Crocodile human conflict in National Chambal Sanctuary, India

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Abstract

In the National Chambal Sanctuary in India human crocodile conflict does not in itself appear to be a major problem with Gavialis gangeticus, but the mugger crocodile Crocodylus palustris is considered a threat to man because the wild populations are increasing in the Chambal River and there are cases of mugger attacking human and their livestock. The degree to which C. palustris can and will attack people is largely a matter of theoretical discussion, but the recent increase in their population due to crocodile conservation and management programmes in the sanctuary, it is hard to accept that they would not pose a problem to people in the Chambal area where people were exposed to crocodiles, by using the river for washing, drinking water extraction, swimming and cattle use. Such conflicts are also highlighted by the media, it is likely that the public do fear crocodile attacks and that these fears may turn out to be serious impediments to reintroducing G. gangeticus into the Chambal River and other water bodies in neighbouring protected areas. Though local people receive compensation from the Government for every case of crocodile attacks they are more reluctant to agree for reintroduction of crocodiles as they feel that crocodile conservation programme is against human poverty alleviation programme. A study conducted in the Chambal River indicated that major crocodile habitats are under severe pressure due to increase in human activities, Locals use crocodile habitats for water extraction for drinking, irrigation including riverside agriculture, sand mining, and livestock grazing and washing. Due to lack of education and awareness about crocodile behavior and the basic purpose of Government run crocodile conservation programmes the locals are against the crocodile reintroduction programme. In this paper mitigation strategies to be adopted to reduce Human Crocodile Conflict are discussed.

Introduction

Conflicts between humans and animals are a serious problem in many parts of the world. The damage and destruction caused by a variety of animals to human property-and sometimes to human life-is a real and significant danger to many human communities and with the animals often killed, captured, or otherwise harmed in retaliation, these conflicts are one of the main threats to the continued survival of many species. Crocodile attacks on people are common in places where large crocodiles are native and human populations live. Only six of the 23 crocodilian species are considered dangerous to adult humans and only individuals 2 meters (6.6 ft) in length or more represent a serious danger to humans, as smaller crocodiles are considered incapable of killing a person. frequent encounters with humans and their livestock have caused human-crocodile conflicts which result in retaliation killings (Deutsch and Coleman, 2000). Human-crocodile conflicts have been reported from different parts of the country (Whitaker, 2007, 2008), indicating possible increases in population and/or Mugger reaching larger sizes. Human-crocodile conflict studies have been carried out extensively in many parts of the world (Langley, 2005; Whitaker, 2007, 2008; Aust, 2009; Dunham et al, 2010; Fergusson, 2010; Udgata, 2011; Mendis, 2012, Webb, 2012; Chomba et al. 2012).

Crocodiles use the riverine ecosystem for their life propagation and also use the sand bank and marshlands for basking, egg-laying and hiding place. People use the river for various purposes including fishing, sand mining, drinking water collection, washing, extraction of water for irrigation, livestock use and also use the bank for agricultural purposes. The crocodiles have to compete for water, fish stock and bank availability with humans. There is also high rate of conflict due to entanglement and death in fishing nets.

Due to Crocodile Rehabilitation programme initiated during late 1970s under Indian Crocodile Project the populations of crocodiles have been increased. The increasing mugger populations pose a potential threat to human and their livestock living in villages along the banks of Chambal River. The present study has been undertaken to assess the mugger population in the study area, causes and occurrence of conflicts, people's mentality towards the animals and to suggest measures to avoid conflicts.
An assessment of human-crocodile conflict in National Chambal Sanctuary, Madhya Pradesh was carried out from March October, 2012 at regular intervals to collect data on crocodile population in the study site, socio-economic status of the adjoining villages and human-crocodile conflict. Primary data were collected through field surveys and secondary data were collected from Madhya Pradesh Forest Department. This study aimed at exploring the human-crocodile conflict in terms of livestock depredation, human casualties, retaliation killing, assess the habitat sharing of crocodiles, assess the anthropogenic pressure on the river ecosystem and determine the crocodile-human conflict to suggest mitigation measures.

Methods

Study area

The Chambal River in India has the single largest contiguous population of gharial reportedly between 48% and 85% of the global population. The gharial is threatened by riverbank land-use changes, reduction in river flows, modification of river morphology, loss of nesting and basking sites, increased mortality in fishing nets and egg-collection for consumption. Few crocodiles reach maturity. Eggs drown sometimes as nests are submerged during wet season flooding and small crocodiles are eaten by jackal, mongoose, goannas, birds, fish, other crocodiles. Anthropogenic processes have physically, chemically and biologically modified India's great river ecosystems. Major part of the Chambal River has been declared as Wildlife Sanctuary during 1978 (Fig. 1). The sanctuary is protected under India's Wildlife Protection Act of (1972). Parts of the sanctuary are threatened by extensive illegal sand mining, which is endangering the fragile lotic ecosystem critical for Gharial breeding.

National Tri-State Chambal Sanctuary Management and Coordination Committee have been formed for the management of NCS.

The present study was conducted in the National Chambal Sanctuary, Madhya Pradesh in an area of around 50 km from village Bilpur/Kuthiyana to Nayapura (Pinahatghat). Geographically, the study site lies between latitude 26°40'N - 26°51'N and longitude 78°5'E - 78°22'E (Fig. 2). There are about 15 villages along the river bank in the study area. The 15 villages selected in the present study have a population of about 6400, with overall male female ratio of 1.07. The literacy rate of the selected villages as per the census 2011 is 49.6. The average temperature of 36°C was recorded in the study area. The minimum temperature was 15.8°C in the month of March, however, the maximum temperature was 42.2°C in the month of May.

The field surveys were carried out during MarchOctober 2012. For the collection of primary data regular site visits were made. The field surveys were classified into two sections, river survey and questionnaire survey for the villages. Secondary data on human-crocodile conflict was collected from records available in the Forest Department. Literature survey was also carried out by consulting different journals, newspapers, and unpublished thesis/dissertations and other study material from the libraries.

Results and Discussion

National Chambal Sanctuary is at the borders of three districts, Sheopur, Morena and Bhind in the state of Madhya Pradesh in North India. In this part of the National Chambal Sanctuary two species of crocodiles Gavialis gangeticus (gharial) and Crocodylus palustris (mugger) are present (Fig. 3). Most of the crocodiles that are present in the study area were adults and only a few among them were juvenile. 14 gharial and 19 mugger sub adults were also seen in the study area (Table 1).

<table>
<thead>
<tr>
<th>Category of crocodiles</th>
<th>No. of crocodiles</th>
<th>Gharia</th>
<th>%</th>
<th>Mugger</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>51</td>
<td>68.9</td>
<td>27</td>
<td>43.6</td>
<td></td>
</tr>
<tr>
<td>Sub Adult</td>
<td>14</td>
<td>18.9</td>
<td>19</td>
<td>30.7</td>
<td></td>
</tr>
<tr>
<td>Juvenile</td>
<td>9</td>
<td>12.2</td>
<td>16</td>
<td>25.7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>100</td>
<td>62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the 50 km River stretch, there are only 8 important basking areas of crocodiles at Kuthiyana, Babusingh ke gher, Kisrouli, Daljeet ka pura, Barsala, Sukhhdyan ka pura, Holapura and Usedghat. In the 50 km River stretch, there are 6 important nesting areas of crocodiles in the study area like Babusingh ki gher, Kisrouli, Daljeet ka pura, Barsala, Sukhhdyan ka pura and Holapura. Approximately 2 km of sand bank on small stretches are used by the Gharial for nesting.

The Gharial bask on the sand bank and mugger also use sand banks for basking, although they prefer hard soil and rocks.
for basking for long hours. Both crocodiles nest on sand banks at many sites. They use sand banks throughout the sanctuary wherever suitable habitats are available. Sand mining is one of the major human activities in the NCS. Sand is continually extracted in the important nesting and basking site, this is reducing the space of nesting and basking habitat and drastically changing the population trends in aquatic biodiversity.

Conservation of aquatic biodiversity in the National Chambal Sanctuary is major subject of research since 1983 (Singh, 1985; Rao, 1989; Sharma, 1991; Hussain, 2009). There are direct conflicts like injury and death of human and indirect conflicts like crocodile destroying the fishing nets, damage to fish population, predate domestic livestock. The present study is mainly focused on the crocodile-human conflict in the National Chambal Sanctuary. Large numbers of people residing in the riverside villages are directly dependent on the Chambal River. They collect sand, grow agriculture along the river banks and collect fish from the river.

Although fishing is totally banned in the Chambal River to avoid incidental mortality of aquatic animal in the gills nets, occasional illegal fishing is continuing. There are many reports of crocodile and turtles mortalities by drawing in fishing nets. Two dolphins were recorded to be killed in the fishing nets and the fishermen extracted oil from the dolphins in April 1987. Because of the fishing activities in the Chambal River the animals are facing a lot of disturbance.

People use the river for various purposes including drinking water collection, cloth washing etc (Fig. 4). People also cross the river by means of a temporary bridge, cross the river using the boats and Camels and also the river bank is used for burial of dead bodies and extraction of water for irrigation, livestock use etc. Most of the crocodiles that are present in the study area were adults and only a few among them were juvenile. 14 gharials and 19 sub adult mugger were also seen in the study area.

Although there are reports of human crocodile conflict in the National Chambal Sanctuary, the present studies revealed that in the study area human beings are not attacked by crocodiles but livestock is attacked by the mugger crocodiles (Table 2). In several villages it is reported that 5-6 accidents have been occurred during 2011-2012. Mostly buffaloes, cows, and goats have been attacked by the mugger crocodile when they visit the river for drinking purpose.

### Table 2: Percentage of injury and death to live stock by mugger crocodile

<table>
<thead>
<tr>
<th></th>
<th>Cows</th>
<th>Goats</th>
<th>Buffalos</th>
<th>Dogs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury</td>
<td>2</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Death</td>
<td>7</td>
<td>15</td>
<td>13</td>
<td>2</td>
<td>37</td>
</tr>
<tr>
<td>Total</td>
<td>9</td>
<td>15</td>
<td>14</td>
<td>2</td>
<td>40</td>
</tr>
</tbody>
</table>

It was found that most of the people who are the residents of the sampled villages were farmers followed by fishermen and labourers. Buffaloes, goats, dogs and cows are the prime victim of the crocodile in the study area. It was found that timing has a direct relationship with accidents rate in the evening hours when people are mostly indoors, however, certain accidents have occurred early in the morning. It has been calculated that 37 casualties of animals viz, cows, goats, buffalos and dogs have occurred in the area due to the conflict with crocodiles and 2 cows and 1 buffalos have become injured during the study period. 29% of the people reported that they are negatively affected by the presence of crocodile and 54% told that they do not have any affect due to presence of crocodile in the area.

Residents living close to the victim of the sampling area believed that their children fear to go to river due to the presence of crocodiles. Grazing, bathing, fishing, drinking and watering have become different for the residents in the area. The opinion of the residents regarding the discomfort of people is listed below. It was found that most of the people are aware of the crocodile behavior in these villages and 80% of the people have seen crocodile once in their life and to escape from clutches of crocodiles and 75% people think to construct alternate source for drinking water, due to the presence of crocodiles and only 9% people prefer to go for fishing.

The information revealed that most of the people who were affected by human crocodile conflict received compensation amount of Rs 5000-10,000 as a relief from Deori Range. In the Chambal River human activities are increasing slowly. In the past the local people collected and utilized the fish for themselves, but gradually people outside the Chambal region are collecting the fish and turtles for sale in different states particularly West Bengal. Wildlife habitats were considerably altered and there are disturbances along the river by wood collectors, poachers, farmers and sand miners. Such human activities have increased instances of human-crocodile conflict. There are many reports in the sanctuary regarding killing of cattle and human by mugger crocodile in the Chambal River. It is the responsibility of the wildlife managers and researchers to take suitable measures for controlling such human-crocodile conflict in the National Chambal Sanctuary. There is a need to take education and awareness programme to the local human population, which depends totally on the river.

For over four decades the crocodile population in the Northern Territory in Australia has been increasing, crocodile attacks have been occurring, and calls for culling have been raised (Webb, 2012). It is not a simple issue to culls the problem crocodiles. A refined public education programme ensures residents and visitors are well-informed about ‘crocodile safety’. Due to the negligence of people, there has been a spike in the number of crocodile attacks on humans in
recent years. The growing human toll, deaths and injuries, have had a far more detrimental consequence on the crocodiles, with the villagers being provoked into poisoning, trapping and killing the crocodiles (Mendis, 2012). Local people in Mozambique are poor and regularly venture into the crocodile areas for collecting fish and are sometimes being attacked by crocodiles. Against crocodile attacks the locals opportunistically killed crocodiles and destroyed their nests because of the danger they posed and the damage they caused to fishing nets. It is suggested that good land-use planning, a long-term solution to many conflicts, is particularly relevant in Mozambique, where crocodile populations of protected areas are often in rivers that borderer these areas, and cause conflicts outside them, and where people commonly live within protected areas. Poverty may prompt fishermen to risk crocodile attack by entering rivers or lakes.

In the Chambal River indigenous crocodiles are once again abundant due to conservation and management programmes. In addition human population in different riverside villages has been increased and they and their livestock depend heavily on the river. The recovery of crocodile population and increase in human population has resulted in substantial levels of human-crocodile conflict. Conflicts between humans and wild animals are as old as the co-existence between them. They occur in all continents only varying in typology and circumstances. When human-wildlife conflicts occur, negative media reporting often exacerbates negative perceptions of the general public towards those species which cause the most conflict such as the crocodile (Chomba, et. al. 2012). The increased and progression loss of natural habitats and biodiversity have probably exacerbated human-wildlife conflicts and may continue in future as communities continue to ignore the need to comply with the provisions of General Management Plans in regulating human settlements. The ignorance on the general behavior of crocodiles coupled with the inability to detect crocodiles in water aggravate the conflicts. According to Chomba et. al. (2012) crocodiles live very close to humans without being detected. This factor together with the inability to detect crocodiles by people may be responsible for high incidences of crocodile attacks on humans and livestock. Many crocodile attacks may additionally go unnoticed and unreported, since at times, human or livestock may be stealthily taken when a person is alone or livestock is not accompanied by a person.

The findings of this study indicate that major habitats of crocodiles are under pressure due to increase in human activities. The major threat at present is habitat loss due to human encroachment, and disruption of populations through fishing and other hunting activities. In the present study it is observed that due to Crocodile-human conflict relationships between local communities and wildlife authorities is not cordial. Locals consider that crocodile programmes in the Chambal River are major obstacles for poverty alleviation as they depend primarily on the river for livelihood and Government restricts use of resources for crocodile conservation.

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Literature cited

Fig. 1. Map of National Chambal Sanctuary showing multipurpose dam on the upper stream, Tributaries and study sites in the present study.

Fig. 2. Map of study area in the National Chambal Sanctuary

Fig. 3. Crocodiles (Gharial and mugger) basking in the Chambal River

Fig. 4. Human activities (sand mining and water extraction) on the river banks