

## Interspecific Behavioral Studies of House Crows (*Corvus splendens protegatus*) and Jungle Crows (*Corvus macrorhynchos culminatus*) on Mutual Foraging Sites

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**Abstract:** The Indian subcontinent has two distinct sub species of crows namely Jungle (*Corvus macrorhynchos culminatus*) and House crow (*Corvus splendens protegatus*). The current study depicted the interactions between the Jungle and the house crows while foraging food. Sites for the investigation were the areas recently depleted or cultivated with forest or grassland and recently urbanized towns, which provided mutual foraging territories for both the Jungle and the House crows. For our observations, we chose three regions: Mumbai and surrounding Western Ghats (coastal); Tirupati (forest); and Katpadi (semiarid) regions of peninsular India and the studies were carried out from July 2009 to April 2010, covering monsoon, post-monsoon, dry, winter and summer seasons. Results portrayed that effective communication was present between both species upon finding food deemed as 'interactions', however Jungle crows portrayed more aggressive and competitive behavior towards House crows when food or perching area was scarce, thus portraying competitive behavior.

**Key words:** Perch • Urbanization • Deforestation • Aforestation • Refuse

### INTRODUCTION

The crows are a distinct species of birds, which are found almost in every continent of the world except Antarctica. Two sub-species of crows thrive in the Indian peninsular region, namely the common House crow (*Corvus splendens protegatus*) and the larger and darker Jungle crow (*Corvus macrorhynchos culminatus*).

The crows are both omnivores and scavengers, who forage food in places where garbage is dumped or where abundant prey is found. Their diet consists of rodents such as mice, rats, squirrels and fruits such as berries etc [1]. Both the Jungle and the House crows feed on the refuse thrown away by humans in cities and villages [2].

Studies have shown that the House crows prefer urban environment for residing due to the presence of city refuse which provides an easy source of food. They often stay in places with abundant tree cover in urban areas for nesting, roosting and breeding purposes [3]. This behavior enables them to adapt in any kind of environment.

The American crow (*Corvus brachyrhynchos*) has adapted from rural and urban environments in a span of 50 years in the United States [4]. It was also observed that

the nest-defense behavior varies among the urban and rural organisms belonging to same species, in rural areas the crows are less habituated to the presence of humans near their nesting sites unlike their urban counterparts which avoid humans when approached.

The Jungle crows prefer to stay in forests or tree covers outside urban areas compared to House crows, which prefer staying inside or near urban areas [2]. They prefer more rural or country environment for roosting and breeding.

Studies undertaken by Morishita *et al.* [5] have shown that crows travel more distances during non-breeding season than in breeding seasons for searching food.

Both species of crows are known for stealing chickens, eggs and fledglings of other birds for feeding. Crows are very intelligent species among birds; Crows often employ techniques such as mobbing and pecking other birds and stealing their food. They are also very intelligent and their cognitive capability is similar to that of chimpanzees [6]. Both these species have been documented to be highly invasive and adaptive to the urban environment [7, 10]. Crows are extremely protective of their nest and portray aggressive behavior towards both humans and predators [9].

In countries such as Japan, the Jungle crows were found to be highly antagonistic against the Carrion crows (*Corvus corone*) and vice versa, when they interacted with each other in their own territories [8], their population has also been on a constant rise due to more amount of refuse [10].

The Indian subcontinent hosts both the species of crows. In some areas, afforestation or deforestation and urbanization of towns into cities has attracted both the species of crows to forage food in the same sites. The current study focuses upon the interactions of these two species in such areas.

## MATERIALS AND METHODS

**Field Survey for Finding Mutual Foraging Sites:** In order to randomize the effects of various parameters such as effects of seasonal change, moisture content, humidity, effect of sun on circadian rhythms of birds, effects of altitude etc., three regions were elected to carry out field studies. The suburbs of Mumbai and the surrounding rainforests of Western Ghats provided an ideal forest cum urban environment for both the species of crows to coexist. This region is also prone to monsoon rains and has moderate coastal climate, hence tolerating less varying temperatures.

The Katpadi town and contiguous semi-arid regions were chosen as a representative region for the Deccan plateau. Unlike other regions, it obtains non-monsoon rains during the month of November and December. Recent afforestation and subsequent urbanization has made it an ideal place for observing the behavior of both the species of crows in one place.

The city of Tirupati and surrounding areas was chosen as a place of observation due to higher altitude, recently cleared forests for urban development which attracted both the species of crows for feeding and rummaging in the same region.

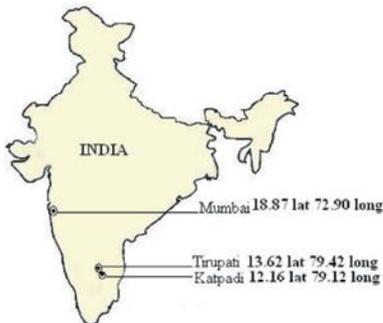


Fig. 1: Diagram depicting the regions chosen to carry out the studies

**Method of Observation:** Behavioral studies were carried out through observation of both Jungle and House crows on mutual foraging sites from 4:00 hours to 20:00 hours. Precautions were taken to maintain a distance of at least 20 meters to minimize human intervention. About seven areas were chosen in each region with varying tree cover/grassland percentage and the studies were carried out thrice a week alternatively. The areas having tree cover and refuse (food) were measured [11], in order to observe the effect of tree cover and area of refuse on the behavior of crows.

The behavior was studied by calculating the total number of Jungle and House crows at a particular area (mutual foraging site where the urban refuse is dumped) in the whole day and counting the number of times behavior such as clawing, pecking, repelling, cawing or communicating etc. displayed by either of the species.

We performed randomized behavioral study, by observing entire population of crows present in the sites, as it is cumbersome to carry out individual behavioral study. We did not statistically investigate interspecies behavior at nesting sites as it we have focused our observations more upon the competitive behavior of both the species on survival rather than reproduction. The current study aims at studying the interspecies behavior of Jungle and House crows in common foraging sites.

## RESULTS

The following Figures 3, 4,5 respectively, portray the fact that seasonal changes or conditions have little or no effect over the behavior of both the species. We found out that neither coastal conditions (which are less varying) nor extreme conditions (such as Tirupati and Katpadi's climate) change the overall behavior of the crows. We have depicted in the following figures the interspecies behavior of Jungle and House crows in the respective areas.

We have depicted observations based on the effect of area of refuse on the population and inter-species behavior of Jungle crows and the House crows. The studies were taken randomly in all seasons in order to determine unbiased and overall behavior of these two species. The interface where both the species perched onto the area of refuse without displaying any aggressive behavior while vocally cawing for indicating the presence of food was considered as normal interactions. Clawing, pecking, flapping of wings was deemed as aggressive behavior.

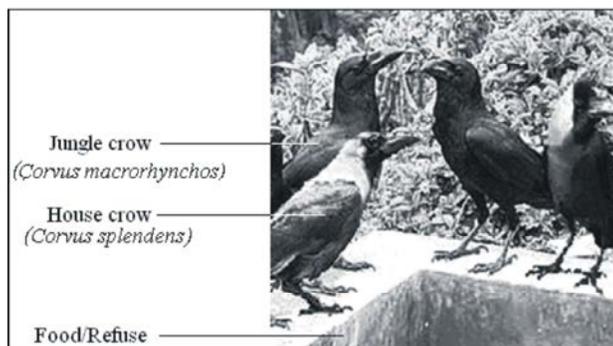


Fig. 2: Diagram depicting the mutual foraging site (MFS)

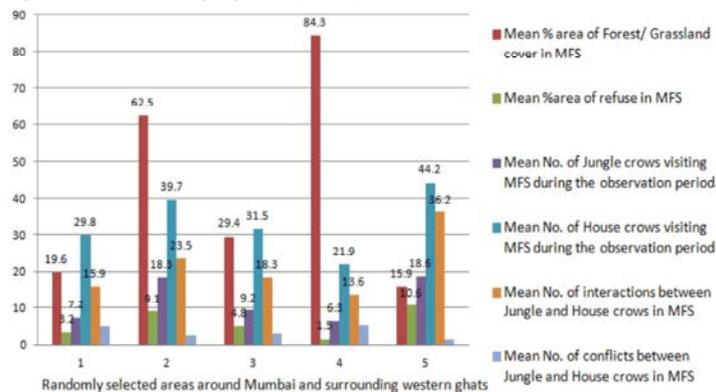


Fig. 3: Interspecies behavior of Jungle and House crows in Mumbai and surrounding western ghats

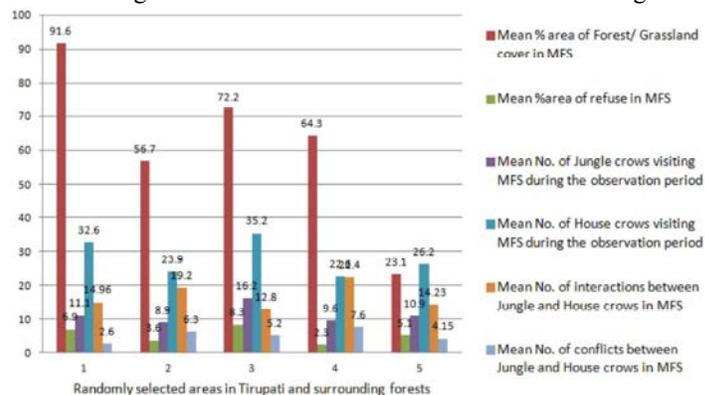


Fig. 4: Interspecies behavior of Jungle and House crows in Tirupati and surrounding forests

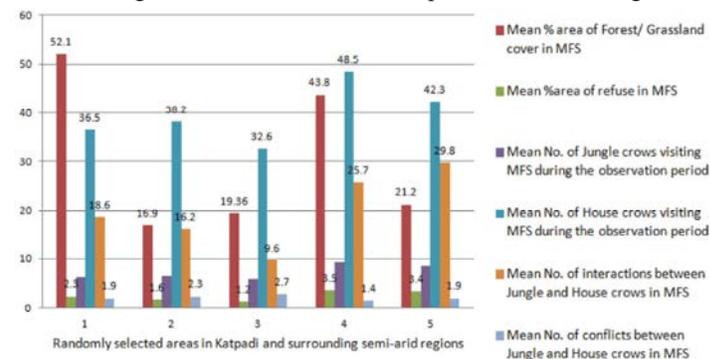


Fig. 5: Interspecies behavior of Jungle and House crows in Katpadi and surrounding semi arid regions

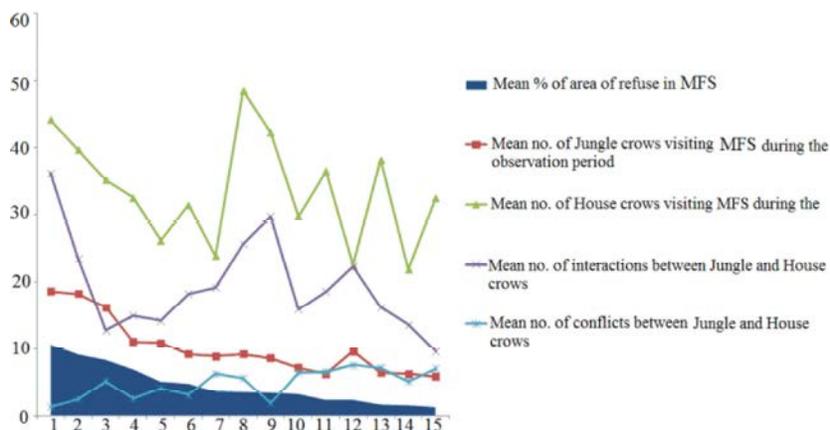


Fig. 6: Graph depicting the inter-species behavior of Jungle and House crows in mutual foraging sites based on decreasing value of individual areas of refuse. (MFS: Mutual Foraging Site)

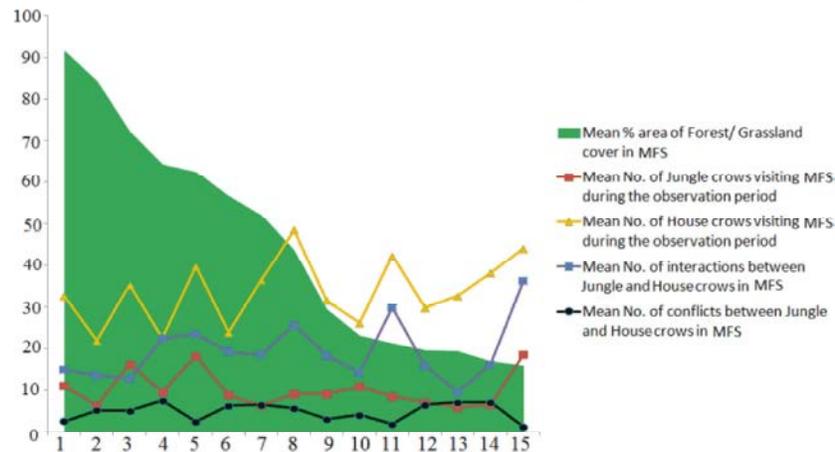


Fig. 7: Graph depicting the inter-species behavior of Jungle and House crows in mutual foraging sites based on decreasing value of individual areas of forest/ grassland. (MFS: Mutual Foraging Site)

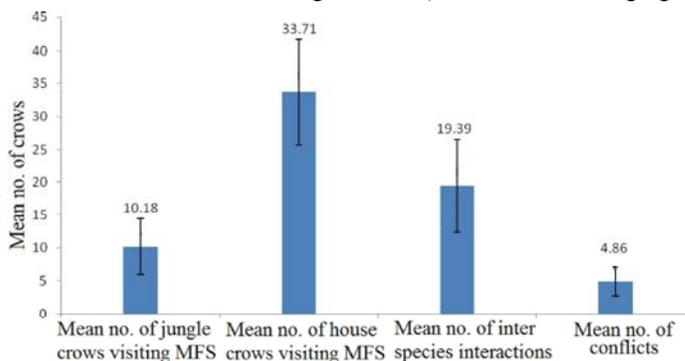


Fig. 8: Graph depicting the overall mean population and behavior of crows in mutual foraging sites (MFS)

We compared the interspecies behavior of Jungle and House crows based upon the area of refuse. Our studies showed that Jungle crows displayed aggressive behavior when the area of refuse became scarce (Figure 6).

We also compared the effect of percentage area of forest/ grassland cover on the behavior of Jungle crows towards House crows. We did this in order to observe the effect of native environments on the behavior of both species (Figure 7).

We calculated the overall mean of population of crows along with their interactions.

About 25.06% of the interactions showed aggressive behavior by Jungle crows against House crow. The basic aggressive behavior was pecking, hovering over the victim by flapping the wings and sometimes clawing.

## DISCUSSION

We observed that Jungle crows displayed more aggressive behavior compared to the House crows. This behavioral pattern was seen consistent in all the seasons and irrespective of the tree/ grassland cover percentage. We considered this parameter to observe the variation in population of crows due to surroundings and the effect of the population on their behavior. However the House crows did not display any aggressive behavior at the common foraging sites. The effect of trees cover on behavior of crows was little.

The areas covered by refuse or food had a near direct effect over the population of the crows. The increment in the amount of refuse or food attracted more number of crows to the foraging site. A 'repulsion zone' was observed in both the species when the food was abundant; however this repulsion zone was minimized when lesser amount of food was available which often lead to conflicts amidst both species. Inter specific aggressiveness has been studied in other intelligent species such as Great Bahamas bank dolphins and Lesser Bahamas bank dolphins [12].

Both the species have showed excellent usage of tools however, they show poor self recognition and treat the mirror images as conspecifics by flapping wings and pecking. Hence, they have similar intelligence and behavior as opposed to magpies (*Pica pica*) which have shown higher self recognition capabilities [13]. In fact, studies by Emery *et al.* [14]. have shown convergence of intelligence in Corvids and Apes. The studies portray that both Apes and Corvids have similar cognitive ability.

The Jungle crows were found to display aggressive nature such as pecking, clawing, flying overhead and flapping wings, whenever the food/refuse was less. However in some exceptional situations the aggressive behavior of House crows was also observed. However this cannot be considered when it came to interspecies behavior of the crows in nesting sites. Both species displayed aggressive behavior at their respective nesting sites.

Larger animals eat things unavailable to smaller competitors, but the reverse is much less true. It is usually conjectured in the literature that success of capture follows a normal type curve; i.e., a predator can prey on a particular size with highest efficacy, sizes larger and smaller with slightly less efficiency and so on [15]. However when the species are of similar sizes and eat similar or same kind of food, competition and conflict arises amongst those species. Our results substantially prove this phenomenon.

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