

Effect of Water Depth and River Width on Indus Dolphin Population

Muhammad Akbar, Abdul Aleem Chaudhry and Muhammad Javed Arshed
Punjab Wildlife Research Institute, Gatwala, Faisalabad, Pakistan

Abstract

Studies on Indus dolphin (*Platanista minor*) were conducted during population surveys in River Indus from Chasma-Guddu Barrage during 1992-94 and 1998-2000. Effect of water depth and river width on population distribution of Indus dolphin was studied. During six different surveys total 819 dolphins were sighted, out of which no dolphin was found in 0-5 feet deep water. Water depth ranged 5-8, 8-11, 11-14, 14-17, 17-20, 20-23 and 23-26 feet had 8.05, 31.87, 31.99, 19.17, 6.10, 0.12 and 2.69% population of Indus dolphin respectively. Width of the river ranged 0.0-0.5, 0.5-1.0, 1.0-1.5, 1.5-2.0, 2.0-2.5, 2.5-3.0, 3.0-3.5, and 3.5-4.0 km indicated 14.16, 29.06, 34.92, 16.12, 3.30, 0.12, 1.10 and 1.22% population of dolphin respectively. The results indicated that the most preferred habitat is that which has a water depth 8-17 ft and river width 0.5-2.0km. Water depth, width of river and the water flow affected the distribution of dolphin population. When quantity of water in the river changed, the river changed its dimensions both in width and depth, consequently dolphin population adjusted according to preferred depth and width by moving up or down stream in the river.

Keywords: Dolphin population, River width, Water depth

Introduction

Blind Indus dolphin (*Platanista minor*) locally called "Bhullan" is one of the least abundant and the most endangered cetacean specie of the world. The animal is endemic to Pakistan. Anderson (1879) reported the presence of Indus dolphin in all the rivers of Punjab, whereas, at present its distribution is restricted only to river Indus.

Indus dolphin has been enlisted as endangered in IUCN Red Data Book since 1976 and is on Appendix I of the Convention on International Trade in Endangered species (CITES), therefore, warrants strict protection. It is protected under the Wildlife Acts of Punjab (1974), NWFP (1975) and Sindh (1997).

Corresponding author: Muhammad Akbar
Punjab Wildlife Research Institute, Gatwala,
Faisalabad, Pakistan
E. Mail: wildlife@fsd.comsats.net.pk

The rivers have been fragmented because of construction of dams and barrages and tamed to irrigate the vast Indus Plains. This has resulted into reduction in stream flow, the habitat loss and greatly reduced distribution of Indus dolphin.

There are great and serious variations in stream-flows, from month to month and year to year. Year 1986, 1988 and 1992 were the years of high floods, reached a peak flood level of 709 thousand cusecs at Sukkur and 900 thousand cusecs at Guddu in 1992. Irrigation water is distributed from Guddu, Sukkur and Kotri barrages. Downstream of Kotri, stream flow is minimized falling to 1,700 cusecs in December 1986, even this flow dries up or is distributed making the river stretch upto the deltaic region unsuitable for the dolphin.

Materials and Methods

Indus river from Chashma-Guddu Barrage was surveyed during the years 1992-94 and 1998-2000 on a motor boat, moving downstream at a range speed of 6-8km/hour. Four observers were deployed on the boat who served as under:

1. Left observer-surveyed the water from in front of the boat to 90 degrees from the vessel on the left side.
2. Front observer-surveyed the river directly in front of the boat and 45 degrees on either side of the boat.
3. Right observer-surveyed the river from in front of the boat to 90 degrees from the boat on the right side.
4. Rear observer-surveyed back side of the vessel and searched for dolphins missed by the other observers. He also worked as data recorder.

Indus river dolphin lack gill-system and appear on surface of water to take oxygen. This appearance on water-surface is termed as surfacing. It is the surfacing-phase only when dolphins appear on water-surface and can be observed/recorded. Physiographic parameters, regarding width of the river and water depth were recorded, where dolphins were sighted. Width of the river was measured with the help of a laser range finder whereas depth of the water was measured by a manually graduated bamboo dipping into water. The data were recorded daily on data sheets.

Results and Discussion

Due to construction of barrages, dams and link canals in the river Indus, water below in the main river body is regulated at headworks. This results in a change in water level, width of the river and habitat dimensions.

Effect of water depth on Indus Dolphin population

During the study observations were recorded on depth of river at the points where dolphin or dolphin groups were observed. In the years 1992-94 and 1998-2000 river depth was recorded. The distribution of dolphin at various depths is shown in Table 1.

According to frequency distribution, dolphin avoid shallow water and no animal was found in 0-5 feet deep water. Water depth ranged 5-8 feet was preferred by 8.05%, 8-11 feet by 31.87%, 11-14feet by 31.99%, 14-17feet by 19.17%, 17-20feet by 6.10% 20-23feet by 0.01% and 23-26feet by 2.69% of dolphin population. According to results 63.86% of dolphin population, prefer water depth ranging between 8-14 feet and 83.03% of dolphin population; prefer water depth ranging between 8-17feet. Dolphin avoids deep water, when depth of water increased above 17ft only 8.91% population was recorded in

deep water. The results indicated that the river segments having 8-17feet water are highly suitable for dolphin and for further conservation of its population.

0.01% population of dolphin was found in 20-23feet deep water whereas, 2.69% population of dolphin was found in 23-26feet deep water which is higher than the earlier. Actually 20-23 feet deep water flows with very high speed which is not favourable to dolphin whereas 23-26 feet deep water is found in the pond areas of barrages and dams which flows with very slow speed. This indicated that flow speed of water also plays an important role in population dispersion of dolphin.

Effect of river width on Indus Dolphin population

As there is increase in water discharge from barrages, the width of river is increased proportionally which results in an increase in dolphin habitat. Effect of river width on dolphin population was studied. According to frequency distribution, river width ranging 0.5-1.5km provide a favourable habitat to dolphin. With the increase in width beyond two kilometer, few dolphins were observed in the river segment (Table 2).

Table 1: Distribution of dolphin population with respect to river depth

S. No.	Depth of river (ft)	No. of Dolphins Observed						Total Population (%)
		1992	1993	1994	1998	1999	2000	
1	00-05	0	0	0	0	0	0	0.00
2	05-08	7	18	13	3	11	14	8.05
3	08-11	35	58	61	15	40	52	31.87
4	11-14	70	67	49	17	26	33	31.99
5	14-17	43	11	30	28	32	13	19.17
6	17-20	12	6	7	20	4	1	6.10
7	20-23	0	0	0	1	0	0	0.12
8	23-26	6	2	0	7	6	1	2.69
Total		173	162	160	91	119	114	819

Table 2: Distribution of dolphin population with respect to river width

S. No.	Width of river (ft)	No. of Dolphins Observed						Total Population (%)
		1992	1993	1994	1998	1999	2000	
1	0.0-0.5	1	20	18	11	29	37	14.16
2	0.5-1.0	28	37	33	35	54	51	29.06
3	1.0-1.5	108	44	52	27	32	23	34.92
4	1.5-2.0	36	36	35	18	4	3	16.12
5	2.0-2.5	0	5	22	0	0	0	3.30
6	2.5-3.0	0	1	0	0	0	0	0.12
7	3.0-3.5	0	9	0	0	0	0	1.10
8	3.5-4.0	0	10	0	0	0	0	1.22
Total		173	162	160	91	119	114	

According to preference, the river segment having width upto half km was preferred by 14.16% of population; river width upto one km was preferred by 29.06% of population. Similarly the river segment upto 1.5 km width was preferred by 34.92% of the dolphin population, which is most preferred width.

In the river segment having width between 1.5 to 2.0km, 16.12% population of Indus dolphin was recorded with the increase in width beyond 2km, a regular decline in population of dolphin was observed. The river segment of 2.0-2.5km width had 3.3% population of dolphin. According to the results

maximum width of the river upto 4km was recorded during the year 1993 and 20 dolphins having 2.44% were observed in the river segment of 2.5-4km width. With an increase in width, the habitat beyond two km is mostly shallow and is not a preferred habitat for dolphin.

Water discharge inversely affects dolphin population; with the increase in water discharge, depth and width of the river are changed and dolphin groups shift to new areas of the habitat, falling in preferred depth and width (Saif, 1991). Water-depth, width of river and the water flow affected the distribution of dolphin populations in the river. Dolphin prefer a certain depth, width and water flow. When discharge of water is increased, flow of water in river body is changed directly. With this the river changes dimensions both in width and depth. Dolphin population adjusts according to preferred depth moving up or down stream. Water depth below 5ft is not preferred by dolphin as no dolphin was observed in water depth less than 5ft. River depth from 08-17ft is preferred habitat for 83.03% population of dolphin. Similarly 14.16% dolphin population preferred river width upto 0.5km and 80.1% dolphin preferred river width 0.5-2.0km. The results indicated that the most preferred habitat by dolphin is that which has a water

depth range 08-17ft and river width 0.5-2.0km. Kasuya and Nishiwaki (1975) reported that population of Indus dolphin was declining 10% per year due to effects of shrinking habitat and direct exploitation.

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Abstract. 1. Many river dolphin populations are most vulnerable during the low-water season when habitat is limited. Indus River dolphin habitat selection in the dry season was investigated using Generalized Linear Models of dolphin distribution and abundance in relation to physical features of river geomorphology and channel geometry in cross-section. 2. Dolphins selected locations in the river with significantly greater mean depth, maximum depth, cross-sectional area, and hydraulic radius, and significantly narrower river width and a lower degree of braiding than areas where dolphins were ab