Journal of
Biodiversity & Endangered Species

Behera et al., J Biodivers Endanger Species 2014, 2:3
DOI: 10.4172/2332-2543.1000130

Research Article Open Access

Preliminary Inventory of Biodiversity at Ghodahada Reservoir: Conservation of Mugger Crocodile at Ganjam District, Odisha

Subrat kumar Behera[1*], **Rajkishore Mohanta**[1], **Chandra Sekhar Kar**[2] **and Sudhansu Sekhar Mishra**[3]

[1]*Integrated Coastal Zone Management Project, Berhampur Division (T), Odisha, India*

[2]*Wildlife HQ, Bhubaneswar, Odisha, India*

[3]*Divisional Forest Office (T), Berhampur, Odisha, India*

[*]**Corresponding author:** Subrat kumar Behera, Integrated Coastal Zone Management Project, Berhampur Division (T), Odisha, India, Tel: 919437698361; E-mail: subb92@gmail.com

Rec date: April 23, 2014; **Acc date:** May 21, 2014; **Pub date:** May 29, 2014

Abstract

The existing small population of Mugger crocodile inhabit in south Odisha near Ganjam and Parlakamundai district Border. The main habitats could be classified in two, main natural and artificial habitats. The main natural habitats are the small and large ponds along the main Reservoir, Ghodahada. Most of these ponds have similar characteristics providing suitable habitats for the Mugger crocodiles. Generally, Mugger crocodiles avoid from running parts of the rivers, streams and prefer fairly deep and calm parts of the rivers with suitable vegetation and sandy banks. As the artificial water bodies also play essential support for the Mugger crocodile population. Small and large ponds nearby villages constructed for the rain water storage as well as the dams constructed along the river Ghodahada supposed to be important habitats for the Mugger crocodiles too.

The movement of Mugger crocodiles between the habitats is usual recorded behavior in the area. In most habitats the Mugger crocodiles have close contact with local people. Some ponds in border area are supposed to be Mugger crocodile habitats too, and some reports from local people indicating movement between the local habitats. Constructed dams on the main rivers had important effects on the habitats too. 37 species of fish, 8 amphibian 28 reptilian and 46 bird species are the main food resources for the Mugger crocodiles in these habitats which also add the richness to biodiversity of area. Since 2008 Mugger crocodile conservation program was initiated by Berhampur forest department. Latest 2014 census recorded 46 basking Mugger crocodiles and 7 nests were found during the nest survey in small islands/mainland in habitat.

Keywords: South Odisha; Ghodahada; Mugger Crocodile; Biodiversity; Nest survey; Basking survey

Introduction

For millennium, crocodilians have survived and diversified in tropical and sub-tropical environments, where they hold the distinction as top predators in the water and on land [1-3]. The secret to their evolutionary success is in large part due to their universal ability to conceal their presence to potential prey, which is ambushed by these sit-and-wait masters at the water's edge. The mugger crocodile, (Crocodylus palustris) has the widest distributional range compared to any of the Asian freshwater crocodilian species [4].The mugger crocodile greatly decreased in number until the early 1970s. Killing of the species for skins was the primary cause of their decline in India [5]. It was most vulnerable to this during years of drought when hunters could track and kill the animals more easily. Habitat destruction and alteration was another primary cause of species loss. Many dam construction projects that occurred during the 1900s to the 1950s destroyed habitat by removing areas of deep water that provided good cover. Timber operations also destroyed habitat during this same time, by damaging forest ponds and rivers. Egg collection, hunting of crocodiles for meat and medicine, and death from fishing nets also have contributed to their decline [6]. During 1970 mugger population was in the verse of extinction so Conservation Project in which Muggers were restored to their natural environment started at Ramtirtha of Simlipal Tiger Reserve. All three species are found in several natural habitats in Orissa State. The Gharial is found in the Mahanadi River system, the Saltwater crocodile is found in the Bhitarkanika Sanctuary and the Mugger is found in the riverine systems of Similipal Tiger Reserve [7,8].

Mugger population was quite unstudied species in Ghodahada reservoir area before 2008. The main existing information is the personal communication with local community that Mugger crocodiles were found in the large pond of the temple before 2006 and these Mugger crocodile migrated to the reservoir area after 2006.

The reservoir acts as a unique independent ecosystem that has supported large breeding populations of Mugger crocodiles. Varity of fish species occur in the reservoir and feeder streams. The fauna reflects to have a close affinity to tropical forms. Apart from this amphibian, reptiles, mammals species associated with this reservoir. Of the 46 bird species recorded in the area, 13 are closely associated with the reservoir for breeding, feeding and roosting.

Because of diversity and ecological importance, reservoir can be designated as Wetland of International Importance. During last census 2014 done on January, a total of 46 Mugger crocodile were sighted using basking survey method and 7 nests were recorded in 4 islands and adjacent habitat.

Study Area

Ghodahada reservoir is located 190 17' 30" N Latitudes and 840 20' 30" E Longitude adjoining the Lakhari valley sanctuary and in a part of the Eastern Ghats. The Eastern Ghats are isolated hill ranges in Peninsular India (Andhra Pradesh, Odisha, Tamil Nadu and Karnataka), harbors primarily tropical moist deciduous vegetation, which represents species of high economic, timber, medicinal potential, lies in 110 30' to 210 0' N Latitudes and 770 22' to 850 20' E Longitudes. Eastern Ghats are highly significant in terms of its Bio-diversity. The Eastern Ghats constitute the principal mountain system of Odisha. Two hills Badapahda and Gadia are hilly forest covers an area of 6415 hectare of forest land surrounding the Ghodahada reservoir. Ghodahada Lake was natural inland reservoir till 1972, which was having larger bodies of standing water occupying distinct basins. This large water body occurs in natural depressions and normally fed by streams/rivers and has natural islands.

The Physiographic of Ghodahada is hill and tableland, the terrain is rolling. The major river system is Ghodahada running from southeast to Northwest. The reservoir is dead end for the river Ghodahada which is tributary of river Rushikulya. The reservoir was existing in the past and water was flowing in southeast-northwest direction. In the year 1974 the Dam was completed.

Method

Here we present information for 7 years of population estimation, one of the most studied populations of the species; we believed a population survey to be the first important step in the management of a species emphasized the importance and urgency of regular surveys and continuous monitoring efforts, especially for species of high conservation status [9, 10], in the location since the beginning of the project.

The reservoir was stratified into 12 strata (Map-1) for total systematic search [11,12]. As the total area of the reservoir is only 4.15 Sq.km during the Monsoon period during summer 3.43 Sq.km. so direct count method was introduced. In each strata boat survey was conducted in the entire reservoir area and nearby ponds from 0800 to 1300 hours on two days for physical verification of the presence of Mugger crocodiles. Notwithstanding the limitations, total count method surveys have an important place in Mugger crocodile surveys [2] and have been used, especially in smaller rivers and lakes [13,14]. Where the crocodilian density is extremely non-randomly distributed [15] suggests that the best time for nest surveys are between mid December and the end of January. This period covers the middle of the nesting cycle when all the Mugger crocodiles are in the system that were going to lay eggs or would have done, so all the Survey was made during the month of January which had the highest possibility to encounter all the population in the area.

A structured questionnaire was administered to 90 householders in 9 surrounding villages Balighai, Bijaynagar, Padmanavpur(Keutasahi), Mahulapada, Burudanga, Burabandha, Pendurabadi, Madhuban and Siripur by the a survey team.

Interview was made to fishermen:

- To estimate the number of Mugger crocodiles accidentally trapped and killed in their nets.
- Interview with family members who were killed by Mugger crocodile attacks and as well as to people who sustained minor injuries due to attacks.

Collection of samples plants, animals and aquatic plants along the reservoir was done and stored properly with standard protocol for identification and identified.

Result

Mugger Population

Mugger population monitoring has involved two methods: Direct surveys using boat and nest counts.

A survey in 2014 estimated a total of 43 muggers (Figure 1) and 1 nests, Positive impacts can also be seen in freshwater Mugger crocodile nesting trends, with a sharp increase of almost 80% recorded between 2008 and 2012 (Figure 2). The majority of Mugger crocodiles encountered were adults (>2.25 m) and sub-adults (1.0-2.25 m), with juveniles (0.5-1.0 m) few. Encounters rates for Ghodahada reservoir 1.72 Mugger crocodiles/km.

Encounter rates include all Mugger crocodiles sighted and observed over the reservoir area. During 2008 and 2009 the mugger outside the reservoir area was not detected, during 2010 onward the adult mugger migrated to the adjacent ponds (Figure 3). During 2014 latest census a total of 12 muggers of which 9 muggers were sighted in the 6 different ponds in the study area and 3 in outer channels of the dam. During 2013 super cyclone the reservoir level increased to its highest level in more than 7 years and many Mugger crocodile nesting sites were subsequently flooded.

Since 2008 to 2014, four male mugger were found dead; one during 2009 another in 2010 and other two in the year 2011 were census could not being done. All the dead were confirmed by the assigned authority and reported as the natural death.

From interview based survey of 9 village we found that there was no direct threats to crocodiles by human activities are: killing of supposed 'man-eaters', destroying eggs to control the growth of the species, killing of yearlings and sub adults which get trapped in fishing nets, (some drown in the fishing nets). But the fishermen report these crocodile attack on small grazers like goat, sheep. There was also no report on the human injury major or minor due to crocodile attack.

Biodiversity assessment:

The biodiversity assessment in two selected important hill forests and the reservoir area of Ghodahada has revealed many interesting to Eastern Ghats of Odisha, and also to peninsular India. The authentic identification of some species could not be completed due to non-availability of desired information.

Rapid survey of biodiversity in two selected hills of Gadia forests range of South Odisha was done to Inventory of flora and fauna of the study area. Survey was carried out on ecologically sensitive plants and animals within the area to identification of threats on existing wildlife of this area.

The study have recoded 40 species of Butterflies, 37 species of Fish 8 species of Amphibians, 15 species of lizards and 13 species of snakes. Apart from this the reservoir supports 46 number of birds species which are resident and migratory. 29 species of Mammals are identified to be present in the locality elephant was not resident of this area but from last three years elephant is residing in the vicinity of this large water body.

The aquatic vegetation of reservoir can be classified into three broad groups, i.e. RE- Rooted emergent, RF- Rooted floating, FF- Free

floating. These macrophytes are observed in different habitats like deep water, shallow water and marshland as well along the shoreline. During the survey, 28 species of macrophytes were recorded in the reservoir. Among these 11 are rooted floating, one species is free floating and 16 are root emergent.

Out of 28 species, 10 have the medicinal value, 6 have the economic value and 9 have both medicinal as well as economical values.

Discussion

Apart from the mugger crocodiles the biodiversity of South Odisha, Ganjam in particular is least explored as compared to northern districts of Odisha due to its diversified topography and difficult terrains. Except the mega fauna of major groups, a very few reports are available on micro fauna of the state and nothing has been done on southern region of the Odisha.

The reservoir acts as a unique independent ecosystem that has supported large breeding populations of Mugger crocodiles. 37 fish species occur in the reservoir and feeder streams one is endangered and five are vulnerable according wildlife protection act. The fauna reflects to have a close affinity to tropical forms. Eight frogs, 15 lizards and 13 snakes are the reptile species associated with the reservoir. Of the 46 bird species recorded in the area, 13 are closely associated with the reservoir for breeding, feeding and roosting.

The tribal people have lived around Ghodahada for centuries, even though the area is known for being unhealthy, inclement and not well-suited for agriculture or stock farming. Their livelihood consists mainly of fishing, the utilization of indigenous fruits and vegetables Extensive cultivation has occurred in most of the catchment area and drainage lines entering the lake system (personal observation) and many important reservoir areas have been transformed to cultivated fields (pers. obs.). Their fishing methods vary according to the nature of the nearby water source, and at Ghodahada they fish throughout the year, using hand lines, and rod, country boat as well as valve baskets that are used on their own.

Sometimes fishermen will walk into the clear water up to a depth of 1.5 m and fish for long periods during the day (pers. obs.). Fishermen seem to be aware of the favored basking sites of Mugger crocodiles as well as their distribution in close proximity to preferred fishing areas.

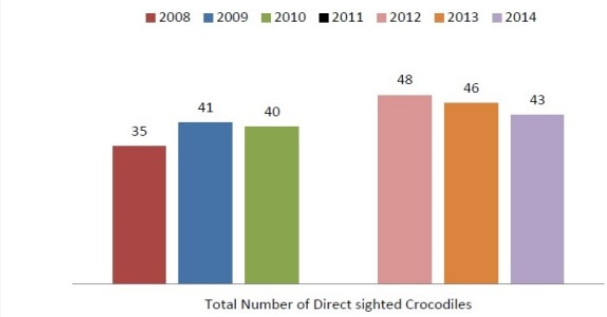

Figure 1: Graph showing the total number of Mugger crocodile in the Ghodahada reservoir area from 2008 to 2014

Although attacks by mugger crocodiles on dogs, goats and calves (pers. obs.) do occur in the area, there is no evidence of an attack by a Mugger crocodile on a person in recent memory.

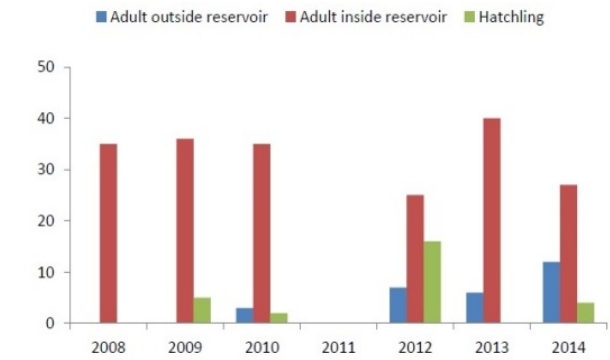

Figure 2: Graph showing the Mugger crocodile inside and outside the Ghodahada reservoir area from 2008 to 2014 and the hatchlings found during the surveys.

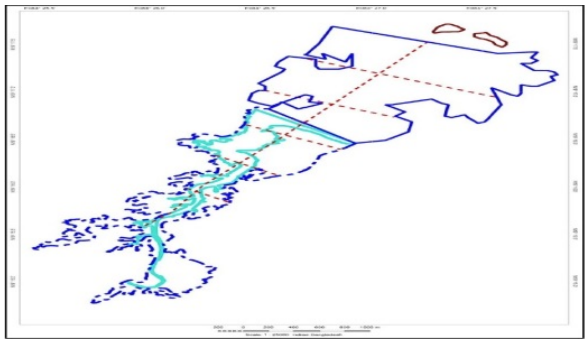

Figure 3: Map Showing the Ghodahada reservoir area and the 12 strata where the direct surveys were carried out

References

1. Chabreck RH (1966) Methods of determining the size and composition of alligator populations in Louisiana. Proceedings of the South eastern Game and Fish Commission 29:105-112.
2. Cott HB, Pooley AC (1972) Crocodiles: The Status of Crocodiles in Mrica. First Working Meeting of Crocodile Specialists. Volume 2. IUCN. Gland Switzerland
3. Caughley G, Sinclair ARE (1994) Counting Animals. In: Wildlife Ecology and Management. 190 - 216. Blackwell Science. Cambridge.
4. Whitaker R, Whitaker Z (1989) Ecology of the mugger crocodile . Crocodiles. IUCN Publ. (NS): 276-296.
5. Whitaker R (1987) The management of crocodilians in India. In: Wildlife Management: Crocodiles and Alligators. Webb, G.J.W., S.C. Manolis and P.J. Whitehead (eds.).63–72. Surrey Beatty and Sons, Chipping Norton, Australia.
6. Britton A (2003) Crocodylus palustris: Lesson
7. Sagar SR, Singh LAK (1993) Captive Breeding and Rehabilitation of Mugger Crocodile (Crocodylus Palustris) In Similipal Tiger Reserve. The Indian Forester. 119: 807-815.
8. Sahu HK, Dutta SK, Rout SD (2007) Survey of Mugger Crocodile (Crocodylus palustris) in Similipal Tiger Reserve, Orissa, India, The Indian Forester 1: 27-32.
9. Bayliss P (1987) Survey methods and monitoring within crocodile management programmes. In: O.J.W. Webb, S.C. Manolis, and P.J.

Whitehead (eds), Wildlife Management: Crocodiles and Alligators: 157-175. Surry Beatty and Sons Pty. Ltd., Chipping Norton, NSW, Australia.

10. Montague JJ (1983) Influence of water level, hunting pressure and habitat type on crocodile abundance in the Fly River drainage, Papua New Guinea. Biological Conservation 26: 306-339.
11. Denny MLS (1979) Ground versus aerial counts. In: Aerial surveys offauna populations. Australian National Parks and Wildlife Service Special publication 1.
12. Collinson RFH (1985) Selecting Wildlife Census Techniques. Monograph 6. Institute of Natural Resources. University ofNatal.
13. Hutton JM (1992) The status and distribution of crocodiles in Kenya
14. Hutton J, Ross P, Webb G (2001) Using the Market to Create fucentives for the Conservation of Crocodilians: A Review. IUCN/CSS Crocodile Specialist Group.
15. Hartley DDR (1990) A survey of crocodile nest in Umfelozi game reserve. Lammergeier 41:1-12.