



Biological Status of Demoiselle Crane (*Anthropoides Virgo*) in FR Bannu, Pakistan

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All authors made equal contributions to the conception and design of the project, data analysis and preparation of the manuscript

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ABSTRACT

In the present study, 73 crane keepers/hunters were interviewed in the FR Bannu region visited and total of 131 active breeding pairs were found in captivity with them. Total of 261 eggs were laid out of which 215 (82.37%) were hatched successfully while the remaining 46 (17.63%) were added. The average incubation period was 29.1 days. The survival rate of adults and chicks was noted which was 100% and 76.49% respectively. It was also noted that the cranes can lay from 2-6 new eggs when the old ones are removed at the time of laying. The fledging time of young ones was an average of 77 days. The parental care duration in captive demoiselle crane was 1 year. The adults were fed with the different types of food of plant and animal sources (vertebrates and invertebrates). The food of adults was slightly different from that of young ones and mostly includes grasshopper, millet, insects and meat. Our study indicated that the survival rate of young ones (Demoiselle cranes) was quite low (76.49%) as compared to the adult (100%). A large number of young ones/chicks die due to various diseases because the young ones are very susceptible to the disease. Many also die in accidents involving electric wires, trees and walls, as they were not mentally so mature as compared to the adults. Serious measures are required to be taken in order to stop crane hunting in these areas. As the hunting and pouching of Cranes are increasing in this area which are strongly affecting their population and migration pattern. They have changed their migratory routes as most of the locals of the area are involved in hunting.

INTRODUCTION

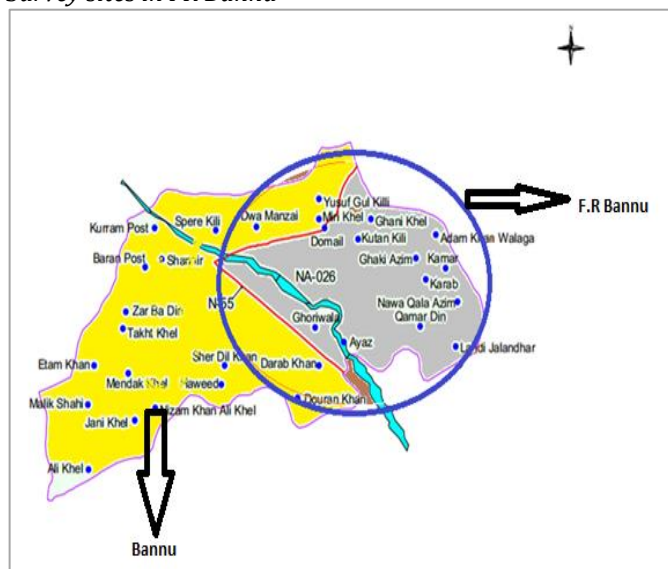
Cranes are large, long-legged and long-necked birds (Walkinshaw, 1973) of the Order Gruiformes and, Family Gruidae. Their height is ranging from 90 to over 150 cm; the smallest crane is the Demoiselle Crane (*Anthropoides virgo*) while the Sarus Crane (*Grus antigone*) is the largest member of the species (Archibald and Lewis, 1996). They have elongated and tapered bills, which are usually longer than their heads (Meine and Archibald, 1996). Most of the cranes do not have any feather on the upper half of their heads. Only the Blue Crane and Demoiselle Crane have red plumage on their heads while the rest are bald-headed (Schoff, 1991). There are two subfamilies of (Gruidae), the Crowned Cranes (Balearicinae) and the Typical Cranes (Gruinae). Up to now 15 cranes species are reported from all over the world which lives on five different continents (Harris and Mirande, 2013) The two surviving species of Crowned Crane are found exclusively in Africa (Urban, 1987). The Typical Cranes are classified into three genera: *Anthropoides*, *Buggeranus*, and *Grus*. The Demoiselle Crane

(*Anthropoides virgo*) and Blue Crane (*Anthropoides paradisea*) have short toes, beaks and live in grasslands like bustard (Archibald, 1976a, 1976b; Krajewski, 1989; Krajewski and Fetzner, 1994). Crane produces a wide variety of calls including low, purr-like Contact Calls, slightly louder Pre-flight Calls, purr-like or shrill Pre-copulatory Calls, groan-like or scream-like Distress Calls, scream-like plaintive Location Calls, abrupt Alarm Calls, and loud Flight Calls and Guard Calls. Cranes also produce loud, complex duets called Unison Calls (Allen, 1952; Masatomi and Kitagawa, 1975; Archibald, 1976a, 1976b; Voss, 1976) which have both sexual and threat functions (Archibald, 1976a). Cranes are omnivorous and some species depend greatly on aquatic foods (Walkinshaw, 1973). Demoiselle Cranes are primarily birds of dry grasslands (savannahs, steppes, and semi-deserts). They do, however, utilize agricultural fields and wetter steppe areas, and are normally found within a few hundred meters of stream and rivers, shallow lakes, depressions, and other natural wetlands (Winter, 1991; Yang and Tong,

1991; Fujita *et al.*, 1994). In Pakistan out of fifteen only four cranes' species have been reported which are Demoiselle cranes, Eurasian crane, Siberian crane and Sarus crane (Sorokin *et al.*, 2009). Threats to cranes population are geographically different which are continuously increasing because there are no effective approaches for the conservation of cranes (Perveen, 2012).

Figure 1

Survey sites in FR Bannu



MATERIALS AND METHODS

In order to collect information about the crane status the following methods and materials were used. The study was done in phases including a study area, formal interview, field survey and data analysis.

Study Area

This study was conducted in FR Bannu. Bordering the city of district Bannu in Khyber Pakhtunkhwa, KP, Pakistan with location coordinates 33.1031° N, 70.6693° E. The climate of district Bannu and FR Bannu is moist and hot. The main feature of climate is hot summer and severe winter. The average annual temperature is 23°C, month of June reaches up to 43°C and in December and January it falls to 10°C (<http://climatedata.org/climate/Bannu>, Retrieved 2016).

Formal Interview

In order to collect information from crane keepers, a questionnaire was designed, that contains all necessary questions and designs useful for gathering information about cranes biological status. Questionnaire was printed in Pashto, Urdu and English. Formal interview was arranged with local village crane keepers to collect deep and meaningful information's about cranes. Pre-tested and finalized before the actual survey was conducted. Various villages of FR Bannu were visited.

RESULTS

This study was carried out to know about the current biological status of Demoiselle cranes in local captives.

During this study 73 crane keepers, belonging to different villages in F.R Bannu were interviewed. In FR Bannu total of 131 active breeding pairs were found in captivity with them. The data was collected from them by filling questionnaire and was analyzed as follow.

Purpose of Keeping Cranes in Home

During this survey it was observed that hunters usually keep 2-10 cranes in their home. 70% of the crane's keepers were keeping Cranes for hunting while the rest 30% for aesthetic beauty.

Captive Breeding of Cranes in F.R Bannu

The research identified and interviewed 73 Demoiselle crane breeders in F.R Bannu. A total of 131 active breeding pairs were found in captivity with them. A total of 261 eggs were found to be laid by these breeding captive cranes. The incubation period of the eggs was ranging from 27-32 days with an average of approximately 29.1 days. Incubation was done by both the parents. Out of the total laid eggs 46 eggs (17.62%) were added. The number of eggs which were hatched successfully was 215 (82.37%). Out of 215 hatched eggs approximately 76.49% of the chicks survived while the remaining 23.51% died due to diseases and accidents. The chicks were very delicate and weak at the initial stages of their life. At the age of 15 to 25 days these were susceptible to various diseases because at this stage of their life they required much higher amount of energy for the development of their feathers (Table 1 and Fig 2).

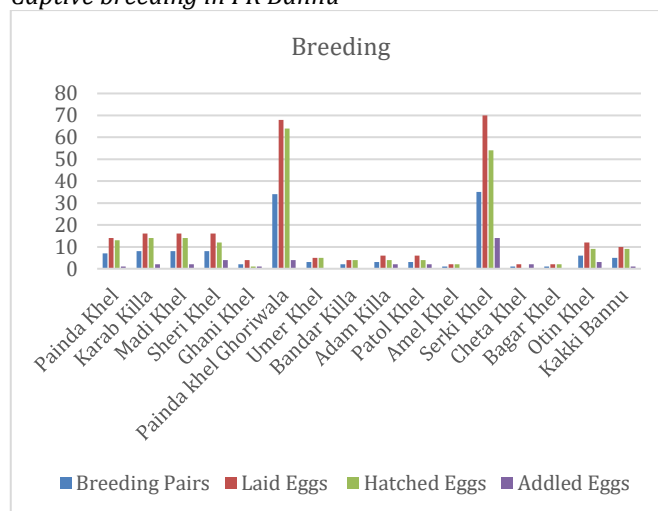
Table 1

Captive breeding in FR Bannu

No. of breeding pairs	No. of eggs obtained	Incubation period (average)	No. of eggs added	No. of eggs hatched	Young one survival rate (%)
131	261	29.1	46(17.63%)	215(82.37%)	76.49

Figure 2

Captive breeding in FR Bannu



Extra Eggs Laying Capacity/Multiple clutching

During this study it was identified that the Demoiselle cranes usually laid two eggs but have the ability to lay new

eggs after the removal of old ones. The period required for new eggs laying is 15 days when the eggs are removed at the time of laying. According to the crane keepers the Cranes can lay from 2-6 eggs after the removal of old ones, but they did not allow the Cranes for multiple clutching because it had bad effect on the health of the cranes and leads to calcium deficiency in them. If the cranes were physically strong and were fed with good food then multiple clutching had no serious effect on their health (Fig 3).

Figure 3

Eggs laying capacity after removal of old one

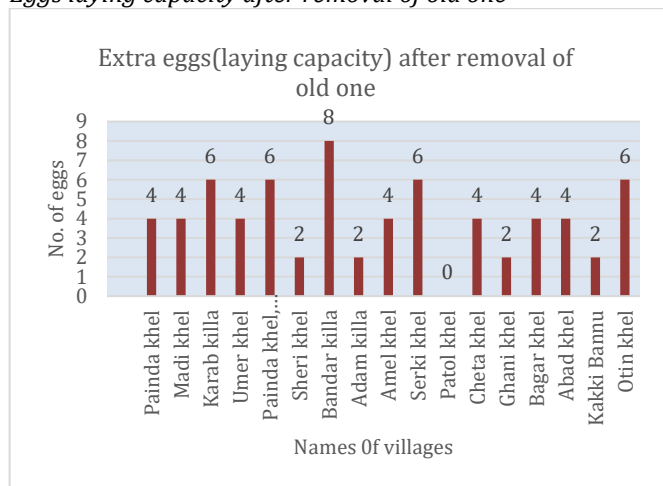
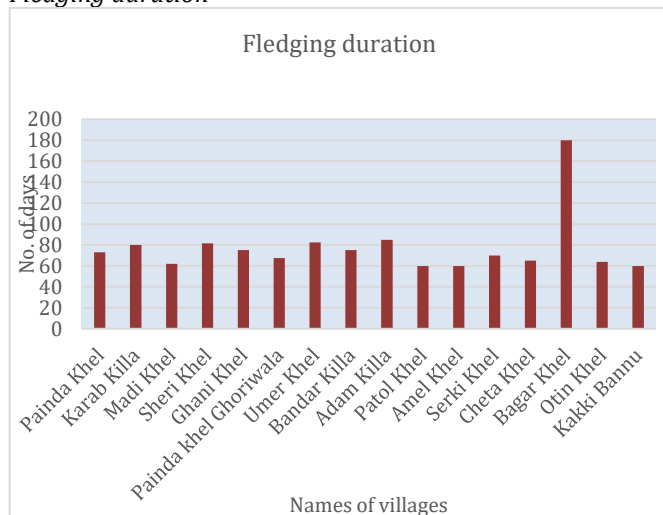


Figure 4

Fledging duration



Fledging Time

According to the performed survey the fledging time of young one's was ranged from 40-180 days with an average of 75.59 days depending upon the food and health status of the young ones. Most of the crane keepers said that the fledging time is 60 days. However it depends on the above two factors (food and health status). The protein rich diet causes obesity and weight gain in them and resulting in the bowing of their legs and also affect their fledging duration (Fig 4).

Survival Rate of Young ones

The survival rate of young ones was quite low as compared to the adult and its average is 76.49%. Large number of young ones/chicks died due to various diseases because

the young ones were very susceptible to the disease. Even if you treat them their mortality was still on the rise. Another cause of their death was imbalance food which the crane keepers gave to them. Most of them were died in the accidents involving electric wires, trees, and walls, as they are not mentally so mature as compared to their adults (Fig 5).

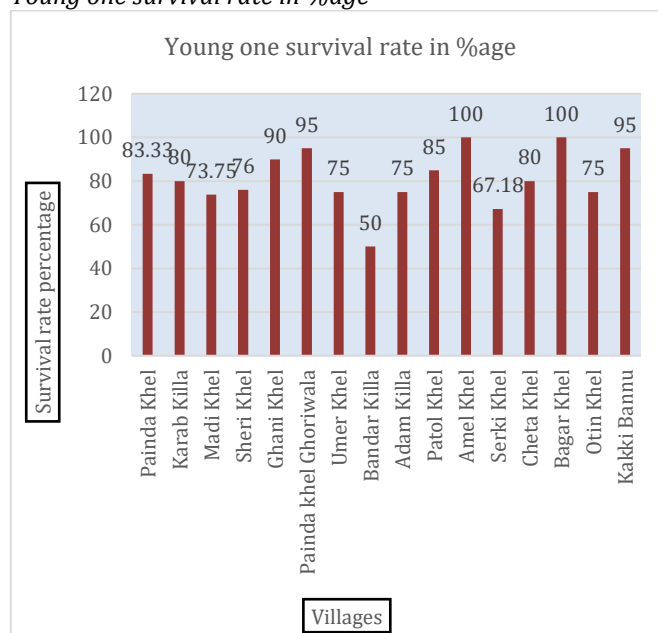
Care of Young Ones by the Crane Keepers

The research identified that the young ones were very delicate at the initial stages of their life and they need full attention and proper protection of the crane keepers. The various care strategies followed by the crane keepers are the following:

- Sometimes the young one's fight with one another and may cause the death of one or both of them due to excessive bleeding. In order to put them on safe side the keepers put them into separate cages or shades.
- Protection from environmental changes i.e. heat, cold, hail stones, wind, thundering etc.
- Protection from various predators and other animals e.g cats, dogs, rats, snakes, varanus, eagles, jackals etc.
- As they hatched in summer (April and May) so the living place is sprinkled regularly to keep it cool.
- Balance diet and inhibition of over feeding.
- Protection from various diseases.
- Immediate treatment when they suffer from any disease.

Figure 5

Young one survival rate in %age



- They keep the area clean and smooth so as they don't feel any difficulty in their walking.
- Provision of water's pitchers from which they drink water.

Survival Rate of Adult Cranes

The survival rate of adults was calculated which was an average approximately 100%. The research identified that the Demoiselle cranes can live as long as up to 150 years.

The main causes of their mortality were diseases and accidents i-e electric wires, road accidents, predators such as dogs, jackals etc. But the crane keepers kept their living grounds neat and clean so that the chances of diseases are very rare and if they suffered from any disease then an immediate treatment was followed. They usually cut their feathers so that they could not fly and were thus protected from various accidents.

Parental Care Duration

The protection of young ones from the predators and unfavorable circumstances is called as parental care. The survey identified that the parental care of the Demoiselle crane was approximately one year. They mostly started breeding in the March and April and they kept their young ones with them up to the upcoming breeding season.

Food of Adult Cranes

In this study it was observed that Demoiselle cranes fed on variety of food items: Wheat (100%), oily food (1.37%), milky food (1.37%), maize (1.37%), grasshoppers (26.02%), wheat bread (100%), spinach (1.37%), millet (34.24%) and lizards (20.54%) etc. But the most common ones which was given to all the individuals, were wheat (100%) and wheat bread (100%). While in some cases lizards were being given to them, especially when they were not feeling well (Table 2).

Food of Young Cranes

The young one was also fed by different kinds of food. According to the present study the food of young ones contained wheat, oily food, grasshoppers, wheat bread, nut, millet, lizards, cricket, egg yolk, meat, insects and small fishes etc. At the age of first two weeks their food mainly contained grasshopper, millet, meat (pigeon meat, hen intestine and cow meat). According to some people the millet accelerates the growth of their feathers and is given for the feather's development. The chicks were moving around their parents after hatching. The parents searched for different types of food (insects, various worms and small pebbles) in the farms and pick it in their bills and then gave them to their young ones. The most common type of food which the crane keeper preferred for the young ones was grasshopper (93.15%), insects (78%), meat (60.237%) and millet (60.27%) (Table 2 and Fig 6).

Figure 6

Food of adult and young cranes

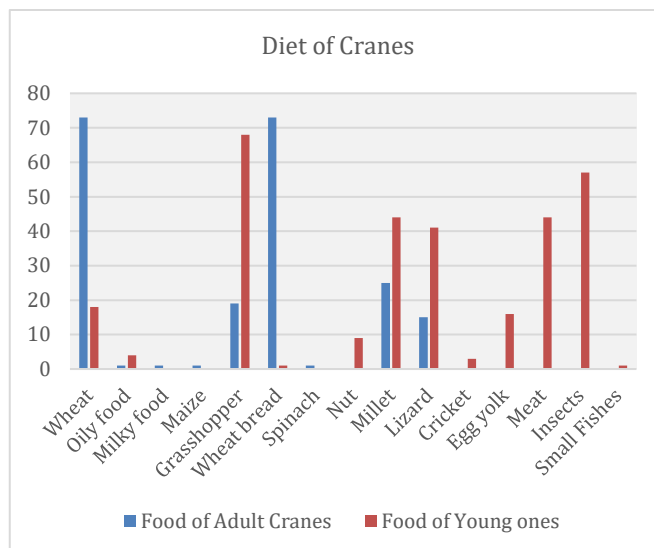


Table 2

Diet of captive Demoiselle cranes provided by the Crane keepers/hunters in FR bannu.

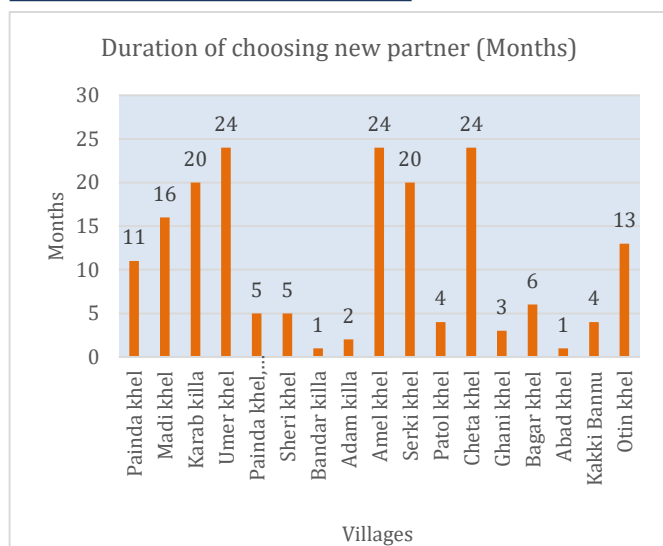
S. No	Food items	Adults	%age	Young one	%age
1.	Wheat	73	100	18	24.65
2.	Oily food	1	1.37	04	5.47
3.	Milky food	1	1.37	0	0
4.	Maize	1	1.37	0	0
5.	Grasshopper	19	26.02	68	93.15
6.	Wheat bread	73	100	01	1.3
7.	Spinach	1	1.37	0	0
8.	Nut	0	0	09	12.3
9.	Millet	25	34.2	44	60.2
10.	Lizards	15	20.5	41	56.1
11.	Cricket	0	0	03	4.1
12.	Egg yolk	0	0	16	21.91
13.	Meat	0	0	44	60.2
14.	Insects	0	0	57	78
15.	Small fishes	0	0	01	1.3

Habituation Time

During this study it was noted that the Demoiselle cranes took 5-12 months with an average of 9 months to become habituate with the new environment in the home. Initially they were placed in small cages and covered with cloth so they could not see the outer objects e.g humans, animals or any other because they felt fear for some days and started jumping in the cages on seeing those objects that may harmed them.

Figure 7

Duration of choosing new partner



Effect of Caption on Breeding of Cranes

During the visit of the research area a survey was carried out that revealed that the caption effect the breeding of the cranes because when they were captured, their pair bond which was formed in the natural environment get detached from each other and took a lot of time to make the pair bond with another. So in this way the caption badly effects their breeding and they can not breed for some years in captivity. However when the preexisting pair was captured then it could start breeding within few months but is situation in rare.

Parents' Behavior during Parental Care

The parents became very aggressive during the first few days. They did not allow any person, animal or any other object in their vicinity. When someone passed near it then they produced a loud sound and also their feathers were protruded out and they looked very dangerous/fearful. They also bite with their powerful and pointed bills when someone was trying to touch their young ones.

Duration of Choosing New Partner

The research identified that the cranes are monogamous. However when one member of the established pair dies then they establish a new pair bond with another opposite sex. Sometime they don't form another pair bond throughout life after the death of one individual. The time required for establishing new pair bond ranges from 10-24 months with an average of approximately 10 months. Sometimes it can take up to 10 years. According to some Crane keepers it depends upon the cranes, if the breeding female survive then it will take 15 days or one month for establishing new pair bond. Some crane keepers said that it also depends upon the season, if they are brought together in May then they will take one month (Fig 7).

Preparation for Breeding

During the survey it was observed that the Demoiselle cranes took 1-12 years with an average of approximately 7 years to prepare themselves for breeding. After caption they took some time to adopt themselves with the new environment in the home and then they started searching for suitable pair. So, in this way they required a lot of time for breeding (Fig 8).

Figure 8

Time taken by new pair up to breeding (average)



DISCUSSION

This study was carried out to know about the current status of captivated Demoiselle cranes FR Bannu. During this study 73 crane keepers, belonging to different villages in F.R Bannu were interviewed. In FR Bannu total of 131 active breeding pairs were found in captivity with them. Hunting is most common practice in these areas and most of the locals are involved in hunting of cranes.

In the present study majority of the hunters reported that the best timing of hunting of Demoiselle crane is late night. During the day time the crane flies very high from earth, so it becomes very difficult for the hunters to trap the crane. Nawaz *et al.*, (2006) reported similar observation, according to them the cranes trapping possibly takes place at night time. Rainy and dark night is more suited for trapping of cranes though some attempts also made on Moon night too.

From the present study it was reported that most of the hunters use Soya method for hunting, which was reported by 78.75% hunters while the same study was also formulated by Tariq and Aziz (2015). According to them most of the hunters use soya and gunfire as a hunting tool. Similarly Meine and Archibald (1996) reported that in Pakistan tame cranes are used by the hunters for attracting wild migratory cranes. The cranes are hunted with the help of soya as well as gunfire.

According to them the hunters hunting the crane for fun or as a hobby without economic interest. Similar results also found by Tariq and Aziz (2015), they also found that the basic reason of cranes hunting and trapping was just a recreational activity for the hunters. Most of the hunters considered that it is symbol of pride and honor, so they hunt and keep the crane as pets. Jan and Ahmad (1995) reported that Demoiselle Cranes are hunted most extensively primarily for sport, but occasionally for food in Pakistan and Afghanistan.

From the present study it was observed that the status of the Demoiselle crane in last five years in FR-Bannu decreasing. The hunters said that during the past a large number of demoiselle cranes were migrating but unfortunately at the present very small number of Demoiselle cranes are passing through this area and not comes down for feeding. Tariq and Aziz (2015) found in their research that the migratory flocks of the Cranes has been decreased by 95% in last 15-20 years in the district

Karak. Beilfuss *et al.*, (2007) acquired similar result in Africa; he found that the wild population of Grey Crowned cranes has been reduced by 50%-75% over last 45 years.

In the present study it was found that the major threats to the Demoiselle crane in FR Bannu are overhunting, Habitat loss (grassland and wetland degradation) and Afghan war. The similar result was also found by Tariq and Aziz (2015) and also Parveen and Khan (2010) but only one thing which was most crucial by present study is Afghan war because the cranes migrate to Pakistan through Afghanistan and due to occupation of Afghanistan by U.S.A, a large number of heavy war weapons are being used which has led to change the migration path of the cranes.

It was showed in the present study that the Demoiselle cranes usually lay two eggs but also have the ability to lay new eggs after the removal of old ones. According to the crane keepers the Cranes can lay 2-6 eggs after the removal of old ones, but they don't allow the Cranes for multiple clutching because it has bad effect on the health of the cranes and leads to calcium deficiency. The study conducted by Koga (1976) and Putnam and Russman (1987) had similar observation with the present study. They reported that multiple clutching in cranes may lead to calcium deficiency, uncalcified eggs laying, slow growth rate, and reduced chick survival and hatchability. Nakayama (1967) reported that rate of egg laying under captive conditions may be increased by removing the eggs of White-naped Cranes (*Grus vipio*) each time when it is laid. Putnam and Russman (1987) reported a seasonal reduction in the weight from first egg to last egg in most of the crane species. Similarly, Hunt (1994) reported that last eggs of the season were less likely to produce fledged chicks than the earlier eggs.

The feeding habits of cranes was a very important aspects of this study. The crane keepers reported that the adults Demoiselle cranes fed on variety of food items: Wheat, oily food, milky food, maize, grasshoppers, wheat bread, spinach, millet and lizards etc. but the most common ones which was given to all the individuals, were wheat and wheat bread. The lizards are given to them, especially when they are not feeling well. The present study show some similarities with study conducted by Sarwar *et al.*, (2013) in Lakki Marwat on wild cranes in their natural habitat. The food acquired for young ones

contains plant materials, insects and small fishes (Chekmenev, 1960). Demoiselle crane primarily consumes seeds, especially grass seeds, but also readily eats large insects, worms, and lizards (Johnsgard, 1983).

Our study indicate that the survival rate of young ones (Demoiselle cranes) is quite low (76.49%) as compared to the adult (100%). A large number of young ones/chicks die due to various diseases because the young ones are very susceptible to the disease. Most of them are also killed by the accidents with the electric wires, trees, and walls etc. as they are not mentally so mature as compared to the adults. Shaw *et al.*, (2010), also reported that power-line collision is one of the main cause of mortality in cranes. They conducted a study on Blue Cranes *Anthropoides paradisea* in the Western Cape of South Africa. According to them the Blue Cranes are highly susceptible to collisions with power lines.

There were many limitations in this study. As the crane capturing and smuggling is an illegal act so the local people were very reluctant to provide information and they were suspecting the researcher as a wildlife inspector. Most of them had many pairs of cranes but they would not admit and would say that they have one or two pairs.

CONCLUSION

Serious measures are required to be taken in order to stop crane hunting in these areas. As the hunting and pouching of Cranes are increasing in these area which are strongly effecting their population and migration pattern. They have changed their migratory route as most of the locals of the area are involved in hunting. At the same time the locals are also involved in firing on them for enjoyment. As a result they have change their routes and are passing through this area very rarely and only a few cranes in the season can be seen. Now a days the cranes don not come down for feeding due to hunting and firing. Public awareness program should be arranged to educate the illiterate hunters as well as the locals of these areas. Seminars should be arranged about the captive breeding of cranes. Such techniques should be given to the people which are increasing the multiple clutching (increased egg laying capacity) of the cranes.

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