Population Structure and Seasonal Migratory Patterns of *Aquila Nipalensis* (Steppe Eagles) at Korangi Creek Area, Karachi (Sindh) Pakistan

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ABSTRACT

Population of winter migrant Steppe Eagle *Aquila nipalensis* is estimated in Korangi Creek Area, Karachi (Sindh) Pakistan from October till March each year 2014-2019. Maximum count of 1012 was recorded in January 2017. The site with plenty of food supply is favorable for these winter migrants to stay in this area. Due to hot weather of Pakistan, long summers and Short Winters the timing of arrival and departure is affected but no marked difference is observed in the population size of migrants. Ratio of young eagles is high as compared to adults and their migration time is also varied. Roosting sites have also been observed. No poisonous drugs have been observed. The energy lines are the main cause of death and injuries.

Keywords: Karachi, Pakistan, Steppe Eagle, winter migrants, Population size

INTRODUCTION

Pakistan is a rich and favorable area for the migratory birds as well as native birds (Nadeem, 2004). According to the data published by UNEP, 2014 Pakistan harbored more than 400 species of migratory birds. Siberian region's birds migrate to oriental region via various aviary routes to keep themselves safe from the risk of predation as well as to bear the extreme winters in the Pakistan (Umar et al., 2018). Approximately 1 million birds has been estimated to migrate and cover the distance of almost about 4500km (2800 miles) every year via International Migratory bird route number 4. According to the observation of Sheikh and Kashif, (2006) the migratory birds get their way into Pakistan in the month of September and continue to arrive until November while they live till February to March and after passing winters start leaving the ground. The birds uses the Indus fly route, over the Karakoram, then from Suleiman mountain ranges to Indus delta near the Arabian Sea (Sheikh and Kashif, 2006). In Pakistan, Sindh province is considered very ideal and suitable niche for the different variety of birds, most importantly aquatic birds, due to its habitat which comprise of various water bodies. Millions of birds emigrate from different parts of the world during the winter season every year. Pakistan is the wintering site for the long distance raptor migrant, *Aquila nipalensis* (Family: Accipitridae), commonly known as Steppe eagle. The weight of steppe eagle is 2.4-3.9 Kg while its length is 63-81 cm and wing span is of 1.65 to 2.15 meter. The anterior portion of Steppe eagle's body is of brown color, neck or throat is pale yellow, whereas, the flight and tail feathers are black. This is eagle of large size and long life, lived up to 41 years in captivity (Del Hoyo et al. 1994). Mebs and Schmidt, (2006) stated that the female laid 1-4 eggs, which incubate for 45 days and the young ones lived in nest for about sixty days. The specie is playing a key role in maintaining the ecosystem, being a higher trophic level species. It is higher trophic level species therefore performs a key role in shaping natural ecosystems. It controls pest population by eating rodents and disposes of carrion (Bird life International 2015b). It is listed as endangered species due to rapid population decrease in last decades, especially inside Europe (Birdlife International 2015). In 2016, the important raptor specie has been added in the list of Appendix 1 of the convention on the conservation of migratory species

(CMS) of wild Animals. In the European part of Russia, the population size has declined by 92% in 30 years from 15,000-25,000 pairs in 1990's to 1200-1900 pairs (Karyakin et al., 2016). Its decline outside Europe is not a rapid rate to reach at vulnerable. But outside Europe this species is also facing threats which includes habitat destruction, poisoning by use of pesticides in fields, illegal hunting, persecution, mortality of juveniles and collision with energy power lines. The rapid decline across much of steppe eagle's global range suggested a decline of 58.6% between 1997-2011 and 2013-2015 and the overall population is estimated to less than 37,000 species (Karyakin et al., 2016).

Long distance migration has fascinated humanity for thousands of years. Steppe eagle is the largest Palearctic bird species to overwinter regularly and in large number in Africa South of equator (Meyburg et al., 2003). Ferguson- Lee's and Christie, (2001) investigated that South Eastern Europe, South West Russia, Central Asia, Trampaikalia, Northern Kazakhstan, the Aral Sea, Mongolia and Northern Tibet are the breeding grounds of Steppe Eagle. Whereas, I t spends the wintertime in South Africa and Eastern Africa with less in the Mideast and Indian subcontinent down to Myanmar. Very less work has been done on the migratory patterns of Steppe eagle in Asia. It is the most common eagle in Asia that migrated to the Indian sub-continent via the central Asian flyway (Bildstein, 2006). This species leaves its breeding ground between Aug and October and returns between January and May (Welch and Welch 1991, Ferguson-Lres and Christie, 2001).

MATERIAL AND METHODS

Geographical Location of Pakistan

Pakistan lies between 23 degrees 35 minutes to 37 degrees 05 minutes North latitude and 60 degrees 50 minutes to 77 degrees 50 minutes east longitude. It touches the Hindu Kush Mountains in the north and extends from the Pamirs to the Arabian Sea. Sindh is located at 25.8943° North and 68.5247° east (Ghalib et al., 2018).

METHODOLOGY

The steppe eagle have been counted from October till March each year 2014-2019 with the 8X25 binoculars and Canon Camera is used for photography. The time of observation was 04 hours daily in morning from sunrise till 09:00 am. At this time eagles were busy foraging and flying near to ground at the watch site and can easily be counted. In Table 1 the maximum number of observed species has been given for each month and year. The basic motive is to study and count the total number of migrants Steppe Eagle winters in the area. Point Transect method is used to count species.

Table 1. Maximum steppe eagle at Korangi creek count of Area.

Months	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	P-Value
Sep	180	200	250	240	210	0.000
Oct	670	510	700	681	690	0.000
Nov	1340	1670	1520	1810	1440	0.000
Dec	1910	2050	2430	2515	2000	0.000
Jan	1807	1900	2090	2000	1702	0.000
Feb	846	920	990	998	890	0.000
Mar	300	390	380	407	360	0.000

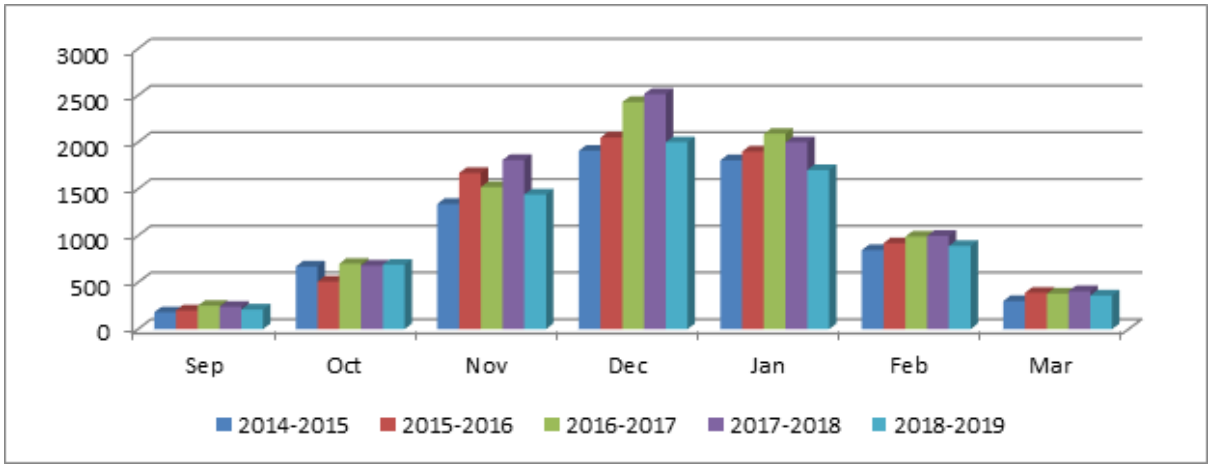

Figure 1. Maximum steppe eagle at Korangi creek count of Area.

Source: Authors' illustration

Table 2. Average number of steppe eagles of different age groups observed during the study period at Korangi Creek Area.

Age group	2014-15	2015-16	2016-17	2017-18	2018-19	Mean	P-Value
Juvenile	700	730	800	810	600	728	0.000
Sub adult	410	400	680	696	500	537	0.001
Adult	800	920	950	1009	900	916	0.000

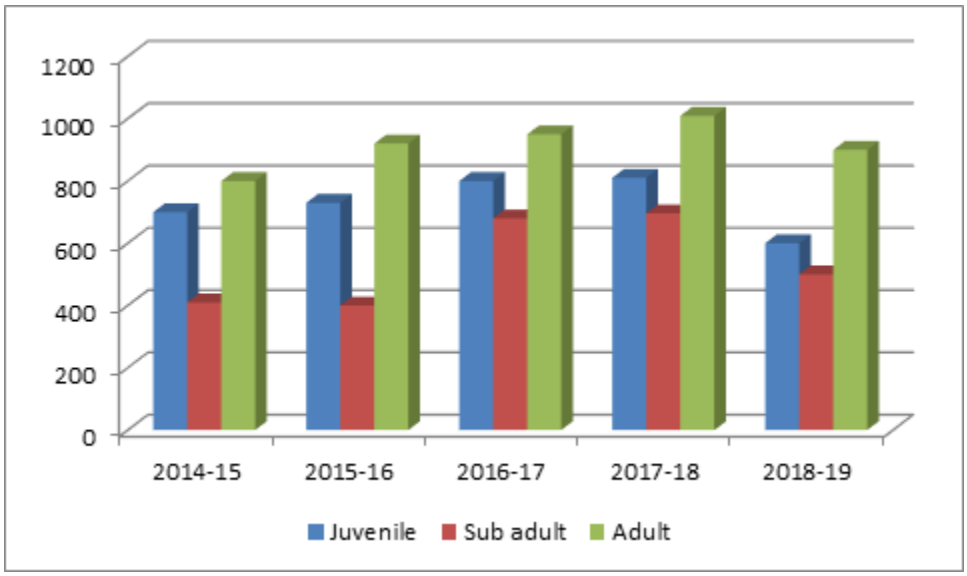

Figure 2. Average number of steppe eagles of different age groups observed during the study period at Korangi Creek Area

Table 3. Number of Steppe Eagle observed on the basis of gender during the study period.

Gender	2014-15	2015-16	2016-17	2017-18	2018-19	Mean	P-Value
Male	1000	1100	1380	1410	1200	1218	0.000
Female	910	950	1050	1105	800	963	0.000

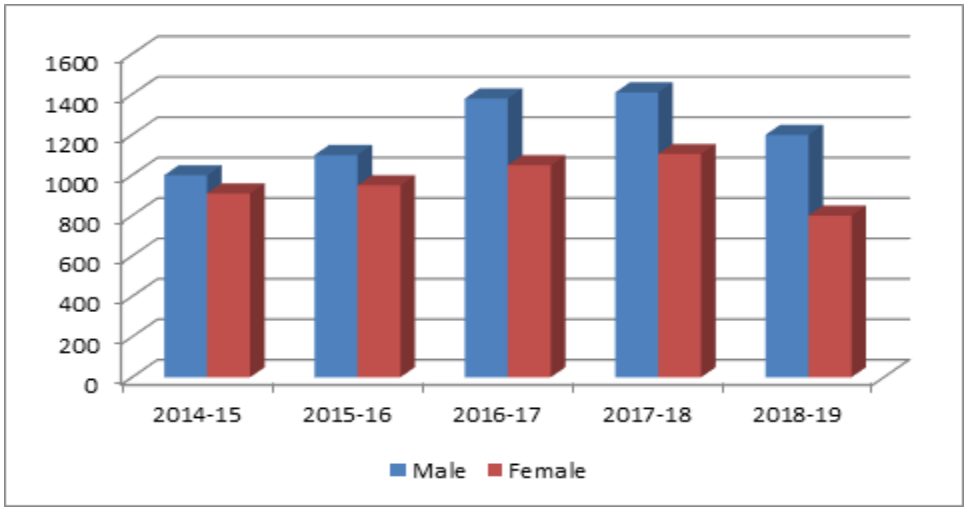

Figure 3. Number of Steppe Eagle observed on the basis of gender during the study period

RESULT AND DISCUSSION

Steppe eagle *Aquila nipalensis* regularly winters at Korangi Creek Area, Karachi (Sindh) Pakistan. They arrive in October and stay up to March or April months. Their ratio is highest in December and January suggesting that the migration from their breeding grounds starts in September and after wintering in the area starts autumn migration in late April as weather starts changing. They reach in small flocks. The maximum population was recorded (n= 1012) in January 2017. Current Population data shows slight fluctuations in numbers of individuals each year. Due to rapid climatic changes in last decade late arrival and early departure of the winter migrants has been observed.

Majority of the eagle population were juveniles. It is estimated that migration of adults and sub-adults is less in number as compared to juveniles and youngs. There is a difference in the timing of migration as well . Young eagles arrive earlier in their wintering grounds while adults arrive in mid of November and also leave earlier,in late February towards their breeding grounds and young start Autumn migration in late March or April. In the month of December and January population size is high with a mixed population of young and adults while in other months the number of young eagles is comparatively abundant. In East Africa Tanzania which is also a wintering ground of steppe eagle, large concentration of adult, juveniles and immature birds has also been observed in December and January (Meyburg et al., 2003). Genetic diversity of the steppe eagle decreases as we move to the East - younger and minimum haplotypes found (Karyakin et al., 2016).

According to Gaston et al., 2000, the accessibility of nutritional supplies throughout the year in wintering sites has a significant influence on population of migratory birds. Steppe eagles were active as they got plenty of food at the watch site due to the presence of numbers of marriage halls in the area which dump wasted food there and become a source of providing food to the raptors. Many eagles observed foraging at Morning in flocks though they are solitary feeders and don't show any type of territorial behavior but 30 to 50 eagles could

easily be observed at a distance of every 5 to 6 meters where food is available. This is the main reason for their abundance in the area. According to many experts, birds migrate to various places based on nutritional resources (Scott, 1991), site is favorable for feeding, nesting or breeding (Umar et al., 2018), variation throughout the different seasons (Lank et al., 2003) and to keep them safe from any danger and predation threat. (Shirazi, 1993). Many roosting sites have also been observed.

No eagle has been observed sick or affected with any kind of poisonous drug or pesticides but few numbers of eagles found dead and injured due to the collision with high power energy wires and collision with the traffic. Power Lines are hazardous to birds during migrations and in winter. Greater collision risk is associated with lines cutting across landscape features and in areas where birds congregate in high numbers (Andriushvhenko Yu and Popenko, 2012). The impacts of collision may be particularly evident along migratory routes (Huppop et al., 2006). During a research period of 5 years, an average of 25 eagles found dead or injured each year which then were taken to Parasitology Lab University of Karachi, Karachi for hospitality of injured and dead were dissected for the study of endoparasites.

Present Research suggested that there is no marked difference is observed in total number of the steppe eagle population in last five years which indicates that there is no threat of population decline to this species in its winter ground. But it can be hypothesized that global climatic changes will definitely affect or alter the migratory patterns and timing of migration in next decade.

Recommendations:

More research is needed on the population size, migratory patterns, and migratory routes and on convention and conservation of steppe eagle especially in Pakistan. The necessity to take precautionary measures to prevent bird death on breeding grounds and migration routes is much needed for the conservation of species. Satellite telemetry studies required to know the migratory routes.

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