



Distribution and Population Status of Marsh Crocodiles, *Crocodylus Palustris* In Nara Desert Wildlife Sanctuary (NDWS) Sindh, Pakistan

M.S. CHANG, G.S. GACHAL, A.H. QADRI, T. JABEEN, S. BALOACH, M.Y. SHAIKH

Department of Zoology, University of Sindh Jamshoro, Sindh, Pakistan.

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Abstract This research paper aimed to study for the bio-ecological status and distribution of Marsh Crocodile population in the studied areas of Nara Desert Wildlife Sanctuary (NDWS) and its adjoining areas. There are 23 living species of order Crocodylia in the world; the Marsh Crocodile, *Crocodylus palustris* is the only species that has been recorded in Sindh Pakistan among the Crocodylian species, occurring in Nara Desert Wildlife Sanctuary (NDWS) Sindh, Pakistan. Present investigation was carried out at NDWS during the year of 2006 to 2009, in order to determine the ecological status of Marsh Crocodiles. The observation revealed that the total number of Marsh crocodiles were 326 in the studied areas of NDWS among them 184 were adult Crocodile, 91 were juveniles and 51 were hatchlings. The population of Marsh Crocodiles are facing the major threats of habitat destruction, hunting, Shortage of water, change of Water quality and other anthropogenic activities.

Keywords: Marsh Crocodile, Sanctuary, Hunting, Habitat destruction and Nara Canal.

1. INTRODUCTION

The Government of Sindh declared as a Nara Desert Wildlife Sanctuary in the year of 1980 and established for the protection of Wildlife in Nara desert district Khairpur. The Nara Desert Wildlife Sanctuary provides home to a large population of wildlife in Sindh province. The Nara Desert Wildlife Sanctuary which covers more than 200 small, permanent, seasonal, freshwater, brackish, marshy and saline lakes. It starts from the Sukkur barrage, run more than 200 km which cultivate the large areas of Khairpur, Sanghar, Umarkot and Mirpurkhas districts. In the past, the large population of Marsh Crocodiles, *Crocodylus palustris* and Gavials (*Gavialis gangeticus*) live co-existed in the Nara Desert Wildlife Sanctuary but due to hunting pressure the Gavials were extinct.

There are 23 species of Crocodiles in the world today, (Alderton, 1991, Densmore, 1983, Hass, *et al.*, 1992). Order Crocodylia is comprised of three families viz: (1). **Alligatoridae** (the Caimans /Alligators), (2). **Crocodylidae**: *Crocodylus palustris* (the Mugger Crocodile) and (3). **Gavialidae**: (the Gaviel) (King 1988, Norell, 1989, and Poe, 1996). The females lay approximately 25-30 eggs in the hole nests near their habitat, (Rao, 1994, Whitaker, and Whitaker, 1989). The incubation period of Crocodiles is very short which lasts about 55-75 days, (Tarsitano, *et al.*, 1989, Thorbjarnarson, 1992, Tikader, 1983, and Webb, *et al.*, 1987). The eggs of crocodiles possess hard calcareous

shell and it has total length of 9×6 cm at both equal ends.

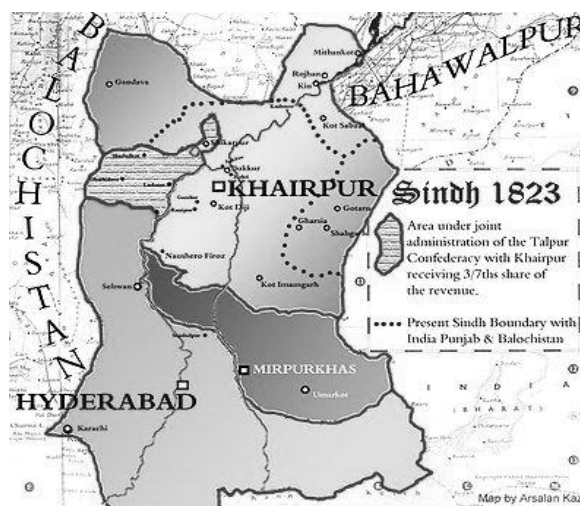


Fig No. 1. Map of Nara Desert Wildlife Sanctuary (Khairpur)

2. MATERIALS AND METHODS

The various surveys were conducted in the areas of Nara Desert Wildlife Sanctuary (Sukkur, Khairpur, Nawabshah, Sanghar and Mirpurkhas districts) during the year of 2006 to 2009. Surveys were undertaken to determine the population status and distribution of Marsh Crocodiles (*Crocodylus palustris*) and its associated threats in the studied areas of NDWS.

(a). Field Equipments

During the collection of data, we have used the strong torch lights for night surveys and also we have looked up the burrows of Crocodile during day. During survey faecal pellets of Marsh Crocodile were collected and saved in plastic bags and labeled it respectively. We have used GPS which was very helpful for the location of areas where the Crocodile population found. It is very helpful for measuring, observing and mapping of studied areas. Binocular was used for the identification of different gut contents of Marsh Crocodile and easy to focus from their location. The captured individuals of Crocodile were measured with tape. For the counting of Crocodile population in lake, canals and its water ways boats were used and launch and fishing net were used for capturing the individuals of Crocodile. Digital camera was used to take the pictures of Crocodile and its tracks, signs, footprints and other evidence of Crocodile. Map was helpful for the location of Crocodile population and identification of studied areas.

(b). Methods

During the study, two methods were used for determining the population of Marsh Crocodile, (i). Direct method and (ii). Indirect method. During the direct method, we have counted and observed the sighting habitats, basking spots, swimming at surface water and catching the reflection of eyes of Crocodile during the night observation. During the investigation of indirect method we have collected the data through the different signs of Crocodile such as faecal pealllets, den or tunnel, tracks, trails and egg shells. We have also collected the data from different sources such as interviews from the local community, Game watchers, Game inspector and fisherman etc.

3.

RESULTS

The study was carried out from the areas of NDWS in the year of 2006 to 2009 for the purpose of bio-ecological status and distribution of Crocodile.

During the study, in the areas of NDWS and waterways, the total number of counted Crocodiles were

Three hundred twenty six (326), out of this, 184 were adult Crocodiles, 91 were juveniles and 51 were hatchlings recorded, (**Table 1**).

During the study, it was recorded that the population of adult Marsh Crocodile was highest (80) in Pirana Pitan and the lowest (1) population of adult Crocodile was recorded in Wahan Dhandh, the highest (30) population of juvenile Crocodile was recorded in Pirana Pitan and the lowest (1) population of juvenile Crocodile was recorded in Dangewari Dhandh, the highest population of Hatchlings (20) was recorded in Pirana Pitan and the lowest (1) population of hatchlings was recorded in Dangewari Dhandh, (**Fig 2**).

Table 1: Population Status Of Marsh Crocodiles In Nara Desert Wildlife Sanctuary

S. NO.	Name of the wetland	Adult	Juvenile	Hatchlings
1.	Nagio Pir Dhandh	5	3	0
2.	AkheroDhandh	5	2	2
3.	Gunja Dhandh-I	2	2	0
4.	Gunja Dhandh-II	2	4	3
5.	Tooty Dhandh	15	8	4
6.	Jahari Dhandh	7	4	5
7.	Dangewri Dhandh	2	1	1
8.	Kherchand Dhandh	3	2	0
9.	Sodhra Dhandh	2	2	0
10.	Pirana Pitan	80	30	20
11.	Goth Saida Sharif	18	10	8
12.	Choti Dhandh (West of Nara)	12	4	6
13.	Karan Dhandh	4	2	3
14.	Deso Dhandh	5	3	2
15.	LeemonWaro pat	2	2	0
16.	Sodhar Faqir	3	2	0
17.	Wahan Dhandh	1	2	0
18.	GhoreWaro/ Sang	3	2	0
19.	BaireWari	13	6	5
Total:		184	91	51

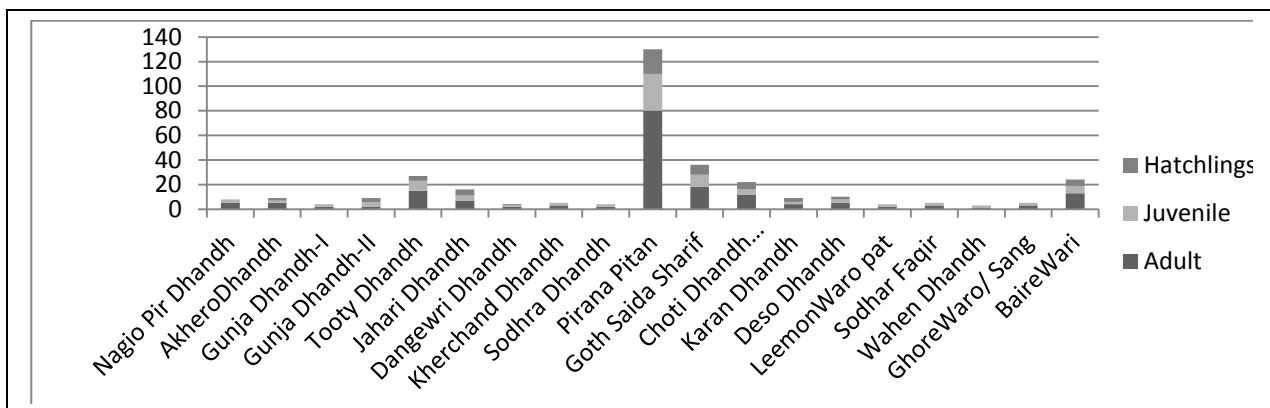


Fig No. 2: Mean graph showing the population of Crocodiles in NDWS Khairpur

The change in temperature of climate in which the Crocodile lives which is severely affected and it is very difficult to survive in the harsh environment. Recently the summer is going to warmer and the winter is going to cold which is directly affecting the body temperature of Crocodile because due to nature of cold blooded animal (Fig No. 3).



Fig No. 3. Marsh Crocodile basking in Nara Canal

Table 2: List Of Wetlands Where Marsh Crocodiles Not Found In Ndws

S. NO.	Name of the wetland	S. NO.	Name of the wetland
1.	Kathore Dhandh-I	18.	Dolaho Dhandh
2.	Kathore Dhandh-II Near Sawan	19.	Sadro Dhandh
3.	Taj Minor (Kathore Channel)	20.	Lalri Dhandh
4.	Khario Dhandh	21.	Putkan Dhandh
5.	Sumabhi Dhandh	22.	Khurandh Dhandh
6.	Wichanowaro Village	23.	Gumbat RD
7.	Adkau Dhandh	24.	Mangrik Dhandh
8.	Keni Dhandh	25.	Barej Dhandh
9.	Sawan Wetland -III	26.	Jagir Dhandh
10.	Phario Dhandh	27.	Sim Dhandh
11.	Puno Dhandh	28.	Kharari Dhandh
12.	Sahore Dhandh	29.	Dabhanwari Dhandh
13.	Jamalaho Dhandh	30.	Pir Dino Village (North of Nara)
14.	Akanwari Dhandh (Goth Allah Bux)	31.	Chirakh Dhandh
15.	Shaho Dhandh	32.	Bhalao Dhandh
16.	Khakhro Dhandh	33.	ChapparWari
17.	Sodha Pir Dhandh	34.	KirariWaro

4.

DISCUSSION

The aim of this study was to determine the ecological, hydrological, environmental, management, distribution and conservational threats to Crocodile's population in wild.

The survey results are described in the Table 1, which shows the total population of Crocodiles in the studied areas of Nara Desert Wildlife Sanctuary.

In Pakistan, some previous studies on Marsh Crocodile were carried out by (Groom bridge, 1982 and Whitaker, 1993). In Pakistan, the various population surveys were conducted by scientists and in NDWS the population surveys were conducted and the Crocodile population were recorded about five hundred only in the areas of Makhi/Bakar lake by Pakistan Zoological Survey of Pakistan in 1997 and about more than one thousand Crocodile population in Chotiari Reservoir and its surroundings by Sindh Wildlife Department in 1999-2000. Two surveys on Marsh Crocodiles were carried out by the Zoological Survey Department of Pakistan in the year of 2004 and 2005 respectively and according to their observation Two hundred twenty six numbers of Marsh Crocodile were recorded in NDWS. WWF-Pakistan conducted the Marsh Crocodiles' population survey of Nara Canal in the year of 2008 and in Chotiari Reservoir in the year of 2008-2009. Crocodile Specialist Group (CSG) carried out most recent Crocodile's survey in the different areas of Sindh including NDWS in January 2009, (CSG March 2009, and Volume 28 Number 1).

It is reported that the population of Marsh Crocodile became extinct in the province of Punjab on account of habitat degradation, (Chaudhury, 1993, Khan, *et al.*, 1976). While in the rivers of Nari, Hab, Fitiani, Hingol, Dasht, Nahang and Kuch kuar a little numbers of Marsh Crocodiles were reported in the province of Balochistan, (Ahmed, 1986, Ghalib, *et al.*, 1977 and Khan, 1989). However, in the province of Sindh only small numbers of Marsh Crocodiles were seen along the Nara Canal in Khairpur (Wild), Deh Akro 2 (Nawabshah), Chotiari reservoir Sanghar (Wild), New Jatoti Moro, Naushahro Feroze (captive), Haleji lake Thatta (Captive and Wild), Mangho Pir, Karachi Zoological Garden, Shamzoo Park and khar center Karachi in Captivity, (Ahmed, 1990 and Javed, *et al.*, 2004). In last decades, the Crocodile Population in Nara Canal, Deh Akro 2 and Chotiari reservoir were in thousand numbers but unfortunately now a day their numbers are very small due to fishing practices, hunting, habitat degradation, shortage of water, construction of dam and so on. During our observation, the Marsh Crocodile population was recorded in the studied areas of NDWS and we recorded the Marsh Crocodile population as: Adults were 184; Juveniles were 91 and 51 were hatchlings, (Table 1).

The development and other human influence have resulted the declination of Marsh Crocodile, Gavial and Otter population from the Nara Desert Wildlife Sanctuary, District (Khairpur), Sindh-Pakistan. The global change in environmental factors has drastically effect on the population of Crocodile and other biodiversity. The hunting pressure and habitat destruction were recorded the major threats for the

Crocodiles. The shortage of water was also recorded serious effect on the Crocodiles.

The availability of food in their natural ecosystem is not fulfilling to the requirement of the population of Crocodiles. Most population was killed during the winter season when it comes out from the water for basking on the bank of Canal or Lake. It also indicates that in the breeding season when the Crocodiles migrate from one lake to an other lake for mating purpose at that time they were killed from the local community and hunters.

The research study reveals that the human interference is severely affected the ecology of Crocodile and their survival in natural environment become very difficult. So that it is the need of time that the people should be aware about the importance of correlation of species with their ecosystem through the scientific study. In ecosystem, when the prey is not available to the animals the population disperse from their original habitat which is very harmful for the survival of the species. The Marsh Crocodiles are bio indicator, which really focused attention on the major issues of the pollution, which are directly concerned with the human health and life by using the polluted water.

5. ACKNOWLEDGEMENT

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