

# Seasonal variation in the population of Cattle Egrets (*Bubulcus ibis*), Inhabiting the Arid Zone of Rajasthan

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## Abstract

It is important to know the population size of a species for ecological studies. Counts of birds are used for many purposes in a variety of field studies. Simple presence or absence information suffices to study avian biogeography, but indices of abundance are needed to track the changing mix of species population associated with plant succession. Still other studies as of trophic dynamic require knowledge of population densities. Based on a pilot study of consecutive 5 days counts of the Egrets at the roosts sites selected it was henceforth assumed that the average number of Egrets at any one roosts remains more or less constant for a period of at least three week. Each census was carried out during first two weeks of the month. It was assumed no radical overlap of individuals among the different roosts in the study area. The flock size of the Cattle Egret varies significantly with seasons. Thus conclusion can be drawn that the dispersal of the egrets depends upon climatic conditions affecting food availability.

**Keywords:** Cattle egret, Communally., Roost sites, Meterological

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## INTRODUCTION

It is important to know the population size of a species for ecological studies. Counts of birds are used for many purposes in a variety of field studies. Simple presence or absence information suffices to study avian biogeography, but indices of abundance are needed to track the changing mix of species population associated with plant succession. Still other studies as of trophic dynamic require knowledge of population densities. There are several methods to census the terrestrial birds (Ralf and Scott 1981, Davis 1982). However, any census

technique is not absolutely perfect for population estimation of diverse avian species, because each census technique has advantages and disadvantages (Pyke 1986, Pyke and Recher 1985,). Some methods are accurate, some are fast, some are fun and same bird census techniques pose special methodological problems (Bull 1981, Dawson 1981). Many factors could influence applicability of census method, such as habitat type weather condition, time of census, effect of observer, and behaviour of species (Conant *et al.* 1981, Robbins 1981, Skirvin 1981, Verner 1985 and Koen 1988). Many Indian bird species roost communally. Since the Egrets are fairly large size bird, it is easy to count individuals at roost sites when the species aggregates as per its communal roosting habit. A tendency of the bird to return in fairly equal numbers from one night to the following at the selected site was noticed during the pilot study. This behaviour was considered in designing the study method to cover all located and identified roost site monthly to perform a population census, including individuals scattered in the study area. According to Chavda (1988) aggregations of the Egrets are larger and more stable at the roosts than on the feeding grounds. Referring to this method, it is more

reliable to carry out a census at roosts sites than on the foraging ground, though the Egret is a flocking feeder. Wards and Zahavi (1973) reported that the birds which feed together usually roosts together. The birds select as their roost site locations nearest to their feeding sites (Gadgil and Ali 1974). Hence it was deliberated that for *flock feeding Egrets* direct counts obtained at roosts might give a most reliable census result. This method was earlier applied by Davis (1982), Chavda (1988) and Lathigara (1989). In present study the method was standardized and census was carried out for long period to understand the trends in population fluctuation. Population of Cattle Egret is also estimated every year at various aquatic habitat in India and Abroad as a part of Asian water fowl census (AWC) conducted by Asian wetland Bureau (AWB). In the present study seasonal variations in the population of the Cattle Egret were studied. Comparison was made between the population estimated by the direct count method at terrestrial habitats and counts at aquatic habitats. The counting of the Cattle Egret in and around Laxmangarh city of arid zone of Rajasthan was carried out by using various methods as mentioned in material and method.

## MATERIAL AND METHOD

The study was carried out in and around Laxmangarh city, Rajasthan, India covering 400 sq. Km area. The study area was surveyed and roosts sites located either by following the flocks of Cattle Egret returning from their feeding grounds to night roosts or by listening to their calls from roost sites early in the morning and by gathering information from the local people. Observations were made with the help of a binocular (Olympus 10 X 50) at the distance of about 40-50 meter from the roosts to avoid interruption of the birds behaviour. All observation was made in clear weather. Data on rainfall, temperature and humidity were collected from the meteorological department of Sikar /Jaipur to seek any affect inclement weather may have on the population's fluctuation. The population of the Cattle Egrets was decided by using counting at roosting site, counting at foraging site and flight line method. Other methods like nest counting method, point counting method and transect counting method were considered improper due to specific size and behaviour of the Cattle Egret. Based on a pilot study of consecutive 5 days counts of the Egrets at the roosts sites selected it was henceforth assumed that the average number of Egrets at any one roosts remains more or less constant for a period of at least three week. Each census was carried out during first two weeks of the month. It was assumed no radical overlap of individuals among the different roosts in the study area. Numbers of Egrets at roosts were counted either during late evening or early

mornings. Evening counts were started about 2 hour before sunset with no birds in roosts, and continued until dark. Morning counts were started before sunrise when all night roosters were present. Each Egret Lacking Orange neck and dark brownish orange buff in breeding season and prominent yellow/black iris was considered to be a Juvenile bird so it was possible to census the population of young individuals separately from the nature birds. The numbers of egret at all active roosts were recorded every month and the total of the roosts was treated as a population.

## RESULT

Total 30 roost sites were identified in the study area of which 16 were located in the urban area and 14 in the rural area. All of the sites were monitored once a month to record the birds at each site. Birds were counted at roosting on Khejadi, Bargad tree during day time. They were also counted at roosting on Neem, Peepal and mostly on Babool during night. It was found that number was relatively higher from June to September in 2010, 2011 and 2012(Table 1). However, the number was highest from June 2010 to Aug. 2010 and lowest from June 2011, to August 2011(Figure 1). Figure 2 highlight the population trend of juvenile and adult Egret during the study period. The maximum number of adult was noticed in the rainy month of every year. A sharp decline in the juvenile population was observed from January 2011 to May 2011. Maximum 31 juvenile birds were observed in the month of May 2011, June 2010 and November and December 2011 while the minimum 7 juveniles were observed in March 2012. There was not a single month when we did not find juvenile Egrets. Figure 3 highlight a positive relationship between the size of the Egret population and rain fall during rainy season. The population of the Egrets attained maximum average 95.83 SD $\pm$  16.28 during 2010 when the study area received 796 mm of rain, whereas population was found to lower average of 102.41 SD $\pm$  20.70 in 2012 when the study area received 957 mm of rain. In 2011 rainfall was 576 mm and above the average but population was 98.25 SD $\pm$  26.13 and noticeably lowers in comparison to previous year (Table 2). An average of 98.83 SD $\pm$  1.73 Egrets were recorded during the study period of 36 months from January 2010 to December 2012, with slightly lower number averaging 77.54 SD $\pm$  5.06 during high rainfall in 2010 and 2012 and slightly higher but consistent number averaging 79.41 SD $\pm$  10.75 during low rainfall year of 2011. Table 3 depicts that an average 38.08 SD $\pm$  10.72 and 37.41 SD $\pm$  7.35 Egrets were recorded during 2010 in rural and urban area respectively. While it was X: 70.54 SD $\pm$  24.88 and 86.59 SD $\pm$  21.80 in 2011, X: 53.51 SD $\pm$  18.21 and 51.41 SD $\pm$  13.75 in 2012 in rural and urban

area respectively. They showed a strong preference for the rural area for roosting in 2010, 2011 and 2012 while in 2011 bird showed preference for roosting in urban area. However, there was no much great difference in preference for rural and urban area during the study period of 2010 to 2012. An average  $68.67 \text{ SD} \pm 8.95$  and  $72.58 \text{ SD} \pm 11.43$  and  $72.83 \text{ SD} \pm 18.43$  Egret were recorded in rural and urban area respectively during the study period of January 2010 to December 2012. Figure 4 depicts that in overall study period of 36 months from January 2010 to December 2012 the bird preferred rural roosting sites in 24 month and urban roosting sites in 12 months and in two month rural and urban preference was same. The maximum number of Egrets 143 individuals, occurred in the month of July 2011. But in general the population remained more or less constant with seasonal variations involving dispersion during winter and aggregation during the monsoons. Maximum 31 Juvenile birds were found in the month of May, June 2010 and November and December 2011. The lowest number of juveniles occurred in the month of March 2010 and January 2011.

## DISCUSSION

The population of the every one bird follows fluctuations as per climatic changes, so Cattle Egrets also show the fluctuations. The population count of this bird through three methods viz. counting at roosting sites, at foraging sites and during flight shows seasonal variation. The number of the birds was found maximum in rainy season and minimum in winter and summer seasons. The reason of comparatively more number during rainy season may be due to high prey availability. Kushlan (1976) also reported similar tendency of some wading birds to aggregate at sites of high prey availability in favorable season. It can be stated that the species would be expected to be more packed as environmental variation decreases, resulting in monophagia (May and Mcarther 1972). Data presented in Figure 1 show that the population of the Cattle Egret was maximum during the rainy seasons of 2011 to 2012 while it was comparatively low in the rainy season of 2010 due to low rainfall in this year. The population of this bird was medium during the summer season and low during the winter of 2010-12 it may be due to low availability of food during these seasons. Data of Figure 2 indicate that there is direct relationship between rainfall and the number of population of the Cattle Egret. Because good rainfall results in the availability of insects as food to the bird. However, low rainfall during 2011 could not improve the number of birds in the rainy season of this year. The diet of Cattle Egret suggests the bird is largely a generalist, including, macro invertebrates and human garbage e.g. food scrapes

etc. Similar observations have been made in sacred egrets also (Ali and Ripley 1987, Maddock 1993). The generalist nature of the Egrets in diet decided its population in different microhabitat in different seasons. Data of Figure 3 show that there were some correlation between the availability of food in the rural and urban area of the study area and the population of the Cattle Egrets. The number of Egrets was comparatively more in rural area during winter and rainy seasons as the bird tends to feed in the sand dunes, grazing fields and agriculture fields in these seasons. In summer the birds confine to the waste water bodies, Municipal garbage dumping station in the nearby area of the city i.e. the urban area. The flock size of the Cattle Egret varies significantly with seasons. Similar correlation is also reported in little Egrets and herons. The ability to exploit diverse feeding grounds enables the Egrets traverses both natural and man-made microhabitat. The scattered form of flocking during a normal rainfall year would allow the birds to forage in a variety of grounds, such as grazing field, agricultural form houses and waste water bodies. An exact opposite situation occurs in the drought period. A phenomenon of the normal rainfall results in unlimited food supply which leads to provincial emigration. However, lower rainfall restricts the useable foraging grounds, leading to the utility of limited resources, such as municipal garbage dumping station, waste water bodies, sand dunes and animal dead bodies dumping station in rural area. That is why higher numbers of individuals prefers roosts in close proximity of feeding sites in the rural area. Even distribution of the bird's supports this hypothesis that aggregation or dispersion is related to the availability of food resources and species would be expected to be more packed as environmental variation decreased, resulting in monophagia. Thus conclusion can be drawn that the dispersal of the egrets depends upon climatic conditions affecting food availability. As breeding virtually ceases in winter, solitary breeding pairs tend to aggregate at communal roosts with their offspring which increases the strength of flock size. Recorded aggregation of the herons and Egrets at certain roosts sites just after the breeding season. This behaviour plays a potential role in the learning and social structure for the juveniles. They can follow the search and exploitation techniques of the adults during the period of potential limited resources in the shorter days of winter. Post winter is a beginning of the breeding season for the majority of the avifaunal species all over the world. Besides heat regulation and its ant predation mechanism, a communal roosts influences pair formation and pair bonding for the following breeding season. Observation by Hilaludin *et al.* (2003, 2005) on the nesting and courtship behaviour of the Cattle Egret and herons on the

roosts supports the probable fact of communal roosting provides better mate selection and flow of stronger genes in future generations. During good rainfall years, insect fauna and aquatic habitat flourish well. Apparently such situations encourage breeding dispersion during the pre and post winter periods and with the normal bumps and busts the recruitment of young egrets at communal roosts

during the winter. And finally, by and large conservative practices, religious attitude of multi millionaire people of the area and biodiversity of the Rajasthan state supports continuance of a substantive number of the birds in both urban and rural area with periodically internal variations depending on climatic changes, food availability and breeding strategies.

**Table 1:** Month wise population of Cattle Egret January 2010 to December 2012 at roosting sites

Year Month	2010			2011			2012		
	Juvenile	Adult	Total	Juvenile	Adult	Total	Juvenile	Adult	Total
January	07	50	<b>57</b>	04	68	<b>72</b>	08	65	<b>73</b>
February	04	54	<b>58</b>	06	74	<b>81</b>	07	69	<b>76</b>
March	06	75	<b>81</b>	05	74	<b>79</b>	05	72	<b>77</b>
April	08	78	<b>86</b>	04	65	<b>69</b>	09	90	<b>99</b>
May	10	101	<b>111</b>	17	95	<b>112</b>	13	89	<b>102</b>
June	10	121	<b>131</b>	19	98	<b>117</b>	12	101	<b>113</b>
July	13	110	<b>123</b>	11	125	<b>136</b>	16	120	<b>136</b>
August	16	125	<b>141</b>	13	130	<b>143</b>	15	95	<b>110</b>
September	12	95	<b>107</b>	10	128	<b>138</b>	14	99	<b>113</b>
October	10	85	<b>95</b>	16	79	<b>95</b>	11	110	<b>121</b>
November	08	80	<b>88</b>	14	50	<b>64</b>	12	91	<b>103</b>
December	09	63	<b>72</b>	18	55	<b>73</b>	10	96	<b>106</b>
<b>Total</b>	<b>113</b>	<b>1037</b>	<b>1150</b>	<b>137</b>	<b>1042</b>	<b>1179</b>	<b>132</b>	<b>1097</b>	<b>1227</b>
Average monthly population	9.41	86.41	95.83	11.31	86.83	98.25	11	91.41	102.41
Population	$\pm 2.017$	$\pm 18.46$	$+\_16.28$	$\pm 2.52$	$\pm 24.98$	$\pm 26.13$	$\pm 07.23$	$\pm 17.51$	$\pm 20.70$

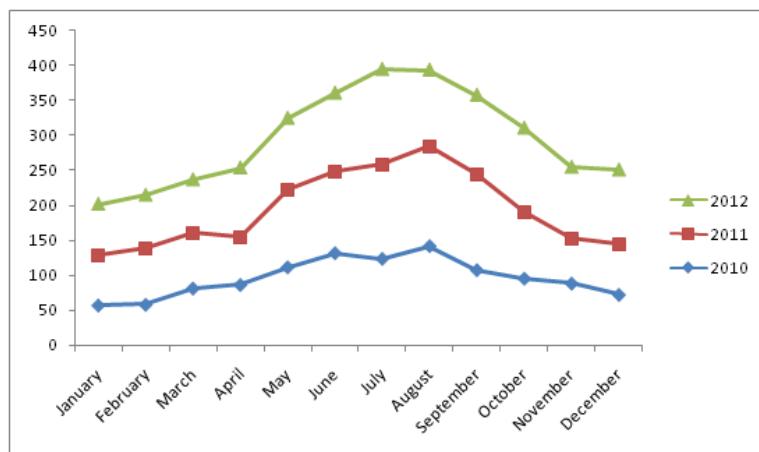
**Table 2:** Annual populations of the *Bubulcus ibis* recorded at the study area and occurrence of rainfall during the same period

Year of observations	Population	Rain fall (mm)
2010	X: 95.83	
N = 12	SD $\pm$ 16.28	796.3 mm
2011	X: 98.25	
N = 12	SD $\pm$ 26.13	576.7 mm
2012	X: 102.41	
N = 12	SD $\pm$ 20.70	957.9 mm

N indicates number of observations per year.

X indicates average number of the Egrets.

SD  $\pm$  indicates standard deviation.



**Figure 1:** Month wise population trend of the Cattle Egret from January 2010 to December 2012.

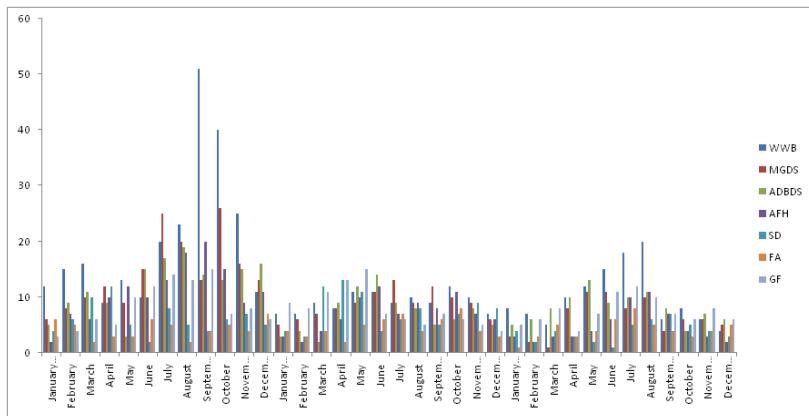


Figure 2: Graph showing correlation between rainfall and population of Cattle Egret from January 2010 to Dec. 2012

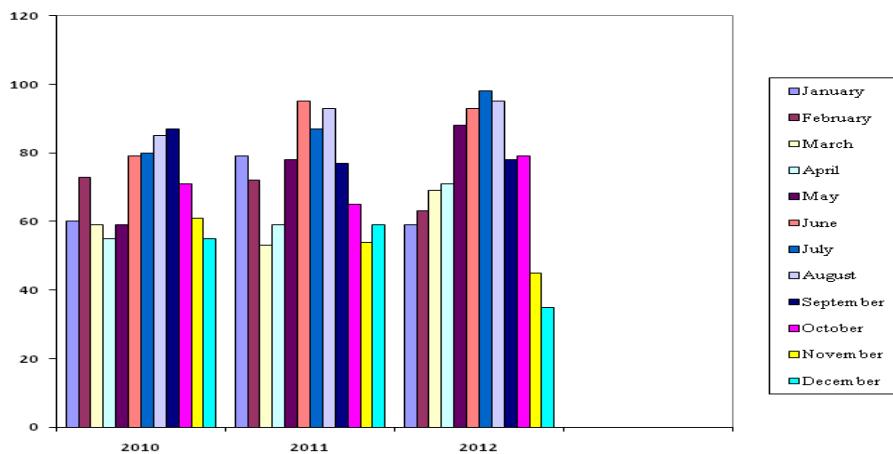


Figure: 3 Month wise population of the Cattle egret from January 2010 to December 2012 in rural and urban roost site

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