

## EX-SITU CONSERVATION - 2

### Role of Nandan Kanan Zoological in the Conservation of Indian Crocodilians

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ALL THE THREE SPECIES OF Indian crocodilians (gharial, mugger or marsh crocodile and saltwater or estuarine crocodile) exist naturally in the wild in Orissa. In June 1974, a preliminary survey of crocodilians in the state carried out by FAO/UNDP, however, revealed that all the three species of crocodilians are endangered/ depleted in their natural habitats. It was felt that unless the existing handful population of these crocodilians was increased through release of captive bred/ reared specimens into the wild, the recovery of the seriously depleted crocodilian population would either be not possible or would be delayed.

Based on the recommendations of the above survey report, an integrated scheme for the conservation of all the three species of crocodilians in Orissa was envisaged and implemented by the wildlife wing of the State Forest Department in 1975-76, with Central funding and technical expertise support from FAO/ UNDP consultant Dr HR Bustard. It was further envisaged, as a part of this scheme, to have an *ex-situ* captive breeding programme of all these three species, in addition to

the *in situ* conservation measures to be taken up in the state.

The Nandan Kanan Zoological Park (NKZP), established on 29 December 1960 had the experience and expertise in the maintenance of gharial, mugger and saltwater crocodiles in captivity since 1963, 1964 and 1967 respectively. The geographical situation of the park within the natural distributional range of these three species alongwith its existing facilities and advantages, e.g. space, skill and expertise, maintenance staff component for the scheme, veterinary case, etc. helped NKZP to be identified as an ideal location for starting captive breeding of all the three species of crocodilians. This was in conformity with the objectives of the World Zoo Conservation Strategy/ National Zoo Policy and IUCN Captive Breeding Policy which strongly advocate the integration of zoo conservation efforts with other conservation measures.

Accordingly, a separate and spacious crocodile breeding complex with three nature simulating breeding enclosures was created within NKZP. These

were so located as to have minimum disturbance and maximum privacy for crocodilians. Besides, an additional artificial hatchery, hatching/yearling pools and an office-cum-laboratory facility was also created.

*Captive breeding and rehabilitation of species*

NKZP was successful in breeding all the three species of crocodilians during the years 1980 - 1985. The zoo hatched crocodilians were reared in hatching/yearling pools of the park to over 1m body length and then released into identified natural habitats/protected areas under a rehabilitation programme or supplied to different zoo in the country and abroad.

Presented below are the initiatives and activities of NKZP with regard to the three crocodilian species separately.

*Gharial*

A large oval-shaped concrete pool with a capacity to hold 2.7 million litres of water was constructed inside the gharial breeding enclosure (area 71 x 51m). The pool measured 60m at the longest part, 30m at the widest part and had a depth of 9.15m at its deepest. The area was fenced with 2m high wall all round except 30m on the viewers' side where a dry moat and a parapet 0.5m high was provided. Provision was made to replace about 0.45 million litres of stagnant water with fresh water daily from the nearby lake for some time of the day. A large sand bank with suitable riverine vegetation, covering an area of

60m x 7m and 2.4m high was created on one side of the enclosure for crocodiles to bask and for egg-laying, which mimicked the natural gharial habitat of the Satkoshia Gorge of river Mahanadi, the ideal natural habitat of the gharial (Mohapatra *et al.*, 1976; Bustard and Moharana, 1985; Acharjyo *et al.*, 1996a).

One male (2.7m) aged about 16 years and two females (2.50m and 2.65m) aged about 12-13 years were introduced into the breeding pool on 13 February 1976 (Mohapatra *et al.*; 1976; Bustard and Moharana, 1985). Subsequently, four more sub-adult female gharial measuring 1.5-1.8m (three) and 2.3m (one from Thiruvanthapuram zoo) were added to this pool during 1979. Another adult male (3.7m) obtained as a breeding loan from Frankfurt Zoological Society, Germany was introduced, increasing the breeding population to eight (2 males and 6 females). The resident male was unfortunately killed by the Frankfurt male during the breeding season in February 1980 (Acharjyo *et al.*, 1996b).

The successful breeding in captivity of gharial was recorded for the first time at NKZP in 1980. Since then, the gharial breeding involving 1-5 out of 6 females and one male gharial has been an annual feature in the park.

Over a 15 year period from 1980 to 1994, 1832 eggs were laid in 57 clutches, the size of which varied from 2-57 eggs with a mean of

32.14. Out of these eggs laid, 1235 hatched, giving a hatching percentage of 67.41. The eggs were always laid in March and hatched in May or early June. All six adult females were in the egg-laying stage but the number of females that laid eggs during each breeding season varied from 1 to 5, suggesting that one male might not be able to mate with more than five females in a breeding season.

The first batch of 35 zoo bred gharial were reintroduced into the river Mahanadi of Satkoshia Gorge Sanctuary on 24 October 1986. So far, 493 gharial yearlings have already been released at different locations in river Mahanadi in the Satkoshia Gorge Sanctuary.

Besides, 78 zoo bred juvenile specimens have been supplied to different zoos in Itanagar (Arunachal Pradesh), Sepahijala (Tripura), Bokaro (Bihar), Bhilai in Jamshedpur, Madras Crocodile Bank, Vandalur and Chennai Snake Park, (Tamil Nadu), Vadodara and Junagarh (Gujarat), Mumbai, Pune, Mysore (Karnataka), Thiruvanthapuram and Thrissur (Kerala) and also Singapore.

*Mugger crocodile*

The mugger breeding enclosure, constructed in 1978-79, has a spacious pool measuring 38m at the longest part and 17m at the widest part with a depth of 2m, having a capacity to hold 8,26,000 litres of water. The land area surrounding the pool is about 1250sq.m with suitable vegetation. A compound wall 2.1m high was

erected all round except 23m on the viewers' side which had a dry moat and 0.6m high parapet. There is provision of replacing stagnant water with fresh water at frequent intervals (Acharjyo *et.al.*, 1996c).

Five adult mugger (2 males and 3 females) procured from Tamil Nadu were released into this pool in January 1979. Subsequently, four more (2 males and 2 females) of Tamil Nadu origin were added to this pool in October 1980. Two of these (one male and one female) died in October 1980 and January 1981.

Between 1981 and 1992, egg-laying took place every year except in 1986, 1987 and 1988. The number of females involved in egg-laying varied from one to three. The number of eggs laid in each of 14 clutches recorded during the other years varied from 4-30 with a mean of 20.7. In all, 290 eggs were laid. The eggs were invariably laid in March but the eggs hatched from mid-May to early June. The hatching has not been satisfactory. The 72 eggs laid in 4 clutches in 1981 (1), 1985 (2) and 1990 (1) did not hatch at all. Of the remaining 218 eggs laid during the other years, 82 hatched, giving hatching percentage of merely 37.6.

So far, 51 juvenile park-bred mugger have been released into the hill streams of Simlipal Wildlife Sanctuary (12), river Mahanadi in Satkosih Gorge Sanctuary (35) and the remaining four juveniles into two waterbodies inside Chandaka-Dampara Wildlife

Sanctuary (Kar *et al.*, 1998). Other than these, seven mugger have been supplied to zoos at Sepahijala, Tripura (2); Bokaro Steel City, Bihar (4) and Kapilash, Orissa (1).

#### *Saltwater crocodile*

A saltwater crocodile breeding enclosure with a spacious pool of almost the same size and capacity as the mugger breeding enclosure was constructed in 1978.

A lone female of this species t in the parks since November 1967. has been laying infertile eggs since 1975. Between 1975 and 1984, it laid a total of 221 eggs in seven clutches, with no record of egg laying in 1979, 1981 and 1983. The eggs were laid during the three-month period, April-June and the clutch size varied from 22 to 35. with a mean of 31.6 eggs. But all these eggs were infertile.

This female was paired with an adult male of the same species procured from Crocodile Rehabilitation Centre, Kukrail (Uttar Pradesh) in April 1983 (Acharjyo and Patnaik, 1987). However, successful breeding of this pair was recorded for only two years - 1985 and 1986, as the female died on 13 April 1987. The two clutches of fertile eggs laid on 15 April 1985 and 18 April 1986 had 16 and 21 eggs respectively. The incubation period recorded varied from 74 to 83 days, 11 (in 1985) and 9 eggs (in 1986) hatched between 30 June and 6 July. The percentages of hatching were 68.75 (1985) and 42.86 (1986).

However, no reintroduction programme or supply to other zoos could not be carried out since the number of captive bred specimens was insufficient.

#### *Research*

One of the objectives of the scheme as well as that of any modern zoological park is to acquire extensive scientific knowledge through scientific research in captivity to help in *ex-situ* and *in-situ* conservation. At NKZP, data on management, different aspects of breeding biology, growth, behaviour, health care, etc. were generated through keen day to day observation and documentation. The data so collected is likely to help in improving the existing management practices of these three species both in captivity and in the wild. So far 20 notes/articles based on the observations made at NKZP on the different aspects of these three species have already been published in leading journals of the country and abroad.

#### *Conservation awareness*

No conservation programme can ever be successful without public support, and this is only possible through education and awareness among the public. The NKZP has been attracting annually 10 to 12 lakh visitors, both Indians and foreigners, of all ages, sexes, religion, rich and poor, urban and rural speaking different languages.

The crocodile complex with a number of living specimens of different age groups of all three species of crocodilians, along with

centres have yielded the desired results, and up till now, about 1000 crocodiles, bred and reared in these centres, have been released in different waterbodies in the state.

The eggs procured from the Hiran dam within the Gir Sanctuary were hatched artificially in the Sasan Gir rearing centre. Over the period, 308 crocodiles have been distributed to various zoos and other such centres for captive breeding and rearing. 25 crocodiles were given to Fatehsing Rao Zoo Trust, Baroda in 1978, 190 to the Natural History Museum, Gandhinagar in 1978 & 1980 and 1993 to Sakkarbag zoo, Junagarh during 1980 to 1986. The relocation of crocodiles commenced on 15 May 1984. A total 1013 crocodiles were released in nature as a part of this programme. Of these, 973 were released in the Gir sanctuary, 13 in Ranjit Sagar lake, 14 in Narmada dam, 4 in Karjan dam and 8 released in Ajwa dam.

In Gir Wildlife Sanctuary alone, as part of the reintroduction programme, 148 crocodiles were released in Kamleshwar dam, 200 in Rawal dam, 264 in Singoeda dam, 94 in Machchhundri dam, 40 in Billiard Kankai, 25 in other small waterbodies and 2 were released in Jarardi river.

Also as a part of reintroduction and augmentation of crocodile populations in nature, 145 crocodile eggs were given to Andhra Pradesh, 50 crocodiles and 51 eggs to Maharashtra and 30 crocodiles to Diu.

#### *Rearing centre, Gandhinagar*

Located in the outskirts of the Gandhinagar city, and covered with dense man-made forest on the picturesque bank of the river Sabarmati, Indroda Nature Park is an ideal place to have a such breeding programme of crocodile. The breeding programme here was initiated in 1979, which is managed by the Gujarat Ecological Education and Research (GEER) Foundation, Gandhinagar, which was known as Natural History Museum prior to 1984. 190 crocodiles were moved to this centre for captive breeding and this centre has successfully bred and released in the Rawal dam in the Gir Wildlife Sanctuary. Similarly, in September 1997, 25 crocodiles were released in Machchhundri dam of in the wildlife sanctuary.

The breeding of crocodiles in Gujarat has yielded positive results, which is confirmed by the increase in the population of crocodile in the state. The crocodile-rearing centre at Sasan Gir have been very successful in its objectives and have restocked the crocodiles in Gir Sanctuary and National park. The population increase in the waterbodies of Junagarh district, which is reflected from above figures, is due to this rearing centre.