IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.
Volume. 1 Issue. 3, PP 24-29
www.iosrjournals.org

Conservation of Crocodylus palustris in Kotmi Sonar of Janjgir - Chamapa (C.G.) India

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Abstract: *Crocodile has been categorized as a vulnerable species in the Red List of IUCN and is placed under schedule 1 of the Wild Life Protection Act, 1972. To protect Crocodiles a Crocodile Conservation Park has been established by The Govt. of Chhattisgarh in Munda pond of Kotmi Sonar, District Janjgir - Champa, (C. G.) India.The physicochemical conditions of Munda pond provide an optimal conditions for, growth and vital activities for this species, Crocodylus palustris. The population of Crocodylus palustris is gradually increasing up to 378. The establishment of incubation centre, artificial hatchery and other technical facilities helps in the increasing population of Crocodylus palustris.The potentialities of Crocodile Park showed explored from point of view of knowledge, research activities and ecotourism as well.*

Key words: *Conservation, Eco tourism, vulnerable species.*

I. Introduction

The Marsh Crocodile, Mugger or Crocodylus palustris is a common and widespread crocodilian species in India [Vyas, 2012]. Crocodylus palustris is ecto and heterothermic, seasonal breeder, gonochoric, diocious, hole-nesting and oviparous species [Jacobson, 1999; Da Silva and Lenin, 2010]. The population of Crocodylus palustris is reportedly declining [Whitaker and Andrews, 2003; Oza, 1975]. The population is reportedly declining due to illegal hunting for skin and indigenous medical purpose, habitat destruction. Lack of appropriate 'rescue and release' protocols and man made causes are another causes for shrinking population of Crocodylus palustris [Vyas, 2012; Da Silva and Lenin. 2010; Whitaker and Whitaker, 1984; Joshi et al., 2011; Vyas and Vyas, 2002; Vyas, 2010]. Their global population is tentatively estimated as 5400 to 7100 non-hatching [Da Silva and Lenin, 2010].

To protect and conserve this endangered species, it has been categorised as a vulnerable species in the Red List of IUCN and Red List of threatened Reptilian species. It is placed under schedule 1 of Wild Life Protection Act, 1972 [Joshi et al., 2011; Choudhury and Chowdhury, 1986; Bharos and Kanoje, 2007].

To provide a higher degree of protection to Crocodylus palustris, a Crocodile Conservation Park is established in Munda pond at Kotmi Sonar of Janjgir-Champa District of Chhattisgarh, India [Fig. no. 1]. Crocodiles were observed here during basking from 08.00 A.M. to 05.00 P.M. The presence of 16 - 17 transverse rows of dorsal shield, usually two median rows are considerably broader [Fig. no. 2], 4 - 6 longitudinal series of scutes, broadest snout with 19 upper teeth and an externally visible cone shaped 4th tooth on each side are the characteristics of Crocodylus palustris [Da Silva and Lenin, 2010] [Fig. no. 2].

II. Study Area

The present study was conducted in Kotmi Sonar. The Kotmi Sonar is an ancient village of District Janjgir - champa (Chhattisgarh) India. It lies at 22^0, 01'; 44.8" north latitude and 82^0, 21', 13.1" east longitude [Bharos and Kanoje, 2007]. It is situated in Mumbai Howrah railway line between Bilaspur and Champa junctions of Chhattisgarh, India [Fig. no. 1].

The Munda pond is spread on 85 acre area. The terrain of Kotmi Sonar is almost plain with gentle slope. The Kotmi Sonar is situated in 620 meters above M.S.L. The underlying rocks are granite, schist and limestone [Bharos and Kanoje, 2007]. In the present study, four study sites [at four corners] were pointed out.

III. Objective

The objective of the present study is to understand the current status of Crocodylus conservational strategies in kotmi sonar of Janjgir-Champa district [C.G.].

IV. Material And Method

The visual ground survey method was used to identify the morphological characteristics and study of behavioural responses. 'Direct Counting Method' and 'Capture and Release Technique' were used to estimate the population of Crocodiles [Fig. no. 3]. The indirect evidences such as foot prints, sign of body impressions were also studied.

The samples of water and soil were collected from the pointed study sites and were sent to laboratory of Regional Office, C.G. Environment Conservation Board, Bilaspur (C.G.) India and Soil Testing Office, Agriculture Department, Bilaspur Division, Bilaspur (C.G.) India for their physico-chemical analysis. The standard protocols as described by Apha [1998] were used to observe physico - chemical characteristics of the samples.

V. Observations And Results

Various physico-chemical parameters of water samples and pedological characteristics were observed during the course study (from 05th July 2014 to 04th June 2015). The observed various parameters were discussed as under –

1.1 Analysis soil samples

Table no. 1. Showing seasonal and spatial variation of mean value of different parameters of water in year 2014-15

S. No.	Name of the study sites	Parameters for soil samples					
		Ph Units	Electric conductivity	Organic carbon	Potash	Phosphate	Nitrate
1.	A.	7.1	0.125	0.3	59.5	0.14	1.48
2.	B.	7.3	0.142	0.7	62.2	0.17	1.65
3.	C.	7.2	0.133	0.6	56.3	0.16	1.58
4.	D.	7.1	0.120	0.4	61.1	0.14	1.85
5.	Range	7.1 -7.3	0.120 – 0.142	0.3 - 0.7	56.3 -62.2	0.14 –0.17	1.48 -1.85
6.	Mean	7.17	0.13	0.5	59.77	0.15	1.64

Months	Parameters for water samples												
	Air Temperature		Water Temp.	pH	Turbidity	SS	TDS	DO	BOD	COD	Total hardness	Total alkalinity	Nitrate	Phosphate
	°C		°C	pH Unit	NTU	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l
Jul.	26.0	33.8	33.6	8.6	90	107.6	126.2	4.9	3.84	40.3	30.5	45.6	0.77	1.04
Aug.	24.0	32.6	32.2	8.4	73	86.2	92.6	5.4	2.76	39.6	30.8	45.2	0.76	1.03
Sep.	22.0	31.0	31.5	8.5	68	101.3	126.5	5.5	2.75	39.1	32.4	41.3	0.74	1.04
Oct.	17.0	32.0	31.2	8.6	63	101.6	134.2	6.0	3.60	40.1	45.6	55.2	0.72	1.02
Nov.	14.0	31.0	24.2	8.4	53	102.4	139.3	6.8	3.50	40.0	76.4	57.4	0.70	1.02
Dec.	11.0	31.0	20.2	8.6	58	102.3	146.3	6.7	3.66	39.8	74.5	71.2	0.63	1.03
4-15	08.0	28.0	22.8	8.2	38	104.0	156.0	6.0	4.88	40.0	60.0	80.0	0.66	1.02
Feb.	09.4	30.2	22.2	8.8	42	103.4	183.8	6.3	4.76	40.6	44.4	86.3	0.68	1.01
Mar.	18.6	36.0	26.5	8.6	46	104.6	189.2	5.8	5.09	41.3	48.3	84.3	0.70	1.06
Apr.	24.2	39.0	32.3	9.1	44	105.2	208.6	6.5	5.35	41.5	25.6	96.4	0.76	1.04
May.	25.0	41.8	34.5	9.2	46	106.3	210.3	6.4	5.30	41.6	26.4	133.2	0.82	1.05
Jun.	24.2	37.4	35.5	9.1	95	109.2	232.3	5.2	5.20	40.8	28.6	140.2	0.85	1.06
Range	8.0 - 26.0	28.0 - 41.8	20.2 - 35.5	8.2 - 9.2	38 - 95	86.2 - 109.2	92.6 - 232.3	4.9 - 6.8	2.75 - 5.35	39.1 - 41.6	25.6 - 76.4	41.3 - 140.2	0.63 - 0.85	1.01 - 1.06
Mean	18.61	33.65	28.89	8.67	59.66	102.84	162.10	5.95	4.22	40.39	43.62	78.02	0.73	1.03

1.2 Analysis of water samples –

Table no. 2. Showing seasonal and spatial variation of mean value of different parameters of water in year 2014-15

The obtained observational data of water and soil samples were further checked by using standard methods as discussed by Apha [1998].

5.3 Number Monitoring

The number of crocodiles was counted on the study sites and their statistical value was calculated. The counted number of crocodiles is as under –

S. No.	Name of the study sites	Counted Number of Crocodiles				Total	% of the population
		Juvenile <1 m.	Sub-adult 1 to 2 m	Adult 2 to 3 m.	Big size > 3 m.		
1.	A.	03	28	28	22	81	21.42
2.	B.	06	33	29	19	87	23.01
3.	C.	09	38	35	16	98	25.92
4.	D.	13	44	40	15	112	29.62
5.	Total	31	143	132	72	378	99.97

Table no. 3. Showing survey results of counted number of Crocodiles

There are about 31 Juveniles, 143 sub adults, 132 adults and 72 big sized (Total 378) Crocodiles were counted during the course study.

5.4 Nestling behaviour

Crocodylus palustris is a hole - nestling species [Da Silva and Lenin, 2010]. Sub - adult and adult Crocodiles dig burrows [Whitaker and Whitaker, 1984]. Nests were excaved by female during day time from December to February. The nests were dug 50 - 100 meters away and above from the water level [Fig. no. 4]. Total 68 burrows were counted. Maximum numbers of burrows were placed away from the human activities.

5.5 Behavioural Responses

The activity and behavioural responses of the crocodiles were observed from 08.00 A.M. to 05.00 P.M.

5.6 Basking behaviour

The crocodiles were observed during prebaking and basking phases. The observations revealed that young crocodiles were basking on the water surface, juvenile and sub-adult were basking in diminutive contact with water and their mouth was oriented towards the water line, while adult and big sized crocodiles were basked away and oriented parallel to the water line.

5.7 Reproductive Behaviour

During breeding season the male life their snout and thrashed their tail.

5.8 Breeding Status

Peak summer season is the breeding season of Crocodylus palustris. In the month of February to April 25-28 eggs were layed by female. Eggs were incubated for 2-3 months inside the nest, hatching occurs between April to June [Fig. no. 5].

VI. Discussion And Conclusions

The Crocodilian species has been categorized as a vulnerable species. To conserve and to reduce people–crocodile conflicts a Crocodile Conservation Park is established in Kotmi Sonar of District Janjgir - Champa (C.G.) India.

The physicochemical factors effect the distribution and population of crocodile [Sahato, 2004]. It was reported that crocodile population is threatened in low water quality [Joshi et al. 2011]. The variation and access limits of physicochemical parameters were the causes of harmful effects on the population of crocodiles [Chang

et al., 2013]. Rubbery of snout and hunch back conditions were occurring in the high level of calcium [Singh et al., 2001]. Low water level without replacement is another cause of bacterial infection in hatchling of Crocodiles [Misra et al., 1993]. The poor water quality and extreme humidity in mansoon causes some myotic infection and death of hatchlings Crocodiles [Lal, 1982; Maskey, 1989].

The observed parameters of water and soil of the Munda pond are suitable for aquatic fauna and vital activities of Crocodylus palustris. Due to the aviability of medical facilities and protection of crocodile the number of crocodiles is exponential increasing.

The Crocodile Park is also developed for eco - tourism. To make the pond attractive four small islands, two watching towers and one knowledge park is also being developed in the park.

The acquired space of Crocodile Park of Kotmi Sonar is not sufficient for increasing population of Crocodylus palustris. Large sized pond or shifting of crocodiles is required for their healthy growth and survival.

The rehabilitation centre for incubation, preparation of artificial hatchery, construction of rearing ponds, development of management projects, a programme of regular systematic monitoring, technical supports and involvement of local people and village panchayat can also help boostup the strength of Crocodylus palustris.

The wetland has high potential for conservation and breeding of Crocodylus palustris. The physico chemical factors of Kotmi Sonar provide a suitable abode for Crocodylus palustris. The Crocodile Park helps in the poverty and live hood of the people. The park is also suitable for research activities and it can also increase the Job opportunities of local people and the eco-tourism as well.

Acknowledgement

. Authors are thankful to field staff and residents of Kotmi Sonar, Distt. Janjgir-Champa, Chhattisgarh state in India for providing supports during the investigation period.

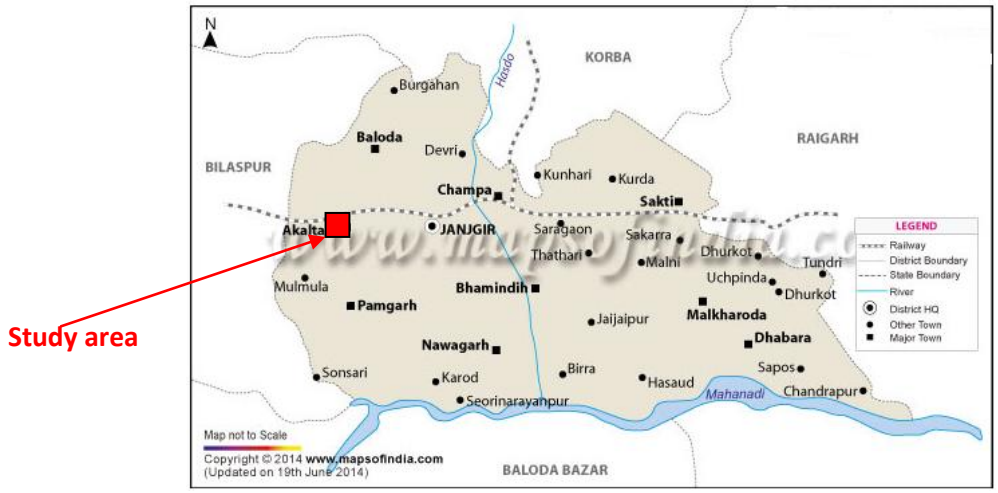

Fig. No. 1

Fig. no. 2

Fig. no. 3

Fig. no. 4

Fig. no. 5

Fig. No 1. Showing location of the study site
Fig. No.2. Showing characteristics features of Crocodylus palustris
Fig. No 3.Capture and release technique used to study characteristics of Crocodylus palustris
Fig. No 4. Showing nest of Crocodylus palustris dug in the bank of pond
Fig. No.5. Showing Hatching of young one.

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