot Dist~~ South Arcot Dist)
2. Kollidam Tank, (~~G~~ Grand Anicut) Tiruchirappalli Dist
3. Amaravati Dam Coimbatore Dist
4. Bhavanisagar Dam (Bhavani & Moyar River) Coimbatore Dist.
5. Hogenakal Falls Dharmapuri Dist
6. Sathanur Dam N Arcot Dist.

METHODS

a. PROTECTION OF NEST SITES

~~Personnels of~~ Tamil Nadu Forest ~~Dept~~ (TNFD) ~~were~~ ~~allowed~~ posted personnels to guard over the nesting sites from disturbance & grazing and to stop poaching of eggs by hill tribes and cowherders (~~1975~~ Whitaker 74/75*). This timely commendable action by TNFD saved nests from being

---

* Whitaker et al (1975 Unpublished paper) reports that ~~[illegible]~~ during the 1975 ~~egg~~ lay nesting season ~~[illegible]~~ eleven nests were ~~poached~~ robbed by tribals and cowherders from Amaravati Dam and were sold in the market

poached. Tribal peoples (experts in ~~eggs~~ nest-tracing) were appointed to locate the nests, ~~this~~ which on the previous years used to go to their frying pans. ~~This important policy of conservation for local participation is very~~ This ~~impt~~. Local participation is an important policy of conservation. The Madras Snake Park Trust Assistants (MSPT) who had previous (1974/75) experience of egg collection joined the tribal ~~eggs~~ ~~locat~~ nest-locaters and watchers to ensure ~~the~~ early collection of ~~the~~ the eggs. ~~which is~~ ~~the~~ Thus ~~essential~~ ~~to save the~~ Late in collection means exposing the nests to countless wild predators.

MSPT assistants previous years experience ~~were~~ made use of by the TNFD personnels for this season they could also involve themselves and had first-hand knowledge of egg collection.

b. LOCATING THE NEST :

Muggers leave behind a good spoor mark (Fig) on the soft sandy/muddy embankments of streams, rivers, lakes and ponds, which ever is their habitat. This mark helped investigator to locate nests. ~~~~ ~~This~~ ~~was~~ However in rocky places like Hogenakal, and Sathanur dam the trial nest holes (Fig) has to be located first. The trial nest holes presumably dug by the mother crocodile is ~~for~~ testing the suitability of the area for egg laying. Some of the trial nest holes that were seen this season were as perfect as the real nest and some were just holes of a couple of ~~a few centimeter of~~ cm depth. The former ~~be~~ sort of trial nest may ~~digging~~. have been found ~~rejected~~ unsuitable by the mother because of hard compact ~~compact~~ soil, or lack of moisture or being ~~with~~ in the area which would be flooded in future rains during ~~early~~ late June or July. [Some of the nests collected this year were as far as 500 meters from the nearest water level; the nearest being hardly 2 meters.].

The nest is so insignificant that it is difficult to find by a close look for the slight mound gives ~~the~~ the exact location of nest. If the nesting area is undisturbed even the female may be seen nearby the nest site.

The nest of about 40-50cm depth is a pitcher shaped hole (~~bottom~~ wide), ~~25~~/30 cm in width. The eggs are in a number of layers, the top layer being at least 15cm below the surface. (Fig)

This season most of the nests confirmed this description except ~~two~~ at Chidambaram which had hardly any soil above ~~on top~~ of the top layer of eggs.

C. Collecting the nest:

The eggs were collected from the nest during early morning or late evening to avoid harsh temperature which may destroy the eggs. The nest holes were duged out carefully removing the top layer of sand. ~~~~ Eggs from each layer were labelled/marked top side with a ~~~~ marking pen a pencil and placed in the incubation box* carefully, marked side up. The incubation box was totally packed with nest soil. ~~to~~ ~~~~ ~~~~ This also helps to minimise shaking of the eggs during transportation.

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*

d. Packing the nest:

Eggs from the nests were collected and packed in the incubation box in the original nest soil or sand. All stones in the soil were removed. ~~these~~ In some nests where the soil was not with enough moisture, water was sprinkled ~~to make~~ on the soil. A simple test for this is to take the soil sprinkled with water and to check if it remains as a ball when taken in ~~the~~ palm and pressed. This is important because of the moisture requirement of crocodilian eggs during incubation.

Eggs were placed in the box layer wise, as they were in the nest, one ~~two~~ inches apart from each other. Enough gap on the sides of the box was also left.

At least 4" thick layer of nest soil was first kept in the box and then,

on top of the 1st layer of eggs 1 inch of nest soil was ~~again~~ covered and the 2nd layer was placed. ~~on~~ ~~top of the eggs At~~ At least 6" of nest soil was placed again and the box was packed with soil up to the brim and ~~the~~ the lid was screwed shut.

~~In case a box is not sufficient to have the all~~ ~~eggs then~~ where the number of eggs exceeded 40 a larger box ~~can be~~ was used instead of dividing the clutch in to two boxes.

~~At~~ Before packing the eggs in to the hatching box random measurement of the eggs and weight was also taken. Nest temperature and ambient temperatures were also recorded to enable maintainance of such temperature in the hatchery.

Transport:

In most of the places where eggs were collected first they were transported from the nesting site to the vehicles by headloads. ~~Eggs~~ Nests ~~that~~ which were collected within 24 hr of laying ~~were~~ were transported with in 10 days of collection to the hatchery. other nests were transported ~~by~~ a few days later (Table).

Transport ~~in~~ ~~was~~ by Jeep and by Rail was done during this year. ~~Car lilo~~

Heavy Cushioning of ~~[illegible]~~ incubation boxes to minimise bumping was done. Bumping and vibrations may cause the ~~[illegible]~~ albumen of the yolk to rotate resulting damages ~~of~~ to the embryo.

Incubation :

All incubation boxes were transferred to the Central hatchery at the Madras Snake park. ~~[illegible]~~ The hatchery, a room of ' x ' dimension had ~~a~~ enough sunlight and air available so that the ~~[illegible]~~ boxes ~~[illegible]~~ had almost the natural temperature and moisture. ~~Careful~~ Attention was given to see that no predator of eggs can enter the hatchery.

Thermometers were inserted in to the boxes up ~~to~~ the centre of the boxes to record ~~[illegible]~~ the temperatures regularly.

~~Longevity~~. Since the ~~incubation~~ incubation period was during the ~~hot~~ dry months of April, May ~~loss~~ of moisture content in the boxes were maintained by sprinkling measured quantity of water. This also helped to maintain temperature at the desired optimum of 30°C to 32°C. At no time the boxes were shifted from their original position to avoid vibration.

~~[illegible]~~

After about 14 to 16 ~~do~~ weeks of incubation the collected ~~nox~~ nests started hatching.

From 10th week ~~of~~ of incubation every morning and evening all boxes were tapped slightly to check for the grunts of ready to hatch hatchlings inside the eggs but only

~~A~~ As soon as the chorus of grunts of the hatchlings are heard from a certain incubation box the box was immediately removed from the hatchery to another room. This is done to prevent premature hatchlings to hatch from other incubation boxes. It is said that grunts from one box may initiate the others to hatch.

HATCHING

In natural nests the mother crocodile stays nearby the nest and the grunts of the hatchlings initiates her to remove the hard compact layer of soil from the top of the nest. ~~and~~ In certain crocodilians the mother even helping the hatchlings to emerge out of eggs by rolling the ~~he~~ eggs in her mouth.

In the hatchery, however the separated ready-to-hatch ~~box~~ has to be mothered by human hand - scraping the top layer of soils from the incubation box. The hatchlings emerge, ~~from the~~ ~~eggs~~ break opening the leathery inner layer of the two layered eggs. ~~Egg~~ By ~~the~~ the time the eggs are ready to hatch the outer calcareous layer is already cracked ~~~~ all over All the eggs of ~~~~ a single clutch may hatch on the same day or may take more than 10 days to hatch.

RESULTS:

Out of 16 nests collected ~~during~~ from Feb ~~28th~~ 15th to April 15th, ~~only~~ 11 nests hatched. The first nest started hatching on 23rd May and the last on 18th June. (Table I)

~~Out of 100 nests~~ Five nests out of the 10 nest collected at Amaravati hatched and the rest, it is believed did not hatch because of rough transport and mishandling during collection.

All nest collected from Sathanur and Kellikudu hatched.

1. From Amaravati collection the five nest that hatched ~~~~ resulted in 78 hatchlings out of 162 eggs a percentage of 48.15%.
2. The Sathanur eggs hatching success was 50.3% ie 67 hatchlings out of 133 eggs of 5 nests.
3. The single nest from Kellikudu with 21 eggs gave 5 hatchlings i(e 23.08%).

At Chidambaram where 3 nests were located one was collected which had 46 eggs and this resulted in 21 hatchlings. The other two nests were left at the nesting site to hatch naturally. One of these hatched giving 23 hatchlings and this had 31 eggs. The third one a small clutch of 18 eggs did not hatch at all though a few dead ~~half~~ developed embryos were found in the eggs when opened. ~~[illegible]~~)

DISCUSSIONS

It is evident from the results that sufficient care must be taken during the collection of eggs. Failure of hatching of Nest No ~~3~~ 1, 2 and 3 of Amaravati is probably due to the rough handling during collection by inexperienced ~~people~~ persons, ~~[illegible]~~ who did the collection before the arrival of the experienced team. (Table I)

So ~~[illegible]~~ also transfer of eggs is always a risky job. The fate of Nest No 8 and 9 of Amaravati proves this.

If sufficient protection staff is available or the nest itself is protected by protective coverings like ~~[illegible]~~ wire mesh from predators, it is ~~[illegible]~~ advisable to leave the nest at least up to 6 to 8 weeks after laying and to collect the ~~eggs~~ eggs at an late stage of development. Since early embryos tend to be damaged when disturbed, this can be a best bet. Nest 5 of Sathanur (Table I) and natural nests like the ones at Madras Crocodile Bank[1] and Jaipur zoo[2] are perfect example of this. However when no such protection is available it is always good to collect the nest as early as possible instead of losing the whole nest to predators or egg poachers.

Incubation period is also less in natural nests ~~8~~ ~~~~ as in Chidambaram nest 2 and 3 (Table I) which is around 7 to 8 weeks but in the hatchery or in the incubation box 10 to 13 weeks.

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1. Newsletter of Madras Snake Park Trust Vol I No 1 May 1976. reports that a female mugger at the ~~crocodile~~ ~~Croc~~ Madras Crocodile Bank laid 23 eggs and 22 (95.65) ~~hatched~~ of them hatched at the natural nest site.
2. Mr P. K. Ganguly in his ~~a~~ article "Crocodile Tears of Joy" in The SUNDAY magazine Vol 4 Issue 20 reports 97.1% ~~hatching~~ (~~3~~ 34 out of 35 eggs) hatching success of ~~captive~~ mugger eggs at the Jaipur zoo.

TABLE I

Details of 1976 C. palustris egg collection and hatching in Tamil Nadu.

Place from where nests collected	Number of nests collected	Clutch size	No of eggs collected	Date of laying	Date of collection	Date of transfer to hatchery	Date of hatching	No of incubation days	Total no hatched	%	Remarks
Amaravati	1	30	30	Feb 29	1 March	12 May	Did not hatch	—	—	—	~~Collection~~ Badly handled during Collection
	2	30	30	Feb 24	1 March	"	"	—	—	—	"
	3	29	29	1 Mar	2 March	"	31 May 76	91	22	75.86	—
	4	30	30	X	2 March	"	Did not hatch	—	—		"
	5	34	34	16 Feb	2 March	"	23 May 76	97 days	11	~~[illegible]~~ 32.35	—
	6	35	35	3 March	4 March	26 March	31 May	88 days	17	48.57	—
	7	33	33	3 March	4 March	"	31 May	88 days	20	60.60	—
	8	33	33	3 March	4 March	"	Did not hatch	—	—	—	~~Incubation~~ Incubation box turned over during transfer
	9	31	31	3 March	5 March	"	4 June	93 days	8	25.8	—
	10	29	29	5 March	7 March	"	Did not hatch	—	—	—	"
Sathanur	1	33	33	X	19 March	16 April	9 June	X + 81	8	24.2	
	2	35	35	X	19 March	-do-	26 May	X + 67	20	57.1	
	3	17	17	X	27 March	-do-	18 June	X + 86	13	76.4	
	4	24	24	X	30 March	-do-	9 June	X + 71	10	41.6	
	5	30	24	X	15 April	-do-	26 May	X + 42	16	53.3	
Killikudu	1	21	21	X	9 April	20 April	10 June	X + 62 days	5	23.8	
Chidambaram	1	46	46	5 March	13 March	13 March	20 May	75 days	21	45.6	
	2	31	31	14 March	—	—	19 May	63 days	23	74.1	
	3	18	—	17 March	—	—	19 May	57 days	2	—	

Place from
where news were
collected

PHOTOGRAPHS

1. Good track mark.
2. Trial nest holes.
3. Nest with eggs.
4. Eggs arranged in the incubation box
5. one hatching photograph.

T A B L E I

Details of 1976 *C. palustris* egg collection and hatching in Tamil Nadu.

Place from where nests collected	Number of nests collected	Clutch Size	Number of eggs collected	Date of Laying	Date of collection	Date of transfer to hatching	Date of hatching	No. of incubation days	Total No. hatched	Percentage	Remarks
	Nest No. 1	30	30	Feb.29	1 March	12 March	did not hatch	-	-	-	Badly handled during collection
	2	30	30	Feb.24	1 March	12 March	did not hatch	-	-	-	Badly handled during collection
	3.	29	29	Mar.1	2 March	12 March	31 May'76	91	22	75.86	--
	4.	30	30	X	2 Mar.	12 March	did not hatch	-	-	-	Badly handled during collection
	5.	34	34	Feb.16	2 Mar.	12 March	23 May'76	97	11	32.35	--
	6.	35	35	Mar.3	4 Mar	26 Marhh	31 May'76	88	17	48.57	--
AMARAVATI	7.	33	33	Mar.3	4 Mar	26 March	31 May'76	88	20	60.60	--
	8	33	33	Mar.3	4 Mar	26 March	did not hatch	-	-	-	Incubation box turned over during transfer
	9.	31	31	Mar.3	5 March	26 March	4June'76	93	8	25.8	--
	10.	29	29	Mar.5	7 March	26 March	didnot hatch	-	-	-	Incubation box turned over during transfer
	1	33	33	X	19 Mar	16 Arpril	9 June	X+81	8	24.2	--
	2	35	35	X	19 March	16 Arpril	26May	X+67	20	57.1	--
ATHANUR	3	17	17	X	27 Mar	16 April	18June	X+86	13	76.4	--
	4	24	24	X	30 Mar	16 April	9 June	X+71	10	41.6	--
	5.	30	24	X	15 April	16 April	26May	X+42	16	53.3	--
KILLIKUDU	1.	21	21	X	9 April	20 April	10June	X+62	5	23.8	--
	1	46	46	Mar.5	13 Mar	13 Mar.	20 May	75	21	45.6	--
CHIDAMBARAM	2	31	-	Mar.14	--	--	19 May	63	23	74.1	--
	3	18	-	Mar 17	--	--	19 May	57	1	-	--

IV left - 25 Amaravati
III left - 18 } Sathanur
VII left - 7 }
V left) - 20 Chidambaram

Total - 70

Amaravat - 12 + 3 + 3 18
chidambaram - 18
Sathanur -

left with me Amaravati - 20 or 19
Killohn 29
Chidambaram 4
18
70
3

17
12
29

24
24
48
29
77

II left - 3
III left - 13
IV left - 12 70
V left - 18
VI left - 3
VII LR - 8
VII L - 9
VIII LR - 4

SPIRAL
NOTE
BOOK

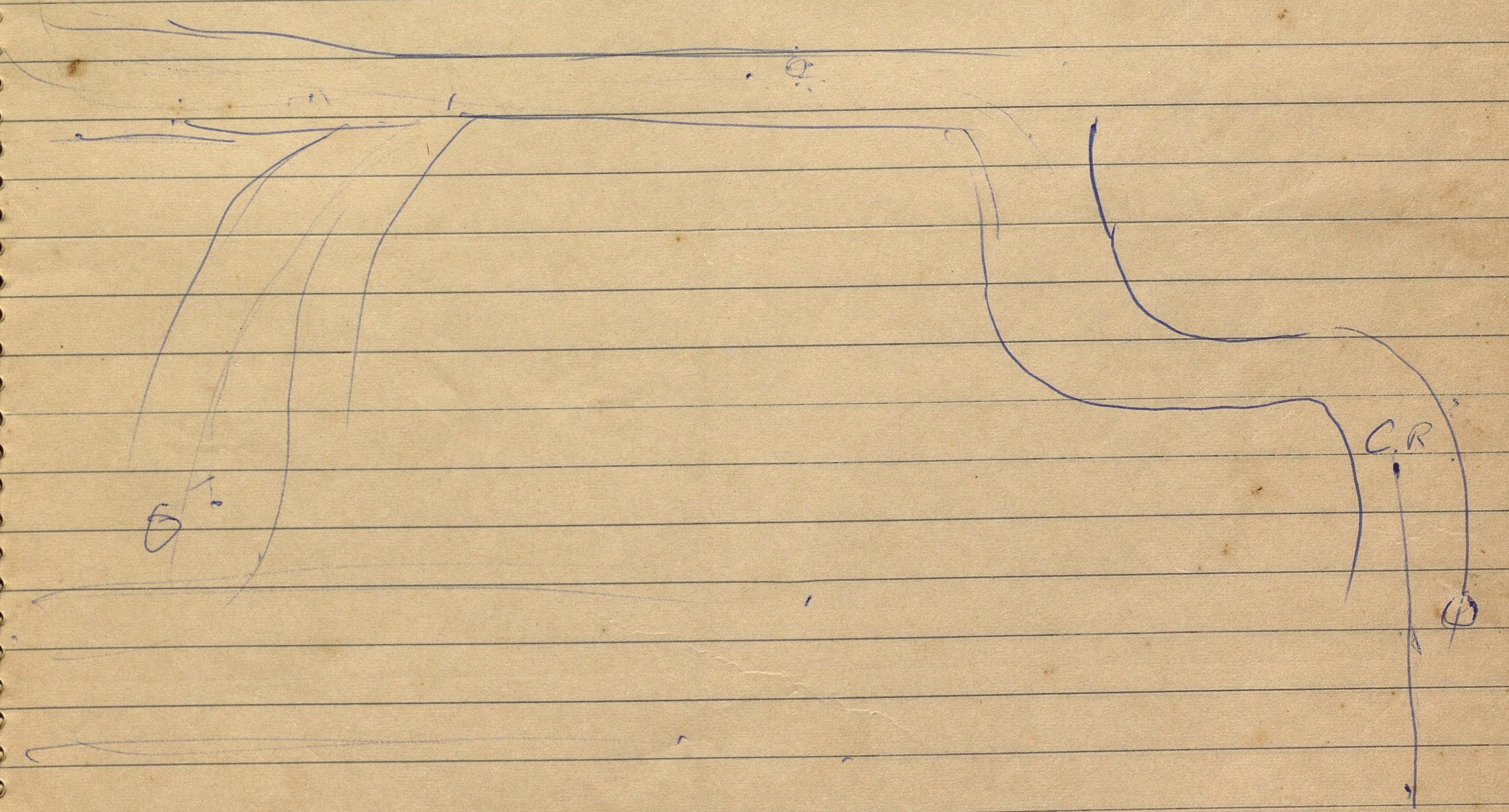
Century

The D.F.O Mr Wilson
Tiruchirapalli Dvn
No 47, PROMINADE ROAD,
CANTONMENT
TIRUCHIRAPALLI - 620001

For safe keeping of
Killikudi Nest Collections
somewhere (??8)

47, 47A

Sterling Road



12.3.76

Amaravati Dam

A huge dam with little water ~~[illegible]~~ provides an ideal place for the crocodiles. There were numerous beautiful track marks on the sandy bed of the dam.

The nests were ~~[illegible]~~ more than 500 yds off the nearest water source. A track on being followed led us to the hills where one (possibly female) crocodile with a fat girth was lying in the shade nearer to the rocks.

(1975) Last years Nests no -

Laying dates - from

hatched on -

This year (1976) Nests collected - !!

laying dates ranged from -

To Contact -

12 March 76

Killikudi Pond

Surrounded by paddyfields allaround and a siva temple to one side. This pond with a huge mass of floating hydrants is the habitat of more than 10 C. palustris. In a short stay of only 1hr about 3 C. palustris could be seen.

No nest nor any trialnest could be seen. The local information says that most of the crocodiles prefer to go out of this pond to the nearby surrounding pools and again comeback to this pond.

A sandy nullah with no water provides a good nesting sites though it is embanked with rocks. (

Last years Laying dates –

No of Nests – One

Collected on – 9.4.76

Trial pits (4 in no) observed on this nullah.

13.3.76, 14.3.76, 15.3.76

Bhawani Sagar Dam. Kedarhalli (Moyar River)

No information of crocodiles or eggs (have to check)

To Mongalpatti for crocodile habitat study and camp.

No nests or trial nests.

A few tracks were marked all leading to the upstream where occasional pools all about 3-5 m deep provide good watering ~~places~~ and shade as an ideal habitat. (No human interference but lot of buffalo grazing)

Tunnels down the rocks and on the roots of the trees of the pools

A huge number of catfish and other fish in the stream provide a good food source but the local Irula tribes from the Nilgiri hills use a euphorbia (Cacti) species to poison the fish and to catch them then. This may have a adverse effect on the crocodile population.

1976 MADRAS (Nungambakkam) February) Rainfall mm Temp - °C

Date	Max	Min	Dry	wet	RH	Rainfall	Dry	wet	R.H

Rainfall - mm Temp °C Rainfall -

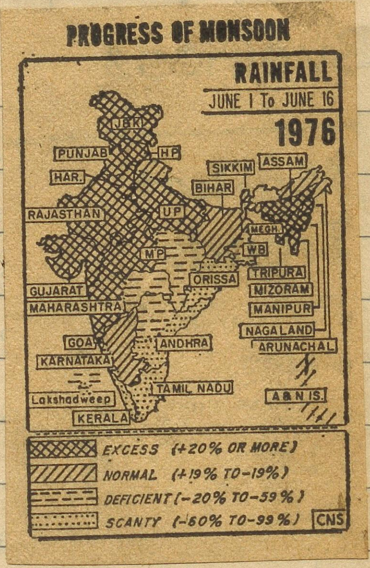
1976 MADRAS (Nungambakkam) FEBRUARY Temp -

	WEATHER REPORT 0830 IST						1730 IST		
DATE	Max Temp	Minimum Temp	Dry bulb	wet bulb	Relative humidity	24 hr Rainfall	Dry	wet	R.H
1	27.6	20.5	23.0	21.8	89	000.0	25.8	22.2	72
2	28.5	20.0	22.6	21.4	89	"	26.4	21.8	65
3	28.8	20.0	22.6	21.6	91	"	26.2	22.2	69
4	29.1	20.5	23.2	21.8	88	"	26.0	22.0	69
5	29.6	20.5	23.0	21.4	86	"	26.2	22.0	68
6	28.9	20.5	24.0	21.4	78	"	26.0	22.2	70
7	28.9	20.2	25.8	21.7	68	"	28.5	25.0	59
8	28.4	21.5	26.0	19.6	52	"	25.8	19.0	49
9	28.1	17.6	22.5	19.4	74	"	28.1	25.4	49
10	28.1	18.0	22.2	19.4	76	"	25.2	19.2	54
11	27.9	18.6	23.2	19.7	71	"	25.6	19.6	55
12	28.7	18.8	22.8	19.6	73	"	26.0	21.4	64
13	28.7	18.8	23.2	20.4	76	"	25.8	21.8	69
14	28.1	19.7	23.2	21.2	83	"	26.0	21.5	69
15	28.7	19.5	23.2	21.0	81	"	26.6	21.4	61
16	28.7	19.3	23.4	20.7	77	"	26.2	20.2	55
17	28.7	18.7	23.6	19.8	69	"	25.2	20.2	61
18	27.6	20.1	23.8	20.8	75	"	26.0	20.4	58
19	28.1	19.1	23.0	20.6	79	"	26.4	21.8	65
20	28.6	19.2	22.0	21.0	91	"	27.0	22.4	65
21	30.3	20.0	21.8	21.2	94	"	28.5	18.5	34
22	32.3	17.8	22.6	17.4	57	"	28.8	20.4	43
23	33.1	18.7	23.4	17.6	54	"	28.6	21.4	50
24	33.4	20.0	23.6	21.6	81	"	28.8	20.4	41
25	33.0	18.8	23.6	19.8	69	"	28.6	19.4	38
26	33.1	18.6	23.6	20.6	75	"	28.8	23.0	63
27	33.3	20.3	23.8	22.4	88	"	28.2	20.6	44
28	32.1	19.4	23.7	21.8	84	"	28.0	23.0	63
29	32.5	20.1	23.8	21.8	83	"	29.2	22.6	54

1976 MADRAS (NUNGAMBAKKAM) MARCH (weather report)

DATE	Max Temp	Min Temp	Dry bulb	wet bulb	R.H	Rainfall	Dry	wet	R.H
		8:30 IST					17:30 IST		
1	33.9	18.8	24.0	19.4	63	000.0	28.4	22.6	59
2	33.6	20.5	24.8	22.0	77	"	28.8	22.4	55
3	32.1	21.5	24.6	22.7	84	"	28.2	23.5	65
4	32.7	22.0	25.4	23.6	85	"	27.8	23.6	69
5	32.0	22.0	25.0	23.4	87	"	27.8	23.4	67
6	30.9	21.5	25.0	22.7	81	"	27.8	22.6	65
7	30.9	20.9	25.0	22.6	80	"	28.2	22.4	58
8	30.9	21.2	25.4	22.6	78	"	28.0	22.6	61
9	30.8	20.7	26.2	22.4	71	"	28.2	24.0	69
10	31.7	22.0	26.6	23.7	77	"	28.4	23.6	65
11	31.2	22.0	25.9	23.4	88	"	29.2	24.8	68
12	32.1	21.4	22.8	22.6	98	"	29.0	23.2	59
13	32.1	21.5	25.4	23.4	84	"	28.4	23.0	61
14	33.2	20.9	24.4	22.4	83	"	29.0	22.8	57
15	31.2	xy	25.4	23.0	81	"	30.2	22.6	49
16	33.6	21.7	26.8	23.4	74	"	28.4	25.0	75
17	33.0	22.2	25.7	24.0	86	"	28.8	24.2	67
18	32.5	21.8	25.8	23.4	81	"	29.8	22.0	48
19	32.6	21.2	25.4	23.0	81	"	29.0	23.2	59
20	32.0	21.3	25.7	23.2	80	"	28.8	23.2	61
21	32.6	22.2	26.2	24.0	84	"	29.8	24.2	61
22	32.7	23.3	26.4	24.4	84	"	29.6	25.0	67
23	32.2	22.0	27.0	24.8	83	"	29.2	25.4	72
24	32.1	23.0	27.2	25.1	83	"	29.0	25.0	71
25	32.5	22.4	26.4	24.4	84	"	29.4	24.2	63
26	32.2	22.9	27.0	24.4	80	"	29.8	25.2	67
27	33.2	22.5	25.6	24.0	87	"	29.8	24.0	68
28	33.5	22.7	27.2	24.6	80	"	28.8	25.0	72
29	32.0	23.4	27.2	25.4	86	"	30.2	25.6	68
30	32.8	24.9	29.8	25.6	70	"	29.4	26.0	75
31	32.5	26.0	29.8	26.6	77	"	29.0	26.2	79

JUNE 76



DATE	Max	Min	RH	R.F
1	39.5	29.0	74	nil
2	38.5	28.7	84	3.4 mm
3	36.5	25.2	77	"
4	38.4	24.5	76	7.7 mm
5	37.4	24.1	89	–
6	38.6	26.7	71	–
7	38.8	26.7	70	nil
9	35.5°c	27.3°c	80	nil
8	35.9	27.5	72	nil
10	37.3°c	27.5°c	74	nil
11	37.8°c	27.2°c	74	nil
12	38.5°c	27.3°c	72	"
13	39.6	27.4	71	"
14	36.5	27.7	71	"
15	36.5	27.2	75	"
16	36.5	27.6	76	"
17	36.6	26.8	71	"
18	38.3	27.4	71	"
19	32.3	28.1	75	"
20	38.0	27.8	73	0.5 mm
21	37.5°c	24.9°c	62	nil
22	33.3	25.7	69	0.8 mm
23	33.6	23.7	73	nil
24	34.6	23.7	83	31.4
25	32.3	25°c	67	nil
26	36.3	26.5	79	trace
27	37.2	26.7	61	nil
28	37.2	27.2	68	
29				
30				

1976 MADRAS (Nungambakkam) APRIL Weather Report

DATE	Maximum Temp	Minimum Temp	Dry bulb (8.30 IST)	Wet bulb (8.30 IST)	R.H.	24 hr Rainfall	Dry (17.30)	Wet (17.30)	R.H. (17.30)
1	32.8	26.4	28.8	26.0	79	-Tr-	29.2	26.0	76
2	32.7	25.7	28.6	24.3	69	0.0	29.6	25.6	71
3	33.3	25.0	28.6	25.8	79	"	30.3	25.6	69
4	33.0	25.7	28.8	25.6	76	"	29.8	25.6	70
5	32.5	23.9	28.3	25.0	75	"	29.5	24.4	65
6	31.7	24.0	27.8	24.4	74	"	30.0	24.6	63
7	32.6	23.7	28.0	24.8	76	"	30.6	26.2	69
8	33.6	24.8	28.0	26.0	78	"	31.2	25.6	62
9	33.6	25.2	29.4	25.8	74	"	30.8	27.0	73
10	35.0	26.5	29.6	26.0	74	"	30.0	26.5	75
11	35.1	26.3	28.4	26.0	75	"	30.0	26.4	74
12	33.6	26.7	29.7	26.6	75		30.8	27.2	80
13	34.3	26.5	29.8	26.0	73	"	30.4	27.2	77
14	36.3	26.8	29.8	26.6	77	"	30.4	26.4	72
15	34.2	26.4	30.0	26.0	71	"	30.6	27.0	74
16	35.6	26.9	29.4	27.1	82	"	30.8	26.0	67
17	33.8	25.5	30.2	26.2	71	"	30.8	25.2	62
18	35.1	24.7	29.4	26.2	77	"	30.4	26.2	70
19	34.0	25.4	29.6	26.2	75	"	31.0	26.6	69
20	35.5	25.4	29.8	26.4	75	"	31.2	26.0	65
21	34.3	25.0	29.4	26.0	75	"	30.0	26.0	71
22	33.9	25.8	29.8	28.2	74	"	30.6	27.0	74
23	34.0	26.5	30.3	26.4	73	"	30.8	26.8	72
24	33.1	26.1	29.9	26.6	76	"	30.4	26.6	73
25	33.2	27.1	29.8	26.8	78	"	30.6	27.0	74
26	34.4	26.3	29.9	26.6	76	"	30.2	26.8	76
T 27									
W 28	36.8	27.3			73				
T 29	36.5	27.6			65				
F 30	38.8	27.3			75				

May 76

Date	Max Temp	Min	R.H	R. fall	Remarks
May I	42.8			0.00	
May 2				"	
May 3	41.2	28.2		"	
May 4	43.1	28.0	49	"	
5	42.6	27.3	55	"	
6	38.3	27.4	79	"	
7				"	
8	38.9	27.3	73	"	Evening Clouds visible
9	34	27.6	92	"	overcast sky for 1 hr
10	33.3	27.7	91	"	
11	35.1	27.5	87	"	
12	34.4	27.7	91	"	
13				"	
14	36.4	27.6	92	"	
15				"	
16	36.1	26.2	85	"	
17				"	
18	31.1	27.4	84	"	
19	39.0	27.7	87	"	
20	39.5	27.7	75	"	
21	39.8	28.3	73	"	
22	41.2	28.7	75	"	Cloudy evenings
23	40.0	38.3	61	"	
24					
25	41.0	29.4	58	"	
26	41.5	29.2	70	"	
27	39.6	29.0	80		
28	40.5	28.7	64	"	
29	40.0	28.5	67	"	
30	40.6	29.1	77		
31	38.6	28.7	75	Nil	

Crocodile Growth

M.S.P

6

1971 — (baby) 6 crocodile from Chidambaram — *C. palustris* — 6 numbers.

Date	Diet	Length	Girth	wt
9.7.71	frog fish	30 cm	10 cm	
16.7.71	fish	—	—	72 gms
7.4.72	(5 numbers)	58 cm	21 cm	350 – 380 gms
4.11.72	fish (5 numbers)	82 (8.6) Max	30 cm (31 max)	2.3 kg
10.2.73	"	82 (88 Max)	30 (32 Max)	2.5 kg
4.12.73	1 biggest	129 cm	53 cm	5 kgs

Alligator mississippiensis

Date	diet	Length	Girth	wt
19.7.71	frog mice	80 cm	25 cm	3 kg
15.8.71	" rats	87 cm	32 cm	4 kg
4.11.71	"	120 cm	48 cm	11 kg
10.2.73	"	129	50 cm	14 kg

3.3.73 C. Palustris From Fisheries dept Aquarium

Approximate date of birth — June 1958 Marina beach

Brought to Aquarium 1959

	Length	Girth	Weight	
~~1959~~				
1959 } Fish diet	1½'			
March 1973 }	6½' (195 cm)	78 cm	N.R.	Male

For 14 yrs it was kept in a closed, dark aquarium (3½' x 8') with 3 turtles

29.8.73	6' 8"	31"	36 kg

✓

Birth - 1969 June - 1970

18.2.74 C Palustris from Chidambaram to M.S.P ♀

Date	Length	Girth	Wt
18.2.74	5'.9"	25"	40kg

11.1.74 C. palustris from Porto Novo Central Fisheries Research station.

Hatched during 1960 Chidambaram -

Date	length	Girth	wt
11.1.74.	6'.	20"	30kg

FCS 74 C. palustris from Mettur dam (Fisheries Dept.) to M.S.P.

Received in exchange for one from Chidambaram.
About 5 ft

6 from Chidambaram.

15.5.74 C. palustris From (Metten Dam ??)

15.5.74 Length	Girth	wt	
1 ♂ 85 cm	33 cm	2.5	missing one toe rt front foot
2 ♂ 80	31	2.5	
5.7.75			
♂ ~~1.5 met~~		–	
1 1.5 mt	60 cm		
2 1.39 m	55 cm		

C. Palustris

9.12.74 From Ahmedabad Zoo

hatched Gujrat (Ahmedabad) zoo? to M.S.P

Measured - 9.12.74 Marks clipped second last d.c.w rt side

	Length	Girth	
1	48	19 cm	
2	53.5	19.5	born 3.6.73
3	53.4	20	
4	47.5	16.5	
5	49	18	

Born 9.6.74

1	33.6	13.7	clipped last d.c.w rt side.
2	39.2	13.2	
3	35.4	12.4	
4	36.0	12.6	

Measured on 6.3.75 (9 months after)

1	56.5	20.5	
2	52	19	clipped 2nd last d.c.w
3	52.5	19	
4	53	18.5	
5	55	19	
1	38.5	14.5	clipped last d.c.w rt side
2	37	14.5	
3	40	15.5	
4	42.5	15	

(P.T.O)

18.6.75 Ahmedabad 200 ones

Measured on 18.6.75

1	63	22	1000
2	62	20.5	600
3	63	21	700
4	60.5	18.5	500

1	52.5	19	450
2	45.5	15.5	350
3	44.5	14.5	350
4	53	16.5	400

ESTIMATED CROCODYLUS PALUSTRIS POPULATION IN AMARAVATI DAM OF TAMIL NADU

Geographical position of the place:
Name of the river on which the dam is constructed -
Description of the reservoir site during the summer months. (from Feb to May)
Egg laying period extends from Feb to May.

1. Total no of ~~the~~ nests collected gives a correct no of female adults living.
2. If a herd is imagined with a male and ~~at~~ at least two female considering C. palustris to bigamous an rough estimate of adult male can be found out.
3.

Method: Considering that C. palustris have the peculiar habit of defecating outside water a ~~place~~ ~~on~~ habitat can be chosen and then observing a few marked individuals frequency and number of defecating outside a count for each animal can be found out. Then starting collection of fecal matter after a thorough cleaning day for a limited number of days atleast one faecal matter from each animal can be obtained giving a rough number of their population.
Favourite basking place & also their favourite defecation place.

16.4.75 Crocodylus palustris from Amaravati Zoo

RWD Zoo

	length	girth	wt	
1	5'	22½"	appr 18 kg	toes knobbly
2	6'8"	34"	appr 52 kg	

1974 C. Palustris hatching at MSPT

Place	No. of nest	No. of Egg	Cracked Egg	No. taken for hatching	Casualty during hatching	Incubation days	Total hatched	%	Casualty	Total left	Shift	With MSPT
Srirangam	one						13			13		
Chidambaram	one						4		1	3		

1975 C. palustris captive hatching at M.S.P

Place from where eggs were Collected	No of nests	No of eggs	Cracked eggs	No Tried for hatching	Casualties during hatching	Day of Hatching / No of days in incubation at hatching	Total no. hatched	% of Success	First six months Casualty or defect	Total left	Shifted	At M.S.P
~~Hogenakal~~ M.S.P Female	1 laid on 8.3.75	22	1 crack 4 rotten removed from pit 6.5	17	2	24.5.76 76 days	15		one blind A [illegible] clutch	15	5 to orissa	10 Average length [illegible]
Killikudu	laid may been 12.4 Collected on 20.4.76	22	2 bad	20	7 5 cracked 2 cracked	20.6.75 60 days	6		1 died after 1 month	5	–	5

HATCHLINGS COLLECTED

HOGENAKAL	–	–		–	–	–	Collected 23	–	–	–	5 to orissa	18
Kedarhalli MOYAR							17 11 28			28	5	23

MSP egg sizes Averages → length 7.2 cm breadth 4.8 cm

Incubation Period for Crocodilians

	Natural	Ref	Artificial	Ref
1. C. palustris (Lesson) ~~(LESSON)~~ kimbula (Deraniyagala)	60 - 65 days		x + 50 days	Deraniyagala
2. C. porosus (Schneider)	75 days	Deraniyagala (1936)	96 days 97 days	Deraniyagala
3. Gavialis gangeticus - (Gmelin)				
4. Alligator mississippiensis - (DAUDIN)				
5. Alligator Sinensis . (FAUVEL)				
6. Caiman latirostris . (DAUDIN)				
7. Melanosuchus niger - (SPIX)				
8. Palaeosuchus palpebrosus (CUVIER)				
9. Palaeosuchus trigonatus - (Schneider)				
10. Crocodylus acutus - (CUVIER)				
11. Crocodylus Cataphractus -				
12. Crocodylus Intermedius - (GRAVES)				
13. Crocodylus johnsoni - (KREFFT)				
14. Crocodylus moreletti - ~~(KREFFT)~~ (C&A DUMERIL)				
15. C. niloticus - (LAURENTUS)				
16. C. novae guineae - (Schmidt)				
17. C. rhombifer - (CUVIER)				
18 C. Siamensis - (Schneider)				
19. C. tetraspis . (Cope)				
20 - T. Schlegelii (S. MULLER)				
21. C. Palustris (Lesson)				
22. Caiman C. yacare (DAUDIN)				
23. C . c. fuscus (Cope)				

13.3.76
First nest at chidambaram collected on 13 March
Collected at 8 AM

Second nest at chidambaram laid on 15.3.76

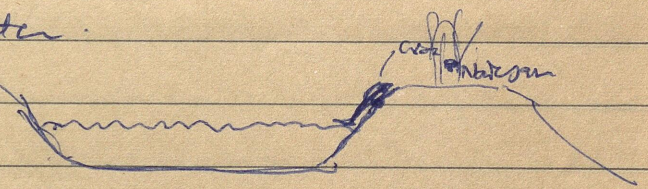
PROCESS OF
(CHIDAMBARAM) EGG LAYING by C. PALUSTRIS

Witnessed and narrated by - Nadesan.

Date of laying 15 March 76

At 6.30 AM Nadesan (Tribesman of M.S.P.) was behind the tall 6" grasses in the centre island of Chidambaram back waters. He saw the crocodile lying calm about 6/8' from him about 5' from the water facing away from the water.

By then the pit was dug and the croc has started laying the eggs



6.30 AM → Nadesan says every two minutes or three of the croc raised its head and the whole body muscles were contracted and 2 eggs were laid. This continued for 80 minutes and then the croc turned left about 120° and started pulling the dug out sands towards its belly by alternate sweeping of left and right fore legs. Then this was again pulled into the pit by same alternate sweeping movement of left and right hind foot. After this the whole nest area was levelled by thumping of the belly raising the body off the ground.

The whole process after the egg laying was very fast and the crocodile was moving very fast.

The most noticeable point during the process of egg laying period is the closure of the eye by the crocodile.

After this whole operation the crocodile lied on the nest site for half an hour and then slowly went back in to the water.

After that for five days it did not come to the site at all but kept a close watch remaining in the water about 10' from the nest. ~~Inside the~~

After the 2nd day itself the crocodile began coming to the nest again everyday during basking time and in the evening. Whenever it was not there it even in the water facing towards the nest site.

19 Jun
27 July

Amaravati - Mest - 10 -

8.30 17

Dear Dr Bustard,

I was at the Hotel Sav

Measurement on 9.5.78

P	Snout to vent	Vent to Tail	T.T	Snout to head
1	13.8	13.7	27.5	4.5
2	14.5	13.0	27.5	4.5

STUDIES ON INDIAN MUGGER

CROCODYLUS PALUSTRIS

(C. palustris kimbala / ceylon)

SYSTEMATICS

(a) Skeleton & osteology (Palaeontology)
(b) Scale counts Identification (Telemetry)
(c) Variations in specimens
(d) Chemo taxonomy (??) (Simpsons)
(e) Haematology
(f) Embryology & Development
(g) Internal body structure (Digestion)
(h) Dentition and their role in feeding

how these things help the animal in its adaptation during the process of evolution what of them has changed.

ENERGETICS

(a) Food intake (rate)
(b) Activity (Periods) (day, months, seasons)
(c) ~~Metabolism~~ PLACE IN FOOD CHAIN (ECOSYSTEM)
(d) Efficiency of conversion
(Assimilation, metabolism, growth)

Behaviour

Barking
Aestivation
Feeding
Temperature control

Physiology

Metabolism,
Assimilation
Excretion
Temperature control
(Aestivation)
Starvation

SYSTEMS

RESPIRATION
LOCOMOTION
DIGESTION

Analysis of stomach

faecal matter

STUDIES ON EGG COLLECTION AND HATCHING AND REARING

BEHAVIOUR

- NESTS -

(a) SEARCHING THE RIGHT PLACE FOR NESTING
(b) TRIAL PITS AND SUITABILITY.
(c) DIGGING PITS (PROCESS ACTION ETC) POSITION
(d) EGG LAYING AND ARRANGEMENTS OF EGGS & COVERING,
(e) CARE, PROTECTION FROM NATURURAL PREDATORS
(f) Size & Shape of Nests
(g) Distance & height from water
(h) Soil Charecterestics and samples.
(i) Micro environment of ~~Eggs~~ Nest (Temp. moisture etc) of dam

- COLLECTIONS -

(a) Methods and Precautions
(b) Recordings while Collection (Egg Size, Weight, positions etc)

- TRANSPORTATION -

(a) Preparation of Eggs for Transport
(b) Best method of Transport
(c) Effect (of Transfering) on hatching percentage

HATCHERY

(a) Hatchery Types and Success of Hatching by them
(b) An ideal hatchery
(c) Egg size and hatchling Size relations

DEVELOPMENT

HATCHING

VARIATION IN THE TIME OF INCUBATION
PROCESS OF HATCHING
CASUALITY DURING HATCHING - reason & remedy
NATURAL & ARTIFICIAL HATCHING DIFFERENCE

— EXAMPLES.
PERCENTAGE SUCCESS - (failure or success)
FAULTS AND REMEDIES

NEST COLLECTED	NEST No	Total EGG COLLECTED	CRACKED PUTTRIED	INCUBATION CASUALTY	HATCHED	No [illegible] died	Total survived	No of Infertile [illegible]
AMARAVATI	1	30						
	2	30						
	3	29			22			
	4	30						
	5	34			11			
	6	35			17			
	7	33			20			
	8	33						
	9	31			8			
	10	29						
SATHANUR	1	33			8			
	2	35			17			
	3	17			12			
	4	24			10			
	5	23			16			
KALLIKUDU	1	21			5			
CHIDAMBARAM	1	46						
	2	31						
	3	18						
	~~4~~							
	~~5~~							
CROC BANK	1	23	-	-	22	-	20	1
HOGENAKKAL	1	24			13			

No of Infertile eggs	No. of Rotten eggs	Date ~~Collected~~ Shifted No 1 ~~Incubation~~ ~~dodged~~	Date Collected	Date Transferred
	—			

315 — 146
1 — ~~14600~~
315
63

29200

| 14600

21

63 | 2920 | 46
252
400
378
1 12

120
146

315

GROWTH RATE OF G. Gangeticus at M.S.P

(1) 13.11.74

	Length	Girth
13.11.74	82	20
~~4.5.74~~	~~92~~	~~25.5 cm~~
9.6.74	82.5	23.5
13.11.74	82 cm	20 cm
9.5.75	92.5	25.5 cm
22.2.76	96 cm	28 cm

(2) 5.3.75 G. Gangeticus from Ahmedabad Zoo to M.S.P

5.3.75	132 cm	35.5 cm
9.5.75	132	39
22.2.76	135	42

(3)
(4) } U.P 1978 stock, exchanged with a S.W. croc. 5/1/79
(Chambal)

(5) Female from Cal Zoo 2.7 m (Brahmaputra?)

(6) Male from Ahmedabad Zoo 2.75 m (Agra?)

	Collected on	Transferred on
1. 30	1.3.76	
2. 30	1.3.76	
3 - 29	2.3.76	12.3.76
4. - 30	2.3.76	
5 - 34	2.3.76	
AV 6 - 35	4.3.76	
7 - 33	4.3.76	
8 - 33	4.3.76	26.3.76
9 - 31	5.3.76	
10 - 29	7.3.76	
11 - 26	Not known	
1 - 33	19.3.76	
2 - 35	19.3.76	
SAV 3 - 17	27.3.76	16.4.76
4 - 24	30.3.76	
5 - 23	15.4.76	
Killikunda 1. - 21	10.4.76	19.4.76
463		

299
90

bad -

$\boxed{30+30+30}$

30
33
29
17
109

199
299
498
3

DETAILS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ADULT ♂	2	2	2																	
ADULT ♀	6	6	6																	
1 YEAR JUVENILE		-	36																	
2 YEAR JUVENILE																				
3 YEAR ~~JUVE~~																				
4 YEAR S.A																				
5 YEAR S.A																				
6 YEAR M.																				
7 YEAR ADULT																				
MASS TO BE FED																				
SURPLUS OVER POP. STAGE																				

13 Feb
20
31
23
57

Carl Gans
Dept of Zoology
The University of Michigan
Ann Arbor, Michigan 48104

	Total bodies	Given to Cows	Left at MSBT
MSPT	- 15	5	10
loss of Nillhandy	- 6		6
Hogenakal	- 23	5	18
Kalahali	- 28	5	23
	72	15	57

155
(70 - 155)

130
(90 - 170)

412624

360