

Comparative Population Status Of *Gavialis Gangeticus* In S.E. Part Of NCS, Rajasthan

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Abstract: *The National Chambal Sanctuary is a Tri-State managed Sanctuary; where Gharials are distributed in pockets and preferred sandy sections of the Chambal River. The gharial population status of annual surveys was compared from Keshoraipatan (Kota) to Pali Bridge (SWM), having approx. 145 kms length September 2014-16. The surveys carried out using various equipments and transect method for the data collection. A total of 24, 23 and 25 gharials were sighted respectively 2014, 2015 and 2016 in the National Chambal Sanctuary, Rajasthan. Among these 2, 3, 2 males were reported respectively. The annual survey population of Gharial is 24 ± 0.577 in NCS, Rajasthan. So it can be conclude an overall increase in the gharial population.*

Keywords: *Gharial, endemic, riverine ecosystem, transect, sightings, distribution.*

I. INTRODUCTION

Chambal River is a 960 km long water channel originates from the Singar Chouri peak in the northern slope of the Vindhyan escarpment, at an elevation of about 843 m, 15 km west-south-west of Mhow in Indore District, Madhya Pradesh [1]. The NCS is a Tri-State managed Sanctuary and protected under management of National Chambal Sanctuary also managed by concerned state forest departments [2]. The River Chambal is protected under management of National Chambal Sanctuary and managed by concerned state forest departments. The River Chambal is cradle home of several C.E. and E. sp. like the *Platanista gangetica* (National Aquatic Animal), *Gavialis gangeticus*, *Crocodylus palustris*, *Lutra perspicillata*, fresh water turtles and *Rynchops albicollis* in large numbers and 145 species of avian fauna [3]. The NCS holds largest viable population of endemic and critically endangered Gharial [4,5]. Keeping in mind the biodiversity significances of riverine stretch, a systematic and scientific study has been conducted to find out to population status of gharial, in NCS,

Rajasthan. Previous studies exhibits that Gharial population is fluctuated between 7-25 [6,7,8,9,10,11] and 49 gharials observed during the monitoring period [12,13,14] of gharial in NCS, Rajasthan.

II. STUDY AREA

The National Chambal Sanctuary (NCS) lies between 25°02' to 26°26'N and 75°40' to 79°12'E. It consists of the large arc described by the Chambal River between Jawahar Sagar Dam (Coordinate; 25°02'N, 75°40'E) in Rajasthan and the Pachnada after Chambal-Yamuna confluence (Coordinate; 26°29'N, 79°14'E) in Uttar Pradesh. Two stretches of the Chambal, along this arc, are protected as the National Chambal Sanctuary; the upper stretch, extending from the Jawahar Sagar Dam to the Kota Barrage and the lower stretch, extending from Keshoraipatan in Rajasthan to the Pachnada after Chambal-Yamuna confluence at Bhareh in Uttar Pradesh [11].

The whole study was conducted between in stretch of 145 kms K.Patan to Pali Bridge; coordinates varies from 25°17'N, 75°56'E to 25°51'N, 76°34'E (table 1 and Figure 1). The study area was divided into three zones, detailed as follow-

Zone ID	Zone name	GPS Coordinates		Approx. Length in Kms
		Start point	End point	
Zone I	Keshoraipatan to Pipalda Samel	N 25°17' E 75°56'	N 25°32' E 76°16'	76.00
Zone II	Pipalda Samel to Dipri	N 25°32' E 76°16'	N 25°42' E 76°20'	32.00
Zone III	Dipri to Pali Bridge	N 25°42' E 76°20'	N 25°51' E 76°34'	37.00
Total length				145.00

Table 1: Zone-wise design of study area of NCS, Rajasthan

III. METHODOLOGY

The study area under sanctuary has been divided into three zone-wise as in table 1. February and March months were selected for the annual study purpose due to most favourable preferred season for basking and nest trail by gharials. The whole survey were conducted by walking along the river at its both banks with the help of raw-boats, between 09:00 hr and 17:00 hr. Binoculars were used to spot gharials, basking on land or swimming on water surfaced. Data were recorded on data-sheets. During the each surveys, GPS device (Garmin-etrex), Binoculars (12X50), Data Sheet, Field Map Camera and field guides for reptiles [15,16,17] were used. The population of gharial was estimated by using transect method [18,19,20], based on the principle of direct sighting and for the size classes of gharials identified as suggested by Bustard and Singh [21].

IV. DATA ANALYSIS

Preliminary data entry was done in MS Excel by developing a format following the parameters mentioned above. Raw data was extracted from the GPS receiver to computer by using Map Source Software. Maps were prepared in the Q GIS software with using waypoints, tacks and GT sheets etc. The mean of the annual survey population and standard error were calculated by using past statistical software [22].

V. RESULTS

Data reveals that gharials are distributed in pockets and preferred sandy sections of the Chambal River. A total number of 24, 23 and 25 gharials of various size classes were sighted in the 145 km stretch of the NCS, Rajasthan from 2014-16 respectively 2, 3 and 2 adult males were observed during study period. The distribution of gharial is show in Figure 4. By the comparison of data of 2014, 2015 and 2016, it can be concluded that population of gharial is rising in NCS, Rajasthan (table 2 and Figure 2).

Zone ID	Zone name	Approx. Length in Kms	Approx. Gharial population		
			2014	2015	2016
Zone I	Keshoraipatan to Pipalda Samel	76.00	0	3	0
Zone II	Pipalda Samel to	32.00	4	3	3

Dipri					
Zone III	Dipri to Pali Bridge	37.00	20*	17	22
Total		145.00	24	23	25

Source: [9,10,11] and Personal observation of Meena from Pali to Pali Bridge of 4.2.2014*

Table 2: Zone-wise population of Gharial in study stretch of NCS, Rajasthan

By the comparing of Gharial population of annual surveys of NCS Rajasthan, It can say that the annual survey population of Gharial is 24 ± 0.577 and encounter rate is 0.165 gharial per km in NCS, Rajasthan.

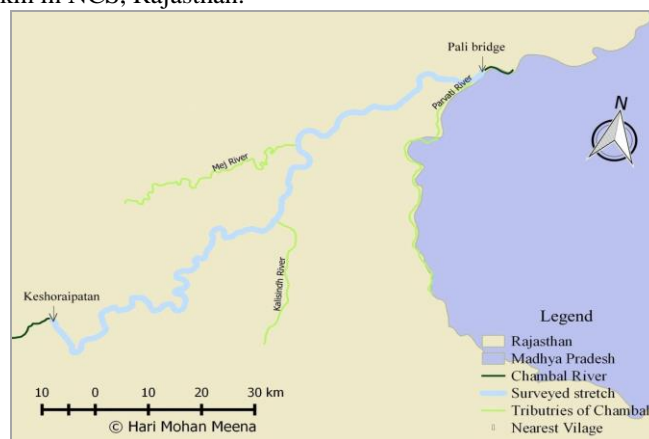


Figure 1: Study stretch of National Chambal Sanctuary, Rajasthan



Photo 1: Basking Male, female and sub-adult Gharial on Pali Island

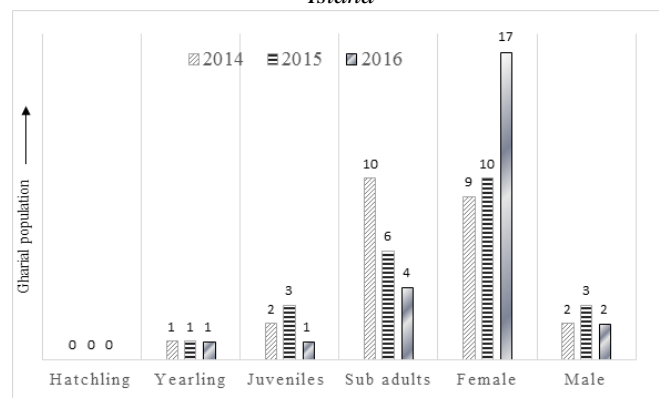


Figure 2: Trend in gharial population from 2014, 2015 and 2016 in NCS, Rajasthan

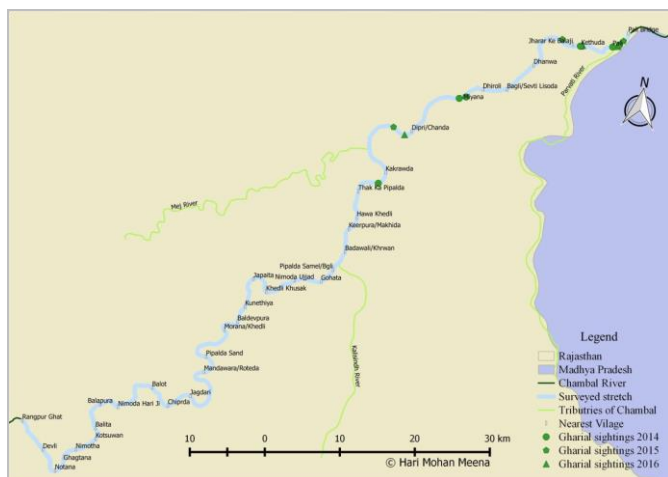


Figure 3: Distribution gharial in study stretch from 2014, 2015 and 2016 in NCS, Rajasthan

VI. DISCUSSION

The gharial is a Critically Endangered, Endemic and Charismatic flagship species of freshwater ecosystem, is increasingly threatened due to over exploitation of its habitat and now 574 gharials remains in NCS, Rajasthan [3]. Land-use changes, reduction in water flow due to dams, modification of river morphology, loss of nesting sites, mortality in fishing nets and egg-collection for consumption [23,24] are some of the major affecting factors of gharial populations [5]. Strict implementation of rules and regulation with appropriate conservation measures are needed to save the surviving population of this flagship species and ecosystem of the NCS.

VII. KEY FINDS AND RECOMMENDATIONS:

The following key finding and recommendations are suggested for the further conservation and managements of National Chambal Sanctuary, Rajasthan

- ✓ Annually scientific census of aquatic fauna should be conducted in the complete stretch of NCS, Rajasthan with coordination of Madhya Pradesh Forest Departments for recognize the trends of population and further development of conservation strategies and monitoring of key habitats stretches.
- ✓ Inadequate flow of water down to Kota barrage and untreated sewage water is directly discharging which is producing water hyacinth weeds in River that indices water pollution. It is recommended that sewage water directly discharged should ban.
- ✓ Threats were observed in the survey stretch, while commercial fishing is doing near the Kota city. To regulate threats in the sanctuary a systematic monthly monitoring plan should be generate and implements in the both banks staffs with mutual coordination.
- ✓ To promote sustainable manner and organic agriculture near the revenue lands of river banks.

- ✓ To promote education awareness programmes for the local community and involve in conservation activities of the sanctuary through the eco development program.
- ✓ In the entire survey stretch only Pali is observed nesting site of critically endangered Gharial. It is recommended that tourism activities should be stop near 5 km stretch of the river.

REFERENCES

- [1] Jain, S.K.; Agarwal, P.K. and Singh, V.P. 2007. Hydrology and Water Resources of India. Water Science and Technology Library. Springer-Verlag, Heidelberg. p. 1258.
- [2] Choudhary, B.C.; Gautam, P. and Nair, T. 2014. Generic tri-state management plan-National Chambal Sanctuary. National Tri-State Chambal Sanctuary Management and Co-ordination Committee (NTRIS-CASMACC). MoEF, GOI.
- [3] Meena, H.M. 2015 RJ-MP. Aquatic Annual Survey of National Chambal Sanctuary, Rajasthan; Pali to Gadi Tidawali, 2015. Submitted to Deputy Conservator of Forests, NCS, Sawai Madhopur, Rajasthan. Page 30.
- [4] Hussain, S. A. 1993. Aspects of the ecology of smooth-coated otter (*Lutra perspicillata*) in the National Chambal Sanctuary, India. PhD thesis, Centre for Wildlife and Ornithology, Aligarh Muslim University, Aligarh.
- [5] Nair, T. 2010. Ecological and anthropogenic covariates influencing Gharial *Gavialis gangeticus* distribution and habitat use in Chambal River, India. Unpublished Master's Thesis. National Centre for Biological Sciences, Tata Institute of Fundamental Research, IV+74pp.
- [6] Sasmal, A. and Meena, H.M. 2012. To assess the impact of Human disturbance on Gharials (*Gavialis gangeticus*) and Mugger (*Crocodylus palustris*) in National Chambal Sanctuary (NCS). Submitted to Coordinator, Department of Wildlife Science, University of Kota, Rajasthan. April 2012, pp 1-37.
- [7] Meena, H.M. 2013. Gharial and Mugger population status survey in National Chambal Sanctuary, Rajasthan; Keshoraipatan to Jhrer Ke Balaji, 2013. Submitted to Deputy Conservator of Forests, Rajasthan Forest Departments, NCS, Sawai Madhopur, Rajasthan.
- [8] Meena, H. M.; Kumar, S.; Sultana, F.; Khan, S.; Rakesh, B. and Bhardwaj, A. 2013. Survey of Gharial and Crocodile in National Chambal Sanctuary, Rajasthan. Published in *National conference on Forest and wildlife: Present Status, Future Needs and Challenges ahead*. 30-31 January, 2013. Page 34.
- [9] Meena, H.M. 2014. Aquatic faunal survey of National Chambal Sanctuary, Rajasthan from Keshoraipatan to Pali Ghat, 2014. Submitted to Deputy Conservator of Forests, Rajasthan Forest Departments, NCS, Sawai Madhopur, Rajasthan. Pages 1-33.
- [10] Meena, H.M. 2015. Aquatic faunal survey of National Chambal Sanctuary, Rajasthan; Keshoraipatan to Pali Ghat, 2015. Submitted to Deputy Conservator of Forests, NCS, Sawai Madhopur, Rajasthan. Pages 1-30.

- [11] Meena, H.M.; Taigor, S.R. and Nama, K.S. 2016. Aquatic faunal Survey of National Chambal (Gharial) Sanctuary, Rajasthan; K.Patan to Pali ghat, 2016. Submitted to Deputy Conservator of Forests, Rajasthan Forest Departments, NCS, Sawai Madhopur, Rajasthan. Page 40.
- [12] Meena, H. M. 2013D. Ecological assessment of Gharial (*Gavialis gangeticus*) and Crocodile (*Crocodylus palustris*) in National Chambal Sanctuary, Rajasthan. M.Sc. dissertation, Department of Wildlife Science, University of Kota, Rajasthan.
- [13] Meena, H. M.; Sultana, F.; Khan, S.; and Anoop, K. 2013J. Status Survey of Gharial (*Gavialis gangeticus*) and Crocodile (*Crocodylus palustris*) in National Chambal Sanctuary Rajasthan, India. Published in *National conference on Biodiversity Conservation: Embracing Our Future, Preserving Our Past*. 27-28 September, 2013. O-20.
- [14] Meena, H.M. and K. Anoop 2014. Ecological assessment of Crocodilian species in NCS, Rajasthan (India); *Gavialis gangeticus* and *Crocodylus palustris*. LAP LAMBERT Academic Publishing. ISBN: 978-3-659-57729-1.
- [15] Daniel, J.C. 2002. The Book of Indian Reptiles and Amphibians. Bombay Natural History Society. Oxford University Press.
- [16] Ahmed, M. F.; Das, A. and Dutta, S. K. 2009. Amphibians and Reptiles of Northeast India - A photographic guide. Aaranyak, Guwahati, India.
- [17] Vasudevan, K. and Sondhi, S. 2010. Amphibians and Reptiles of Uttarakhand, India. Wildlife Institute of India. Dehradun.
- [18] Perrin, W.F. and R. L. Brownnell, Jr. 1989. Report of the workshop. In W.F. Perrin, .L. Brownell, Jr., Zhou Kaiya, and Liu Jiankang (eds). Biology and Conservation of the River Dolphins. IUCN Species Survival Commission Occasional Paper 3. Pp. 1-22.
- [19] Singh, L.A.K. and Sharma, R.K. 1985. Gangetic Dolphin *Platanista gangetica* habits and distribution pattern in National Chambal Sanctuary. J. Bombay Nat. Hist. Soc., 82(3):648-653.
- [20] Rao, R. J., Hussain, S. A. and Sharma, R.K. 1989. The status and conservation of Ganges dolphin (*Platanista gangetica*) in the National Chambal Sanctuary. *Tiger paper*, 6 – 10.
- [21] Bustard, H. R. and Singh, L. A. K. 1977. Studies on the Indian Gharial *Gavialis gangeticus* (Gmelin) (Reptilia, Crocodilia) – I: Estimation of body length from scute length. Indian Forester 103 (2): 140-149.
- [22] Hammer et al., 2001. <http://folk.uio.no/ohammer/past>.
- [23] Whitaker, R. and Members of the Gharial Multi-Task Force, Madras Crocodile Bank 2007. "The Gharial: Going Extinct Again". *Iguana* 14 (1): 24–33.
- [24] Hussain, S. A. 2009. Basking site and water depth selection by Gharial *Gavialis gangeticus* Gmelin 1789 in National Chambal Sanctuary, India and its implication for river conservation. *Aquatic Conservation-Marine and Fresh water Ecosystems* 19:127-133.