SYMPATRIC DISTRIBUTION OF GHARIAL *GAVIALIS GANGETICUS* AND MUGGER *CROCODYLUS PALUSTRIS* IN INDIA[1]

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(With a text-figure)

This paper briefly deals with present status of wild gharial *Gavialis gangeticus* and mugger *Crocodylus palustris* in their major habitats. In the Chambal river the basking sites of mugger (77.7%) were rock and for gharial (22.2%) sand banks, though their nesting sites were the same. The distribution of gharial in this river was restricted to 68 (83.9%) survey units of 5 km each whereas mugger were restricted to 18 (22.2%) units. From this study it appears that to minimise the level of interspecific competition more conservation management inputs should be given to gharial in the Ganges and Brahmaputra river systems whereas more management inputs are necessary for the mugger in southern India and in the rest of its allopatric range.

INTRODUCTION

The results of a status survey in India conducted during the mid 1970s showed that the mugger *Crocodylus palustris,* once widespread and common, had become rare throughout its range by the early 1970s (Whitaker and Daniel 1980). The mugger is now present in small numbers in almost all the states of India except Jammu & Kashmir, Himachal Pradesh and Punjab (Whitaker and Whitaker 1989). The gharial *Gavialis gangeticus* once inhabited the major Himalayan fed river systems but is now restricted to the Ganges and Brahmaputra river systems. It is also found in the Mahanadi (FAO 1974) and was perhaps once found in the Godavari river (Bustard and Choudhary 1982) in Peninsular India.

SYMPATRIC DISTRIBUTION

The gharial and mugger are sympatric in some north Indian rivers, and in the Mahanadi river in eastern Orissa. The range of the mugger overlaps with that of the gharial in Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar and Orissa. However, the mugger also occurs in the same locality in habitats other than rivers. The major Indian rivers which both gharial and mugger inhabit are: Chambal, Son, Ken, Yamuna, Ramganga, Ghaghra, Girwa, Kosi and Mahanadi (Fig.1).

Present status: Data from published literature, field surveys and interviews with local people indicate that fairly good populations of mugger are present in different states, particularly in protected areas. But the gharial is found only in protected areas.

The Chambal river is one of the major gharial habitats in the country and monitoring of the gharial population is being carried out regularly. Since 1975 the gharial population in the Chambal has increased considerably. Around 800 gharials of all size classes and 50 nests were recorded from Chambal during 1988, whereas only 38 mugger have been reported from the same area.

In the Son river, 66 captive reared gharial have been released between 1985-90 and a natural population was also reported here. A total of four mugger were present in the Son river including two released mugger.

Whitaker and Daniel (1980) have reported eight mugger and four gharial from the Ramganga River inside the Corbett National Park in Uttar Pradesh. During 1982-1984 a total of 27 captive reared gharial and 12 mugger were released in the Ramganga river (Basu, pers. comm.).

A breeding population of gharial is present

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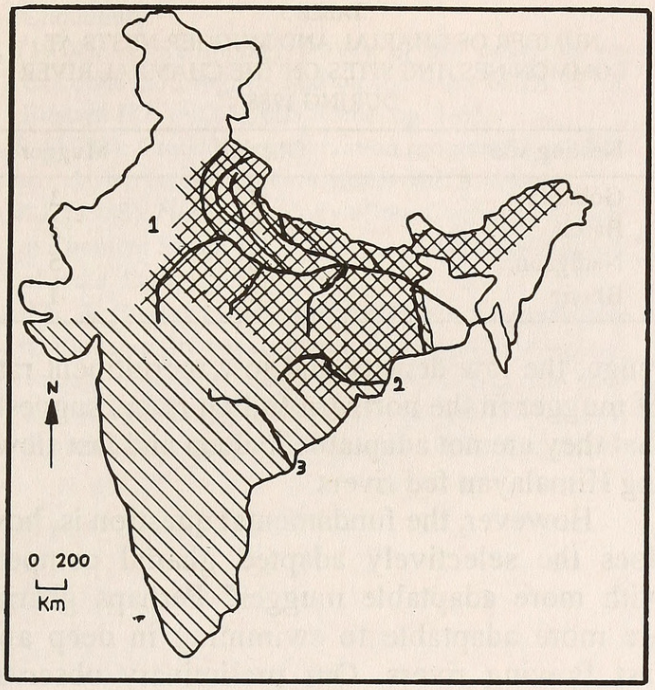

Fig. 1. Sympatric distribution of gharial and mugger in India. Striped area represents allopatric range of mugger, square area represents sympatric range of gharial and mugger. 1. Ganges river system, 2. Mahanadi river, 3. Godavari river.

in the Katerniaghat Sanctuary on the Girwa river with approximately 20 animals (Whitaker and Daniel 1980). Mugger are also reported from this river. During 1979-1986, 129 captive reared gharial were released in the Girwa river.

In the Mahanadi river 550 captive gharial have been released so far (Kar 1989). Mugger have also been reported from this river (FAO 1974) (Table 1).

Habitat Requirements

Since 1974, detailed studies on the habitat preference of mugger and gharial have been undertaken (Choudhury 1981, Choudhury and Bustard 1982, Singh 1978, 1985). However, information on many aspects of habitat selection and utilisation pattern by sympatric crocodile species is scanty.

In a survey conducted on the Chambal river during 1988, mugger were sighted in 18 survey units (22.2%) and gharial in 68 units (83.9%). Each unit represented a 5 km river stretch of the Chambal river. Young mugger were very few in number (22.2%) indicating that the population recruitment of mugger in Chambal is low.

Ecological studies on the Chambal river revealed that the basking habits of the two species differ significantly. The mugger mainly prefer to bask on rocks (77.7%) and rarely on sand (22.2%). The gharial bask on sand banks or on sand bars (98%), and only occasionally on rocks (2%) (Rao and Sigh 1987).

In the Chambal river both gharial and mugger breed successfully. The nesting season for both species was March-April. During 1988, a total of 15 gharial nesting sites were identified where 50 gharial nests were located (Rao 1988). Mugger used four nesting sites along with gharial (Table 2). A total of 15 mugger nests were located during 1988 at these sites. No conflict for the selection of nesting sites was observed between gharial and mugger. At one

Table 1
MUGGER AND GHARIAL RELEASE IN INDIA

River	State	Year	Gharial	Year	Mugger
Chambal	Madhya Pradesh/Uttar Pradesh	1979-90	1532	1984	28
Son	Madhya Pradesh	1985-89	66	1983	2
Son	Uttar Pradesh	1990	30	—	—
Rapti	Uttar Pradesh	1986	10	1984	10
Girwa	Uttar Pradesh	1979-86	129	—	—
Ghagra	Uttar Pradesh	1986	20	1985	6
Ramganga	Uttar Pradesh	1982-84	27	1984	12
Sharda	Uttar Pradesh	1986	20	—	—
Ken	Madhya Pradesh	1985-87	20	—	—
Mahanadi	Orissa	1977-89	550	—	—

TABLE 2
NESTING SITES OF GHARIAL AND MUGGER IN THE CHAMBAL RIVER DURING 1988

Sl. no.	Nesting site	Species
1.	Bagdia sandh	gharial
2.	Gobarda	gharial + mugger
3.	Baroli	gharial + mugger
4.	Nadigaon	gharial + mugger
5.	Banwara	gharial
6.	Bharra	gharial + mugger
7.	Dang Basai	gharial
8.	Tigri Rithoura	gharial
9.	Papripura	gharial
10.	Pureni	gharial
11.	Daljitpura	gharial
12.	Barsala	gharial
13.	Barenda	gharial
14.	Khera	gharial
15.	Gyanpura	gharial

nesting site near Nadigaon 5 mugger shared the nesting ground with 10 gharial in a 200 sq. m area (Table 3). This indicates that interspecific use of nesting grounds is very high. The survey results show that 26% of the mugger nesting sites overlapped with gharial nesting sites.

DISCUSSION

With a diverse habitat and dietary preference (unlike the gharial which is exclusively a fish eater and seems to select deep, fast flowing rivers), the more adaptable mugger tends to fail in competition with the gharial where sympatric. In its allopatric range (i.e. south and west India) the mugger is quite successful. The reason for this is not clear. Lack of information on resource utilisation by gharial and mugger in their sympatric range makes it difficult to understand the reasons for niche separation between these species.

Unlike the gharial which is thriving in its range, the low density and low recruitment rate of mugger in the northern Indian rivers suggests that they are not adaptable to deep and fast flowing Himalayan fed rivers.

TABLE 3
NUMBER OF GHARIAL AND MUGGER NESTS AT COMMON NESTING SITES ON THE CHAMBAL RIVER DURING 1988

Nesting site	Gharial	Mugger
Gobarda	3	1
Baroli	9	3
Nadigaon	10	5
Bharra	4	1

However, the fundamental question is, how does the selectively adapted gharial compete with more adaptable mugger? Perhaps gharial are more adaptable to swimming in deep and fast flowing rivers. Our preliminary observations in the Chambal river indicate that the natural recruitment of gharial was greater than mugger, even though hatching of both gharial and mugger took place at the same nesting sites. Occurrence of fewer mugger hatchlings at the same nesting sites makes us wonder if gharial prey on mugger hatchlings.

To minimise the level of interspecific competition between sympatrically distributed endangered crocodiles in India, more conservation management inputs should be given to gharial in the Ganges and Brahamaputra river systems. At the same time more inputs should be given to mugger in southern India and in the rest of its allopatric range.

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