Human and Greater Adjutant *Leptoptilos dubius* Interaction in Guwahati Garbage dump, Assam

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Abstract : ***This study was focused on the interaction between human and Greater Adjutant Leptoptilos dubius, sharing the same urban and human modified habitats. How different age groups of rag pickers show differences in their perception towards approaching L. dubius for food. A questioner survey along with Focal animal sampling method was used for the study of human and L. dubius interaction in Guwahati garbage dump (GGD). The differences in the interactions were also grouped for their mean occurrences per hour throughout the annual biological cycle of L. dubius. The results were found to show significant differences in the occurrence of interactions per hour among age groups of human and across different biological seasons of the species.***

IndexTerms - Ciconiidae, Rubbish dump, behaviour, ethology.

INTRODUCTION

Urban environments are well known shelter for many wild species across the world (Belant, 1997; Luniak, 2004; Adams, 2005; Warren et al., 2006; Goddard et al., 2010; Lowry et al., 2013; Machovsky-Capuska et al., 2015). The sustaining of all such wildlife in an urban environment is because of continuous food supply from human generated wastes and their discards (Orams, 1994; Hockings and Sousa, 2012; Schlacher et al., 2013; Newsome et al., 2015; Newsome and van Eeden, 2017). On the other hand, some processes have been often reported to affect the avian community adversely in the urban environments (Bowman and Marzluff, 2001; Marzluff, 2001). Many stork species are known to be utilize human discarded food from landfills (Hoyo et al., 1992; Hancock et al., 2011). Such as White Stork *Ciconia ciconia* (Blanco, 1996; Ciach & Kruszyk, 2010; Tortosa et al., 2003), Marabou *Leptoptilos crumenifer* (Kahl, 1966 a & b; Monadjem & Bamford, 2009; Pomeroy, 1973, 2008), and Greater Adjutant *L. dubius* (Mandal & Saikia, 2013; Rahmani et al., 1990; Saikia & Bhattacharjee, 1996; Singha, 1998). Highly urbanized habitats are often dominated by human beings and their animal groups. In Guwahati garbage dump (GGD), *L. dubius* have well been associated with other species of birds, as well as with other animal groups such as human along with their cattle and stray dogs (Saikia, 1995; Singha, 1998; Mandal and Saikia, 2013).

The relationships between these hetero-specific foraging animal groups and their community structure are least known. The human working as rag pickers in GGD also live close to it along with their cattle and livestock. The GGD is often utilized by these livestock for food. Thus adding to the density of hetero-specific animal community of the site. This study focuses on the interaction between human and *L. dubius* utilizing the same habitat. Further, it also focuses on the interaction differences across biological cycle of *L. dubius*.

METHODS

A questioner survey was conducted among the rag pickers in GGD situated in West *Boragaon* of Kamrup (Metropolitan) District of Assam. The questions were designed mainly to understand the interaction (positive and/or negative) between rag pickers and *L. dubius* in their largest urban foraging habitat in Brahmaputra valley. Total 31 respondents with varying age group between 21 – 45 years were interviewed individually over a period of two months. Out of 31 respondents, 19 were female and 12 male rag pickers. The respondents below 20 yrs age were not taken in consideration for the study. Apart from this *L. dubius* were also observed and their interaction to human and working vehicles at the site were recorded using (Altmann, 1974; Altmann and Altmann, 1977) method for 15 minutes. A total of 268 focal samples, monthly 35 (40 in March and 30 in November) were taken. The annual biological cycle of the species was divided into four biological seasons [1] *pre-breeding* (August and September), [2] *breeding* (October – March), [3] *post-breeding* (April and May) and [4] *non-breeding* (June and July). Then the differences in the inter-annual interactions flushing occurrences were also recorded. Further observations were also made on the working human and vehicles and total number of retreat occurrences of *L. dubius*.

Analysis of Data

The independent variable Kruskal-Wallis H test was done between the two sex categories of respondents in order to determine the variations on their understanding towards the species. The retreat and flush distance from the rag pickers during different biological seasons of the species were analysed using 1-way ANOVA followed by Tukey test in order to determine the significant differences between these seasons. All analyses were performed in R (R Core Team, 2013).

RESULTS AND DISCUSSION

The foraging *L. dubius* flock in GGD found to well adapted in presence of rag pickers and other hetero-specific animal groups as well as the working vehicles. Though, they maintain a differential threshold distance from different age group as well as gender of rag pickers. The *L. dubius* were found to more reluctant in presence of woman than man and children. Similarly, there were differences in the human perception towards the species. Such differences were much visible across the different age class of rag pickers. The age class of respondents found to show significant differences towards the perceptive distance from *L. dubius* while working on the dump ($\chi^2 = 7.94$, $P = 0.05$). The *L. dubius* were benefited from the rag pickers, because while collecting necessary recyclable materials using the metal hook, edible food components often get exposed. Thus, facilitative to the foraging *L. dubius* to acquire food component easily from the heap of rubbish. Similar results were also observed for dumping trucks and dumpers. The *L. dubius* found to follow such dumping trucks on arrival at the dump for food. On the other hand, *L. dubius* on approaching very close to rag pickers often chased away using the metal hook. Such threats were mostly given by children and human males when afraid. Such response to working rug pickers and vehicles by *L. dubius* for food was an imprint, learned and conditioning behaviour.

The close approach to rug pickers and working vehicles often results in conflicts showing agonistic retreats. The frequency of occurrence of retreat per hour from rag pickers were found to be variable across the annual biological cycle of the species (Fig. 1). Similarly, the mean occurrence of retreat per hour from the rag pickers were also variable. It was observed highest during breeding season of the species (5.72 ± 0.02), followed by non-breeding, pre-breeding and post-breeding 4.82 ± 0.05, 4.00 ± 0.05 and 3.18 ± 0.04 seasons respectively (Table 1; Fig. 2). Similarly, the frequency of occurrence of retreat per hour from vehicles were found to be variable across the annual biological cycle of the species (Fig. 3). The mean occurrence of retreat per hour from the vehicles were also variable. It was observed highest during non-breeding season of the species (2.09 ± 0.04), followed by pre-breeding, breeding and post-breeding 1.82 ± 0.04, 1.74 ± 0.01 and 1.27 ± 0.03 seasons respectively (Table 1; Fig. 4). The overall retreats from rag pickers and vehicles show significant differences across annual biological cycle of the species (1-way ANOVA, $F_{264} = 2.92$, $P = 0.05$). Pair-wise comparisons showed that the occurrence of retreats during non-breeding was significant*l*y lower than in breeding season (Tukey test, $P = 0.05$).

Table 1: Differences in the mean occurrences of retreats per hour of *L. dubius* from rag pickers and vehicles in Guwahati garbage dump.

Biological cycle	From rag pickers (Mean ± SE)	From vehicles (Mean ± SE)
Pre-breeding	4.00 ± 0.05	1.82 ± 0.04
Breeding	5.72 ± 0.02	1.74 ± 0.01
Post-breeding	3.18 ± 0.04	1.27 ± 0.03
Non-breeding	4.82 ± 0.05	2.09 ± 0.04

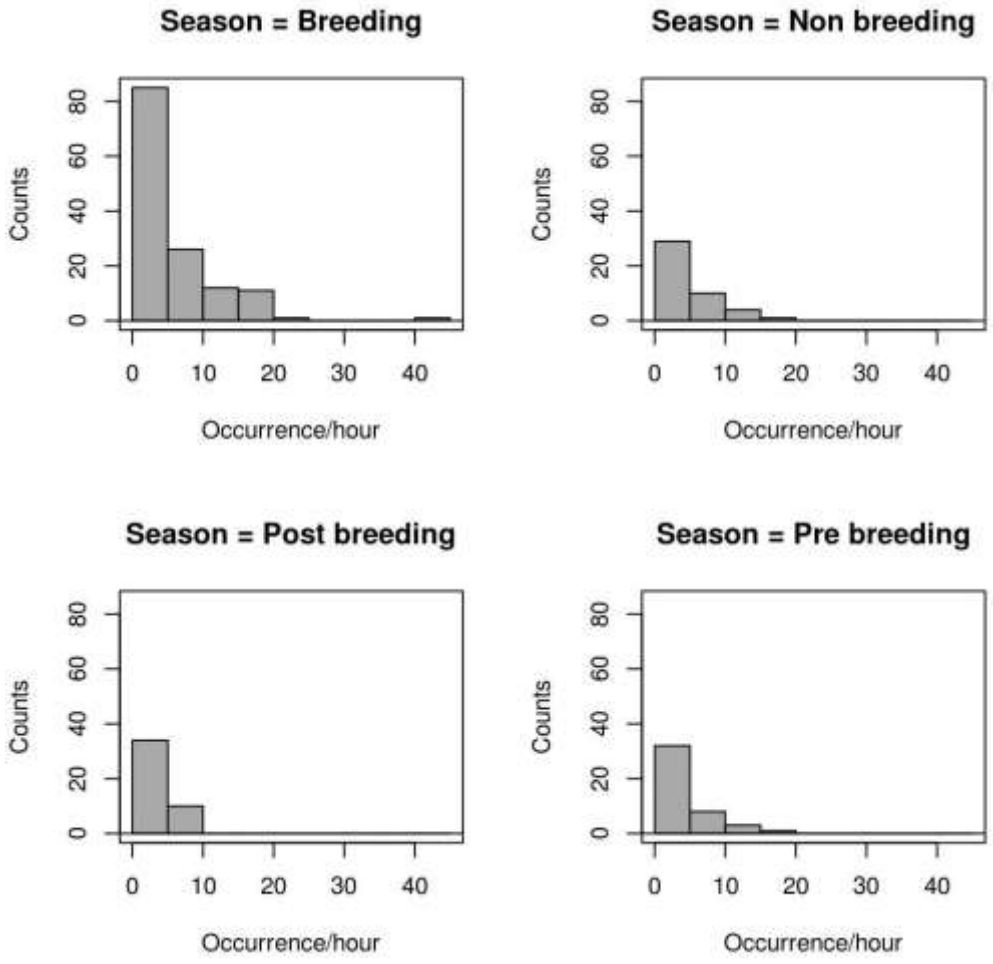

Figure 1: Frequency of occurrence of retreat per hour from rag pickers during different biological cycle of foraging *L. dubius* in Guwahati garbage dump.

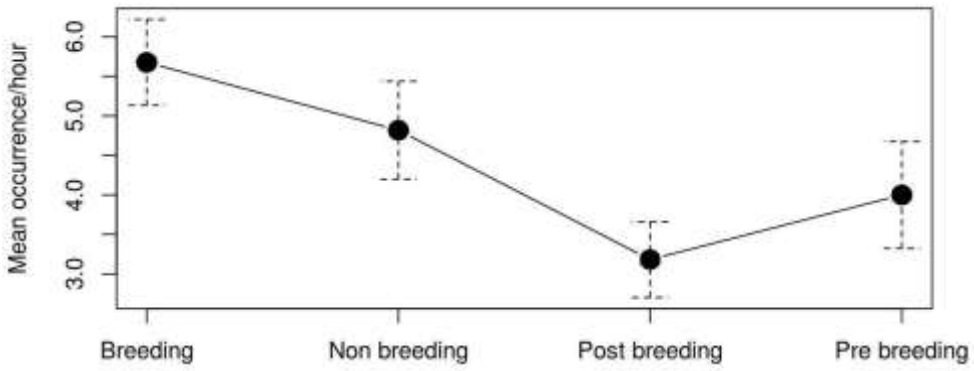

Figure 2: Differences in the mean occurrence of retreat per hour from rag pickers during different biological cycle of foraging *L. dubius* in Guwahati garbage dump.

There were differences in the perception and response of rag pickers towards the foraging *L. dubius* in GGD. Majority of respondents (58.06 %, N = 31) never driven or chased away the bird species, of which 52.63 % were female and 66.67 % male respectively (Table 2). According to 94.74 % female and 91.67 % male, *L. dubius* has fallowed them while collecting recyclable materials. Similarly, 57.89 % female and 66.67 % male responded of exposing consumables for *L. dubius* while collecting recyclable materials from the dump heaps (Table 2).

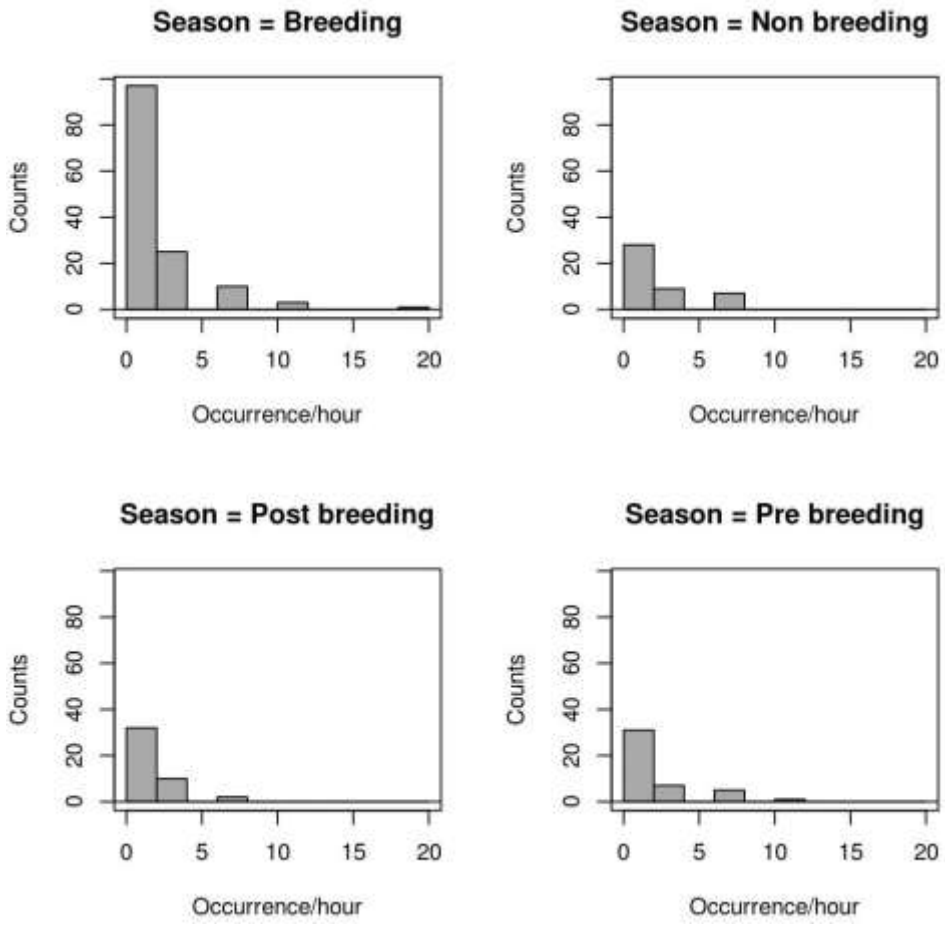

Figure 3: Frequency of occurrence of retreat per hour from working vehicles during different biological cycle of foraging *L. dubius* in Guwahati garbage dump.

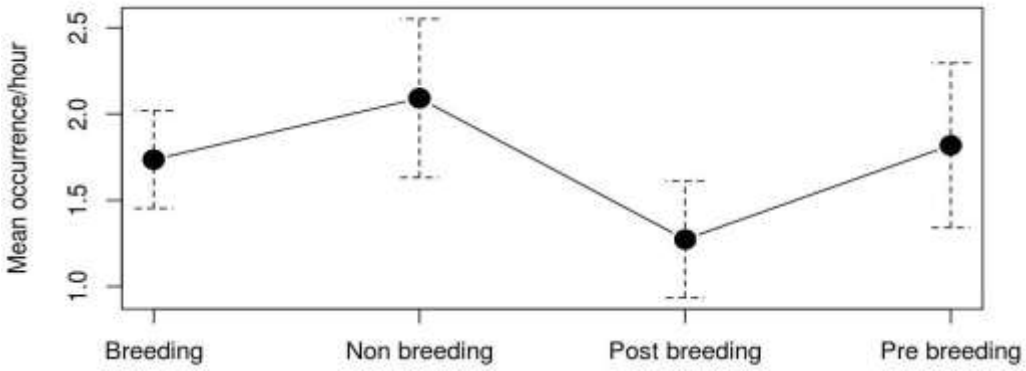

Figure 4: Differences in the mean occurrence of retreat per hour from working vehicles during different biological cycle of foraging *L. dubius* in Guwahati garbage dump.

Table 2: Differences in the perception and response of rag pickers towards *L. dubius* in Guwahati garbage dump.

Variables	Response	Female (%)	Male (%)
Chased/driven away	No	52.63	66.67
	Yes (intentional)	05.26	00.00
	Yes (unintentional)	31.58	16.67
	Not sure	10.53	16.67
Observed to fallow	Yes	94.74	91.67
	Not sure	05.26	08.33
Exposed food components	Yes	57.89	66.67
	Not sure	36.84	41.67

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