

**Indian Gharial (*Gavialis gangeticus*)**  
**PHVA held at Jiwaji University, Gwalior, M.P.,**  
**16-18 January 1993**



**Executive Summary**

From 16-19 January 1995 a Population and Habitat Viability Assessment (P.H.V.A.) Workshop for Gharial was held at Jiwaji University, Gwalior. It was attended by an assembly of wildlife field managers, captive management specialists, gharial researchers, university professors and NGO's / NGI's.

Twenty years ago -- in 1975 a Crocodile Project was initiated in India. This programme included conservation of three threatened species of crocodilians, including gharial, a species of immense scientific interest. After two decades of conservation and significant progress, some researchers and wildlife officers felt that the work lacked a well-defined direction. There were accompanying concerns about the actual success of the conservation measures so far implemented, and the fate of the species in the near and distant future. Recent decisions to terminate supplementation of wild populations withdrew active assistance towards recuperation of the species. Concerned researchers and managers felt that a systematic assessment of the current status of the species following the years of harvest, supplementation and other management strategies was necessary at this time.

After consultation with leading crocodile experts and institutions of the country in states like Orissa, U. P., Tamil Nadu and M. P., the PHVA for Gharial was initiated by the School of Studies in Zoology at Jiwaji University which has been involved actively in research activities and conservation of this species since the last ten years. The Madhya Pradesh Forest Department. came in as a co-organiser. The Ministry of Environment and Forests, Government of India agreed to sponsor the Workshop. The Zoo Outreach Organisation/CBSG, India agreed to facilitate the Workshop.

Population and Habitat Viability Assessment, developed by the Conservation Breeding Specialist Group, SSC, IUCN, is a process for assessing extinction risk for a species and for developing management recommendations to enhance long-term survival. PHVA workshops are conducted in the range area of the species in collaboration with wildlife agencies of the area. Also included in the PHVA process was an evaluation of the status of the species in captivity, projected plans for reintroduction, and issues requiring collaborative research.

In this Workshop issues and concerns of gharial were discussed in a combination of small working group sessions alternating with plenary discussions. The Working Groups were: Census and Distribution Group, Habitat Group, Modelling Group, Threats Group, Captive Management and Disease Group, Education/Awareness/Human Interaction Group, Trade Group, and Reintroduction Group. The Census and Distribution Group reviewed the information collated by the researchers and field managers. In the past two decades about 4000 gharial have been released into 12 rivers in four states under the "Grow and Release" programme in which eggs were collected and hatched and hatchlings reared to sizes which could increase the probability of their survival in the wild. While there are indications that this Programme has made the species secure in certain areas, there was a conspicuous lack of information in other areas.

This Working Group recommended that the annual census be done in every area, using a more standardised methodology, and taking the help of local people and other volunteers for whom briefing sessions and literature would be organised. It was also recommended that a Central Coordinating Unit be established which would provide a mechanism for better interaction between the different states and agencies involved in conservation activities for gharial.

The Habitat Group defined the various components (with particular emphasis on prey availability) that make up an "ideal" habitat, which constitute the criteria by which suitable reintroduction sites could be identified in the future. Sites which fall outside protected areas but are felt to be highly suitable and stable or those which migrant gharials are trying to recolonise, should be protected under the Wildlife

(Protection) Act. International cooperation for better management of metapopulation is recommended for habitats extending across international borders.

The Modelling Group simulated gharial populations over a wide range of sites and under various conditions. The three populations -- Chambal, Mahanadi and Kateriniaghat -- are in different degrees of stability. The Chambal population is stable and can even withstand a yearly small harvest for genetic supplementation of other populations. A review of the Chambal population is recommended before five years and after collection of some more information. The Mahanadi population, while appearing relatively stable, suffers from a larger number of more potentially catastrophic threats. Extensive studies need to be done on these threats and the population needs to be thoroughly assessed again before five years with additional data. The Kateriniaghat population is very small and unstable, and requires continuous supplementation in order to be sustained at all. Genetic studies for diversity and for variability are crucial for all populations.

The Threats Group identified 10 direct and 8 indirect threats and identified that gharial populations of Mahanadi River was the most seriously threatened. It was felt that the Ramganga population was least affected by such threats. It was noted that threats to gharial in unprotected areas such as fishing, sand mining, river side cultivation and industrial pollution can be controlled best by education/awareness activities. It emerged from the Modelling exercise that inbreeding could be a more serious threat than previously considered.

The Captive Management and Disease Group assessed the ability of existing captive facilities to breed and rear gharial for future, either for supplementation of wild or for provision to zoos for exhibition and education. They concluded that all these facilities taken together could generate a spatial capacity to propagate as many as 4000 - 5000 animals per year if required. In this scenario, a coordinated, scientific breeding programme is necessary. The Group recommended that the zoos holding gharial should create or upgrade gharial enclosures so as to be more educationally relevant and more mindful of the welfare of the animals. Those zoos which are identified as breeding or holding units for conservation may be suitably improved.

The Trade Group assessed the request of some agencies for an opinion on the opening of trade based on utilisation of Gharial. The Group felt that conservation of Gharial would not be improved by opening of trade and in fact could be seriously damaging. The Group affirmed other effects of opening trade also, e.g. that it would convey a wrong signal for conservation of wildlife in general, offend the cultural and religious sentiments of a large portion of the population, and even contradict Article 5/A of the Constitution of India.

The Reintroduction Group endorsed the contention of the Census and Distribution Group as well as that of the Modelling Group that regular supplementation should be maintained without significant reduction. However, it was felt that the age of the animals when released and the sex ratio may need to be redefined according to scientific research input. Frequent and consistent monitoring to determine habitats in which populations had responded favourably to supplementation with captive reared animals is recommended.

The Education Group identified several target groups, including the people who are most affected by gharial conservation, e.g. fishermen. They suggested methodology suitable for each target group and recommended a drastic upgrading of public education with respect to gharial conservation. The PHVA participants agreed that lack of public education had been a major lacuna in the Crocodile Conservation Programme.

## **Recommendations**

### **General**

A National Action Plan should be prepared under the auspices of the central coordinating unit incorporating sub-plans for each major river system. Comprehensive management plans should be prepared

with recommendations for these areas as well as for Protected Areas that already exist for gharial and these plans implemented to minimise irreversible limiting factors.

A second PHVA for gharial should be held within three years, after some of the recommendations have been implemented and more facts about the biology of the species have emerged.

The research base of every range state of Gharial needs to be strengthened and additional resources made available for this in view of the importance of the species and its habitat. On grounds of logistic advantage and presence of trained and experienced manpower, the Zoology Department at Jiwaji University, Gwalior should be encouraged to grow as a National Centre for Gharial research, with Gharial rehabilitation Centre at Deori (Morena) being revived as a vibrant field research station.

The Government of India, the range states of gharial, and the zoos and captive rearing centres holding gharial should utilise the occasion of the 20th anniversary of the Crocodile Project to highlight the success of the project, the need to continue protection of gharial and the importance of gharial to the aquatic ecosystem. Government of India should mark this anniversary in an elaborate manner, bringing out posters and brochures reviewing the Project and suggesting future directions.

### **Population Biology (Modelling)**

#### **General recommendations for all three populations:**

1. Systematic monitoring of all gharials is to be carried out to record longevity, age of first reproduction, sex ratio and other basic biology.
2. DNA fingerprinting is recommended for all populations to better understand the genetic make up and the effects of population bottleneck.
3. If the populations have retained sufficient genetic diversity between them, Katerniaghat and Mahanadi populations be supplemented with gharials from Chambal.
4. Effects of threats must be studied in detail so as to reduce the causes and the impact of these threats.

#### **i) Chambal population**

1. Subpopulation within the Chambal population must be studied for migration by monitoring their movements to understand the dynamics of the population.
2. Harvest of eggs should be done giving due consideration to the requirement of other populations. The Chambal population can withstand a harvest of maximum 500 eggs every year.

#### **ii) Katerniaghat population**

1. Continuous supplementation is recommended to insure viability of the population.
2. Gharial juveniles of minimum age 4 years and above should be released to reduce post release mortality.
3. Monitoring of the juveniles must be carried out once they are released.

#### **iii) Mahanadi population**

1. Continuous supplementation of the Mahanadi population over the last 19 years has in fact helped the population avoid total extinction. Although continuous supplementations were carried out, however, the population has not stabilized. Even though the simulation model showed no extinctions in the populations, high degrees of threats can push this population to extinction. Supplementation must continue to be carried out.
2. Studies on threats and their effects must be made in detail. This will help understand the actual role such threats play on the dynamics of the population and also help reduce this cause.

### **Census and Distribution**

Annual census must be conducted. Habitat status with respect to basking and nesting sites should be surveyed at the time of annual census and possible occurrence of changes monitored by compiling habitat field maps.

All participating state agencies should have effective coordination. Annual census by different agencies should be well coordinated and a permanent central coordinating unit should be created.

Comprehensive maps showing distribution of gharial (i) historically, (ii) before initiation of the project, and (iii) current population strength should be prepared and made available to census agencies. These should be updated on the basis of census results.

A brief brochure dealing with census techniques should be prepared for distribution to agencies and individuals associated with the census with the idea of optimising survey and census techniques. The possibility of making these more accurate can be explored in workshops to be conducted periodically.

NGO's and other interested individuals should be motivated to participate in survey and census work and a network of participants to conduct annual census of gharial throughout its countrywide distribution built up. A briefing session should be organised in sector levels for all the participants before census.

### **Habitat**

Availability/status of habitat be assessed by trained surveyors on the basis of identified qualifiers. Such habitats outside protected areas which are identified as highly suitable and stable, or those that gharial migrating out of P.A.'s attempt to recolonise be protected under the Wildlife (Protection) Act.

Habitat extending across international borders necessitates international cooperation for management of metapopulations which occur in such habitats. Several important gharial populations are affected by impediments arising from lack of coordination between India, Bangladesh and Nepal.

### **Threats**

Identify community nesting areas and provide protection to the nests to reduce the risk of predation. As there are many gharial in unprotected areas, threats such as fishing, sand mining, riverbed cultivation and industrial pollution can be controlled best by education/awareness activities.

The computer modelling exercise indicated that a lack of heterozygosity resulting from inbreeding may be a problem in some populations. Also very little is known about the age structure of the populations. As no genetic management has been considered in release programmes to date, it is strongly recommended that managers take cognisance of genetic and demographic factors.

Operation of irrigation and hydro-electric structures should be examined for possibilities in their modification to facilitate proper Gharial management and the construction of migration routes for river life be incorporated into the planning of future projects.

### **Trade**

Although there is no significant trade in gharial, it is still important to educate the local people in and around gharial habitats. This will promote awareness to stop illegal local trade, which takes place from time to time for non-tannery products such as eggs, meat and medicinal biomaterial. Training of enforcement officers (customs, local policemen and forest dept.) to help them in identifying derived products should be done.

Although there has been substantial pressure from international bodies for opening up trade in crocodilian products in line with the conservation strategy of sustainable use, it was strongly felt by the Workshop participants that opening of trade in India, at least at present, is not justified. It would create unwanted results which, on balance, would negate any economic or social benefit generated by opening of trade, especially for gharial.

The requests which have come from within India for opening up of trade in crocodilian products in recent years stem in part from the surplus animals which exist with different agencies which bred them in anticipation of need. Zoos and rearing centres should therefore rear only such numbers of gharial as are required for exhibition or supplementation. In the case of accidental surplus accumulated "in good faith" and not required for conservation due to unavoidable circumstances, the Government of India may consider undertaking support of the animals for the rest of their natural lives.

### **Reintroduction**

Releases for supplementation should be made at a standard optimum size. This exercise should be supplemented with scientific research input accompanied by frequent and consistent monitoring.

Releases must strictly adhere to the accepted norms of release except when there are species- or habitat-specific variables which require different norms.

As a result of the modelling exercise which was done on Katerniaghat populations as well as scrutiny of results of 20 years of supplementation of wild populations with captive reared animals, the view of the group was that long-term survival of gharial could not be assured without continued supplementation.

### **Captive Population / Disease Group**

Individual identification marking of gharial should be done using a standardised code to facilitate planned captive breeding. Preparation of a studbook should be carried out and maintained with available gharials in zoos/gharial rearing centres.

It is recommended to have detailed investigation with the help of disease diagnostic laboratories to come to definite conclusion about the disease responsible for mortality and to find out the proper prescription for cure.

Detailed investigation with the help of disease diagnostic laboratories should be carried out to arrive at definite conclusions about diseases and causes of mortality. Better management practices which include prophylactic measures may be undertaken as well as proper prescriptions for treatment, developed with collaboration between veterinary institutions and captive rearing centres.

The number of hatchlings to be reared should be decided strictly according to the requirement of the stock intimated by the concerned authorities responsible for reintroduction programmes.

Rearing procedures for hatchlings should be standardised and these standards strictly maintained to ensure maximum production of gharials from eggs produced in captivity.

Contemporary research has opened up possibilities of controlling sex ratios of crocodylians produced through temperature controlled incubation. This technique should be investigated with the objective of improving gharial management in situ through supplementation if so required.

### **Education**

The PHVA participants agreed that lack of public education had been a major lacuna in the success of the crocodile conservation programme. It was felt that a major initiative should be directed towards specific target groups important to gharial conservation, such as fishermen and others who might have been affected by the gharial programme. Emphasis should be given on the utility of gharial for sustaining the health of the river system and the perilous consequences of its disappearance.